Bridging Borders and Economies: The Transformative Role of Foreign Immigration in Late Qing China's Yangtze River Delta

Bridging Borders: Immigration in Late Qing China's Economy

12 JANUARY 2025

THE UNIVERSITY OF HONG KONG

Submitted to Undergraduate Economic Review

Table of Contents

Bridging Borders and Economies: The Transformative Role of Foreign Immigration in Late Qing China's Yangtze River Delta[1]

Mengkun Qi[1], Jiahe Yue[2], Shijia Lyu[3], Chen Ji[4], Zhuohan Zuo[5]

Abstract

This study examines the impact of foreign immigration on economic development and industrial transformation in the Yangtze River Delta during late Qing China. Using reconstructed GDP data, we employ time-series regression to quantify immigration's economic effects. The regression results, combined with theoretical insights, explore how external factors introduced by immigrants—such as advanced technologies and ideologies—contributed economic growth. Our findings show that moderate international immigration stimulated economic growth while hindering industrialization, yet beyond a critical threshold, these effects reversed. By analyzing immigration's role in fostering diversity and innovation, our study provides valuable insights for China's talent openness policies.

Key Words: Foreign Immigration, Economic Development, Industrialization, Yangtze River Delta, Late Qing China, The Great Divergence, Talent Openness Policies

[1] This manuscript began as a term project for the ECON2273 course at the University of Hong Kong's Business School. we extend our heartfelt gratitude to Chicheng Ma, the course instructor, for his revision suggestions and feedback during the proposal stage and group presentations.

I. Introduction

1.1 Historical Background & Stereotypical Understanding

The defeat in the First Opium War in 1840 is portrayed as the inception of China's humiliating modern history, leading to the coerced opening of the nation, territorial concessions, and indemnities (Lovell, 2011). Established treaty ports catalyzed an influx of overseas immigrants who founded settlements in these urban centers, signifying late Qing China's decline into a semi-colonial, semi-feudal state (Lovell, 2011; Polachek, 1992). From a political and national standpoint, the erosion of national sovereignty represents a profound failure for a nation. However, this pedagogical perspective cultivates a stereotypical mindset among Junior Chinese History Scholars[i], who, when discussing the settlement of overseas immigrants in Chinese cities, predominantly associate them with a narrative of humiliation, seldom considering the multifaceted impact of immigration on economic development and industrial restructuring.

1.2 Motivation & Research Focus

The motivation for this research stems from our Economic History course, alongside the theoretical frameworks put forth by the 2024 Nobel laureates. Within ECON2273, we examined a widely accepted hypothesis regarding the persistent "Great Divergence" between ancient China and European countries, particularly emphasizing the influence of institutional frameworks and Confucian ideology in harmonizing economic growth with technological advancement. As noted by Acemoglu and Robinson (2012, pp.7-44), a nation's institutional structures and ideology are deeply ingrained and resistant to change. This implies that for China to tackle the enduring economic development challenges arising from the rigidity of its internal institutions and ideology, external influences—specifically, foreign immigration—might serve as more immediate and effective solutions. Consequently, our analysis of GDP data reconstructed by Ma and Jong in 2017 reveals that China's economy experienced substantial growth from 1880 to 1912. This prompts us to question: during the unique period of the late Qing dynasty, did the influx of foreign immigrants contribute to China's economic development by introducing external factors such as innovative ideologies and technological advancements? In contrast to conventional studies that focus on the effects of political reforms within the Qing government and the Self-Strengthening Movement, we also aim to clarify the role of foreign immigrants in reshaping the industrial landscape at the end of the Qing Dynastic.

Due to this era's lack of official records, our research narrows to Shanghai, the only site with reliable data on international settlement figures. This study examines the influence of continuous immigrants on Shanghai's economic development and industrial transformation. As a treaty port city, Shanghai was crucial, serving as a modernization and technological hub. The influx of migrants turned it into a multicultural center, spurring economic growth and cultural exchange. Its factories, docks, and trade

activities provided numerous opportunities, reflecting China's broader economic and social shifts. Although Shanghai is the focus, its impact extends to the Yangtze River Delta. As the region's economic and cultural core, Shanghai's experiences reflect nearby cities' interconnected migration and development dynamics. The economic spillover from Shanghai's industrial expansion likely affected adjacent urban areas, contributing to the Delta's emergence as a significant economic region.

Figure 1: *The Geographical Location of Shanghai and the Yangtze River Delta*

1.3 Contribution & Innovation

Our research aims to address the existing gaps in the literature within this field. On the one hand, we focus our study on significant external factors during the late Qing period—specifically, the impact of foreign immigration—rather than continuing with mainstream policy analysis. On the other hand, we utilize a novel methodology involving time series data regression analysis to quantitatively evaluate the impact of immigration, investigating both the short-run and the long-run impact on China's economy and industrial sectors. By integrating these two aspects, our research distinguishes itself from traditional policy impact analyses such as Difference-in-Differences or qualitative methods, thereby offering novel perspectives for research in this area during that period.

II. Literature Review

2.1 Lei Shi (2015): Labor Market Transformation

In *Moving to Shanghai: The Massive Internal Migration to the First Chinese Megacity (1927–1937)*[ii], Lei Shi examines how migration between 1927 and 1937 transformed

Shanghai's labor market. Using a combination of historical documents and quantitative methods, Shi highlights the influx of migrants, particularly from the Jiangnan and Subei regions, as a cornerstone for Shanghai's industrial development. The study underscores the role of labor-intensive industries like textiles and the pivotal contribution of male workers in propelling the growth of the manufacturing sector, which, in turn, facilitated the city's rapid industrialization.

2.2 Lei Shi (2017): Rural-Urban Migration Dynamics

Building on this analysis, Shi further investigates rural-to-urban migration in his doctoral dissertation, *The Dream and the Reality: Rural-Urban Migration to Shanghai (1927–1937)*. This work delves deeper into the socio-economic dimensions of migration, using linear regression analysis to examine income disparities among immigrants. Key variables such as region of origin, gender, and occupation type are influential factors in income determination. Social networks and educational background also emerge as significant determinants of earnings. Through this rigorous descriptive statistics analysis, Shi demonstrates how migration satisfied labor market demands and fostered industrial diversification and economic expansion, particularly in Shanghai's manufacturing and service sectors.

2.3 Fengyi Zhang (2023): Migration and Private Enterprise

In *The Relationship Between Migration and Private Enterprises in Shanghai during the Late Qing Dynasty and the Early Republic*, Zhang explores the nexus between migration and the growth of private enterprises. Employing a qualitative methodology, Zhang utilizes historical records and local gazetteers to evaluate the contributions of both domestic and foreign migrants. The study reveals that migrants provided critical labor while introducing innovative technologies and management practices, thereby accelerating the modernization of Shanghai's industries. Case studies of economic activities within the Shanghai concessions illustrate how migration transformed the city into a modern commercial hub. Although primarily qualitative, Zhang's findings align with those of Shi, particularly regarding labor market specialization and the expansion of industrial sectors such as light industries and manufacturing.

2.4 Synthesis and Contributions

Together, these studies provide a nuanced understanding of how migration influenced Shanghai's labor market and industrial landscape during the Republican periods. Shi's works (2015, 2017) adopt robust quantitative approaches, focusing on labor market dynamics and industrial growth, while Zhang (2023) offers a complementary qualitative perspective on the role of migration in the evolution of private enterprises. Despite their differing methodologies, these works collectively underscore the indispensable role of migration in supplying labor, driving industrial expansion, and facilitating Shanghai's transformation into a modern and diversified economic center.

Notably, although these studies employ quantitative methods, they primarily rely on descriptive statistics, with minimal use of econometric techniques. Fortunately, thanks

to recent scholarly efforts in reconstructing annual per capita GDP for the late Qing period and the more detailed compilation of Shanghai's demographic data, we are now able to apply modern econometric methods for quantitative analysis. By organizing these valuable time-series datasets, we can employ research methodologies beyond Difference-in-Differences to examine long-term trends, rather than merely conducting regression analyses over a few years with available data.

Moreover, existing literature on migration related to the Shanghai region predominantly focuses on the micro-level. In contrast, our research emphasizes the macroeconomic impact of migration on both short-term and long-term economic development and industrial structural changes across the entire Yangtze River Delta. Consequently, our study appeals to a broader audience, including not only labor market participants but also policymakers involved in immigration policy formulation.

III. Data & Methodology

3.1 Data Collection and Analysis

This section outlines the processes for collecting, synthesizing, and organizing the raw data used in our research. The data is classified into three categories: the response variables (per capita GDP during the late Qing Dynasty and the by-sector data), the explanatory variables (overseas migration in Shanghai and its vicinity from the late Qing to the early Republic period), and the control variables (assessed by railway length in Shanghai, port throughput at Shanghai's harbor, and the number of educational institutions in the region). The following subsections will detail the rationale for selecting indicators for each variable and the methods used for their collection and analysis.

3.1.1 Response Variables

In the absence of official records, this study employs the real per capita GDP reconstructed through the Purchasing Power Parity (PPP) methodology, as delineated by Ma and Jong in their 2017 work, "*Unfolding the Turbulent Century: A Reconstruction of China's Historical National Accounts, 1840–1912*," as the dependent variable. The dataset curated by Professors Ma and Jong provides a real per capita GDP reflective of current Chinese prices[iii], incorporating value added from the **agricultural, service, and industrial sectors**. The real per capita GDP dataset utilized in this analysis is detailed in *Appendix 1*.

In contrast to the traditional metric of per capita wages as an indicator of economic performance, we contend that real per capita GDP presents a more holistic evaluation. As highlighted by Ma and Jong (2017), China's economy is characterized by a significant rural demographic and a prominent primary sector, rendering per capita GDP a more universally applicable measure than real wages[iv].

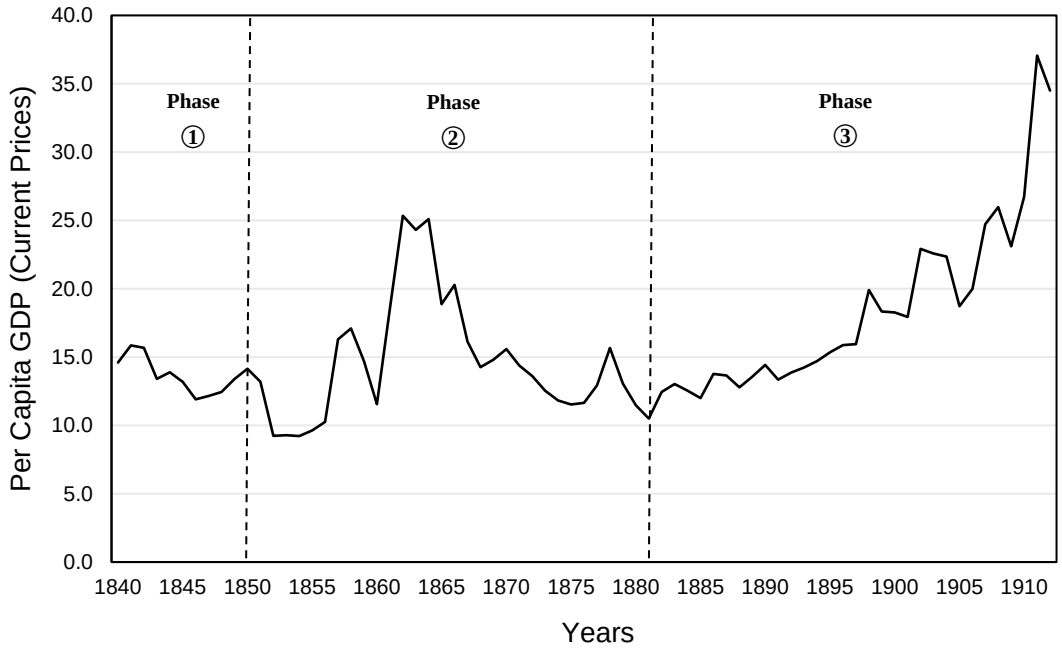


***Figure 2**: Economic Performance in Late Qing China from 1840-1912*

Refer to Figure 2, where we have segmented the GDP data of the late Qing Dynasty into three distinct phases. Notably, Phase 2 exhibits an abnormal fluctuation, while Phase 3 shows a growing trend. The irregularity arises in Phrase 2 from the fact that the data we collected pertains to **per capita** GDP, which is typically expressed by the following formula:

$$Per\ Capita\ Real\ GDP_t = \frac{\sum_{i=1}^{n} P_{current_i} \times Q_{it}}{Total\ Population_t} \tag{1}$$

Based on the formula, in addition to genuine economic growth, a significant decline in population may also contribute to an increase in $Per\ Capita\ Real\ GDP_t$. Historically, during this tumultuous period, there were indeed brutal wars, such as the Taiping Rebellion and invasions by Western powers. Therefore, the per capita GDP during Phase 2 cannot be regarded as a reliable measure of economic growth, and we cannot utilize this data as a regression variable.

For measuring Industrial Structure Change, Ma and Jong's per capita GDP estimates encompass value added from each sector. Although not detailed by specific industries, these sectoral aggregates offer insights into their proportional contributions to overall per capita GDP. By assessing each sector's share of total per capita GDP for a given year, we can deduce the industries' roles in economic development during that timeframe.

Annual sectoral contribution change is calculated as follows:

$$\Delta\%\ Sector_{it} = \underbrace{\frac{value\ added\ Sector_{it}}{percapGDP_t}}_{\%Sector_{it}} - \underbrace{\frac{value\ added\ Sector_{it-1}}{percapGDP_{t-1}}}_{\%Sector_{it-1}} \tag{2}$$

Using Formula (2), we computed the annual growth rates for the proportion of each of the three major sectors in the per capita GDP data. This analysis not only helps elucidate the contributions of each sector to economic growth but also provides critical data support for further economic research.

3.1.2 Explanatory Variables

Our data on overseas migration is derived from the book: "*The Population of Shanghai (1865–1953)*." In the book's appendix Table 2 provides detailed population data within Shanghai's international settlements from 1880 onward. This includes annual total population counts and the numbers of non-residents and children. For this study, we excluded immigrants who are out of the labor force from our calculations to ensure data accuracy and reliability. The formula used for our calculations is as follows:

$$\begin{aligned} &Foreign\ Working\ Age\ Residents_t \\ &\quad = Foreign\ Population_t - Non\ Residents\ Population_t \\ &\quad - Children_t \end{aligned}$$

$$\begin{aligned} &Foreign\ Immigration_t \\ &\quad = Foreign\ Working\ Age\ Residents_t \\ &\quad - Foreign\ Working\ Age\ Residents_{t-1} \end{aligned} \tag{3}$$

We first calculated the number of working-age foreign residents in Shanghai's international settlements for each year. This makes sure that we exclude children and non-residents, as they are not considered part of the explanatory variable for migration and have less economic impact compared to working-age residents. This is because if the influx of overseas immigrants, as an external factor, can indeed stimulate economic development or alter the industrial structure of the late Qing Dynasty through the introduction of new ideas or technologies, then only those who have reached working age and settled in urban areas can truly impact China's development. Subsequently, by comparing year-over-year changes in the number of working-age foreign residents, we determined the real annual overseas immigration inflows to Shanghai (see *Appendix 2*).

3.1.3 Controlled Variables

This subsection details the control variables incorporated into the econometric models used in this study, as well as the methods employed to collect and estimate missing data to ensure the accuracy and reliability of our findings. For the complete dataset of control variables, please refer to *Appendix 3*.

Railway Length. The extent of a railway network reflects a country's ability to mobilize both human and material resources, playing an essential role in economic development. During the late Qing era, the considerable delay in technological innovation meant that railway construction was largely overseen by foreign specialists (Wang, 2015). As a result, the length of these railways may have also been shaped by patterns of foreign immigration. We investigated railway lengths in Shanghai from 1880 to 1912. The

Wusong Railway, China's first operational line established in 1876, measured approximately 14.9 kilometers but was dismantled in 1877 due to local opposition and Qing government concerns over foreign influence (Wang, 2015). Consequently, Shanghai had no railway infrastructure for an extended period. In 1905, the Shanghai-Nanjing Railway construction commenced, becoming operational by 1908 and extending the railway length to 307 kilometers. The Shanghai-Hangzhou Railway, spanning 200 kilometers, began construction in 1906 and was operational by 1909 (Chinasage, 2010). These railways significantly enhanced transportation in East China, facilitating economic integration in the Yangtze River Delta.

Port Throughput. Shanghai's foreign migration was closely tied to international trade, a key economic determinant. Port throughput indicates maritime trade during this era. Due to limited records, we obtained Shanghai port import data at five-year intervals from 1880 to 1895 and annual export data from 1867 to 1930, with complete annual data available from 1954 (Gotohui, 2022). We utilized inference methods based on existing trends to address gaps in intermediate years. Regression analysis revealed a consistent growth trend in Shanghai's port throughput pre-1912 and post-1949. We employed a segmented extrapolation method to estimate port throughput from 1912 to 1880, integrating known growth rates with historical context. Starting from the 1954 baseline, we extrapolated data back to 1940 using observed year-over-year growth rates, which remained stable due to post-war recovery and industrialization. For the period from 1940 to 1912, lacking detailed growth rate data, we referenced economic trends and historical events from the late Qing and early Republican periods, assuming an average annual growth rate $\bar{\gamma}$ of 2.5%-3%, influenced by treaty port openings, foreign investments, and remittance support. The calculations adhered to these two formulas:

$$T_t^{Forward} = T_{t-1} \times (1 + \bar{\gamma}) \tag{4}$$

$$T_t^{Backward} = T_{t+1} \times (1 + \bar{\gamma})^{-1} \tag{5}$$

Education and Human Capital. The growth of human capital and education significantly influences the economic development of a region in the long run. According to the Solow growth model, this increase in productive resources enhances the production possibilities of an economy (Barro and Sala, 2004; Solow, 1956). Thus, schools play a vital role in cultivating talent and augmenting human capital. At the same time, the arrival of international migrants has facilitated the creation of various contemporary educational establishments in Shanghai and supplied educators for these institutions. According to Xin (2022), missionary schools steadily increased during this period, driven by Shanghai's growing foreign presence and educational initiatives. Consequently, we included the number of schools in the Shanghai region as a control variable in our models.

However, compiling data on school numbers during the late Qing period posed significant challenges due to sparse records. We relied on reports from The Global Times (2014) and Xin's (2022) research to estimate the number of schools, categorizing them into missionary schools, foreign-language schools, girls' schools, and

international schools. Besides, data on women's schools were drawn from Chapter 2 of Qian's book (2022), *Politics, Poetics, and Gender in Late Qing China: Xue Shaohui (1866–1911) and the Era of Reform*. The summary table below provides rough estimates of school numbers:

Year	Missionary Schools	Foreign Language Schools	Women's Schools	Private Traditional Schools (Si-Shu)	International Schools
1880	~10[v]	2	None	Numerous (decreasing)	None
1897	12 (girls' schools)	~5	None	Numerous (decreasing)	None
1898	12 (girls' schools)	~6	1	Numerous (decreasing)	None
1900	16 (12 primary, 3 middle/high, 1 college)	~8	1	Numerous (decreasing)	None
1912	16 (no evidence for new school)	~10	1	Numerous (decrease due to reform efforts)	1 (Shanghai American School)

***Table 1**: The number of different types of schools in Shanghai (1880-1912)*

The statistics marked with the "~" symbol in the table indicate that the values are derived from estimations. Due to the limited number of observations, we aim to avoid overcomplicating the model. Therefore, taking into account the significance of the type of schools and reliability, we adjusted the number of schools to derive their weighted values. Our weighting formula is as follows:

$$W_{educ_t} = 0.3 \times Missionary_t + 0.2 \times Women_t + 0.5 \times International_t \quad (6)$$

We excluded foreign language schools from the education weighting index calculation due to the limited literature confirming only two language institutions before 1880. Church schools, serving mainly adolescents and presenting data deficiencies, contribute only 30% to the index. In contrast, international schools in Shanghai hold greater significance, as they integrated a considerable number of international teachers from their establishment, representing a vital influx of human capital. After calculating the weighted values for each year, we incorporated them into all models as control variables.

3.2 Research Methodologies

Upon collecting the requisite data for our study, we formulated econometric regression models to examine the profound impact of foreign immigration on economic development and the transformations in industrial structure during late Qing China. We developed a total of four models, followed by the following conceptual framework:

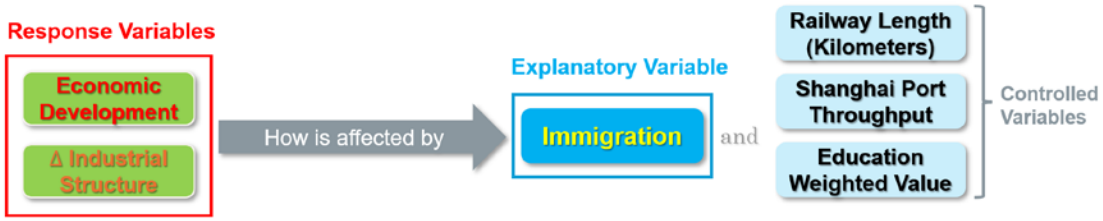


***Figure 3**: The Structural Framework of Research Models*

3.2.1 Incorporating Quadratic Terms and Centralizing Data to Mitigate VIF

To conduct an in-depth analysis of the multifaceted nature of foreign immigration ($immi_t$) and its enduring impact on China's development, we have undertaken further meticulous processing of the original data on immigration. In all the models we constructed, we incorporated the squared term of the number of immigrants for that year, aiming to explore the effects of varying immigrant numbers on the dependent variable and to investigate the potential existence of a turning point ($\widehat{immi_t^*}$) in these effects, as calculated by the following formula:

$$Y_{it} = \beta_o + \beta_{immi_t} \times immi_t + \beta_{immi_t^2} \times immi_t^2 + \gamma_i' X_{it} + u_i$$

$$\frac{\partial \widehat{Y_{it}}}{\partial \widehat{immi_t}} = 0$$

$$\widehat{immi_t^*} = -\frac{\widehat{\beta_{immi_t}}}{2 \times \widehat{\beta_{immi_t^2}}} \tag{7}$$

However, given the high correlation between $immi_t$ and $immi_t^2$, incorporating the squared term could exacerbate the variance inflation factor, thereby introducing multicollinearity concerns within the model. Consequently, we centered the immigration data by subtracting its mean, resulting in a set of centered immigration values ($immi_t^c$) for each year, which were then utilized in the regression analysis. The centering formula is outlined as follows:

$$immi_t^c = immi_t - \mu_{immi} \tag{8}$$

3.2.2 Model I: The Effect of Immigration on GDP per Capita

$$percapGDP_t = \alpha_0 + \beta_1 immi_t^c + \beta_2 (immi_t^c)^2 + \gamma_i' X_{it} + \varepsilon_t \qquad (Model\ I)$$

The first model of this research aims to investigate the impact of overseas migration ($immi_t^c$) on economic development ($percapGDP_t$) during the late Qing in the Yangtze River Delta, controlling railway length, marina trade activities, educational resources, and human capital. We avoided using log-level or log-log transformations due to numerous zero values in our control variable, railway length, as railways were only partially developed in the region by the end of the economic growth period.

Before moving into the regression process, we conducted an **Augmented Dickey-Fuller (ADF) test** to ensure that the residuals from our time-series regression did not follow a unit root process. Verifying stationarity is crucial for avoiding spurious regression results, particularly when working with economic data spanning multiple years. We focused on Model I because preliminary analysis suggested a possible time trend in the residuals of our GDP per capita data, whereas no clear trend existed in the remaining models.

Augmented Dickey–Fuller test for unit root

Variable: **residuals** Number of obs = **31**
Number of lags = **1**

H0: Random walk with or without drift

	Test statistic	Dickey–Fuller critical value 1%	5%	10%
Z(t)	**-5.463**	**-4.325**	**-3.576**	**-3.226**

MacKinnon approximate *p*–value for Z(t) = **0.0000.**

***Table 2**: ADF Test Result for Model I Residuals*

The test statistics, presented in **Table 2**, indicate that the ADF statistic $Z(t) = -5.463$ is more negative than the 1% critical value (-4.325) and is associated with a **p-value of 0.0000**. Consequently, we reject the null hypothesis of a random walk with or without drift and conclude that the residuals in Model I are stationary. This result supports the appropriateness of our model specification and provides greater confidence in interpreting the estimated parameters of Model I.

3.2.3 Model II-IV: Immigration and Industrial Structural Change

$$\Delta\%Indus_t = \delta_0 + \beta_1 immi_t^c + \beta_2 immi_t^{c^2} + \beta_3 immi_{t-1} + \beta_4 immi_{t-2} + \gamma' X_t + v_t \quad (Model\ II)$$

$$\Delta\%Serv_t = \zeta_0 + \beta_1 immi_t^c + \beta_2 immi_t^{c^2} + \beta_3 immi_{t-1} + \beta_4 immi_{t-2} + \gamma' X_t + \tau_t \quad (Model\ III)$$

$$\Delta\%Agri_t = \eta_0 + \beta_1 immi_t^c + \beta_2 immi_t^{c^2} + \beta_3 immi_{t-1} + \beta_4 immi_{t-2} + \gamma' X_t + \xi_t \quad (Model\ IV)$$

We also introduced the number of immigrants from the year prior ($immi_{t-1}$) and the two years prior ($immi_{t-2}$) into our regression Models II, III, and IV, thereby examining

the profound influence of immigration on China's Industrial Structural Change. These three models did not include the railway length and marina trade volume in the Yangtze River Delta region as controlled variables. This decision was based on regression analysis, which revealed no correlation between these variables and $\Delta\%Indus_t$, $\Delta\%Agri_t$, and $\Delta\%Serv_t$. This lack of correlation may be attributed to the fact that both variables can only influence a region's economic development. Still, they cannot fundamentally alter the transformations in the region's industrial structure.

IV. Results

4.1 Regression Model Results

Table 3: Models I-IV Regression Results Summary

	(1)	(2)	(3)	(4)
VARIABLES	$percapGDP_t \times 10^6$	$\Delta\%indusGDP_t$	$\Delta\%servGDP_t$	$\Delta\%agriGDP_t$
$immi_t^c$	5,028.6 **	-26.4 × 10⁻⁶ **	15.60 × 10⁻⁶	9.87 × 10⁻⁶
	(2,324.2)	(11.20)	(12.00)	(16.00)
$immi_t^{c\,2}$	-3.09 **	.0166 × 10⁻⁶ ***	-.00757 × 10⁻⁶	-.00842 × 10⁻⁶
	(1.23)	(.00584)	(.00625)	(.00833)
$immi_{t-1}$		7.41 × 10⁻⁶	-7.73 × 10⁻⁶	.0524 × 10⁻⁶
		(4.73)	(5.06)	(6.74)
$immi_{t-2}$		-9.76 × 10⁻⁶ **	1.47 × 10⁻⁶	8.59 × 10⁻⁶
		(4.51)	(4.83)	(6.43)
$RailwayLenth_t$	9,516.5 ***			
	(3,000.2)			
T_t	376,081.1 ***			
	(101,854)			
W_{educ_t}	339,166.4	4775.80 × 10⁻⁶	-3344.10 ×10⁻⁶	-1292.50 × 10⁻⁶
	(1,008,299)	(3513.10)	(3759.90)	(5009.00)
Constant	3,484,119	-21709.8 × 10⁻⁶	15410.20×10⁻⁶	5655.20 × 10⁻⁶
	(2,638,542)	(13365.30)	(14304.30)	(19056.40)
Observations	33	33	33	33
Adjusted R^2	0.8926	0.2502	0.0351	-0.0419
F	54.22 ***	3.14 **	1.23	0.74

Std. error in parentheses (Model II-IV × 10⁻⁶)

$*** p < 0.01,\ ** p < 0.05,\ * p < 0.1$

The OLS regression analysis of our model corroborates the initial hypothesis, elucidating the intricate and multifaceted effects of foreign immigrants settling in Shanghai on China's developmental path. Our findings reveal that a modest to moderate influx of immigrants positively influenced economic growth during the late Qing Dynasty. Nevertheless, this influx also challenged the industrialization process, indicating a dual impact. Notably, Model I and Model II exhibit significantly divergent outcomes when the immigrant population exceeds a certain threshold. In such instances,

a substantial influx of immigrants within a given year not only disrupts China's economic growth but also markedly alters the nation's industrial structure.

Our analysis, incorporating the quadratic term $immi_t^{c\,2}$, identifies the inflection point in the impact of immigration on China's economic growth and industrialization trajectory. In our attempt to perform regression without including $immi_t^{c\,2}$, the results were not significant. However, the overall significance of the model improved substantially upon the inclusion of the quadratic term. This discovery highlights the strong nonlinear relationship between foreign immigrants and our dependent variables. This relationship embodies the economic principle of diminishing marginal returns, suggesting that each additional immigrant contributes progressively less to economic development and industrialization, as opposed to a constant linear relationship.

In Model I, we enhanced the dependent variable by scaling $percapGDP_t$ by a factor of one million. This adjustment allows for a more nuanced interpretation of the dependent variable and model parameters: "*For each additional immigrant in* $year_t$*, the effect on the GDP of the Shanghai region, for every population of one million during* $year_t$*, is quantified as* $\beta_1 - 2\beta_2 \times immi_t^c$ *Yuan.*" Our analysis demonstrates that the settlement of overseas immigrants exerts an economically significant influence on Shanghai's economy, though its effects on railway expansion and maritime trade volume are comparatively minor. Moreover, by employing the regression coefficients, β_1 and β_2, we determined the inflection point Model I gave to be approximately **1218**. This finding suggests that when the annual influx of overseas immigrants to Shanghai is below 1218, it fosters economic growth in the city and its surrounding regions. Conversely, when the number of immigrants surpasses 1218, the increased influx tends to hinder economic productivity in Shanghai and its environs. The precise formula for calculating the inflection point is as follows:

$$\widehat{immi_t^{*\prime}} = \widehat{\mu_{immi}} - \frac{\widehat{\beta_{immi_t^c}}}{2 \times \widehat{\beta_{immi_t^{c\,2}}}} \tag{9}$$

In Model II, the dependent variable—the variation in the industrial sector's contribution to GDP—exhibits stochastic fluctuations, lacking a consistent annual pattern. This observation reinforces our earlier hypothesis: **China's industrialization strategy through domestic legal reforms has not been successful.** If it had been, the GDP share of the industrial and manufacturing sectors would have shown a stable upward trend, rather than the stochastic variations depicted in Figure 4.

By integrating the regression results of Model II with data visualization, we can discern a pronounced nonlinear inverse relationship between international immigration and changes in industrial share. This indicates that the fluctuations in the $\Delta\%indusGDP_t$ are not merely random, except during the significant immigration surges in 1905. In these years, immigration numbers surpassed the Model II threshold of **1199** individuals (inflection point of Model II), catalyzing China's industrialization process. Thus, while the influx of small to moderate numbers of immigrants hindered

China's industrialization, large-scale immigration, despite disrupting economic production, restructured the industrial framework of late Qing China.

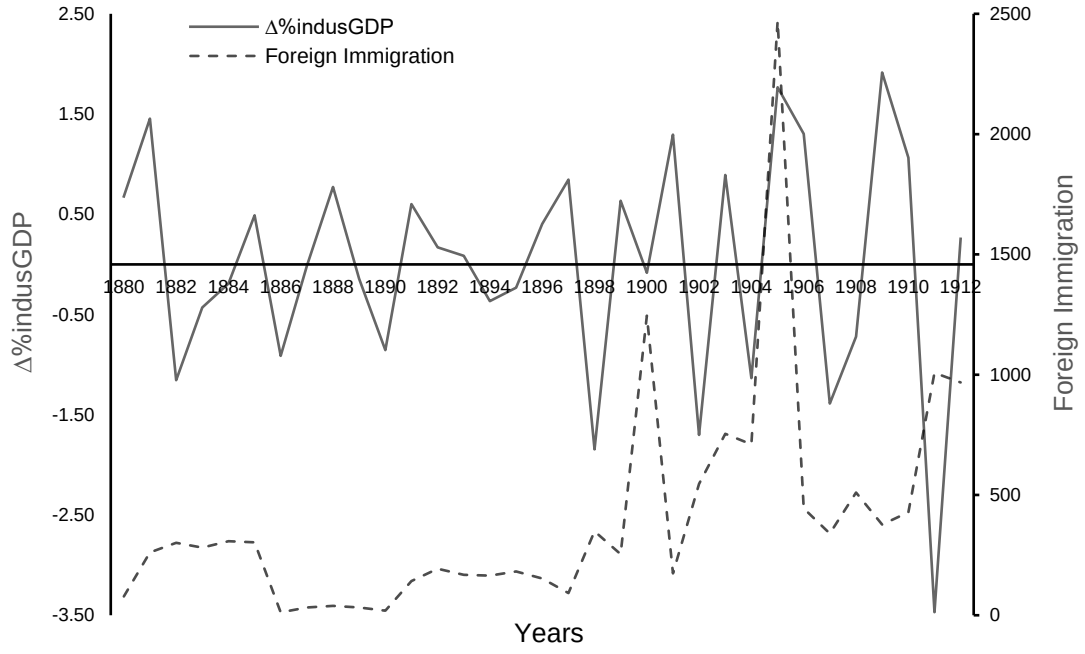


***Figure 4**: Comparison of $\Delta\%IndusGDP$ with Trends in Foreign Immigration*

Despite the absence of statistical significance in Models III and IV, we have chosen to retain them because they serve as robust natural control groups. This decision highlights that the correlation observed in Model II is not merely a result of random variation in small sample sizes. It must be the case that a reduction in the industrial sector's share of national output invariably increases the shares of the service and/or agriculture sectors. Our regression analysis indicates that the influx of immigrants does not correlate with the proportions of these two sectors. This finding indirectly supports the notion that immigration influences China's industrialization trajectory.

4.2 Long Run vs. Short Run Dynamic: The ECM

To capture both the short-run dynamics and the long-run equilibrium behavior of our variables, we estimate an Error Correction Model (ECM) for Models I and II. In our ECMs, the dependent variable is specified in the *first differences* ($D_{percapGDP_t}$ and $D_{\Delta\%indusGDP_t}$, while the error correction term $Residuals_{t-1}$ measures how deviations from the long-run equilibrium in the previous period influence current adjustments. The short-run coefficients on the differenced explanatory variables (e.g. $D_{immi_t^c}$ and $D_{immi_t^{c2}}$) capture immediate impacts from changes in immigration or other covariates. Meanwhile, a **negative and significant** coefficient on the error correction term typically indicates that a portion of the last period's disequilibrium is "corrected" each period, reflecting a stable long-run relationship.

Table 4: Error Correction Model I & II Results

VARIABLES	(1) $D_{percapGDP_t}$	(2) $D_{\Delta\%indusGDP_t}$
$D_{immi_t^c}$	.0133566 ***	-.0000663 ***
	(0.0027093)	(.0000209)
$D_{immi_t^{c^2}}$	-4.79 × 10^{-6} ***	2.63 × 10^{-8} ***
	(.944 × 10^{-6})	(6.96 × 10^{-9})
$D_{immi_{t-1}}$		.0000103
		(6.73 × 10^{-6})
$D_{immi_{t-2}}$		-.0000105 **
		(5.64 × 10^{-6})
$D_{RailwayLenth_t}$	-.0032472	
	(0.0053819)	
D_{T_t}	.9439076	
	(.9693391)	
$D_{W_{educ_t}}$	-1.221115 ***	.00433
	(.3963152)	(.0029032)
$Residuals_{t-1}$	-.6848802 ***	. 0051434 **
	(.1925321)	(.0013984)
Constant	-.3125022	.0006832
	(.9906684)	.0036364
Observations	33	33
Adjusted R-squared	0.5181	0.5043
F	6.55 ***	6.26 ***

Std. error in parentheses

$*** p < 0.01,\ ** p < 0.05,\ * p < 0.1$

In Model I, the error correction term ($Residuals_{t-1}$) of −0.6849 (significant at the 1% level) indicates that **about 68%** of any disequilibrium from the previous period is corrected in the current period, affirming a **stable long-run relationship** between immigration and per capita GDP. In the short run, $D_{immi_t^c}$ and $D_{immi_t^{c^2}}$ are both **positive (or negative) and highly significant**, suggesting that immediate changes in immigration levels and their squared term strongly influence GDP growth. Turning to Model II, the ECT of 0.0051 (significant at the 5% level) is comparatively smaller and **positive**, indicating a less conventional adjustment pattern for industrial GDP share but confirming a **significant long-run equilibrium**. Short-run coefficients in Model II reveal that the immediate change in immigration is significant, while one-year lagged immigration is **not**, and the two-year lagged term carries a **small but significant** negative effect.

Overall, **immigration significantly impacts short-term fluctuations and long-term stability in both models**. Our findings emphasize capturing immediate fluctuations and

long-term equilibria in time-series data. Incorporating error correction, our model offers a nuanced view of Shanghai's economic response to immigration and infrastructure changes. The ECM results support the OLS findings, confirming the resilience and consistency of our conclusions.

4.3 Acknowledging Methodological Constraints

In the last part of this sub-section, we aim to present the limitations and shortcomings of the quantitative methods employed in this study. First and foremost, the absence of official records from the late Qing Dynasty and concerns regarding data accuracy have confined us to just 33 observations across all our econometric models. This has led to two main limitations. For one thing, while a small sample size can provide unbiased causal inference under the assumption of zero conditional means, the limited number of observations inevitably raises issues of heteroscedasticity, making the inferential results less robust than those from larger samples. A possible solution to this issue could be to refine our models once other researchers reconstruct the annual per capita GDP data for the Republic of China period. For another, there is a restriction on the number of regressors in the model. Given that both the dependent and control variables in our Model I show growth trends, it would generally be appropriate to conduct a detrending analysis and rebuild the model, even though the growth of these variables is nonlinear/nonexponential. However, due to the limited number of observations, we must avoid including too many variables to maintain model accuracy, which has led to an overestimated Adjusted R-squared. Despite these two drawbacks, our model parameters should remain unbiased, and the positive/negative correlations identified by the model are accurate, not affecting our conclusions.

Additionally, we observed that the regression results for our controlled variable—education-weighted values (W_{educ_t}) —are not significant. We suggest three possible explanations for this unexpected result: 1) In late Qing China, Solow's theorem may have limitations, and changes in educational resources might not significantly boost economic growth; 2) Changes in educational resources may not impact the economic development of the same year, as students trained in previous years could be the true drivers of economic growth and technological advancement; 3) There is some data deficiency, particularly the lack of records on the number of missionary schools before 1897, leading to certain biases in our estimated education weighted values. These uncertainties may introduce variability to our control variable, but they do not affect the explanatory variables of the models.

V. Further Discussions and Implications

In this section, we explore the influence of overseas migration on China's development through external factors during the transformative period of the late Qing dynasty. Our analysis reveals a positive correlation between the number of overseas migrants and China's economic growth, while a negative correlation exists with the industrial sector's share in the economy. This suggests that: (1) overseas migration contributed to the

economic development of late Qing China by introducing external factors; (2) despite fostering economic growth, the influx of migrants impeded China's already sluggish industrialization process. We propose that the impact of overseas migration is complex, and we will conduct a comprehensive qualitative analysis of these multifaceted effects in subsequent sub-sections, offering insights into contemporary Chinese policymaking.

It is important to note that while the settlement of overseas migrants objectively aided the economic recovery of late Qing China, foreign colonizers, as victors of war, were primarily attracted to China for its market's economic potential. Having been isolated for over a century, China presented an undeveloped market akin to an unclaimed vast cake. Consequently, foreign migrants prioritized their economic interests, seeking to maximize benefits through trade, with the impact on China's economy and industrial development being a secondary outcome of their trade activities.

5.1 Beyond Opium and Tea: Textiles and the Roots of Industrial Transformation in Late Qing China

In discussions of trade liberalization post-Opium War, opium and luxury goods such as tea and silk are often highlighted. These goods generated substantial wealth for foreign merchants, while the Qing government also benefited through taxation. However, other commodities had a more profound impact on China's manufacturing industrialization. Textiles, as essential goods, were crucial market segments. Late Qing China's manufacturing, not having undergone the Industrial Revolution, remained a hybrid of household and workshop production, resulting in high costs and low output (Chaffee et al., 2015). The influx of mass-produced textiles severely impacted traditional manufacturing. Machine-produced textiles from Western countries, benefiting from economies of scale, offered lower costs and better quality, quickly dominating the Chinese market and leading to the closure of many workshops and unemployment among skilled workers. For instance, historically significant Chinese silk and cotton textiles were replaced by inexpensive, mass-produced Western fabrics. Similarly, European-manufactured steel products accelerated the decline of China's small-scale steel production (Chaffee et al., 2015). Ideally, in such industrial disruptions, the government should swiftly adopt new technological products to keep pace with the times. However, the Qing government's reluctance to embrace Western technology, coupled with traditional elites' cultural and ideological resistance to Western machinery and practices (Chaffee et al., 2015), further hindered the development of the domestic industrial base. The actions of the decaying Qing ruling class amplified the impact of overseas migration and trade influx on the industrialization of China's traditional manufacturing.

Our model also indicates that when the number of migrants exceeds a certain threshold, the industrial sector's proportion in the overall economy increases. Henriot and Shi (2018) provide a possible explanation for this phenomenon—the influx of professionals related to industrial production. Specifically, when the number of migrants is small, the impact of foreign industrial goods brought by caravans outweighs the positive effect of

talent settlement on industrial development. However, when the number of migrants surpasses a certain threshold, the positive effect of talent settlement on industry development exceeds the impact of goods. Figure 5 presents a sample survey from the sourcebook on the occupations of foreigners in the international settlement of early Republican Shanghai, highlighting a significant proportion of individuals engaged in industrial and production-related work.

TABLE 36 The structure of occupation of foreigners in the International Settlement (1885–1935) (*cont.*)

Sector 1	Sector 2	Professional category 1	Professional category 2
INDUSTRY	HANDICRAFT PRODUCTION	Workers	Skilled workers
INDUSTRY	HANDICRAFT PRODUCTION	Workers	Skilled workers
INDUSTRY	HANDICRAFT PRODUCTION	Workers	Skilled workers
INDUSTRY	HANDICRAFT PRODUCTION	Workers	Skilled workers
INDUSTRY	HANDICRAFT PRODUCTION	Workers	Skilled workers
INDUSTRY	HANDICRAFT PRODUCTION	Workers	Skilled workers
INDUSTRY	INDUSTRY	Middle managers	Technicians
INDUSTRY	INDUSTRY	Professionals and senior executives	Senior administrative executives
INDUSTRY	INDUSTRY	Trade and Industry Business Owners	Craftsmen
INDUSTRY	INDUSTRY	Trade and Industry Business Owners	Manufacturer
INDUSTRY	INDUSTRY	Workers	Laborers
INDUSTRY	INDUSTRY	Workers	Skilled workers
INDUSTRY	INDUSTRY	Workers	Skilled workers
INDUSTRY	INDUSTRY	Workers	Skilled workers
INDUSTRY	LEATHER AND RUBBER INDUSTRY	Trade and Industry Business Owners	Small traders
INDUSTRY	LEATHER AND RUBBER INDUSTRY	Workers	Skilled workers
INDUSTRY	MACHINERY AND METAL PRODUCTS	Professionals and senior executives	Engineers
INDUSTRY	MACHINERY AND METAL PRODUCTS	Professionals and senior executives	Engineers
INDUSTRY	MACHINERY AND METAL PRODUCTS	Trade and Industry Business Owners	Manufacturer
INDUSTRY	MACHINERY AND METAL PRODUCTS	Trade and Industry Business Owners	Manufacturer
INDUSTRY	MACHINERY AND METAL PRODUCTS	Workers	Skilled workers
INDUSTRY	MACHINERY AND METAL PRODUCTS	Workers	Skilled workers
INDUSTRY	MACHINERY AND METAL PRODUCTS	Workers	Skilled workers
INDUSTRY	MACHINERY AND METAL PRODUCTS	Workers	Skilled workers
INDUSTRY	MACHINERY AND METAL PRODUCTS	Workers	Skilled workers
INDUSTRY	MACHINERY AND METAL PRODUCTS	Workers	Skilled workers
INDUSTRY	OTHER INDUSTRY	Trade and Industry Business Owners	Manufacturer
INDUSTRY	PAPER AND PRINTING	Middle managers	Technicians
INDUSTRY	PAPER AND PRINTING	Trade and Industry Business Owners	Manufacturer
INDUSTRY	PAPER AND PRINTING	Trade and Industry Business Owners	Craftsmen
INDUSTRY	PAPER AND PRINTING	Workers	Skilled workers
INDUSTRY	PAPER AND PRINTING	Workers	Laborers
INDUSTRY	PAPER AND PRINTING	Workers	Skilled workers
INDUSTRY	PUBLIC UTILITY	Employees	Office workers
INDUSTRY	PUBLIC UTILITY	Workers	Skilled workers

: Shanghai's Foreign Immigration in the Industrial Sector

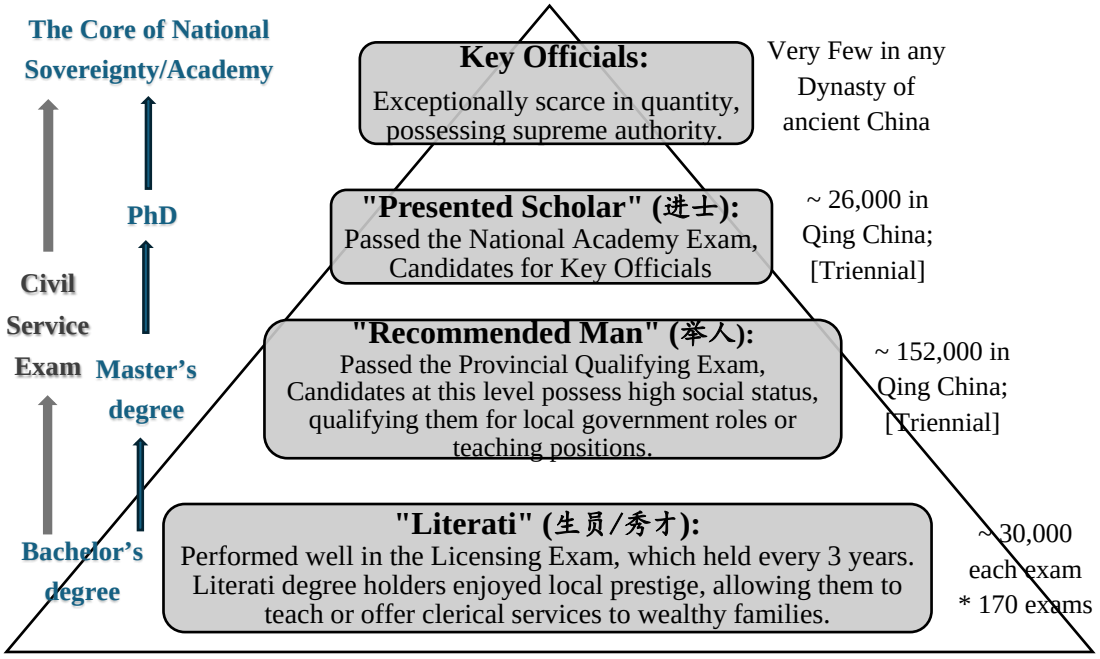
***Figure 5**: Sample Statistics of Foreigners' Occupations in the Shanghai International Settlement in 1935 (Henriot, Shi and Aubrun, 2018)*

5.2 Immigration, Human Capital, and Economic Growth: Revisiting Acemoglu and Robinson's Theory for Qing

This study posits an additional hypothesis to evaluate the applicability of Acemoglu and Robinson's (2012) theory to Qing Dynasty China. We aim to investigate whether overseas migration functioned as an exogenous catalyst for the introduction of novel ideas and ideologies into China, thereby challenging the entrenched Confucian doctrines of the feudal era, which impeded technological advancement and economic growth. While Acemoglu and Robinson (2012) emphasize the influence of diverse national institutions on wealth inequality, our focus is on economic development. In the context of late Qing China—a nation characterized by a severely underdeveloped economy—economic stagnation and pronounced wealth disparity were pressing social

issues. Crucially, China's feudal system exemplified an "extractive" social institution, where pervasive corruption facilitated the transfer of substantial wealth from the populace to a select group of officials. These officials, enjoying elevated status, could engage in corruption or exploitation with impunity, fostering a bureaucratic system that reinforced an ideology prioritizing government service as the ultimate aspiration.

How did this ideology impede China's economic development, and how did overseas migration introduce external factors that fostered economic growth? Before examining the impact of overseas migration, it is imperative to comprehend the core of this ideology—the imperial examination system of feudal China. Essentially, the imperial examination system was a state-administered literary examination of Confucian classics, designed to select elite individuals loyal to the state. More informally, the government established a standardized examination framework to select the most intelligent and loyal individuals for government service, thereby maintaining centralized power.



**Right side: Statistics of the Qing Dynasty Imperial Examination and the Number of Candidates*
**Left side: Comparison of the hierarchical structure of Qing Dynasty Imperial Examination Candidates with Contemporary Chinese Higher Education Degrees, Accompanied by the Framework of Modern Chinese National Examinations*

Figure 6: Overview of the Imperial Examination System during the Qing Dynasty

Figure 6 depicts the hierarchical structure of the Qing Dynasty's imperial examination system and provides basic information about each level. According to estimates from the Cambridge History of China (Chaffee et al., 2015), approximately two million candidates registered for each Licensing Exam during the Qing Dynasty, indicating that fewer than one in ten thousand ordinary individuals emerged as potential members of the class supported by the majority. The imperial selection system and the ideology of valuing officialdom above all else resulted in a critical issue—the misallocation of human capital. Envision a society with exceedingly low production efficiency, where

numerous students with educational opportunities abandoned social production to focus exclusively on Confucian literary classics, resulting in the initial wave of human capital loss. Among those who succeeded in the examinations, some became Literate or Recommended Men, but due to ideological constraints, they seldom engaged in social production or economic activities, instead aspiring to join the privileged class. These two waves of human capital loss impeded technological progress in China, decelerating productivity growth and, consequently, economic development.

What direct factors did the influx of overseas migrants during the late Qing period introduce that challenged the long-standing ideology of pursuing government positions? Historical precedents provide insights. During the preceding Ming Dynasty (1368-1644), few Jesuit missionaries arrived in China as early foreign migrants, initiating the first encounter between Western advanced science and the self-sufficient Confucian peasant ideology (Tsien, 1954; Gernet, 1985). Ma (2021) discovered that this early wave of foreign settlers stimulated local Chinese scholars' interest in science, increasing the publication of scientific works during the Ming Dynasty China. However, this scientific exchange was confined to a few Confucian elites, as the Ming Chinese elite continued to prioritize the imperial examination and officialdom, resulting in minimal impact from the Jesuits and little emphasis on applying scientific knowledge in commerce and industry. Although the Ming Dynasty was less resistant to Western advanced technology than the Qing, this early exchange did not prompt the Ming government to recognize the necessity of technological development. **Nevertheless, the increase in scientific publications indicated a correct use of human capital, as Ming Literate and Recommended Men [vi], when confronted with advanced scientific technology, developed an interest in exploring fields beyond officialdom.**

In short, we summarized the reasons why early overseas migration did not promote technological progress and economic development: 1. The number of migrants was too small, limiting their contact with a few Chinese elites; 2. After passing the imperial examinations, officialdom remained the primary choice for scholars. Returning to our study period—late Qing China—these were no longer factors affecting exchange. Firstly, the continuous defeats in foreign wars during the late Qing led to increased openness, as analyzed earlier, with many migrants settling in treaty ports. Secondly, the Qing government's military failures further weakened its rule, destabilizing the imperial examination's status, and its abolition in 1905 prompted elites to seek alternative paths. Therefore, compared to the less impactful overseas migration during the Ming Dynasty, the late Qing period's overseas migration was more influential. Referring to Ma (2021), **we posit that the influx of overseas migrants during the late Qing period opened new horizons for Chinese elites no longer constrained by the imperial examination system, allowing them to perceive the significant applications of technology in various fields, thereby redirecting human capital back to promoting economic production.** Based on available data and literature, we encourage other scholars to conduct more in-depth academic research and discussion on this topic.

5.3 Further Implications on Modern China

Contrary to contemporary studies, our research explores an earlier period in Chinese history characterized by a distinctly different societal structure. Does this mean our findings lack relevance to modern China? Certainly not. In the final sub-section of this paper, we aim to demonstrate how our results can provide insights for policymakers. As previously mentioned, our research highlights the essential role of cultural exchange, with migration serving as a key channel. An open nation is crucial for the integration of immigrants and cultural interaction. Despite China's two major phases of opening—the forced opening during the late Qing Dynasty and the modern Reform and Opening up era—China remains one of the most challenging countries for obtaining visas or permanent residency. Nevertheless, Shanghai stands out as relatively more open and inclusive, attracting international high-caliber talent (Zhang and Zhou, 2021). Throughout China's development, Shanghai has consistently led in openness, with cultural exchange driving sustained economic growth. According to CEI (2025) data, Shanghai's per capita GDP in 2023 was 190,300 RMB, closely following Beijing's 200,300 RMB, which ranks second in China's per capita GDP and the first in the Yangtze River Delta. Therefore, other local governments in China can emulate Shanghai's successful openness strategy, leveraging their unique strengths within national policy frameworks to attract foreign talent and stimulate local economic growth.

If the imperial examination system truly hindered China's economic and scientific progress, its impact is still evident in modern China. While the content of today's examinations in China has significantly diverged from the ancient imperial exams, now including a broad spectrum of modern science and mathematics, we maintain that the negative effects of the imperial system persist. Many candidates achieve high exam scores not out of a genuine passion for learning but to acquire diplomas from prestigious institutions or secure government positions for stable and respectable careers. It can be argued that the current Chinese examination system continues to channel human resources into institutional roles rather than encouraging independent inquiry and entrepreneurial ventures [vii]. We acknowledge that the influence of the imperial examination system and Confucian ideology is deeply rooted in China and challenging to change. In early 2025, statistics show that 4.38 million candidates registered for China's 2024 master's entrance examination (China Central Television News Network, 2023). The civil service examination is even more competitive, with 3.033 million individuals passing political scrutiny and registering, while the hiring ratio is 77:1 (China News, 2024), underscoring the fierce competition for these exams.

In light of the entrenched ideology favoring system-based employment, is there an alternative paradigm? We advocate for reforming talent acquisition as a pragmatic solution, a more balanced and efficacious strategy than dismantling established ideologies. For example, state-owned enterprises could enhance international talent recruitment to promote cultural exchange and diversity. What is more, government agencies should also prioritize diversity in talent acquisition. While foreign applicants

may face restrictions due to national security concerns, international students with Chinese citizenship offer a moderate and feasible alternative. These students typically receive a comprehensive education in China and achieve a higher education degree in other countries, with cultural identity courses taught when they were young significantly contributing to a heightened sense of national identity and loyalty compared to foreign nationals. Integrating international students with diverse educational backgrounds can facilitate cultural exchange within government institutions. Shanghai exemplifies a city with the most advantageous policies for international students in China (Zhang and Zhou, 2021). In this region, state-owned enterprises are notably receptive to recent graduates holding international academic qualifications. Additionally, the government's adaptable residency policies align with the diverse talent acquisition strategies of these enterprises, thereby bolstering the region's significant economic growth. The policy framework in Shanghai serves as a model for other regional governments in China, as adopting similar policies could potentially drive equivalent economic progress. In summary, through diversified talent acquisition, China can incrementally achieve cultural diversity and innovation without compromising its foundational ideology, thereby supporting sustainable economic growth.

References

Acemoglu, D. and Robinson, J.A. (2012). *Why Nations fail: the Origins of Power, Prosperity, and Poverty*. London: Profile Books, pp.7–44.

Barro, R. and Sala, X. (2004). *Economic growth*. Cambridge, MA: The MIT Press.

CEI Data (2025). *Shanghai's GDP Per Capita*. [online] ceidata.cei.cn. Available at: https://ceidata.cei.cn/new/.

Chaffee, J.W., Fairbank, J.K., Feuerwerker, A., Franke, H., Liu, K.-C., Loewe, M., Macfarquhar, R., Mote, F.W., Smith, P.J. and Twitchett, D. (2015). *The Cambridge History of China*. Cambridge University Press.

China Central Television News Network (2023). *The 2024 National Postgraduate Entrance Examination Commenced on the 23rd, with 4.38 Million Candidates Registered nationwide.* [online] Cctv.com. Available at: https://content-static.cctvnews.cctv.com/snow-book/index.html?item_id=5070545311082470234&toc_style_id=feeds_default&share_to=qq&track_id=a782372c-3547-46df-9628-5e02d273ddc9 [Accessed 11 Jan. 2025].

China News (2024). *The Online Registration and Qualification Review Process for the 2024 National Civil Service Examination Has concluded.* [online] Jiemian.com. Available at: https://www.jiemian.com/article/10294305.html [Accessed 11 Jan. 2025].

Chinasage (2010). *History of Railways in China*. [online] Chinasage.info. Available at: https://www.chinasage.info/railways.htm.

Gernet, J. (1990). *China and the Christian Impact: a Conflict of Cultures*. Cambridge Cambridgeshire; New York: Cambridge University Press.

Gotohui (2022). *Shanghai Port Cargo Throughput: Historical Data Compilation*. [online] Gotohui.com. Available at: https://www.gotohui.com/ndata/show-36308 [Accessed 11 Jan. 2025].

Henriot, C., Shi, L. and Aubrun, C. (2018). *The Population of Shanghai (1865-1953)*. BRILL.

Lovell, J. (2015). *The Opium War: Drugs, Dreams and the Making of China*. New York, Ny: The Overlook Press.

Ma, C. (2021). Knowledge Diffusion and Intellectual Change: When Chinese Literati Met European Jesuits. *The Journal of Economic History*, 81(4), pp.1052–1097. doi: https://doi.org/10.1017/s0022050721000413.

Ma, Y. and Jong, H. de (2017). Unfolding the Turbulent Century: a Reconstruction of China's Historical National Accounts, 1840–1912. *Review of Income and Wealth*, 65(1), pp.75–98. doi: https://doi.org/10.1111/roiw.12314.

Polachek, J. (1994). The Inner Opium War. *The Australian Journal of Chinese Affairs*, 31(03), pp.178–180. doi: https://doi.org/10.2307/2949934.

Qian, N. (2020). *Politics, Poetics, and Gender in Late Qing China: Xue Shaohui and the Era of Reform*. Stanford, CA: Stanford University Press.

Shi, L. (2015). Moving to Shanghai: The Massive Internal Migration to the First Chinese Megacity (1927-1937). *RePEc: Research Papers in Economics*. [online] Available at: https://ideas.repec.org/p/ahe/dtaehe/1510.html [Accessed 3 Jan. 2025].

Shi, L. (2017). *The Dream and the reality: rural-urban Migration to Shanghai (1927-1937)*. [online] *Dipòsit Digital de Documents de la UAB*. Universitat Autonoma de Barcelona. Available at: https://ddd.uab.cat/record/187164.

Solow, R.M. (1956). A Contribution to the Theory of Economic Growth. *The Quarterly Journal of Economics*, 70(1), pp.65–94.

Tsien, T. (1954). Western Impact on China through Translation. *The Far Eastern Quarterly*, 13(3), p.305. doi: https://doi.org/10.2307/2942281.

Wang, H.-C. (2015). Mandarins, Merchants, and the Railway: Institutional Failure and the Wusong Railway, 1874-1877. *International Journal of Asian Studies*, 12(1), pp.31–53. doi: https://doi.org/10.1017/s1479591414000205.

Yu, Z. (2014). *A Touch of Class*. [online] Globaltimes.cn. Available at: https://www.globaltimes.cn/content/836197.shtml?.

Zhang, F. (2023). The Relationship Between Migration and Private Enterprises in Shanghai during the Late Qing Dynasty and the Early Republic of China. *Journal of Education, Humanities and Social Sciences*, 8(1), pp.978–981. doi: https://doi.org/10.54097/ehss.v8i.4389.

Zhang, X. (2022). Foreign Language Education during War-time: Interpreter Training in Shanghai during the Late Qing Dynasty. *US-China Foreign Language*, 20(6). doi: https://doi.org/10.17265/1539-8080/2022.06.001.

Zhang, Z. and Zhou, Q. (2021). *China Permanent Residence Application: the Process in Shanghai*. [online] China Briefing News. Available at: https://www.china-briefing.com/news/china-permanent-residence-application-faq-process-shanghai/.

Appendix

Appendix 1, 2, and 3: Raw Data Set

Appendix 1: Response Variables Utilized in this Research

Years	$percapGDP_t$	Value added per capita			$\Delta\%Agri_t$	$\Delta\%Indus_t$	$\Delta\%Serv_t$
		Agricultural Sector	Industrial Sector	Service Sector			
1880	11.47	7.38	0.86	3.23	-2.1716	0.6779	1.5704
1881	10.50	6.60	0.94	2.97	-1.4846	1.4546	0.1253
1882	12.44	8.13	0.97	3.34	2.4966	-1.1550	-1.4368
1883	13.03	8.55	0.96	3.52	0.2641	-0.4298	0.1657
1884	12.54	8.06	0.90	3.58	-1.3435	-0.1906	1.5341
1885	12.00	7.64	0.92	3.43	-0.6077	0.4896	0.0347
1886	13.77	9.13	0.93	3.71	2.6369	-0.9129	-1.6407
1887	13.65	8.98	0.92	3.75	-0.5160	-0.0139	0.5299
1888	12.78	8.25	0.96	3.56	-1.2336	0.7718	0.3835
1889	13.57	8.89	1.00	3.67	0.9582	-0.1425	-0.8111
1890	14.43	9.66	0.94	3.82	1.4317	-0.8550	-0.5723
1891	13.35	8.83	0.95	3.58	-0.8015	0.6019	0.3439
1892	13.86	9.26	1.01	3.60	0.6686	0.1711	-0.8425
1893	14.24	9.43	1.05	3.76	-0.5891	0.0864	0.4305
1894	14.70	9.47	1.03	4.20	-1.8001	-0.3668	2.1669
1895	15.35	10.01	1.04	4.30	0.7900	-0.2316	-0.5584
1896	15.88	10.47	1.14	4.28	0.7203	0.4036	-1.0609
1897	15.95	10.33	1.28	4.35	-1.1671	0.8462	0.3206
1898	19.90	13.39	1.23	5.28	2.5215	-1.8442	-0.7401
1899	18.34	12.30	1.25	4.80	-0.2199	0.6348	-0.3604
1900	18.27	12.24	1.23	4.80	-0.0714	-0.0834	0.1003
1901	17.94	11.98	1.44	4.52	-0.2169	1.2944	-1.0775
1902	22.92	15.83	1.45	5.64	2.2882	-1.7004	-0.5878
1903	22.58	15.55	1.63	5.39	-0.2001	0.8924	-0.7366
1904	22.35	15.24	1.36	5.74	-0.6783	-1.1338	1.8116
1905	18.72	12.56	1.47	4.69	-1.0939	1.7676	-0.6289
1906	19.99	13.61	1.83	4.54	0.9900	1.3020	-2.3421
1907	24.72	17.22	1.92	5.59	1.5762	-1.3876	-0.0981
1908	25.97	18.03	1.83	6.11	-0.2339	-0.7204	0.9139
1909	23.10	15.66	2.07	5.37	-1.6341	1.9144	-0.2804
1910	26.73	18.53	2.68	5.52	1.5307	1.0651	-2.5958
1911	37.06	26.67	2.43	7.96	2.6415	-3.4693	0.8277
1912	34.50	24.95	2.35	7.21	0.3545	0.2547	-0.5801
Aver.	16.14	10.81	1.34	3.99	0.08	-0.06	-0.02
Max.	37.06	26.67	2.68	7.96	5.38	6.31	3.03
Min.	9.22	5.55	0.86	2.35	-6.30	-4.70	-2.83

Appendix 2: Explanatory Variables Utilized in this Research

Years	Foreign Population	Non-residents	Children	Foreign Working Age Residents	$Foreign\ Immigration_t$	$immi_{t-1}$	$immi_{t-2}$
1880	2197	23	7	2167	78	81	94
1881	2492	51	13	2428	261	78	81
1882	2789	37	23	2729	301	261	78
1883	3082	55	17	3010	281	301	261
1884	3377	37	22	3318	308	281	301
1885	3673	32	20	3621	303	308	281
1886	3702	51	18	3633	12	303	308
1887	3731	46	20	3665	32	12	303
1888	3760	33	23	3704	39	32	12
1889	3789	25	28	3736	32	39	32
1890	3821	35	31	3755	19	32	39
1891	3980	45	38	3897	142	19	32
1892	4140	32	18	4090	193	142	19
1893	4310	31	21	4258	168	193	142
1894	4500	37	40	4423	165	168	193
1895	4684	44	35	4605	182	165	168
1896	4834	47	29	4758	153	182	165
1897	4909	32	27	4850	92	153	182
1898	5240	17	24	5199	349	92	153
1899	5510	28	29	5453	254	349	92
1900	6774	60	16	6698	1245	254	349
1901	7000	91	37	6872	174	1245	254
1902	7600	125	57	7418	546	174	1245
1903	8300	82	46	8172	754	546	174
1904	9000	78	40	8882	710	754	546
1905	11497	112	33	11352	2470	710	754
1906	11904	71	37	11796	444	2470	710
1907	12311	83	92	12136	340	444	2470
1908	12718	0	72	12646	510	340	444
1909	13125	0	102	13023	377	510	340
1910	13536	0	85	13451	428	377	510
1911	14532	0	73	14459	1008	428	377
1912	15529	0	102	15427	968	1008	428
Max.	15529	125	102	15427	2470	2470	2470
Min.	2197	0	7	2167	12	12	12
Aver.	6738	44	39	6655	404	377	350

Appendix 3: Controlled Variables Utilized in this Research

Years	Railway Lenth (km)	Shanghai Port Throughput （Part Est.）	Missionary Schools	Foreign Language Schools	Women's School	International Schools	Education Weighted Value
1880	0	21.34	10	2	0	0	3
1881	0	22.01	10	2	0	0	3
1882	0	22.67	10	2	0	0	3
1883	0	23.37	10	2	0	0	3
1884	0	24.1	10	2	0	0	3
1885	0	24.82	10	2	0	0	3
1886	0	25.57	10	2	0	0	3
1887	0	26.34	10	2	0	0	3
1888	0	27.13	10	2	0	0	3
1889	0	27.95	10	2	0	0	3
1890	0	28.79	10	2	0	0	3
1891	0	29.65	10	2	0	0	3
1892	0	30.54	10	2	0	0	3
1893	0	31.46	10	2	0	0	3
1894	0	32.4	10	2	0	0	3
1895	0	33.37	10	2	0	0	3
1896	0	34.35	10	2	0	0	3
1897	0	35.35	12	5	0	0	3.6
1898	0	36.38	12	6	1	0	3.8
1899	0	37.43	12	6	1	0	3.8
1900	0	38.5	16	8	1	0	5
1901	0	39.59	16	8	1	0	5
1902	0	40.71	16	8	1	0	5
1903	0	42.13	16	8	1	0	5
1904	0	43	16	8	1	0	5
1905	0	44.17	16	8	1	0	5
1906	0	45.37	16	8	1	0	5
1907	0	46.58	16	8	1	0	5
1908	307	47.81	16	8	1	0	5
1909	507	49.06	16	8	1	0	5
1910	507	50.33	16	8	1	0	5
1911	507	51.61	16	8	1	0	5
1912	507	52.9	16	10	1	1	5.5
Max.	507	52.9	16	10	1	1	5.5
Min.	0	21.39	10	2	0	0	3
Aver.	81.2	35.41857143	12.54545455	4.757575758	0.454545455	0.03030303	3.86969697

Appendix 4: Stata Code and Results

Model I

```
. regress per_capita_GDP foreign_immigration_centered immi2_centered railway_lenthkm ShanghaiPort_Throughput educationweightedvalue

      Source |       SS           df       MS      Number of obs   =        33
-------------+----------------------------------   F(5, 27)        =     54.22
       Model |  1195.77832         5  239.155664   Prob > F        =    0.0000
    Residual |  119.098268        27  4.41104696   R-squared       =    0.9094
-------------+----------------------------------   Adj R-squared   =    0.8926
       Total |  1314.87659        32  41.0898934   Root MSE        =    2.1002

---------------------------------------------------------------------------------------------
             per_capita_GDP | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
----------------------------+----------------------------------------------------------------
foreign_immigration_centered |   .0050286   .0023242     2.16   0.040     .0002596    .0097976
             immi2_centered |  -3.09e-06   1.23e-06    -2.52   0.018    -5.61e-06   -5.72e-07
            railway_lenthkm |   .0095165   .0030002     3.17   0.004     .0033606    .0156723
    ShanghaiPort_Throughput |   .3760811    .101854     3.69   0.001     .1670939    .5850683
     educationweightedvalue |   .3391664   1.008299     0.34   0.739    -1.729693    2.408025
                      _cons |   3.484119   2.638542     1.32   0.198    -1.929723     8.89796
---------------------------------------------------------------------------------------------

. regress D_per_capita_GDP D_foreign_immigration D_immi2 D_railway_lengthkm D_ShanghaiPort_Throughput D_educationweightedvalue residua
> ls_lag1

      Source |       SS           df       MS      Number of obs   =        32
-------------+----------------------------------   F(6, 25)        =      6.55
       Model |  130.400024         6  21.7333373   Prob > F        =    0.0003
    Residual |  82.8889036        25  3.31555614   R-squared       =    0.6114
-------------+----------------------------------   Adj R-squared   =    0.5181
       Total |  213.288928        31  6.88028799   Root MSE        =    1.8209

------------------------------------------------------------------------------------------
         D_per_capita_GDP | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
--------------------------+---------------------------------------------------------------
    D_foreign_immigration |   .0133566   .0027093     4.93   0.000     .0077768    .0189364
                  D_immi2 |  -4.79e-06   9.44e-07    -5.07   0.000    -6.74e-06   -2.85e-06
       D_railway_lengthkm |  -.0032472   .0053819    -0.60   0.552    -.0143315    .0078371
D_ShanghaiPort_Throughput |   .9439076   .9693391     0.97   0.340    -1.052484    2.940299
 D_educationweightedvalue |  -1.221115   .3963152    -3.08   0.005    -2.037342   -.4048889
           residuals_lag1 |  -.6848802   .1925321    -3.56   0.002    -1.081407    -.288353
                    _cons |  -.3125022   .9906684    -0.32   0.755    -2.352822    1.727818
------------------------------------------------------------------------------------------

. dfuller foreign_immigration_centered, lags(1) trend

Augmented Dickey–Fuller test for unit root

Variable: foreign_immigr~d                  Number of obs  = 31
                                            Number of lags =  1

H0: Random walk with or without drift

                                       Dickey–Fuller
                   Test      -------- critical value ---------
              statistic           1%           5%          10%
--------------------------------------------------------------
 Z(t)            -3.422       -4.325       -3.576       -3.226
--------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0485.
```

Model II

```
. regress change_in_percentindus_gdp foreign_immigration_centered immi2_centered t1foreignimmi t2foreignimmi educationweightedvalue
```

Source	SS	df	MS	Number of obs	=	33
				F(5, 27)	=	3.14
Model	.001563441	5	.000312688	Prob > F	=	0.0233
Residual	.002692839	27	.000099735	R-squared	=	0.3673
				Adj R-squared	=	0.2502
Total	.00425628	32	.000133009	Root MSE	=	.00999

change_in_percentindus_gdp	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
foreign_immigration_centered	-.0000264	.0000112	-2.35	0.026	-.0000495	-3.38e-06
immi2_centered	1.66e-08	5.84e-09	2.84	0.009	4.59e-09	2.86e-08
t1foreignimmi	7.41e-06	4.73e-06	1.57	0.129	-2.29e-06	.0000171
t2foreignimmi	-9.76e-06	4.51e-06	-2.17	0.039	-.000019	-5.10e-07
educationweightedvalue	.0047758	.0035131	1.36	0.185	-.0024325	.011984
_cons	-.0217098	.0133653	-1.62	0.116	-.049133	.0057135

```
. regress D_change_in_percentindus_gdp D_foreign_immigration D_immi2 t1foreignimmi t2foreignimmi D_educationweightedvalue residuals_lag
> 1
```

Source	SS	df	MS	Number of obs	=	32
				F(6, 25)	=	6.26
Model	.006606369	6	.001101061	Prob > F	=	0.0004
Residual	.004399184	25	.000175967	R-squared	=	0.6003
				Adj R-squared	=	0.5043
Total	.011005552	31	.000355018	Root MSE	=	.01327

D_change_in_percentind~p	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
D_foreign_immigration	-.0000663	.0000209	-3.18	0.004	-.0001093	-.0000234
D_immi2	2.63e-08	6.96e-09	3.78	0.001	1.20e-08	4.07e-08
t1foreignimmi	.0000103	6.73e-06	1.53	0.139	-3.56e-06	.0000242
t2foreignimmi	-.0000105	5.64e-06	-1.86	0.075	-.0000221	1.13e-06
D_educationweightedvalue	.00433	.0029032	1.49	0.148	-.0016492	.0103092
residuals_lag1	.0051434	.0013984	3.68	0.001	.0022633	.0080235
_cons	.0006832	.0036364	0.19	0.852	-.0068061	.0081724

Model III

```
. regress Change_in_percent_ServGDP foreign_immigration_centered immi2_centered t1foreignimmi t2foreignimmi educationweightedvalue
```

Source	SS	df	MS	Number of obs	=	33
				F(5, 27)	=	1.23
Model	.000704292	5	.000140858	Prob > F	=	0.3211
Residual	.003084538	27	.000114242	R-squared	=	0.1859
				Adj R-squared	=	0.0351
Total	.00378883	32	.000118401	Root MSE	=	.01069

Change_in_percent_ServGDP	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
foreign_immigration_centered	.0000156	.000012	1.30	0.206	-9.10e-06	.0000402
immi2_centered	-7.57e-09	6.25e-09	-1.21	0.236	-2.04e-08	5.26e-09
t1foreignimmi	-7.73e-06	5.06e-06	-1.53	0.138	-.0000181	2.65e-06
t2foreignimmi	1.47e-06	4.83e-06	0.31	0.763	-8.43e-06	.0000114
educationweightedvalue	-.0033441	.0037599	-0.89	0.382	-.0110588	.0043706
_cons	.0154102	.0143043	1.08	0.291	-.0139398	.0447603

```
.  regress D_Change_in_percent_ServGDP D_foreign_immigration D_immi2 t1foreignimmi t2foreignimmi D_educationweightedvalue residuals_lag
> 1
```

Source	SS	df	MS	Number of obs	=	32
				F(6, 25)	=	1.17
Model	.001785797	6	.000297633	Prob > F	=	0.3553
Residual	.006379408	25	.000255176	R-squared	=	0.2187
				Adj R-squared	=	0.0312
Total	.008165205	31	.000263394	Root MSE	=	.01597

D_Change_in_percent_Se~P	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
D_foreign_immigration	.0000237	.0000251	0.94	0.355	-.0000281	.0000754
D_immi2	-9.87e-09	8.39e-09	-1.18	0.250	-2.71e-08	7.41e-09
t1foreignimmi	-.0000115	8.10e-06	-1.42	0.167	-.0000282	5.16e-06
t2foreignimmi	.0000125	6.80e-06	1.83	0.079	-1.55e-06	.0000265
D_educationweightedvalue	-.0020077	.0034961	-0.57	0.571	-.009208	.0051925
residuals_lag1	.0015828	.001684	0.94	0.356	-.0018855	.0050511
_cons	-.0006636	.004379	-0.15	0.881	-.0096822	.008355

Model IV

```
.
. regress change_in_percentagri_gdp foreign_immigration_centered immi2_centered t1foreignimmi t2foreignimmi educationweightedvalue
```

Source	SS	df	MS	Number of obs	=	33
				F(5, 27)	=	0.74
Model	.000752819	5	.000150564	Prob > F	=	0.5984
Residual	.005474378	27	.000202755	R-squared	=	0.1209
				Adj R-squared	=	-0.0419
Total	.006227196	32	.0001946	Root MSE	=	.01424

change_in_percentagri_gdp	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
foreign_immigration_centered	9.87e-06	.000016	0.62	0.543	-.000023	.0000427
immi2_centered	-8.42e-09	8.33e-09	-1.01	0.321	-2.55e-08	8.67e-09
t1foreignimmi	5.24e-08	6.74e-06	0.01	0.994	-.0000138	.0000139
t2foreignimmi	8.59e-06	6.43e-06	1.34	0.193	-4.60e-06	.0000218
educationweightedvalue	-.0012925	.005009	-0.26	0.798	-.01157	.0089851
_cons	.0056552	.0190564	0.30	0.769	-.0334452	.0447556

```
. regress D_change_in_percentagri_gdp D_foreign_immigration D_immi2 t1foreignimmi t2foreignimmi D_educationweightedvalue residuals_lag1
```

Source	SS	df	MS	Number of obs	=	32
				F(6, 25)	=	2.55
Model	.00498288	6	.00083048	Prob > F	=	0.0457
Residual	.008137935	25	.000325517	R-squared	=	0.3798
				Adj R-squared	=	0.2309
Total	.013120815	31	.000423252	Root MSE	=	.01804

D_change_in_percentagr~p	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
D_foreign_immigration	.00004	.0000284	1.41	0.171	-.0000184	.0000984
D_immi2	-1.55e-08	9.47e-09	-1.64	0.114	-3.50e-08	4.00e-09
t1foreignimmi	7.51e-07	9.15e-06	0.08	0.935	-.0000181	.0000196
t2foreignimmi	-1.33e-06	7.68e-06	-0.17	0.864	-.0000171	.0000145
D_educationweightedvalue	-.0022542	.0039486	-0.57	0.573	-.0103865	.0058781
residuals_lag1	-.0067039	.001902	-3.52	0.002	-.0106211	-.0027867
_cons	-.0000333	.0049458	-0.01	0.995	-.0102194	.0101528

Appendix 5: Main Text Figures and Tables Compilation

Figure 1: *The Geographical Location of Shanghai and the Yangtze River Delta*

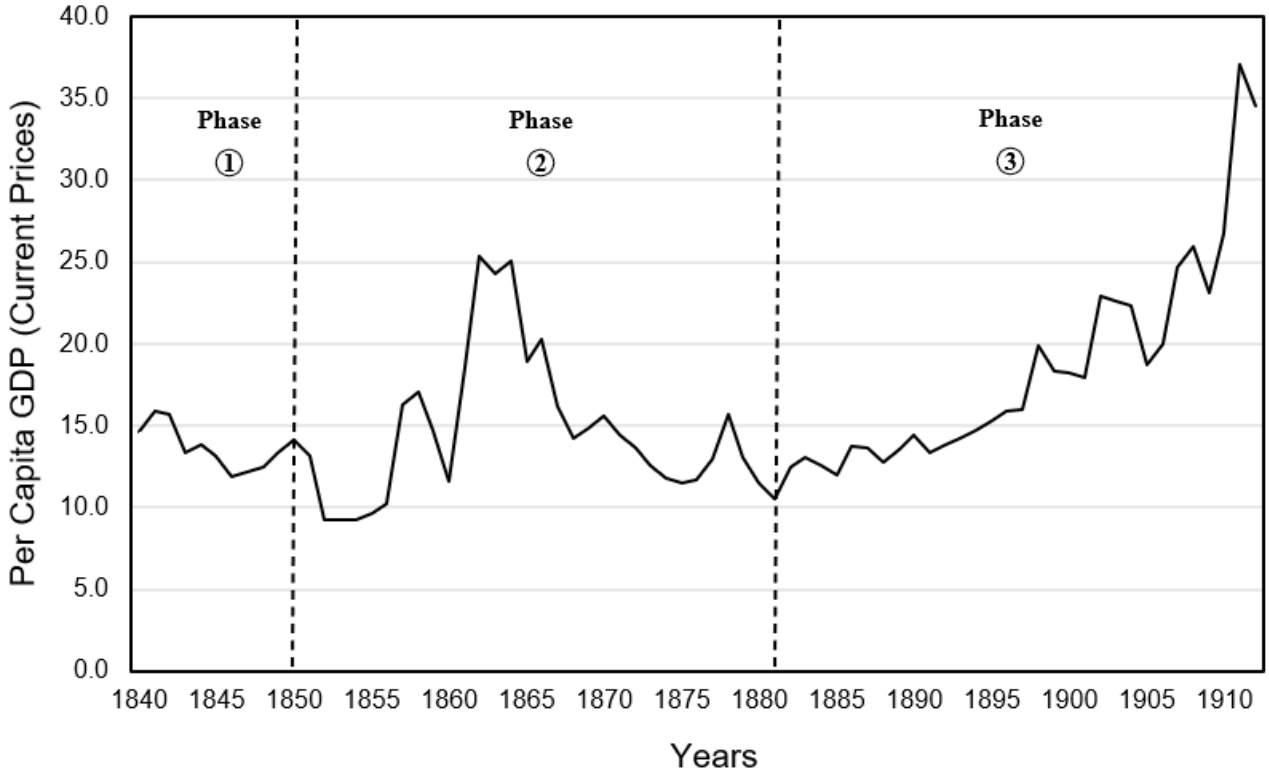


Figure 2*: Economic Performance in Late Qing China from 1840-1912*

Year	Missionary Schools	Foreign Language Schools	Women's Schools	Private Traditional Schools (Si-Shu)	International Schools
1880	~10[i]	2	None	Numerous (decreasing)	None
1897	12 (girls' schools)	~5	None	Numerous (decreasing)	None
1898	12 (girls' schools)	~6	1	Numerous (decreasing)	None
1900	16 (12 primary, 3 middle/high, 1 college)	~8	1	Numerous (decreasing)	None
1912	16 (no evidence for new school)	~10	1	Numerous (decrease due to reform efforts)	1 (Shanghai American School)

***Table 1**: The number of different types of schools in Shanghai (1880-1912)*

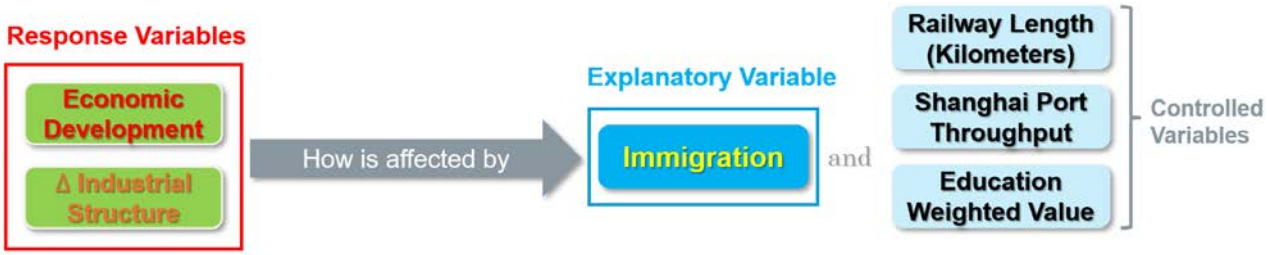


***Figure 3**: The Structural Framework of Research Models*

Augmented Dickey–Fuller test for unit root

Variable: **residuals** Number of obs = **31**
Number of lags = **1**

H0: Random walk with or without drift

	Test statistic	Dickey–Fuller critical value 1%	5%	10%
Z(t)	**-5.463**	**-4.325**	**-3.576**	**-3.226**

MacKinnon approximate *p*–value for Z(t) = **0.0000.**

***Table 2**: ADF Test Result for Model I Residuals*

Table 3: Models I-IV Regression Results Summary

VARIABLES	(1) $percapGDP_t \times 10^6$	(2) $\Delta\%indusGDP_t$	(3) $\Delta\%servGDP_t$	(4) $\Delta\%agriGDP_t$
$immi_t^c$	5,028.6 **	-26.4 × 10⁻⁶ **	15.60 × 10⁻⁶	9.87 × 10⁻⁶
	(2,324.2)	(11.20)	(12.00)	(16.00)
$immi_t^{c\,2}$	-3.09 **	.0166 × 10⁻⁶ ***	-.00757 × 10⁻⁶	-.00842 × 10⁻⁶
	(1.23)	(.00584)	(.00625)	(.00833)
$immi_{t-1}$		7.41 × 10⁻⁶	-7.73 × 10⁻⁶	.0524 × 10⁻⁶
		(4.73)	(5.06)	(6.74)
$immi_{t-2}$		-9.76 × 10⁻⁶ **	1.47 × 10⁻⁶	8.59 × 10⁻⁶
		(4.51)	(4.83)	(6.43)
$RailwayLenth_t$	9,516.5 ***			
	(3,000.2)			
T_t	376,081.1 ***			
	(101,854)			
$W_{educ\ t}$	339,166.4	4775.80 × 10⁻⁶	-3344.10 ×10⁻⁶	-1292.50 × 10⁻⁶
	(1,008,299)	(3513.10)	(3759.90)	(5009.00)
Constant	3,484,119	-21709.8 × 10⁻⁶	15410.20×10⁻⁶	5655.20 × 10⁻⁶
	(2,638,542)	(13365.30)	(14304.30)	(19056.40)
Observations	33	33	33	33
Adjusted R^2	0.8926	0.2502	0.0351	-0.0419
F	54.22 ***	3.14 **	1.23	0.74

Std. error in parentheses (Model II-IV × 10⁻⁶)

$*** p < 0.01,\ ** p < 0.05,\ * p < 0.1$

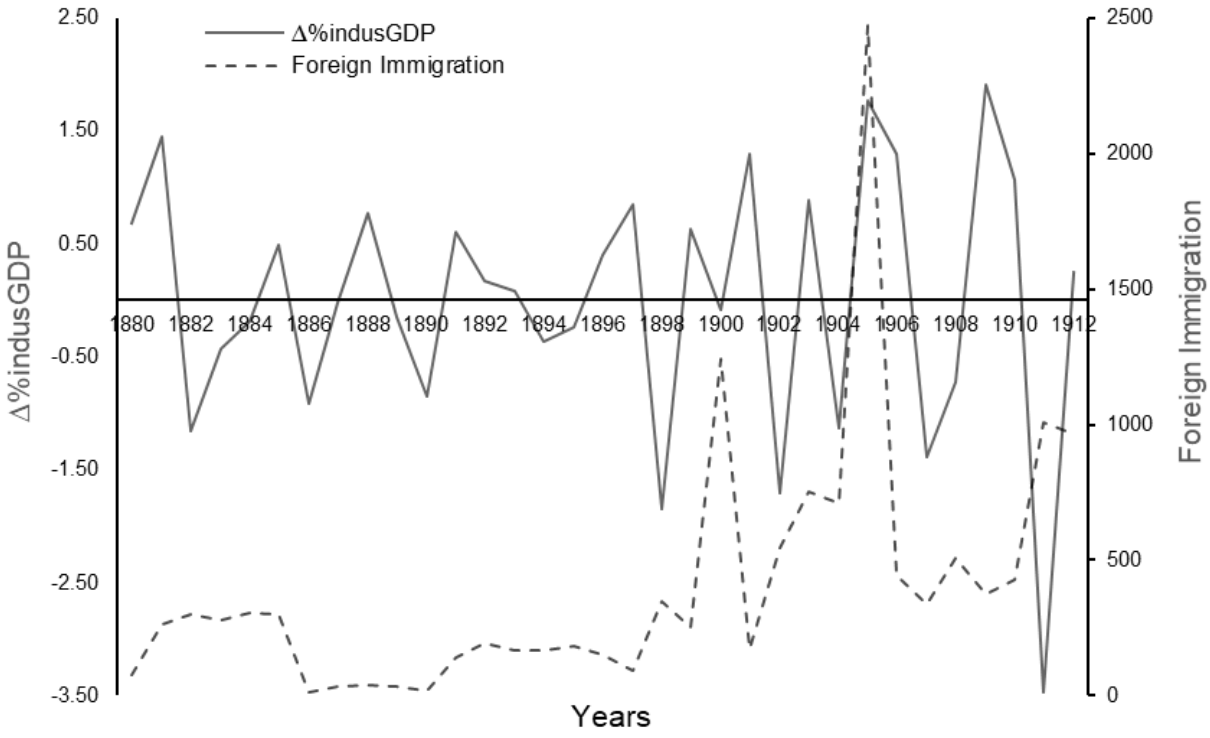


***Figure 4**: Comparison of Δ%IndusGDP with Trends in Foreign Immigration*

Table 4: Error Correction Model I & II Results

VARIABLES	(1) $D_{percapGD\ P_t}$	(2) $D_{\Delta\%indusGD\ P_t}$
$D_{imm\ i_t^c}$	.0133566 ***	-.0000663 ***
	(0.0027093)	(.0000209)
$D_{imm\ i_t^{c\,2}}$	-4.79 × 10^{-6} ***	2.63 × 10^{-8} ***
	(.944 × 10^{-6})	(6.96 × 10^{-9})
$D_{imm\ i_{t-1}}$		.0000103
		(6.73 × 10^{-6})
$D_{imm\ i_{t-2}}$		-.0000105 **
		(5.64 × 10^{-6})
$D_{RailwayLent\ \ h_t}$	-.0032472	
	(0.0053819)	
D_{T_t}	.9439076	
	(.9693391)	
$D_{W_{educ\ t}}$	-1.221115 ***	.00433
	(.3963152)	(.0029032)
$Residuals_{t-1}$	-.6848802 ***	. 0051434 **
	(.1925321)	(.0013984)
Constant	-.3125022	.0006832
	(.9906684)	.0036364
Observations	33	33
Adjusted R-squared	0.5181	0.5043
F	6.55 ***	6.26 ***

Std. error in parentheses

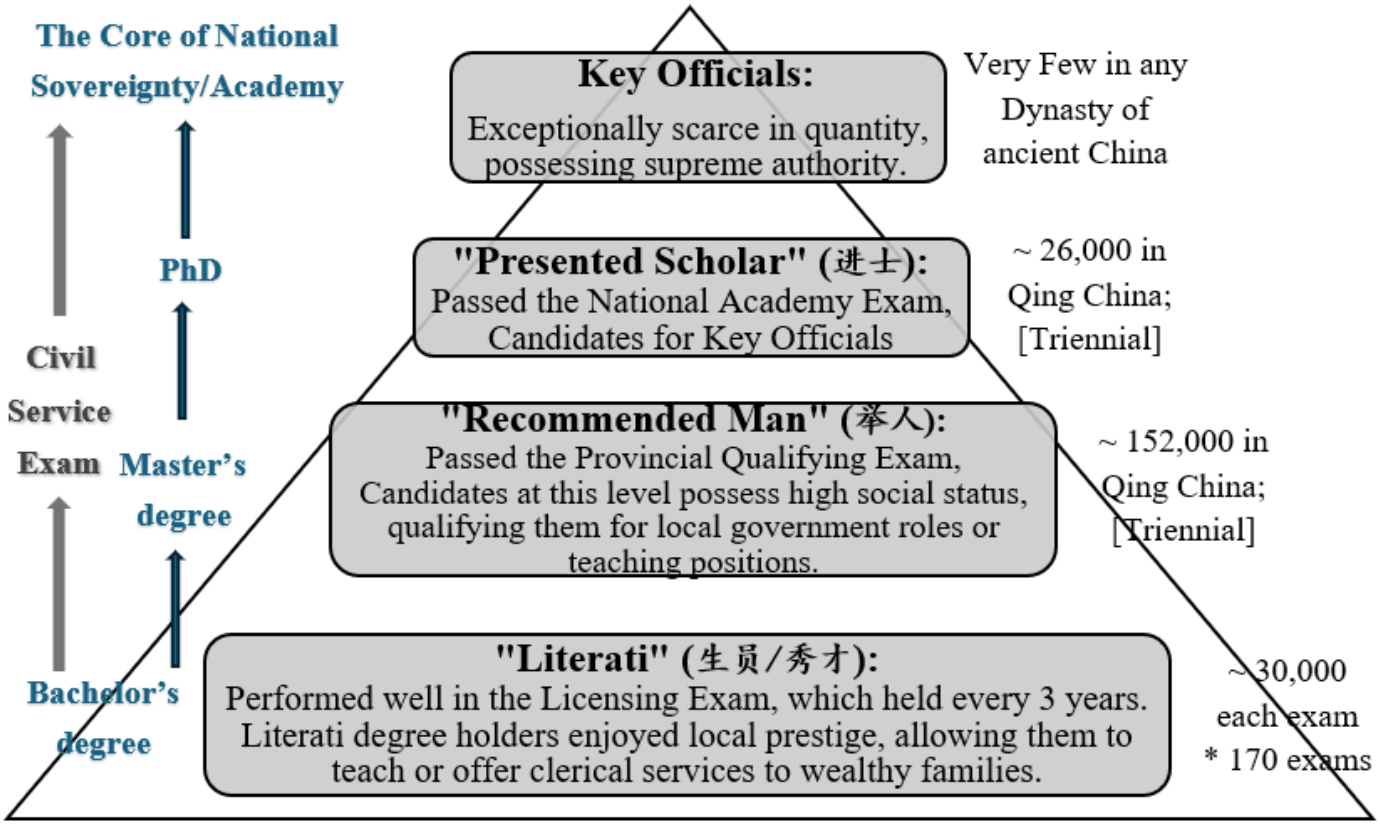
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

TABLE 36 The structure of occupation of foreigners in the International Settlement (1885–1935) (*cont.*)

Sector 1	Sector 2	Professional category 1	Professional category 2
INDUSTRY	HANDICRAFT PRODUCTION	Workers	Skilled workers
INDUSTRY	HANDICRAFT PRODUCTION	Workers	Skilled workers
INDUSTRY	HANDICRAFT PRODUCTION	Workers	Skilled workers
INDUSTRY	HANDICRAFT PRODUCTION	Workers	Skilled workers
INDUSTRY	HANDICRAFT PRODUCTION	Workers	Skilled workers
INDUSTRY	HANDICRAFT PRODUCTION	Workers	Skilled workers
INDUSTRY	INDUSTRY	Middle managers	Technicians
INDUSTRY	INDUSTRY	Professionals and senior executives	Senior administrative executives
INDUSTRY	INDUSTRY	Trade and Industry Business Owners	Craftsmen
INDUSTRY	INDUSTRY	Trade and Industry Business Owners	Manufacturer
INDUSTRY	INDUSTRY	Workers	Laborers
INDUSTRY	INDUSTRY	Workers	Skilled workers
INDUSTRY	INDUSTRY	Workers	Skilled workers
INDUSTRY	INDUSTRY	Workers	Skilled workers
INDUSTRY	LEATHER AND RUBBER INDUSTRY	Trade and Industry Business Owners	Small traders
INDUSTRY	LEATHER AND RUBBER INDUSTRY	Workers	Skilled workers
INDUSTRY	MACHINERY AND METAL PRODUCTS	Professionals and senior executives	Engineers
INDUSTRY	MACHINERY AND METAL PRODUCTS	Professionals and senior executives	Engineers
INDUSTRY	MACHINERY AND METAL PRODUCTS	Trade and Industry Business Owners	Manufacturer
INDUSTRY	MACHINERY AND METAL PRODUCTS	Trade and Industry Business Owners	Manufacturer
INDUSTRY	MACHINERY AND METAL PRODUCTS	Workers	Skilled workers
INDUSTRY	MACHINERY AND METAL PRODUCTS	Workers	Skilled workers
INDUSTRY	MACHINERY AND METAL PRODUCTS	Workers	Skilled workers
INDUSTRY	MACHINERY AND METAL PRODUCTS	Workers	Skilled workers
INDUSTRY	MACHINERY AND METAL PRODUCTS	Workers	Skilled workers
INDUSTRY	MACHINERY AND METAL PRODUCTS	Workers	Skilled workers
INDUSTRY	OTHER INDUSTRY	Trade and Industry Business Owners	Manufacturer
INDUSTRY	PAPER AND PRINTING	Middle managers	Technicians
INDUSTRY	PAPER AND PRINTING	Trade and Industry Business Owners	Manufacturer
INDUSTRY	PAPER AND PRINTING	Trade and Industry Business Owners	Craftsmen
INDUSTRY	PAPER AND PRINTING	Workers	Skilled workers
INDUSTRY	PAPER AND PRINTING	Workers	Laborers
INDUSTRY	PAPER AND PRINTING	Workers	Skilled workers
INDUSTRY	PUBLIC UTILITY	Employees	Office workers
INDUSTRY	PUBLIC UTILITY	Workers	Skilled workers

: Shanghai's Foreign Immigration in the Industrial Sector

***Figure 5**: Sample Statistics of Foreigners' Occupations in the Shanghai International Settlement in 1935 (Henriot, Shi and Aubrun, 2018)*



**Right side: Statistics of the Qing Dynasty Imperial Examination and the Number of Candidates*
**Left side: Comparison of the hierarchical structure of Qing Dynasty Imperial Examination Candidates with Contemporary Chinese Higher Education Degrees, Accompanied by the Framework of Modern Chinese National Examinations*

Figure 6: Overview of the Imperial Examination System during the Qing Dynasty

Appendix 6: Online Link for Research Data

The dataset employed for quantitative analysis in this research is accessible and freely available at the provided link, allowing fellow researchers to engage with the dataset using statistical regression software and reproduce the identical regression outcomes with our publicly accessible Stata code.

Appendix_Term paper Raw Data Excel.xlsx

Available at: https://1drv.ms/x/c/eb9b435acf349607/ESdZh0o4yhxPtCmO_Oy17UIBXRrguzFUzwwvdgC-pWt3yA?e=gz5QOU

This is the end of this Paper. Thanks for reading.

[i] We define " Junior Chinese History Scholar " here broadly refers to Chinese high school graduates who have undergone high school history education in Mainland China. Stereotypical mindsets arise for two reasons: 1) Standardized answers in secondary school history exams require rote memorization for high scores; 2) Economics is not taught as a separate subject in compulsory education. Only a small portion of political economics is taught in political science courses. Please allow us to use our experience as evidence to support this perspective. Interestingly, the five authors involved in this study hail from various provinces and municipalities across China, including Beijing, Wuhan, Henan, and Hebei, covering a significant portion of the country. Prior to embarking on this research, when discussing the migration of overseas immigrants to the mainland in modern history, we acknowledged that we had not deeply considered the economic aspects. Naturally, our examples cannot perfectly represent all Chinese high school students; they can only reflect a segment of students who have received similar education.

[ii] The period we studied—commonly defined as the late Qing Dynasty—spans from 1840 to 1911, while both Article 1 and Article 2 focus on research concerning immigration in the Shanghai region during the Republican era (1912-1948). This reliance on studies from the Republican period is necessitated by the extreme scarcity of relevant research from the Qing Dynasty.

[iii] Ma and Jong did not specify the year of the price levels they referenced. Considering the publication date of their research, we can infer that it likely pertains to the price levels in China around 2012-2015.

[iv] However, for conducting a micro-level analysis, the average wages of workers in specific industries serve as a more effective performance indicator. Therefore, if we can obtain detailed wage data for workers across various industries during this period, it would also be a valuable choice of regression variable.

[v] This is the only uncertain source among our controlled variables. We can only estimate, based on some literary works, that there are approximately ten Missionary schools, a figure that may fluctuate by around two. We are still working on this.

[vi] In ancient China, due to the generally low cultural level of the populace, we speculate that only those who held the degrees of Literate and Recommended Men but had lost confidence in entering government service, would engage in the publication of scientific works. This also explains why we believe that a portion of the human capital was reasonably utilized at the time. Without this academic exchange, those who obtained Literate or Recommended Men degrees might have continued to consider taking the imperial examinations, awaited a sinecure from the local government or opened private schools to educate the next generation of students.

[vii] This passage refers to two distinct examination systems in China: the National Postgraduate Entrance Examination and the Civil Service Examination. To prevent misunderstandings among readers unfamiliar with contemporary Chinese examination systems, we provide a detailed explanation of these two pathways. Both routes, leading to academic or governmental prominence, require a bachelor's degree. We begin by outlining how a student in China attains an undergraduate degree. Within the Chinese educational framework, the sole avenue for ordinary individuals to enter university is through the National College Entrance Examination, commonly known as the "Gaokao," considered one of the most competitive exams globally. After completing nine years of compulsory education, students must first pass the Chinese High School Entrance Examination (Zhongkao) to qualify for general high school education (approximately 50% of candidates do not enter high school and may choose to drop out and work or attend secondary vocational schools). Upon successful entry into high school, students have three years to prepare for the Gaokao. Held annually, the Gaokao includes repeat candidates and social examinees, with only about 40% gaining admission to comprehensive universities, thus having the opportunity to earn a bachelor's degree.

Route One: After obtaining a bachelor's degree, students aspiring for higher education can pursue a postgraduate degree. Unlike most countries, admission to master's programs in Chinese universities is not application-based but involves a rigorous examination process to select from among bachelor's degree holders.

Route Two: For many bachelor's graduates, and even those with master's or doctoral degrees, working in government agencies or state-owned enterprises is an attractive option. In China, entry into these positions requires passing the Civil Service Examination, which varies in content. Given the broader range of candidates' backgrounds, competition for the Chinese Civil Service Examination is even more intense.

Refer to the flowchart on the left side of Figure 6 for a visual representation of these two examination-based pathways to higher echelons.