Colonial Education and Industrialization: Evidence from Korean Peninsula in 1930

By

LU, Wenyuan

THESIS

Submitted to

KDI School of Public Policy and Management

In Partial Fulfillment of the Requirements

For the Degree of

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Colonial Education and Industrialization: Evidence from Korean Peninsula in 1930

Wenyuan Lu

Abstract

This study examines how colonial education affects industrialization in the context of Korea under Japanese rule. I focus on the role of the two different languages, Japanese and Korean. Rising literacy rates of Korean and Japanese would reflect improving cognitive abilities and better chances of adopting advanced technologies, respectively. Collecting and examining district-level data, I test how each channel contributed to the industrialization of colonial Korea. I find that having a Japanese literacy rate is strongly associated with the development of non-agricultural industries in 1930. In contrast, the Korean literacy rate does not show a significant correlation. This means that knowing the colonial language gave an advantage to learning new technology and entering a new sector. I also address potential endogeneity by instrumenting the Japanese literacy rate by the presence of civil exam passers during the Joseon Dynasty, which corroborates my results. My study sheds light on the role of colonial education in the industrialization of latecomer countries.

Keywords: Industrialization, literacy rate, education, colonial institution, Korea

1. Introduction

There is a wide consensus regarding the importance of human capital for economic growth. From the Solow model to the endogenous growth model, various economic growth models state that human capital generates spillover effects to improve productivity (Lucas, 1988) and this internal process finally generates the persistent economic growth gap between different countries. Countries have invested much in formal education to improve human capital.

Abundant empirical studies focus on the relationship between education, industrialization, and economic growth (Sandberg, 1979; Clark, 2005; Squicciarini & Voigtländer, 2015; Madsen & Murtin, 2017; Cinnirella & Streb, 2017; Mokyr, 2018; Mokyr et al., 2022). Recently, this topic is studied in the context of latecomer countries during the second phase of the industrial revolution. For example, Becker et al. (2021) find that primary education is significantly associated with non-textile industrialization in both phases of the Industrial Revolution. The basic education of Prussian laid the sound foundation for Germany to become a leading nation during the second industrial revolution. Montalbo (2022) also reveals the effect of primary education on the development of France before World War I. There existed a positive effect of primary education acquisition and elementary skills on the development of French municipalities, which is the measure of urbanization, finally generating a positive modernization outcome.

This study extends the literature by examining how the colonial education system served the goal. I focus on the fact that the official school language can be different from the native language. The colonial government has incentives to promote their language. While it helps adopt advanced technologies, it may exclude many local people from access to new knowledge. This problem, the effects of dual languages at schools under the colonial education system on industrialization, is hardly discussed in the literature.

My hypothesis is colonial education system can improve technology adoption and industrialization. However, the underlying mechanism would be different from the commonly known channel. Improving the average human capital would also increase the speed of technology adoption and knowledge spillover. In the colonial economy, those who received colonial education and learned the colonizer's language were more likely to have more opportunities to access new information and knowledge, which would have led to technology adoption and industrialization. Those who receive traditional education would not have had such opportunities.

Colonial Korea provides a proper context to examine the hypothesis. To test this hypothesis, I use the Japanese literacy rate as the measure of acceptance of colonial public education and the Korean literacy rate as the indicator of traditional education. I use the proportion of non-agricultural occupations for the industrial outcome. For the important instrument variable --- *mungua* (imperial exam passer) intensity. I utilize the same data and measurement as Hong and Paik(2017), and control variables Yangban intensity and land tenancy ratio which represent s the local elites class intensity and rich

level of agriculture sector[1] are also the same as their measurement and data resources. Furthermore, I also control the distance from the county center to Seoul and Busan, which represent the two political and economic centers of Korea, and Busan is one the most important Korean port to Japan.

From OLS and IV analysis, I find that having a Japanese literacy rate is strongly associated with the development of non-agricultural industries in 1930. In contrast, the Korean literacy rate does not show a significant correlation. This means that knowing the colonial language gave an advantage to learning new technology and entering a new sector.

I also address the potential endogeneity problem by utilizing the implementation of the Joseon Education Decree as an exogenous shock, then observe the effect of two literacy rates that are impacted by public schools on the non-agricultural occupational rate at the district/county level. The analysis results in support my results.

This paper makes several contributions to the literature. First, I add more evidence to the role of human capital in industrialization. Second, I provide economic explanations of how colonial institutions would bring long-term negative effects, especially on national identity.

This paper is organized as follows. Section 2 provides historical background to explain how colonial education was introduced and how it would have affected

[1] Use Tenancy customs in colonial Korea (1930) to calculate the land tenancy ratio as the number of tenant households divided by the number of owner-operator households and landowning households combined.

industrialization. Section 3 introduces the data and empirical strategy. Section 4 reports and interprets results. I also explain possible mechanisms. Section 5 concludes.

2. **Historical Background**

a) Korea's primary industrialization

Comparing with the first-phase leader of industrialization Britain and catch-up leader Germany in the second phase industrial revolution. Most Asian countries, besides Japan, are very latecomers in industrialization. In the nineteenth century, most Asian countries were still during the last period of the feudal dynasty, and the long-term isolationism attitude towards foreign affairs made most Eastern Asian countries close the door of their territory. However, the trend of globalization is irresistible. The urgent desire of these countries that already finished industrialization is to look for overseas markets and raw material exporting countries to sustain the fast-growing of their domestic production. In this way, the era of colonialism arrived.

After the forced opening of the country, Meiji government, the new government implemented a modernization plan. They quickly adopt the European and U.S. political structures, provide people universal access to free public schools and vocational schools, reform the army, and equip them with new weapons. However, the Japanese industry has a deadly disadvantage --- The island country lacked many raw materials and natural resources. Therefore, to look for new markets for their goods, and resources to make the goods, they intended to look for some markets by forcibly taking colonies. So, the

Korean peninsula, the neighboring country with both a large volume of population and natural resources, become one of the first targets(Trevor Getz, n.d.).

Korea was forced to be open to international trade in 1876 because of the invasion of the Japanese navy, then Japan annexed the country in 1910, replacing the feudal dynasty with a colonial state. In 1910, because of the investment from Japan, industrialization emerges. Between 1912 to 1939, the ratio of mining and manufacturing industries combined in the total economy grew significantly, from about 5% to about 20%. Furthermore, because the mining location and waterpower resources mainly concentrate in the north, so based on the higher volume of investment and the capital accumulation, demographic expansion, per capita output growth, and structural change occurred at considerably faster rates in the northern than in the southern province. In short, the 1910s-1940s represented a period of quick transition from a feudal economy to a primary industrialization economy of Korea(Cha & Kim, 2012; Kimura, 2018).

b) Korea's education during the colonial period

During the time of Japanese occupation, Korean education was distorted by Japanese imperialism. Although the public resources provided by the colonial government-general caused a significant increase in the number of schools and students enrolled. Public education flourish while private and traditional schools shriveled(Yuh L., 2010).

Since the implementation of the first Joseon Education Decree in 1911, the colonial education system is introduced to Korea. During 1911- 1922(the period of the first Joseon Education Decree) primary, middle schools, and vocational schools widely spread. The two major functions initially conceived by the Japanese authorities for the new education were, first, to emphasize moral character and thorough propagation of the "national language" (Japanese) to inculcate the quality and character of a loyal subject of the Japanese Empire. Secondly, to rationalize education for rather practical purposes (Chang, 1975). In the first stage, this system only aims at Korean residents. The Korean language is widely used in the courses in public schools since the system lacks Japanese teachers, and most students cannot understand course contents in a foreign language. Till 1922-1937, the period of the second Joseon Education Decree implementation, the colonial education system is open to both Korean and Japanese children. Public normal colleges are included in the development of colonial education. Korean people can participate in the cultivation of local teachers. Korean-taught courses persist. However, till the period of the third Joseon Education Decree 1938-1945, which is also the climax of the Kominka Movement(皇民化運動; 황민화정책), Korean-taught courses are comprehensively canceled and replaced by pure Japanese-taught courses which aim to totally kominka (Japanese-nationalize) Korean citizens. Even Korean students' names have to be replaced by Japanese names in public schools. Therefore, in summary, 1930 is the year the period of the second Joseon Education Decree, which is a comparatively mature time of the colonial education system, but dual languages still exist. Furthermore, since 1922, local teachers cultivated from

normal colleges should have been already working in the public education system. So, the year 1930 should be a suitable time window to evaluate the impact of two literacy rates and the underlying mechanism.

At the time of colonial education development, the number of indigenous schools in Korea has been greatly reduced. In 1919, the number of private schools in the Korean peninsula dropped from 1973 in 1911 to 690. When the third " Joseon Education Decree " in 1938 was issued, the Korean language was removed from school education subjects, school names were uniformly changed to Japanese names, and ethnical education was strangled(교육(敎育) - 한국민족문화대백과사전, n.d.; 林敬淳, 2012).

3. Empirical Strategy and Data

To evaluate the logical mechanism of education – literacy – industrialization, thus the main models are to identify the relationship between two literacy rates and industrialization.

$$\text{Non-agriculture}_i = \alpha + \beta_1 \text{ Japanese\_Lit}_i + \beta_2 \text{Korean\_Lit}_i + X_i\Omega + \varepsilon_i$$

This equation examines the relationship between the non-agriculture ratio and two different literacy rates. In this equation, I index the district in colonial Korean. $\text{Korean\_Lit}_\text{i}$ and $\text{Japanese\_Lit}_\text{i}$ represent the Korean/Japanese literacy rate in the district i. $Control_i$ represents a series of control variables of district characteristics.

Because the regression model above involves endogeneity, to identify the causal impact of Japanese literacy, I utilize the indicator of historical human capital accumulation --- the intensity of *mungua* (imperial exam passers) as the instrument

variable in the second model. Because *mungua* intensity can reflect the intensity of local educational talents. The local elites or talents would have more education resources, such as a better study atmosphere, books, and communication opportunities. Mungua intensity is supposed to be highly correlated with a higher literacy rate. In this work, I found there is a significant correlation between mungua intensity and Japanese literacy. While as a historical indicator, mungua intensity is with no direct correlation with modernization and industrialization. Therefore, I hypothesize that *mungua* intensity is a reasonable instrumental variable for the literacy rate.

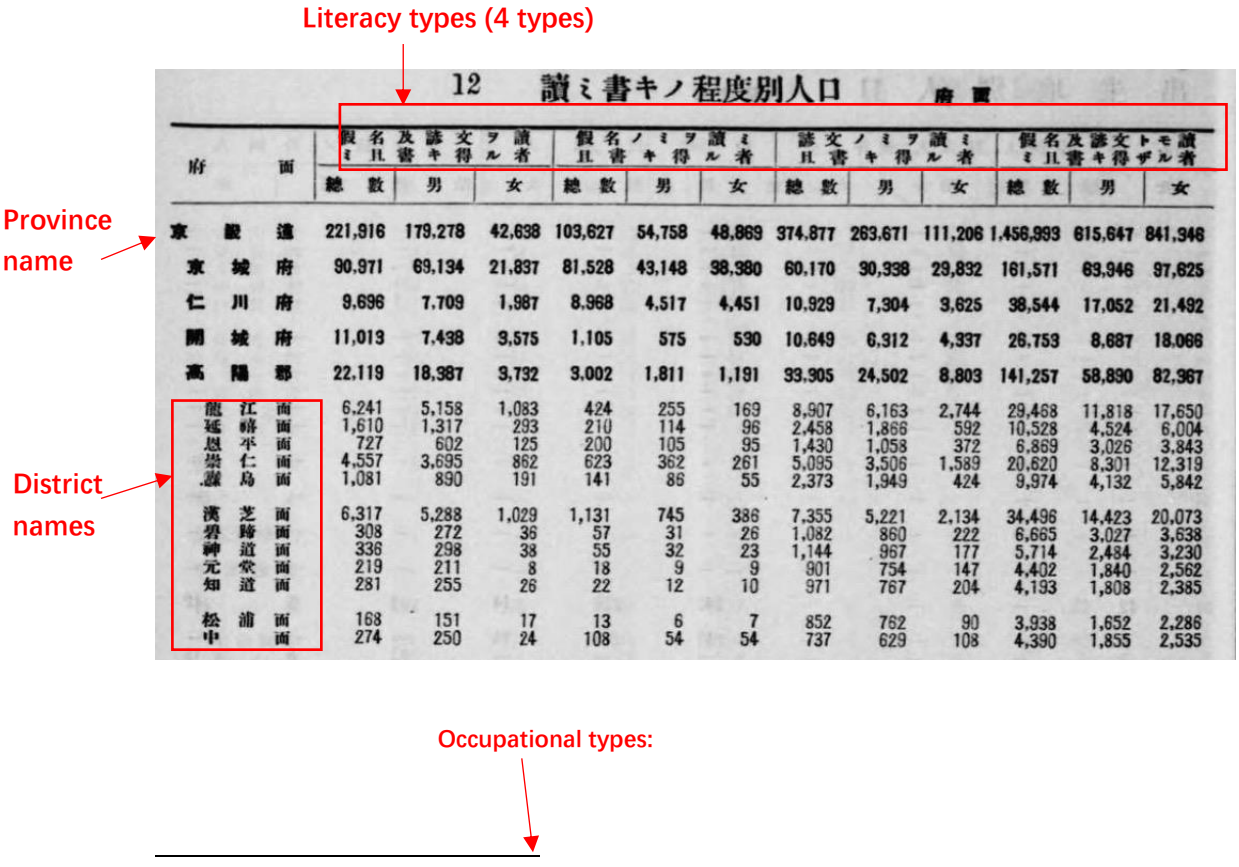
My analysis relies on several data sources. The Japanese colonial census, "Chōsen Government-General" the year 1930 ("Chōsen": Japanese name of Korea) contains information about Korean and Japanese residents' literacy at the county level. Figure 1 shows the original documents. The literacy rates are reported by four types: Korean, Japanese, both, and neither. I define the Korean literacy rate as the ratio of either Korean only or Korean and Japanese, which means the add them together and then dividing by the total population. The Japanese literacy rate is calculated in the same way, and I focus on the Korean population.

For industrialization, I measure it by the non-agricultural-and-fishery occupation ratio. The 1930 census contains 10 occupation categories, which include agriculture, fishery, mining, manufactures, commerce, transportation, public/freelance, housework, other industries, and unemployed. I classify mining, manufacturing, commercial, and transportation industries as the non-agricultural occupation categories, while also classifying the first six categories (agriculture, fishery, mining, manufacture,

commercial, and transportation) as the social production sector[2]. Finally, the ratio of the number of non-agricultural occupation numbers among the occupation number of social production sectors is the non-agricultural occupation ratio in this article.

Figure 2 shows the distribution of the non-agricultural-and-fishing occupations ratios in the 1930 Korean Peninsula.[3] Figure 3 shows the distribution of the Japanese literacy rate at the county/district level. It is not difficult to observe that exist many overlapping districts of Japanese literacy rate and non-agricultural industrial ratio and mainly concentrated in the northern part than the Southern part of the Korean peninsula.

Figure 1. The original copy of Colonial Census, 1930 朝鮮總督府國勢調查報告

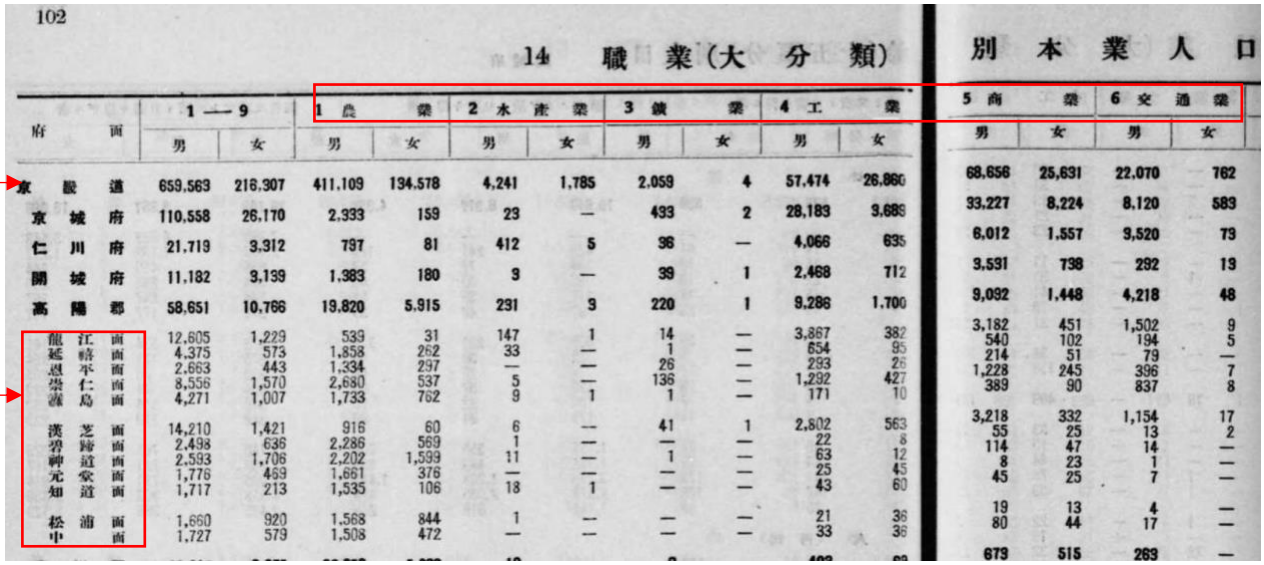


12 讀ミ書キノ程度別人口 府 面

府 面	假名及諺文ヲ讀ミ且書キ得ル者			假名ノミヲ讀ミ且書キ得ル者			諺文ノミヲ讀ミ且書キ得ル者			假名及諺文トモ讀ミ且書キ得ザル者		
	總數	男	女	總數	男	女	總數	男	女	總數	男	女
京畿道	221,916	179,278	42,638	103,627	54,758	48,869	374,877	263,671	111,206	1,456,993	615,647	841,346
京城府	90,971	69,134	21,837	81,528	43,148	38,380	60,170	30,338	29,832	161,571	63,946	97,625
仁川府	9,696	7,709	1,987	8,968	4,517	4,451	10,929	7,304	3,625	38,544	17,052	21,492
開城府	11,013	7,438	3,575	1,105	575	530	10,649	6,312	4,337	26,753	8,687	18,066
高陽郡	22,119	18,387	3,732	3,002	1,811	1,191	33,905	24,502	8,803	141,257	58,890	82,367
龍江面	6,241	5,158	1,083	424	255	169	8,907	6,163	2,744	29,468	11,818	17,650
延禧面	1,610	1,317	293	210	114	96	2,458	1,866	592	10,528	4,524	6,004
恩平面	727	602	125	200	105	95	1,430	1,058	372	6,869	3,026	3,843
崇仁面	4,557	3,695	862	623	362	261	5,095	3,506	1,589	20,620	8,301	12,319
蘇島面	1,081	890	191	141	86	55	2,373	1,949	424	9,974	4,132	5,842
漢芝面	6,317	5,288	1,029	1,131	745	386	7,355	5,221	2,134	34,496	14,423	20,073
碧蹄面	308	272	36	57	31	26	1,082	860	222	6,665	3,027	3,638
神道面	336	298	38	55	32	23	1,144	967	177	5,714	2,484	3,230
元栄面	219	211	8	18	9	9	901	754	147	4,402	1,840	2,562
知道面	281	255	26	22	12	10	971	767	204	4,193	1,808	2,385
松浦面	168	151	17	13	6	7	852	762	90	3,938	1,652	2,286
中面	274	250	24	108	54	54	737	629	108	4,390	1,855	2,535

[2] Theoretically, commercial and transportation industry should be only treated as the service sector not production sector. But commercial and transportation industries can be regarded as the important se industries in the society and one of the most common occupational choices for most people. So, I still put it into the categories of social production sectors.

[3] Cheongyeon Won generously provided the 1930 map of Korea. I appreciate his help.



102

14 職業(大分類) 別本業人口

府面	1—9 男	1—9 女	1 農業 男	1 農業 女	2 水産業 男	2 水産業 女	3 鉱業 男	3 鉱業 女	4 工業 男	4 工業 女	5 商業 男	5 商業 女	6 交通業 男	6 交通業 女
京畿道	659,563	216,307	411,109	134,578	4,241	1,785	2,059	4	57,474	26,860	68,656	25,631	22,070	762
京城府	110,558	26,170	2,333	159	23	—	433	2	28,183	3,688	33,227	8,224	8,120	583
仁川府	21,719	3,312	797	81	412	5	36	—	4,066	635	6,012	1,557	3,520	79
開城府	11,182	3,139	1,383	180	3	—	39	1	2,468	712	3,531	738	292	19
高陽郡	58,651	10,766	19,820	5,915	231	3	220	1	9,286	1,700	9,092	1,448	4,218	48
龍江面	12,605	1,229	539	31	147	1	14	—	3,867	382	3,182	451	1,502	9
延禧面	4,375	573	1,858	262	33	—	1	—	654	95	540	102	194	5
恩平面	2,663	443	1,334	297	—	—	26	—	293	26	214	51	79	—
崇仁面	8,556	1,570	2,680	537	5	—	136	—	1,292	427	1,228	245	396	7
蓮島面	4,271	1,007	1,733	762	9	1	1	—	171	10	389	90	837	8
漢芝面	14,210	1,421	916	60	6	—	41	1	2,802	563	3,218	332	1,154	17
碧蹄面	2,498	636	2,286	569	1	—	—	—	22	8	55	25	13	2
神道面	2,593	1,706	2,202	1,599	11	—	1	—	63	12	114	47	14	—
元衆面	1,776	469	1,661	376	—	—	—	—	25	45	8	23	1	—
知道面	1,717	213	1,535	106	18	1	—	—	43	60	45	25	7	—
松浦面	1,660	920	1,568	844	1	—	—	—	21	36	19	13	4	—
中面	1,727	579	1,508	472	—	—	—	—	33	36	80	44	17	—
											679	515	263	—

Province name

District name

Besides the independent and dependent variables, the census includes various information on population size at the county level. Next, the land tenancy ratio in 1930 may also have positively influenced the local economic condition, and then the industrialization level. For the number of public primary schools and teachers in each district in 1929, I gather the data from Japan's colonial education policy document collection: Joseon.22 The number of public schools is our measure of the extent of the colonial education system's influence on literacy; the provision of schools in each district was determined primarily by the colonial government with some influence from the elite class or the local population.

For the control variable railway intensity at the county-level which is regarded as the proxy of local investment from the colonial government. I utilize one Korean railway map in 1928 cited from the University of Wisconsin library to calculate the railway mileage at the county level and then divide it by the area of the county[4], which

[4] Map address: https://collections.lib.uwm.edu/digital/iiif/agdm/690/full/full/0/default.jpg

finally is the railway intensity at the county/district level. It is shown in the right lower graph of Figure 2.

Figure 2. The non-agriculture-and-fishery occupation ratio and the manufacture, transportation, commerce, and transportation occupation ratio in 1930, and the railway intensity in 1927

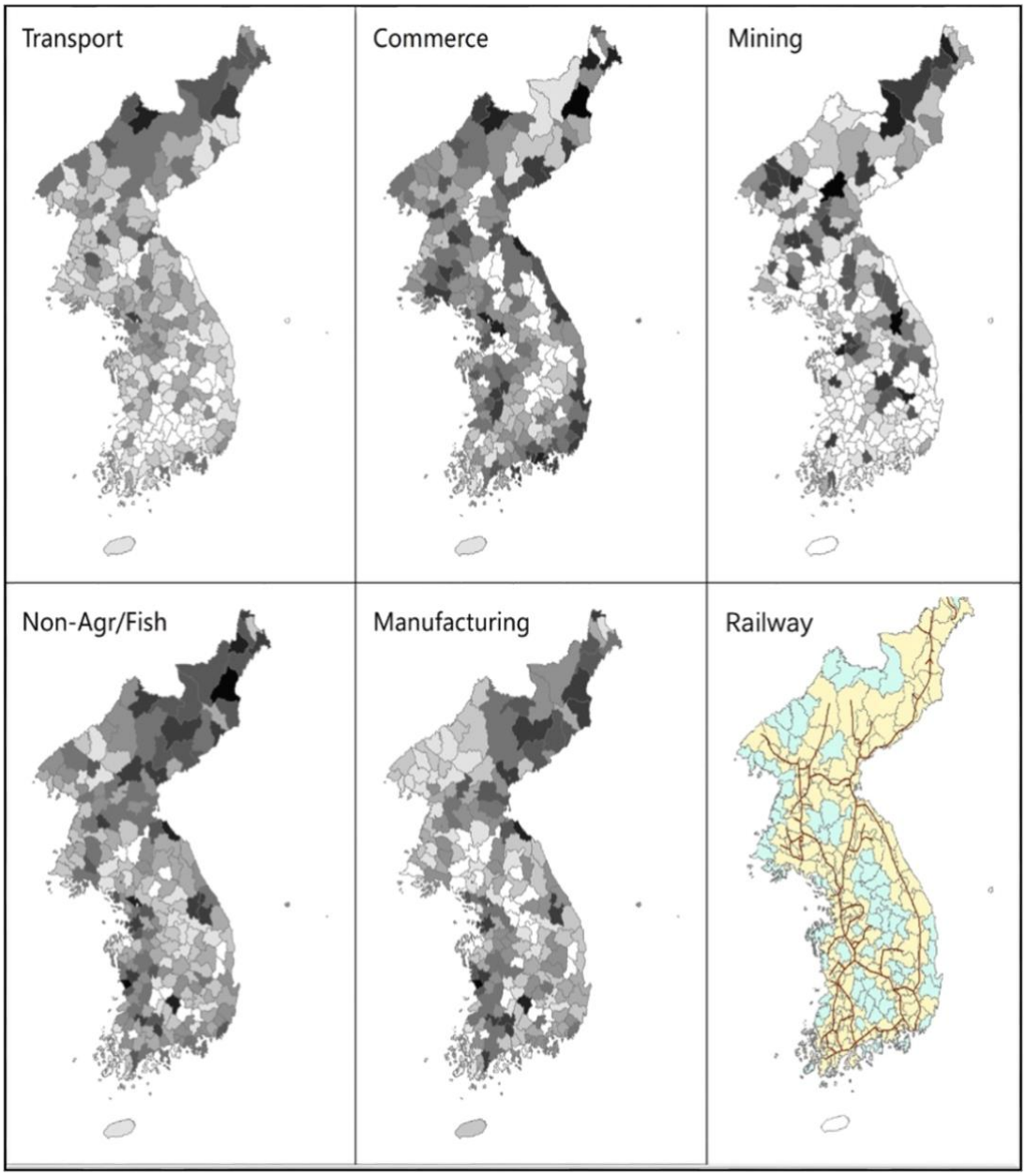


Figure 3 and Figure 4: Japanese literacy rate(left) and Korean Literacy rate(right) in 1930

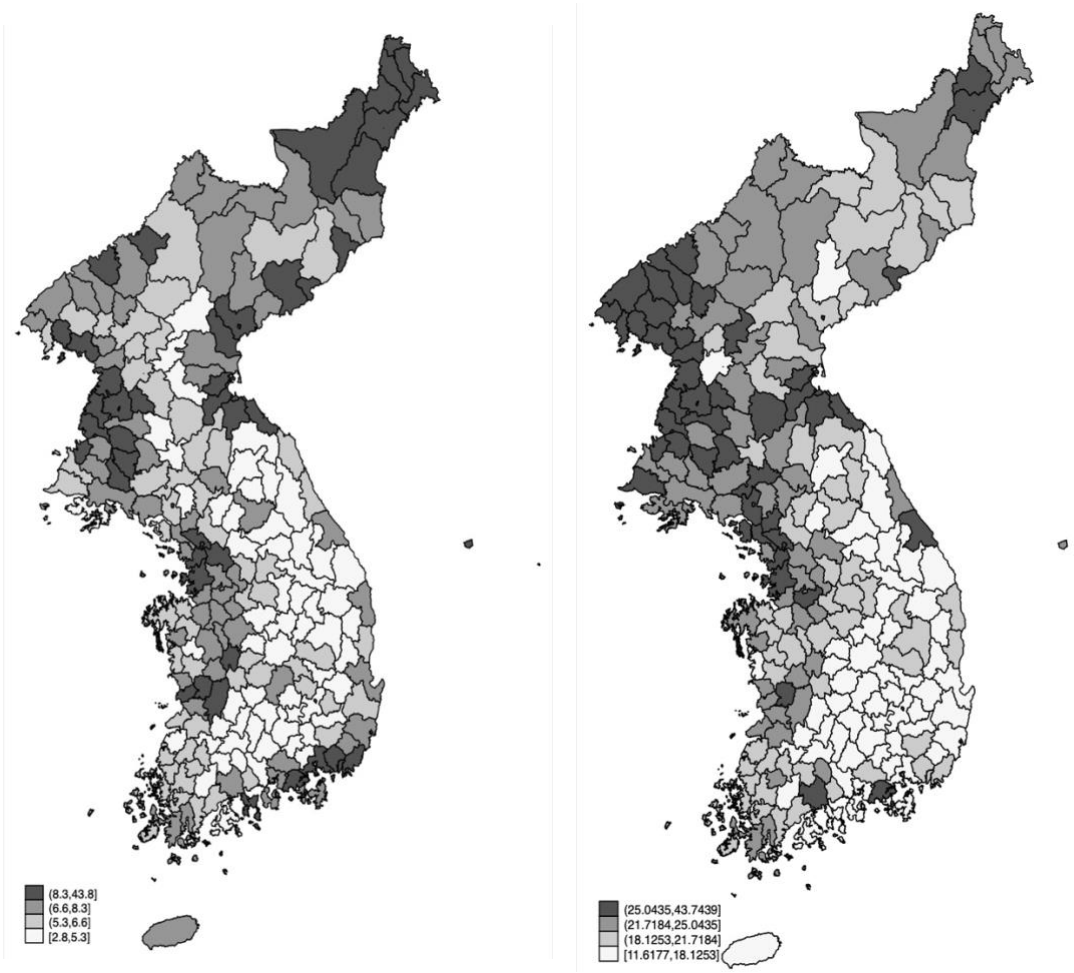


Table 1 shows the descriptive statistics of all the variables in the model. And I also separate the variables into three groups: independent variables, dependent variables, and control variables. Dependent variables represent industrialization level and industry ratios. Independent variables contain three aspects: literacy rates (Korean literacy rate and Japanese literacy rate); schools (public schools per 1000) and teachers (Korean/Japanese teachers per 1000 in 1918 and 1929) district characteristics: Distance to Seoul, Distance to Busan, Population density, Yangban share, and land tenancy ratio.

From the summary statistics in Table 1, we can find that the mean of the non-agricultural level is 6.273, while the manufacturing ratio, commercial ratio, and mining ratio are roughly 2.7%, 2.5%.0.5%, and 0.6% respectively. The means are small comparatively. Observed by the standard deviation, industrialization showed a largely different level from different areas. For the independent variables, the Japanese literacy rate is 8.5% while the mean Korean literacy rate is 21.9%. Comparing their standard deviation, we can know that the deviation level of the Japanese literacy rate level is higher than the Korean literacy rate level in different districts.

For the data about public schools and teachers, the mean of public schools per 1000 is only 0.074 which equals 7.4%. While Korean teachers per 1000 in 1918 and 1929 are 0.13 and 0.15, which equal 13% and 15% respectively; Japanese teachers per 1000 are 0.1 and 0.115, which equal 10.1% and 11.5%. So, generally, the number of teachers increase a little from 1918 to 1929. But the total size of local Korean teachers is larger than the Japanese teachers, and the different level at the district level is not very big.

Table 1: Summary Statistics

	N	Mean	SD
Dependent Variables	234	6.273	5.145
Non-agricultural occupation ratio (1930)			
Manufacture industry (1930)	234	2.665	2.576
Commerce industry (1930)	234	2.454	2.491
Mining industry (1930)	234	.533	1.223
Transportation Industry (1930)	234	.62	1.081
Independent Variables			
Japanese literacy rate (%)	234	8.461	7.025
Korean literacy rate (%)	234	21.921	5.184
Public schools per 1000(1929)	233	.074	0.027

Korean teachers per 1000(1929)	233	.146	0.089
Korean teachers per 1000(1918)	234	.132	0.091
Japanese teachers per 1000(1929)	233	.115	0.085
Japanese teachers per 1000(1918)	234	.101	0.082
Control Variables			
Distance to Busan (km)	233	347.491	206.538
Distance to Seoul (km)	233	223.118	122.658
Population density (1930)	232	.554	0.596
Yangban share (1909)	223	.007	0.013
Railway intensity (1928)	234	.091	0.162
Land tenancy ratio	228	1.099	0.898

4. Results

a) OLS and Instrument Variable Regression Results

Table 2 shows the estimation results of the OLS analysis. From the table, I find a significant and positive relationship between the Japanese literacy rate and the non-agricultural occupation ratio, the measure of industrialization. In contrast, the Korean literacy rate has no significant relationship with the non-agricultural occupation ratio. And every 1 percentage point increase in the Japanese literacy rate is associated with a 0.58 percentage point increase in industrialization level, while also significantly associated with manufacture, commerce, and transportation ratio by 0.13 percentage point, 0.31 percentage point, and 0.11 percentage point respectively.

Table 2: Korean and Japanese Literacy Rates and Industrialization

VARIABLES	(1) Non-agricultural	(2) Manufacture	(3) Commerce	(4) Transportation	(5) Mining
Korean literacy rate (%)	-0.055	0.094	-0.024	-0.055**	-0.070*
	(-0.58)	(1.46)	(-0.71)	(-2.20)	(-1.76)
Japanese literacy rate (%)	0.576***	0.134***	0.322***	0.107***	0.012
	(6.60)	(3.39)	(8.26)	(2.72)	(0.76)
Population (1930)	-0.014	0.112	-0.022	-0.007	-0.098
	(-0.03)	(0.53)	(-0.11)	(-0.04)	(-0.87)
Yangban share (1909)	-22.757	-25.970	-3.908	2.000	5.121
	(-0.96)	(-1.10)	(-1.07)	(1.64)	(0.99)
Distance to Seoul (km)	0.003	0.000	0.001	0.000	0.002
	(0.66)	(0.09)	(0.54)	(0.38)	(0.89)
Distance to Busan (km)	-0.003	-0.001	-0.003**	0.000	0.001
	(-0.84)	(-0.49)	(-2.58)	(0.49)	(0.83)
Railway intensity (1928)	-0.607	0.435	-0.739	-0.406	0.103
	(-0.47)	(0.41)	(-1.63)	(-1.21)	(0.28)
Land tenancy ratio	-0.568*	-0.499*	-0.113	-0.075	0.120
	(-1.88)	(-1.95)	(-1.04)	(-1.18)	(1.11)
Observations	217	217	217	217	217
R-squared	0.590	0.291	0.795	0.548	0.124
Province FE	YES	YES	YES	YES	YES

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3: Mungua intensity as the instrument variable of Japanese literacy rate

VARIABLES	(1) First-stage	(2) Non-agricultural	(3) Manufacture	(4) Commerce	(5) Transportation	(6) Mining
No. of mungua per 1,000	2.413***					
	(5.67)					
Japanese literacy(%)		0.328**	0.157	0.225***	-0.012	-0.041
		(2.34)	(1.44)	(4.90)	(-0.39)	(-0.64)
Observations	216	216	216	216	216	216
R-squared	0.660	0.545	0.291	0.763	0.136	0.105
Province FE	YES	YES	YES	YES	YES	YES
Controls	YES	YES	YES	YES	YES	YES

t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3 shows the IV estimation result. The *mungua* intensity is the instrument variable of the Japanese literacy rate. From the first column, the result shows the first-stage result of *mungua* intensity on the Japanese literary rate. The coefficient is 2.413 and significantly, which shows that mungua intensity is a strong instrument variable to the Japanese literacy rate.

Comparing all the coefficients in Table 3 and Table 2, I find that all the coefficients become smaller or insignificant. The results indicate that every 1 percent point increase in the Japanese literacy rate was significantly associated with an 0.3 percent point increase in industrialization level by using the IV strategy. Model 1 is still robust. For these new industries, only the coefficient of the commercial sector is still significant and shows as 0.2 percent point, which means every 1 percent increase in the Japanese

literacy rate is significantly associated with a 0.23 percent point in the commercial occupational ratio by applying the IV estimation.

b) Possible Mechanisms

In this part, I explore the mechanism between the literary rate and industrialization: the effect of public schools and teachers on literacy rates.

I examine the effect of the Japanese and Korean literacy rates on industrialization in the main model, but the underlying mechanism is unclear. Based on the historical background information of the education system under Japanese rule, I hypothesize that public schools should be the critical mechanism to realizing literacy, especially the Japanese literacy rate. Furthermore, teachers also should play an important positive role in the spreading of literary rate. Particularly, after the second education decree in 1922, the period of allowing Korean people to enter normal colleges and work as local teachers in the later time, the Japanese and Korean literacy rates would increase by the increasing supply of teachers, and their contribution to Japanese literacy rate should be higher than Korean literary rate, because the priority of Japanese language courses is higher than the Korean language courses in the public schools.

To identify the mechanism, I introduce a series of new variables: the number of public schools in 1929, the number of Japanese and Korean teachers in 1919 (during the first education decree), and the number of Japanese and Korean teachers in 1928(during the second education decree). To make the estimation more reasonable, I treat all these variables above into the intensity per 1000 people. (2) and (3) are the

models for the mechanism. (2) the effect of schools (3) the effect of teachers in different stages under the controlling the number of public schools.

$$\text{Jap/Kor\_Lit}_i = \alpha + \beta_1 \text{PublicSchool}_i + X_i\Omega + \varepsilon_i \quad (2)$$

$$\text{Jap/Kor\_Lit}_i = \alpha + \beta_1 \text{PublicSchool}_i + \text{Teachers}_i + X_i\Omega + \varepsilon_i \quad (3)$$

Table 4: The effect of schools and teachers on Literacy rates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	**Kor**	**Kor**	**Kor**	**Jap**	**Jap**	**Jap**	**Jap**
Korean teachers per 1000(1929)		1.990	5.256			16.117***	10.119
		(0.45)	(0.69)			(3.30)	(0.80)
Korean teachers per 1000(1918)		16.978***	16.120***			19.699***	10.517
		(3.80)	(2.67)			(4.07)	(1.58)
Japanese teachers per 1000(1929)			-6.271		12.879*		3.883
			(-0.68)		(1.81)		(0.25)
Japanese teachers per 1000(1918)			2.897		23.799***		12.906*
			(0.50)		(2.64)		(1.79)
Public schools per 1000(1929)	45.863*	39.612*	39.570	56.432*	52.003**	42.770*	46.723*
	(1.78)	(1.66)	(1.65)	(1.87)	(2.09)	(1.78)	(1.91)
Obs	216	216	216	216	216	216	216
R-squared	0.592	0.648	0.649	0.326	0.483	0.485	0.491
Province FE	YES	YES	YES	YES	YES	YES	YES
Controls	YES	YES	YES	YES	YES	YES	YES

Robust t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.

Here, $PubSchool_i$ represents the number of public schools per 1000 in district *i.* $Teacher_i$ represents the number of teachers per 1000 in the district *i.*

In table 4, I investigate the two channels that can influence the Korean/ Japanese literary rates. Model (1) - (3) focuses on the Korean literacy rate while model (4)-(7) focuses on the Japanese literacy rate.

From models (1) and (4), It can be observed that the intensity of public schools is significantly associated with two literacy rates, especially the Japanese literacy rate. Increasing one school per 1000 can be associated with an increasing 45.86 percentage points in the Korean literacy rate and an increase of 56.43 percentage points in the Japanese literacy rate. Secondly, I evaluate the effect of teachers on different literacy rates. In model (2)-(3), only the Korean teachers in 1918 are significantly associated with the Korean literacy rate in 1930. The coefficient of Korean teachers in 1929 is insignificant, no matter controlling the intensity of Japanese teachers or not. I conjecture that, till the mature time of colonial education in 1929(the period of the second education decree), Korean-taught courses have already faded out from the course list of public schools. Therefore, the effect of teachers on the Korean literacy rate becomes almost insignificant if controlling the intensity of public schools. The spreading of the Korean literacy rate should be attributed to the Christine schools and private schools at that time.

Model (5)-(6), shows an important transformation from Japanese teachers to Korean teachers on the effect of the Japanese literacy rate. In 1918, Japanese teachers are quite important in the spreading of the Japanese literacy rate, since they should undertake the majority of the teaching load in Japanese-taught courses. But in the year 1929, with more and more Korean teachers graduating from local normal colleges and

being recruited into public schools, these new local Korean teachers become a more crucial role in the Japanese literacy rate. However, if adding all the teacher's intensity together, the early-time Japanese teachers in 1918 still play the most critical role in the Japanese literacy rate.

Table 5: Does speaking two languages pay off?

VARIABLES	(1) Industrialization	(2) Manufacture	(3) Commercial	(4) Transportation	(5) Mining
Both languages	0.902***	0.317***	0.518***	0.107**	0.039*
	(5.39)	(4.92)	(6.49)	(2.16)	(-1.94)
Only Korean literacy	-0.163	0.070	-0.092**	-0.053**	0.087*
	(-1.29)	(0.80)	(-2.03)	(-2.31)	(-1.79)
Observations	217	217	217	217	217
R-squared	0.482	0.275	0.640	0.341	0.125
Province FE	YES	YES	YES	YES	YES
Controls	YES	YES	YES	YES	YES

Robust t-statistics in parentheses

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

Furthermore, In order to make the conclusion more rigorous， I determine whether there exist a payoff effect between the Japanese literary rate and Korean literacy rate. My hypothesis is that the Korean who can speak Japanese well can have higher probability to enter the new industries. Thus, I compare the impact of Korean ratio who have both languages and who only can use Korean in the Table 5. I can find that the empirical results are consistent with my pypothesis. Korean people who have both language literacy is significantly associated with this new industry occupational ratio while only Korean literacy is not only insignificantly, even negatively significant

associated with the new industries, which can empirically justify the previous conjecture is right.

5. Conclusion

This empirical research suggests the different effects of two literacy rates under the colonial education system on the industrialization, which can contribute to the literature gap about the effect human capital on economic growth. The colonizer country would compulsorily set their national language as the official language used in education to homogenize the colonized country people. Because language is a very important channel to build up a nation's identity, the language of the colonized country is the target that the colonizer country intends to eliminate. Besides, public schools would teach core courses in the language of the colonizer country, which also attracts local children be access new science and knowledge by the channel of learning colonizer language. Till the time that they graduate, the people who can speak and write the language of the colonizer country would have more opportunities to enter the promising sectors that the colonizer country controlled. The modernization of education system and industrialization seems to benefit the colonized countries and attract local elites to enter the new industries or government. However, the process is "poisonous".

In our case of colonial Korea in 1930, we can find that the effect of the Korean literacy rate is insignificantly associated with the industrialization. The effect of the local language literacy rate disappeared, which means the “usefulness” of the local

language become much weaker. Local people would not cherish their language so much if the mechanism of the colonial education system persists.

From the mechanism part, I can observe that public schools and teachers contribute to the improvement of the literacy rate, especially the Japanese literacy rate. Especially during the period of the second education decree, the increasing supply of local Korean teachers further contribute to the Japanese literacy rate, but their effect on the Korean literacy rate disappears because the local language is no longer widely used in the course-teaching. That also means that most Korean children cannot receive education in their own language from the channel of public schools and teachers.

However, thanks to the existence of private schools and Christian schools, the Korean language is still the first-priority language taught in these schools, so the Korean literacy rate was still popular(S. O. Becker & Won, 2021; Hong & Paik, 2017). That is the critical aspect different from another Japanese colonized area Taiwan. The different situation of literary rate, to some extent, determines their later diverge in national identity, ideology, and pollical institution. Even though Korean revolutionaries had to move to China to continue the independent battle after March 1st movement, and build the interim government in Shanghai, Korean language education is still very critical for Korean immigrants. Compared with Taiwan, the areas where many local people identify themselves as Japanese because of the high Japanese literacy rate which overshades the local language Hokkien and Hakka, Or India, a country without a united language causes the nationals to lack a united cultural identity, Korean people have a more consistent local language system and keep the high literacy rate in the early stage of

modernization, which lay a solid foundation for Korean national identity building and the mass revolution.

My research also exists several limitations. First, it is with high probability that the so-called industrialization in Korea in 1930 cannot be regarded as normal industrialization. according to Kimura's description(2018), the Japanese mainly intend to predate the natural resources, raw materials, and elementary manufacture products from the Korean peninsula, Perhaps, the early-stage industrialization was an illusion---- "industrialization" is just some non-agricultural industries with low productivity. he factories only produce primary-level products providing to Japan and almost no market competitiveness internationally. Secondly, only the result from the one-year panel data lack of strong persuasiveness. However, since the census data in the years 1925,1935,1940, and 1945 adopt the statistical caliber at the provincial level, which causes it is impossible to merge data in different years as a cross-year panel. The significant limitation based on original data can hardly be sloven by any other methodologies.

For the further study of this topic, I intend to determine the effect of colonial educational legacy on the later comprehensive and independent industrialization (Hangang miracle). Whether the widespread Japanese literacy rate benefits the technology adoption and knowledge spillover from Japanese equipment and products can contribute to the literature on linguistic similarity, social networks, and economic outcomes.

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