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**Wage Convergence and Divergence in
East Asia, 1900-39**

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This study calculates Robert Allen's "welfare ratio" for eleven cities in Japan, Korea, Manchuria, and Taiwan from 1900-39. Although considerable gap in prices and nominal wages existed, real wages remained roughly comparable in the 1910s in different cities of East Asia outside Manchuria, where unskilled workers enjoyed substantially higher living standards. Interwar decades saw real wage grow at different speeds in East Asian cities, causing both convergence, e.g. between Dairen and Tokyo, and divergence, e.g. between Beijing and Taipei. Workers in various cities of East Asia fared differently, primarily because productivity advanced at distinct speeds depending upon the amount of human capital available.

Key words: price, wage, living standards, skill premium, ethnic wage gap

JEL classification: E31, N1, N3, J3

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Japan embarked on empire-building by acquiring Taiwan as a part of reparation from China defeated in the war of 1894. In the subsequent conflict with Russia, the country emerged victorious again in 1905, adding Korea and southern Manchuria to its imperial sphere. By invading Manchuria in 1931, Japan brought under its control an area more than twice as large as Japan, Korea, and Taiwan combined. Existing studies suggest that the four key regions of the Japanese empire differed significantly in terms of the pace of population growth and economic development in the early twentieth century.

This article is an attempt to shed light on comparative economic development in East Asia by estimating real wages of unskilled laborers working in major cities of the empire in the early twentieth century. Diverse institutions upholding the Japanese empire gathered price and wage information in a more or less systematic and comparable manner. In particular, the observations were recorded consistently in terms of the common currency, the yen, allowing one to avoid the difficulty of finding exchange rates between various monies in use in Republican China. The availability of such price and wage data simplifies estimation of real wage indices revealing how the imperial cities differed in terms of living standards, and how the disparities evolved over time. The real wage index this study estimates refers to “welfare ratio,” a measure of living standards developed by Robert Allen and his colleagues to compare living standards in Asia and Europe from the eighteenth to early twentieth century. Hence, the real incomes of workers as reported in this study can immediately be compared with the Chinese welfare ratios presented in Allen, et al. (2011) and on the website of the Global Price and Income History Group (<http://gpih.ucdavis.edu>).

This article begins by introducing key indicators of economic development in China, Japan, Korea, Manchuria, and Taiwan in the first section. Data and procedures used to estimate wages and prices in major cities of the empires are described in the second section. We examine the estimated intercity price gaps in the third section, which is followed by inspection of nominal wage gap, skill premium, and gender wage gap in the fourth section. Price and nominal wages as compiled in the third and fourth section are combined to calculate unskilled real wages – welfare ratios – in East Asian cities (section V). The sixth section ponders why intercity real wage gap evolved the way it did. The final section concludes by discussing the implication of the findings

on origins of East Asian growth and on the high growth occurring in the region after 1945.

Comparative Economic Development in East Asia

At its zenith reached in 1942, the Japanese empire spread out so far as to control a significant part of south eastern Asia and China, which represented a short-lived extension of the core consisting of four regions, Japan, Korea, Taiwan, and Manchuria. The mainstay resembled the European Union in important respects, including monetary integration, free trade, and factor mobility. Each of the four building blocks of the empire had its own central bank issuing coins and notes differently designed, which however were freely convertible into the Japanese yen on a par. Exchange rate risk remained very low, and tariff rates applied to intra-empire trade was close to zero. Capital was allowed freely to cross intra-imperial borders before the outbreak of WWII, which together with low degree of exchange and political risk, resulted in close integration of financial markets of different parts of the empire.¹ Although Japan did try to control migration from colonies to the metropole, two million Koreans could be found regularly staying in Japan in 1944, indicating that barriers erected at checkpoints were by no means watertight.² The Japanese empire represented an area even more integrated economically than the European Union in the sense that fiscal union was in place: Japan provided unilateral transfer to be used for construction of infrastructure in colonial Korea, while budget surplus in colonial Taiwan contributed to fiscal balance of Japan proper.

Table 1 Land, Population, and Railway circa 1935

	Japan	Korea	Manchuria	Taiwan	China ex. Manchuria
Population	69,254,000	22,899,038	35,386,000	5,212,426	505,292,000

¹ On financial integration in the Japanese empire, see Kim(2011).

² Kwon (2004: 256, Table 10.2). Chung & Gill (1998) attribute the ineffectiveness of immigration control to conflicting policy stances of the governments of Japan and colonial Korea.

Area	383,000 km ²	220,000 km ²	1,303,000 km ²	36,000 km ²	8,293,961 km ²
Cultivated area	60,090 km ²	61,736 km ²	139,140 km ²	13,430 km ²	980,000 km ²
Acreage per worker	0.15 ha	0.49 ha	0.39 ha	0.46 ha	0.19 ha
Railway	24,236 km	4,968 km	7,976 km	882 km	12,870 km
Railway/km ²	0.064 km	0.023 km	0.006 km	0.025 km	0.002 km

Sources: area from Yamamoto(2004: 4); cultivated area from Ando (1979: 16), Park(2006), Eckstein, Chao, and Chang(1974: 248), Ka(1995: 69), and Perkins(1969); Chinese acreage refer to cultivated area in 1933; population is Miwa & Hara (2007:4), Census Reports of Colonial Korea (*Chōsenkokuseichōsahōkoku*), Yamanaka(2009: 129), and Barclay(1954: 13), and Maddison(2006: 540); Chinese railway length was derived by subtracting railway length in Manchuria from the length of tracks in China, including Manchuria, as given in Rawski(1989: 209); railway length in the Japanese empire was taken publications by railway authorities, such as *Tetsudōshōtōkeishiryō*, *Chōsensotokufutetsudōkyokunenpō*, and *Minamimanshutetsudōkabushikikaishatōkeinenpō*.

Table 1 shows that key regions of East Asia differed significantly in terms of factor endowment. Territorially, Manchuria, less than one sixth of China proper, was more than twice as large Japan, Korea, and Taiwan added together. As of 1935, Japan had a population, which was more than twice the sum of the population of its three colonies, was dwarfed by the large population of China. As a result, cultivated area per person was only about one third of that in its colonies, and even China held advantage over Japan in terms of land availability. Railway network, an important component of capital stock, was densest and sparsest in Japan and China, respectively. Available estimates of capital stock as standardized by population suggests that

capital/labor ratio in Japan was ten times and twice as large as that in Korea and Taiwan, respectively.³

In sum, prewar Japan remained a capital- and labor-abundant country vis-à-vis its colonies, where land was richly available. The only input in abundant supply in China was labor. This description is consistent with both the direction of factor flows and patterns of external trade between East Asian countries. Japan exported manufactured items to and imported agricultural goods from its imperial possessions. Yarn and textile were the most important export items for China, which imported a wide variety of manufactures from the rest of the world.⁴ While easy access to land in Korea and Manchuria attracted a large number of immigrants from China and Japan, Japan exported capital to China, Korea, and Manchuria.

Table 2 Indices of Economic Development circa 1935

	Japan	Korea	Manchuria	Taiwan	China
Life expectancy	45	37	n.a.	40	24
Population growth	1.2%	1.3%	3.3%	1.9%	0.7%
Primary school enrolment	67%	31%	22%	51%	14%

Sources: life expectancy -Miwa &Hara(2007: 7), Kwon(1977: 303, 304), Barclay (1954: 154), and Barclay, et al. (1976); population growth - Miwa & Hara(2007:4, 5), Cha(2006), Yamanaka(2009: 118), Barclay(1954: 13), and Maddison (2006: 539, 540); primary school enrolment-Lindert(2001), except for Manchuria, which was estimated by Kurokawa(2000:6); primary school enrolment for China was derived by dividing the number of primary school student as given Yan(2008) with the number

³ Sources of capital stock data include Ohkawa, et al (1966), Mizoguchi and Umemura (1988), and Cha (2012).

⁴ For data on the external trade of East Asian countries, see Young (1971) and Mizoguchi and Umemura (1988).

of population aged from 5 to 15 estimated using age structure of population in 1929/31 as available from Buck(1937).

Notes: life expectancy is male life expectancy at birth circa 1930; primary school enrolment was calculated as the number of children in primary school as a proportion of persons aged five to fourteen.

The four pillars of the Japanese empire were awakened one after another by gunboats from deep-rooted lethargy: Manchuria in 1858, Japan in 1867, Korea in 1876, and finally Taiwan in 1895. Although mortality on the eve of the encounter with the West is not precisely known, in none of the four regions is life expectancy at birth appeared to exceed forty.⁵ Introduction of modern medical technology triggered mortality transition driving life expectancy up to around forty in the Japanese empire by the mid-1930s, while highly mortality continued to prevail in China.⁶ The mortality decline accounted almost entirely for why the Taiwanese population grew as rapidly as 1.9% per year in the pre-WWII decades (Barclay(1954)), while high mortality seemed to stand in the way of the Chinese population growing as rapidly. The slow expansion of the Chinese population was also a consequence of out-migration of Chinese workers into Manchuria, which caused the Manchurian population to expand 3.3% per year. Out-migration into Manchuria also underlay the moderate pace of demographic expansion in Japan and Korea.

The other important thing gunboats brought to East Asia was modern education. By the mid-1930s, Japan achieved a substantial advantage in schooling relatively to the

⁵ Kito(2000: 177) conjectures that life expectancy in nineteenth century Japan remained in the late thirties. Cha(2009: 130, Table 4)'s estimate of the Korean life expectancy in the eighteenth and nineteenth centuries is 23. According to Barclay (1954: 154, Table 37), Taiwanese male life expectancy was 27.7 in 1906.

⁶ Despite the availability of Manchukuo census of 1940, little is known about mortality level in Manchuria, except Taeuber(1945: 268)'s conjecture that infant mortality in Manchuria was probably lower than in Korea but higher than in Taiwan and her observation that "The recorded mortality in the productive ages was impossibly lows, partly because of the highly selective nature of the in- and out-migration of the Chinese labor that contributed an appreciable proportion of the total population."

rest of East Asia, with about two thirds of the country's school-age children receiving primary education. In contrast, less than one seventh of school age children were put into primary schools in China. Having been incorporated into the empire one quarter of a century earlier than Korea, Taiwan achieved a considerably higher primary school enrolment rate than colonial Korea around 1935. Thus, in the early twentieth century Japan stood out as a region, where not only physical but also human capital abounded.

Table 3 Economic Growth and Structural Change

	Japan	Korea	Manchuria	Taiwan	China
Per capita output	\$2,120	\$1,337	\$679	\$1,235	\$565
Per capita output growth	2.3%	2.3%	2%	2.2%	0.5%
Aggregate output	100	21	4	16	194
Aggregate output growth	3.7%	3.6%	4.6%	3.7%	1.2%
Share of agriculture	20%	42%	40%	39%	65%
Share of manufacturing	26%	20%	12%	18%	10%

Notes and sources: Per capita output is in 1990 Geary-Kharmis dollar and from the website of Angus Maddison, <http://www.ggd.net/MADDISON/oriindex.htm>, unless otherwise indicated; Manchurian per capita GDP is obtained by multiplying Maddison's estimate of Chinese per capita GDP with the ratio of Manchurian to Chinese per capita GDP from 1931-36 as calculated from Ma(2008: 367); the aggregate output is measured relatively to the Japanese aggregate output, which equals 100; output and per capita output growth is from circa 1910-40 and was calculated from Miwa & Hara (2007: 2, 3), Cha & Kim (2012), Eckstein, Chao, & Chang(1974: 254), and Mizoguchi (2008: 231); sectoral output as share of GDP is from Miwa & Hara (2007: 4,9), Cha & Kim (2012), Eckstein, Chao, & Chang(1974:

255), Mizoguchi (2008: 229, 278, 292), and Ma(2008: 367); agriculture includes forestry and fishery.

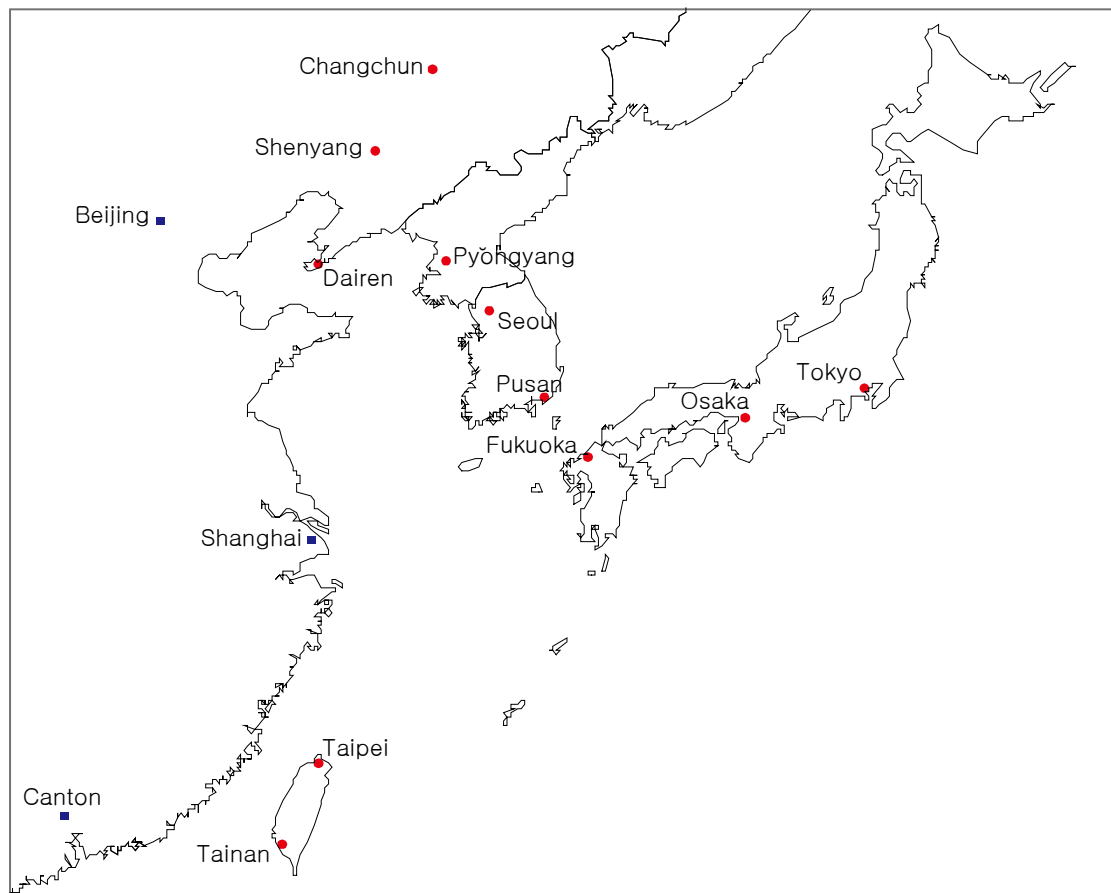
Maddison's estimate of per capita output, quoted in Table 3, suggests that as of 1935 Japan was more than one and half times as well off as either Korea or Taiwan, which were in turn about twice as well-off as China and Manchuria. Notwithstanding the large income gap, per capita output growth did not differ significantly among the regions in the Japanese empire, while Chinese suffered significantly slower improvement in their living standards. Japan accounted for roughly 70% of the output of the empire, which was far exceeded by the Chinese output. Output growth tended to be faster in Manchuria and Taiwan, where population expanded more rapidly. Agricultural production as share of the aggregate output was almost two thirds in China, but only about 40% in Japan's colonies, a percentage, which was twice as large as that in Japan. Manufacturing's importance in the aggregate economy tended to be positively correlated with the level of per capita output. To summarize, Japan, the highest-income region in East Asia, was richly endowed with labor and capital, both human and physical. Manchuria, the poorest regions in the Japanese empire, enjoyed huge advantage in land availability but suffered scarcity in other factors of production. Korea and Taiwan, roughly on a par, could be found between the two opposite poles of the empire in terms of living standards, economic structure, and factor endowment. Being abundant only in labor, China appeared as less developed than Manchuria, the worst off part of the Japanese empire.

Data Sources and Estimation Procedure

Price and wage data used in this study were taken in large part from publications issued by the Japanese and colonial governments, which include *Oroshiuribukkatōkeihyō* (Statistical Tables of Wholesale Prices), *Kouribukkatōkeihyō* (Statistical Tables of Retail Prices), *Nihonteikokutōkeinenkan* (Statistical Yearbook of the Japanese Empire) and *Chingintōkeihyō* (Tables of Wage Statistics) for Japan, *Chōsensotokufutōkeinempō* (Statistical Yearbook of the Colonial Government of Korea) for Korea, *Kantōtotokufutōkeisho* (Statistical Yearbook of the Governing Authorities of Kwantung Area) and *Hōtenkeizaitōkeinempō* (Statistical Yearbook of Fengtian) for Manchuria, and, finally, *Taiwansotokufutōkeisho* (Statistical Yearbook of the Colonial Government of Taiwan) for Taiwan. The official materials were

supplemented by a variety of data sources as published by private or quasi-governmental institutions, such as the Seoul and Dairen Chamber of Commerce, Southern Manchurian Railway Company, and the central banks of Korea (*Chōsenginkō*) and Manchukuo (*Manshūchūōginkō*).⁷ Also used were *Dairen, Keijō*, and *Shinkyōshōkōkaigishokeizaigeppō* (Monthly Bulletin of Statistics of Chamber of Commerce of Dairen, Seoul, and Changchun), *Chōsenginkōchōsageppō* (Monthly Research Bulletin of the Bank of Colonial Korea), *Kinyūkeizainenpō* (Financial Yearbook of the Bank of Manchuria), and *Mantesuchōsageppō* (Monthly Survey Bulletin of the Southern Manchurian Railway Company).

Figure 1 Cities of East Asia



Note: imperial cities are indicated by circles.

⁷ Functioning as the central bank not only for colonial Korea, but also for Manchuria before the establishment of Manchukuo, the Bank of Colonial Korea published monthly bulletin, which reported price information for both regions. See O(1998) for description of activities of the Bank of Colonial Korea in Manchuria.

These data sources provide prices and nominal wage observations as made in more than one hundred cities located in the Japanese empire. Of these cities, eleven cities were selected and are indicated by circles in Figure 1. Tokyo and Osaka are political and economic capital of Japan, respectively, while Fukuoka was included due to its geographical proximity to Korea. In addition to Seoul, the capital city of colonial Korea, Pusan and Pyongyang were chosen, because they were Korea's gateways to Japan and China, respectively. It was mainly through Dairen, China's northernmost warm water port, that Manchuria carried out trade and other dealings with the rest of China and foreign countries. Shenyang, designated by the Manchu people as their capital city in the seventeenth century, was and remains the commercial and transportation hub of Manchuria. Japanese rulers elected in 1932 Changchun as the capital city of Manchukuo, the puppet state they controlled. The colonial government of Taiwan was located in Taipei, while Tainan, chosen for its remoteness from Taipei, remained the trading and ruling post of the Dutch VOC and prefectural capital under Q'ing dynasty,.

Wage and price data for Japanese cities are available from 1880 and 1900, respectively. Both price and wage figures began to be recorded from 1907/8 in Korea, 1917 in Manchuria, and 1902 in Taiwan.⁸ Although observations continued to be made well into the Second World War depending on location, commodity, and occupation, the end point was set down in 1939, when wartime controls began to affect prices and wage.

Wage tables found in the official and quasi-official publications used in this study provide (mostly) daily wage rates observed in different cities for several scores of occupations requiring different amounts and kinds of skill. Some traditional trades (like rickshaw pullers and rice polishers) exit the wage tables well before 1939, while modern activities (such as car drivers and steamship sailors) make their first appearance as late as in the 1920s or 1930s. Moreover, there are years when wage observations are missing briefly. Nevertheless, it was relatively straightforward to compile consistent nominal wage series for key occupations in the eleven cities of the Japanese empires by joining wage data from different sources and drawing on

⁸ Pre-1900 data for Japanese cities as found in *Nihonteikokutōkeinenkan* and isolated observations made in 1907 and 1908 in Manchurian cities are not used in this study.

interpolation. The key occupations include common laborers, carpenters, and typesetters.⁹

Although price observations were recorded with regularity (or irregularity) similar to that found in wage data, compilation of price series for key consumption items is more complicated for at least four reasons. First, while retail price data are needed to calculate consumer price indices, it was not until 1920 that authorities began to collect retail price information.¹⁰ Second, gathering price information, surveyors did not always held quality of goods fixed. Similarly, manufactured products are normally created in several distinct types commanding considerably different prices, but recorded prices refer to different types of manufactures in different years. Finally, recorded prices are not infrequently in terms of different measures, but required conversion ratios are not always known.¹¹

To obtain consistent price series from price database with such defects, I resorted to hedonic price regression, which may be best explained with the example of estimating cotton textile prices in Tokyo from 1900-39.

$$\log(P_{it}) = \alpha + \sum_t \beta_t \cdot \text{YEAR}_t + \sum_j \gamma_j \cdot \text{TYPE}_j + \delta \cdot \text{RETAIL} + \varepsilon_{it} \quad (1).$$

The sources of Japanese price data provide seventy-seven observations on cotton textile prices from 1900-39, pre-1930 figures referring to wholesale prices only and both retail and wholesale price information being available in the 1930s. In equation (1) the price observations are expressed by P_{it} , subscripts i and t representing observation identifier (running from 1 to 77) and year of observation (running from

⁹ Common outdoor workers appear as *hiyatoininpu* (日傭人夫) and *hiraninsoku* (平人足) in Japanese and Korean data sources. They correspond to *ninpu* (人夫), *zatsueki* (雑役), *coolie* (苦力) in Manchurian and Taiwanese sources.

¹⁰ The case in point is colonial Korea. Retail price data began to be made available from 1922 on for Taiwan and from 1930 on for Japan and Manchuria.

¹¹ A case in point is *koku* (石), unit traditionally used to measure the volume of different types of grain. Different estimates of conversion ratio between *koku* and kilogram for rice exist, and to my knowledge, conversion ratios for grains other than rice are unknown.

1900 to 1939), respectively. On the right-hand side of equation (1) are included dummy variables, controlling for year of observation ($YEAR_t$), three different types of cotton textiles ($TYPE_j$), and whether the price refers to retail or wholesale transactions. Ordinary least squares estimation of equation (1), taking the year 1900, bleached cotton textile (*sarashimomen*, 晒し木綿), and wholesale price as the reference, indicated that bleached cotton textile was significantly cheaper item than non-reference types, and that retail price was about 10 per cent higher than wholesale prices.¹²

While different versions of equation (1) – mostly incorporating a smaller number of dummy variables -- were applied to estimate prices of commodities other than cotton textile in cities other than Tokyo, it would be neither possible nor useful to report all the details of estimation here. Only three issues seem worth elaborating. First, retail mark-up ratios cannot be estimated in the absence of years when both retail and wholesale prices were observed, in which case estimated mark-up ratios estimated for other cities in the same or a comparable country were applied. For some products, such as soybean, retail mark-up could be estimated in none of the eleven cities, which left me no choice but to substitute the mark-up ratio as directly observed (not estimated) in Korea in 1940.¹³ Even such information being unavailable for sorghum, wholesale prices of the product had to be used.

Second, in estimating prices of some commodities, dummy variables were introduced to control for the effect of place of production, which revealed transportation and transactions costs did matter.¹⁴ In calculating consumer prices indices for different cities, prices of locally produced goods of comparable quality and type were used, because it is reasonable to assume that, quality and type being equal, a typical consumer would have preferred locally produced to imported goods, which were

¹² The two other types are white and striped cotton textile (*shiomomen* 白木綿 and *shimamomen*, 鑄木綿, respectively), which were about 22% and 67% more expensive, respectively, than bleached cotton textile. Estimated retail markup ratio was similar for Fukuoka, but roughly three times as high in Osaka.

¹³ The information is available from Park (2006).

¹⁴ For instance, imported rice was about 40% more expensive in Taipei than locally grown rice.

usually more expensive due to transport and transactions costs. Finally, hedonic regression allowed estimation of conversion ratios between different measures, which would have remained otherwise unknowable in a precise way. For instance, Seoul rice price data revealed that one *koku* (石), a traditional volume measure, equals 136 kilogram, a ratio, which was applied to estimate rice prices in Taipei, where estimation of the conversion ratio was not feasible.¹⁵ Estimation of price of soybeans, grains of which being larger than rice grain, indicated that one *koku* of soybean weighed about 100 kilograms.

Consumer Price Indices

This section calculates for different cities in the Japanese empire the amount silver required to pay for the Chinese subsistence life style as defined by Allen, Bassino, Ma, Moll-Murata, and van Zanden (2011). The bare subsistence consists of sorghum (179 kg) or rice (171 kg), depending on whether a person works in northern or southern China, beans (20 kg), meat (3 kg), oil (3 kg), soap (1.3 kg), cotton textile (3 m), candles (1.3 kg), lamp oil (1.3 kg), and fuel (3 million BTU). In this study, I assume workers in Manchurian cities to be sorghum eaters, while rice-based consumption pattern prevailed in the rest of the Japanese empire. Meat is represented by beef, because price data were not forthcoming on a regular basis for pork or chicken. I assumed workers used only coal as fuel. Finally, for lack of data, I followed Allen, et al. (2011: 36) in setting candle price per kilogram equal to lamp oil price per liter and setting price of soap equal to half the price of lamp oil.

Table 4 Price of Subsistence in 1923 in gram of Pure Silver

Items	Quantity	Tokyo	Seoul	Dairen	Taipei	Beijing	Shanghai	Canton
rice	171 kg	1221	1041	934	533	710	na	na
sorghum	179 kg	na	na	214	na	242	na	na
beans	20 kg	323	93	56	92	57	na	na
meat	3 kg	180	118	67	85	23	na	na

¹⁵ Compare this with existing conjecture on the weight of one *koku* of rice, including 142.4 kg by Park(2006: 103) and 144 kg by Chung(2008: 317).

oil	3 kg	33	40	18	34	33	na	na
soap	1.3 kg	4	6	2	3	5	na	na
cotton	3 m	10	10	10	14	33	na	na
textile								
candles	1.3kg	9	13	5	7	10	na	na
lamp oil	1.3 kg	8	11	5	7	10	na	na
fuel	3 m BTU	109	70	46	49	35	na	na
Total		1899	1402	423	823	450	835	928
				(1144)		(918)		

Sources: price data for Beijing, Shanghai, and Canton are

from <http://gpih.ucdavis.edu/>; for data sources for other cities, see text.

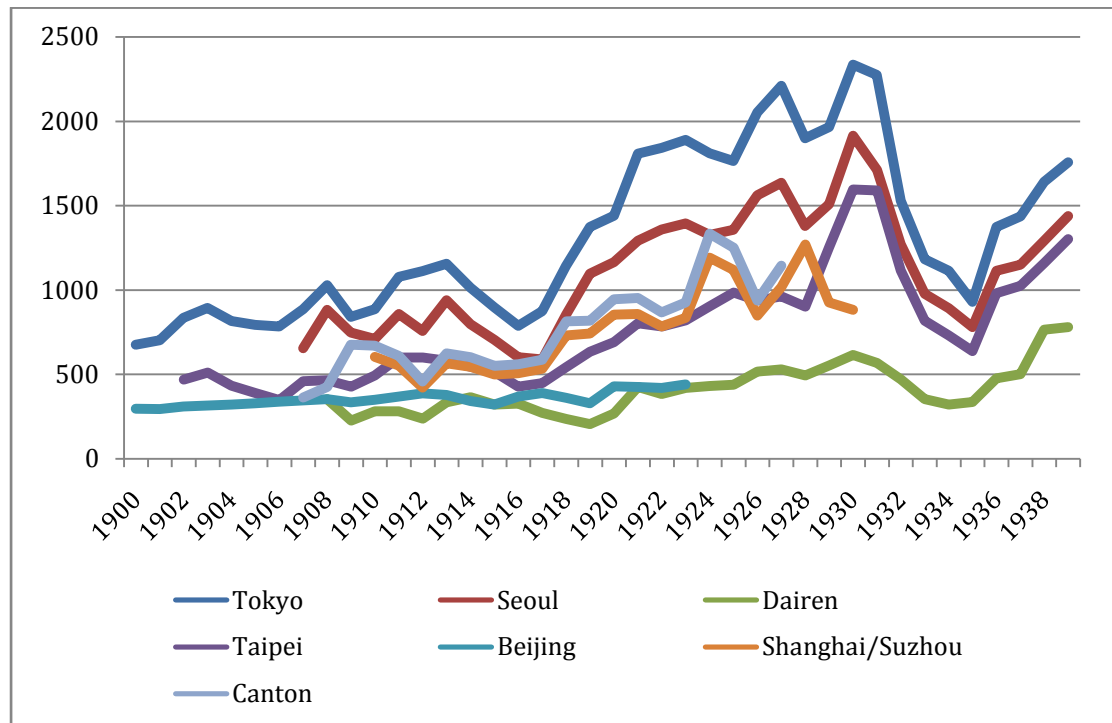
Notes: one yen was set equal to 24.88g of pure silver, a ratio based on silver price in London and the pound/yen exchange rate as available from *Kinyūjikōsankōsho* (Handbook of Financial Matters), various issues; total amounts in brackets are costs of living, which include rice, rather than sorghum, in Beijing and Dairen; figures for Beijing, Shanghai, and Canton are based on wholesale prices, while those for other cities reflect retail prices, except sorghum in Dairen; meat refers to port and chicken in Chinese cities and to beer in the cities of the Japanese empire.

Table 4 presents the amount of silver required to buy the subsistence life style in the four major cities of the Japanese empire in 1923. In the table are also compared the costs of living in imperial cities with those in Beijing, Shanghai, and Canton, which were calculated by Allen, et al. (2011). Total amounts include expense on sorghum in Beijing and Dairen, while in other cities the totals were calculated assuming rice, rather than sorghum, to be staple diet. Costs of subsistence based on rice in the two sorghum-eating cities are shown in brackets.

Table 4 reveals distinct patterns in intercity price gap. First, agricultural goods tended to be more expensive in Japan than in its colonies and China, where agricultural output as a share of GDP was significantly larger. In particular, retail price of refined rice was about twice as expensive in Japanese cities than in Taiwanese cities, where rice could be bought most cheaply. While lower than those observed in Tokyo, rice prices in Seoul exceeded that in Dairen or Beijing. Price of bean also remained far higher in Tokyo than in other cities, and beans could be bought with the smallest

amount of silver in Dairen and Beijing. In contrast, cotton textiles were cheaper in Tokyo than either in Taipei or Beijing. Workers in Beijing enjoyed lowest fuel, i.e. coal, prices. Overall, such a pattern of regional price difference suggests transportation costs accounted for much of intercity price differences. Prices of the two staple diet – rice and sorghum – so differed that buying of 171 kg of rice cost about three times as much as 179 kg of sorghum in Beijing and Dairen. Consumption of the two grains accounting for the lion’s share of the subsistence budget, the cost gap went far to lower the cost of subsistence in the two cities. Totals in brackets for the two sorghum-eating cities in Table 4 indicate the workers in the two cities would have had to pay about twice as much, had they chosen to eat rice, rather than sorghum. It should however be recalled that the cost gap is somewhat overstated, given that sorghum prices – unlike rice prices -- used in this study are wholesale prices. Finally, note that costs of living for Chinese cities were calculated by Allen, et al. (2011) using wholesale prices, which would imply price gap between, say, Tokyo and Beijing, is actually smaller than is suggested by totals in Table 4.

Figure 2 Costs of Subsistence in East Asian Cities (grams of pure silver)



Source: see text for cities in the Japanese empire; <http://gpih.ucdavis.edu/> for Chinese cities.

Note: costs of living in imperial cities were first calculated in terms of the yen which was converted into amounts in pure silver, using silver price in London and the pound/yen exchange rate as given in *Kinyūjikōsankōsho* (Handbook of Financial Matters).

Subsistence costs may be similarly calculated for years other than 1923, which are presented as Figure 2. Cost of living remained highest in Tokyo and lowest in Beijing and Dairen, where sorghum was eaten, throughout the first four decades of the twentieth century. Seoul was the second most expensive city to live, while prices in rice-eating cities in southern China -- Taipei, Canton, and Suzhou -- were lower than in Seoul but higher than in the two northern cities.

Figure 3 Coefficient of Variation of Consumer Price Indices in Different Cities



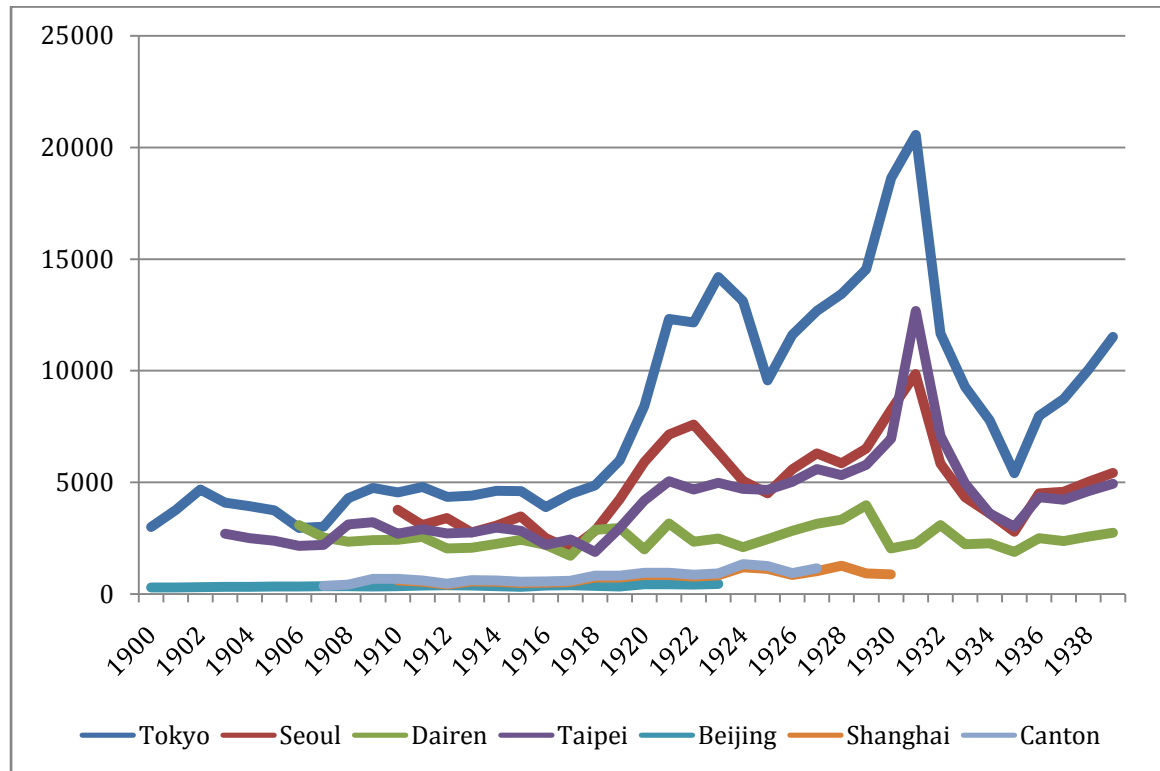
Sources: same as Figure 2.

Figure 3 shows consumer price gap for three different sets of cities in East Asia. The coefficient of variation including all the fourteen cities of East Asia spans only fourteen years, from 1910-23, which conveys an impression of price differential neither widening nor narrowing. The longest series from 1907-39, comprising the eleven cities of the Japanese empire, indicates that price gap among these urban

centers was being closed in the interwar decades. Finally, coefficient of variation for the imperial cities plus Shanghai/Suzhou runs from 1910-30, tracking closely the coefficient of variation for the eleven imperial cities.

Nominal Wages, Skill Premium, and Gender Wage Gap

Figure 4 Nominal Wages of Common Laborers in East Asia



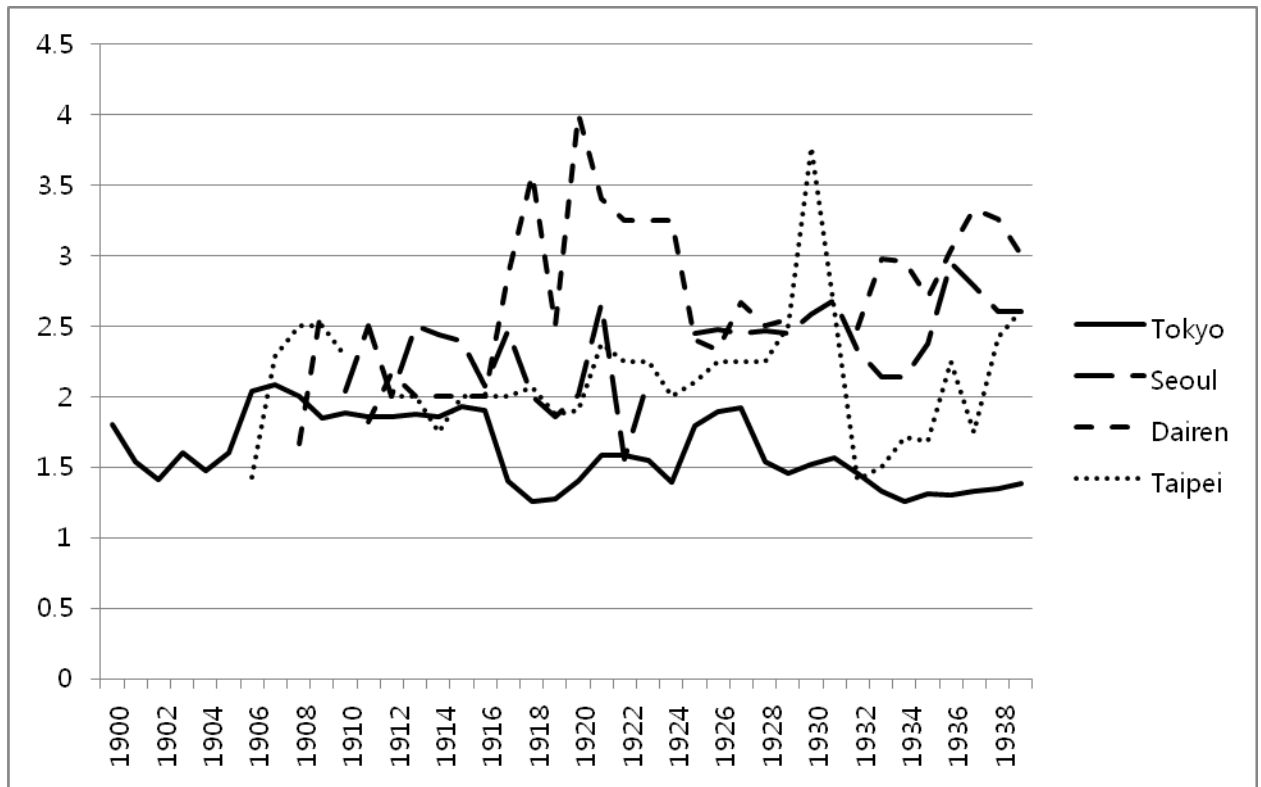
Sources: see Data Appendix.

Figure 4 shows that wages of common laborers differed substantially in terms of silver among East Asian cities. Nominal wages continued to remain highest in Tokyo and lowest in Chinese cities in the early decades of the twentieth century. Nominal wages in Dairen were higher than in Chinese cities, but lower than in either Seoul or Taipei. Overall, nominal wages tended to be higher, where higher prices prevailed, and vice versa. Until the end of WWI, nominal wage gap between Dairen, Seoul, and Taipei was not substantial, but in the 1920s and 1930s, nominal wages rose in Seoul and Taipei as they did in Tokyo, while workers in Dairen suffered nominal wage stagnation as in China. Nominal wages in Shenyang and Changchun, the two Manchurian cities further to the north of Dairen, not included in Figure 4 for the sake

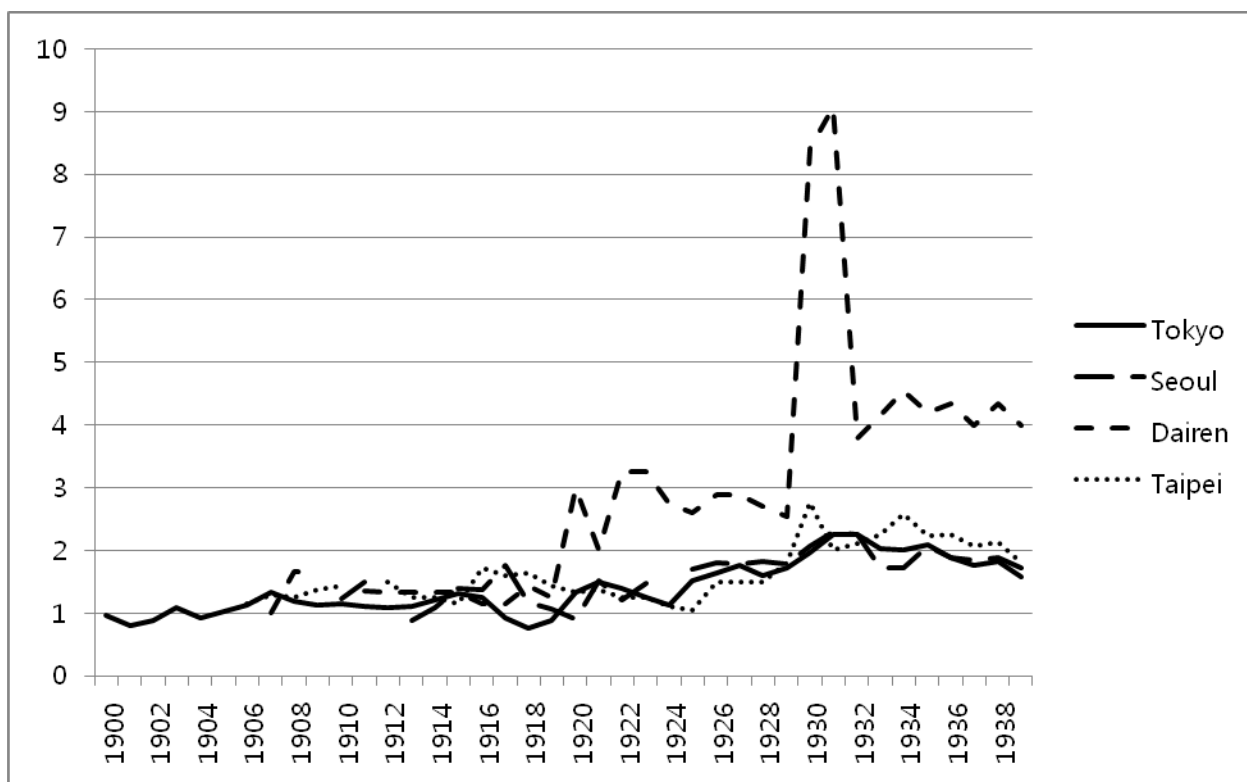
of readability, rose in the interwar decades. Nominal wages in different cities either in Japan or in Korea or in Taiwan (not shown in Figure 4 either) remained fairly close to each other in the early twentieth century.

Figure 5 Skill Premium

A. Carpenter/Common Laborer Wage Ratios



B. Typesetter/Common Laborer Wage Ratios

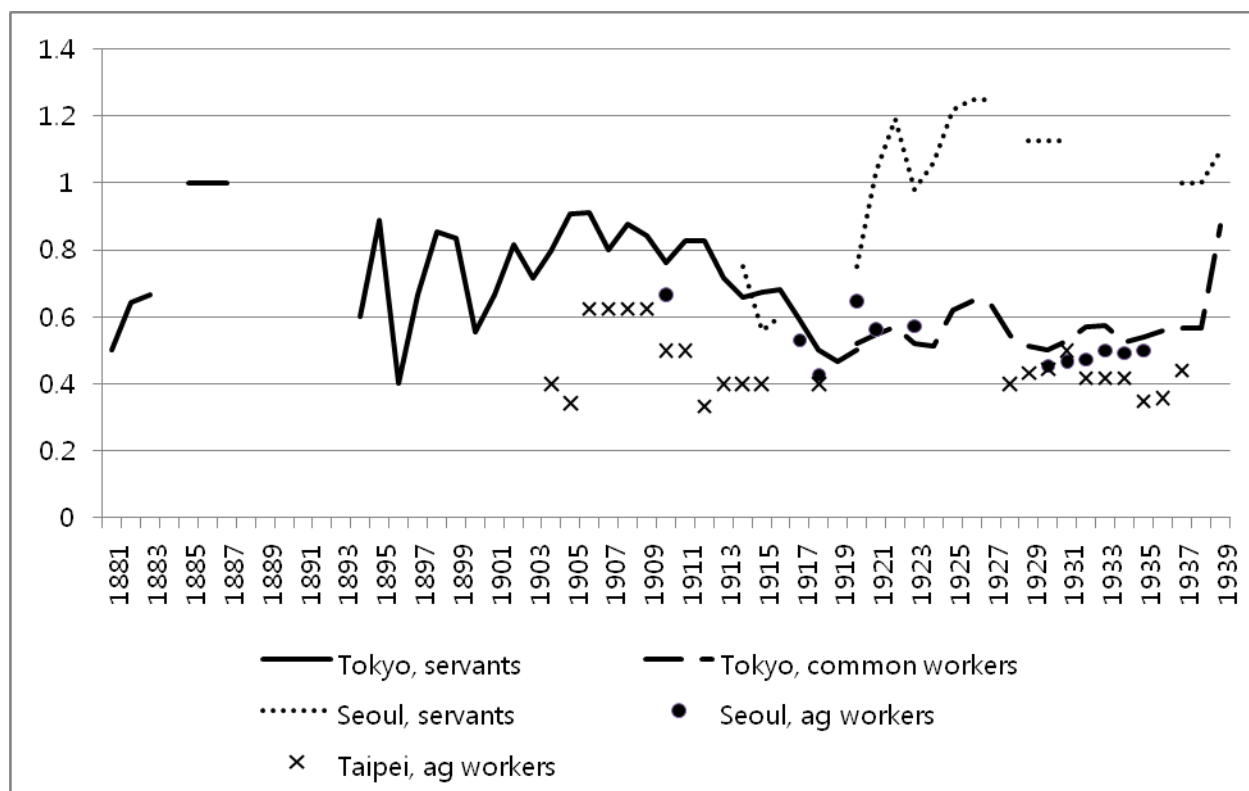


Sources: see Data Appendix.

A large majority of available wage data concern a variety of skilled workers, who in fact was in the minority of working population even in Japan. Skilled occupations listed in my wage data sources are mostly of traditional type in the sense that skills required were acquired on the job, rather than through formal schooling or training. Carpentry represents one example of such jobs, and in Panel A of Figure 5 is shown wages of carpenters relatively to wages earned by common laborers. Until the outbreak of WWI, carpenters tended to be rewarded roughly twice as highly as common laborers in the four cities. Thereafter, the skill premium diverged, rising in Dairen and Seoul on the one hand and stagnating in Taipei and falling in Tokyo on the other.

In Panel B are compared the wages of common labourers with the wages of typesetters, which may be described as a modern type of skilled worker, given that typesetting requires a certain level of literary that is achieved normally through formal schooling. Until the end of WWI, wages did not differ significantly between the typesetters and common laborers. Skill premium emerged in the 1920s to increase steadily to reach two by the early 1930s in Tokyo, Seoul, and Taipei. Rising more rapidly, the skill premium became as high as four in Manchuria on the eve of WWII.

Figure 6 Gender Wage Gap



Sources: see Data Appendix

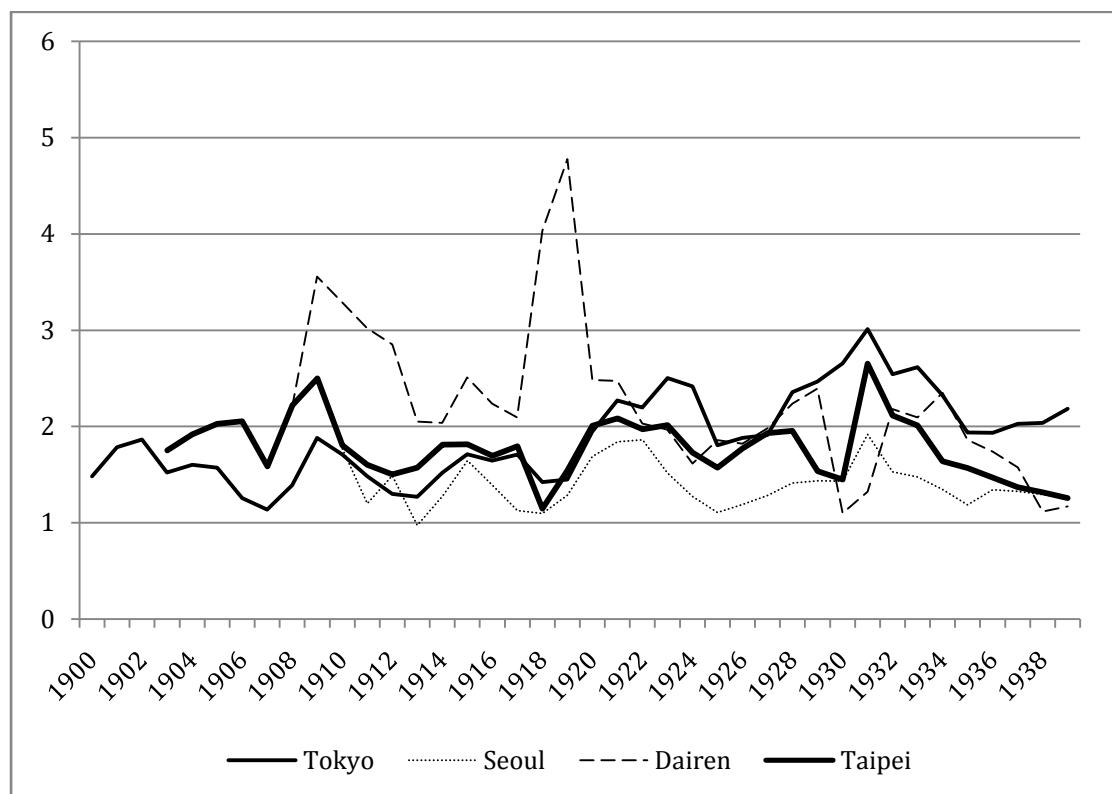
Referring predominantly to male workers, the wage data used in this study provides wage information for both male and female workers in three occupations: servants, agricultural workers, and common laborers. Female/male wage ratios in these occupations are presented as Figure 6. For Tokyo, gender wage gap is represented by female/male wage ratio for servants (solid line ending in 1919) and that for common laborers (dashed line starting from 1920), which neither narrowed nor widened as a matter of trend. The Japanese gender wage gap fluctuated around 0.6, tending to rise in wartimes – such as the Sino-Japanese War (1894), Russo-Japanese War (1904/5), and WWII. While gender wage gap as revealed by agricultural wages was devoid of trend in Seoul and Taipei, wage superiority of male over female servants in Seoul declined rapidly virtually to disappear by the late 1920s. The only evidence available on gender wage gap in Manchuria is female/male weavers' wage ratios in 1938 and 1939, 0.82 and 0.73, respectively.

Comparative Living Standards of Unskilled Workers

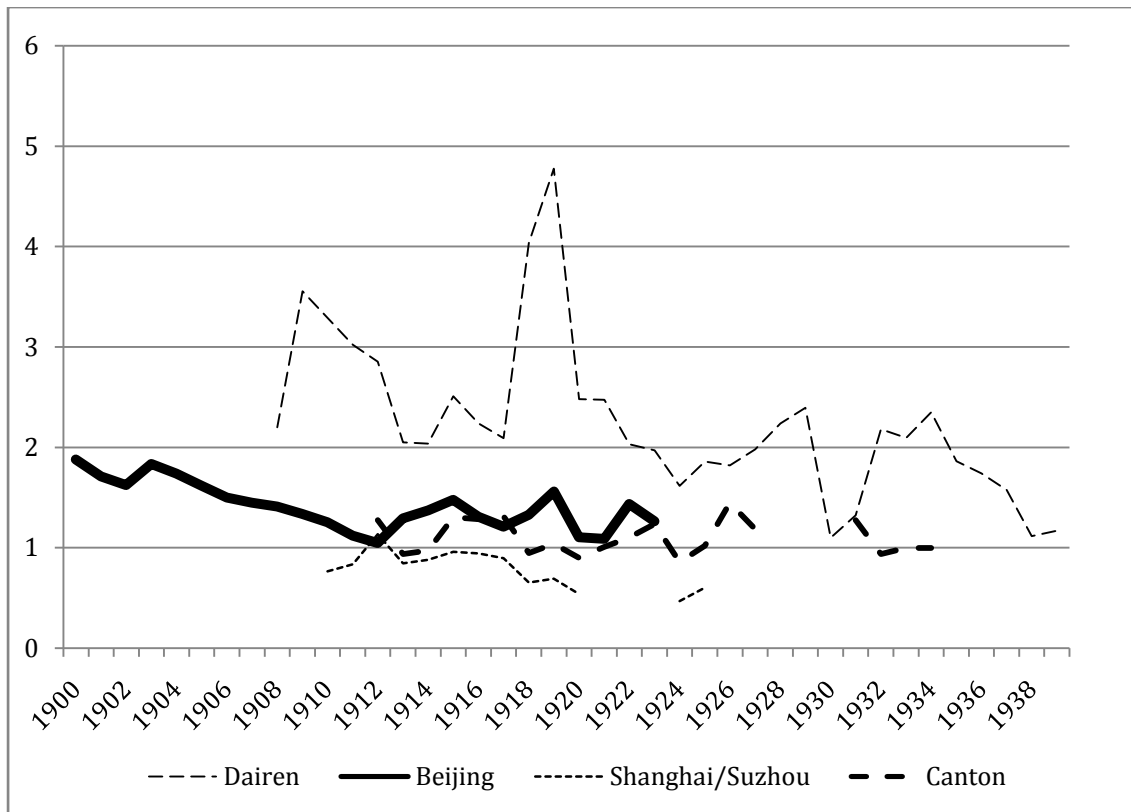
Unlike either China or Korea, Japan avoided the fate of being invaded and colonized by imperialist powers and modernized itself to emerge as a leading industrial economy after the Second World War. Does the contrast have roots in the Japan's economic superiority over the rest of East Asia at the time of their encounter with the West? Emulating European powers, Japan set upon building an empire comprising an area more than four times as large as the Japanese archipelago. How did workers in its colonial territories fare under Japanese rule, particularly in comparison with workers' living standards in the metropole? Did trade and factor mobility occurring within the empire cause income levels in Japan and its different colonial territories to become increasingly similar? Construction and comparison real wage indices, which tell not only inter-regional income gap at a particular point in time, but also how the disparity evolved over time, seems like a good starting point in the search for answers to these questions. And one of such real wage indices is welfare ratio, which can be obtained by standardizing nominal wages (shown in Figure 4) with the costs of subsistence in different cities (presented as Figure 2).

Figure 7 Welfare Ratios in East Asia, 1900-39

A. Four Large Cities of the Japanese Empire



B. Chinese and Manchurian Cities



Sources: see text.

Figure 7 presents welfare ratios in East Asia in two panels for the sake of readability. At the beginning of the twentieth century Beijing, Taipei and Tokyo appeared not to differ significantly in terms of unskilled workers' living standards, with welfare ratios in the three cities well above the poverty line, which is unity. In the 1910s, although real wages in Beijing fell to a level somewhat below that in Taipei and Tokyo and similar to that observed in Seoul, difference in the workers' welfare in these three cities was still not large. Compared with the three cities, workers in Dairen enjoyed living standards about twice as high in the 1910s, while workers in Shanghai fared worst.

In the two decades following the end of WWI, real wages in Tokyo and Dairen followed opposite trends, rising in Tokyo and declining in Dairen. As a consequence, fortunes of workers in the two cities were reversed on the eve of WWII, with common laborers in Tokyo being twice as well off as their counterparts in Dairen. Workers' welfare improved slowly in Taipei, while in Canton, Seoul, and Shanghai unskilled real wages stagnated.

Figure 8 Welfare Ratios in Manchurian Cities

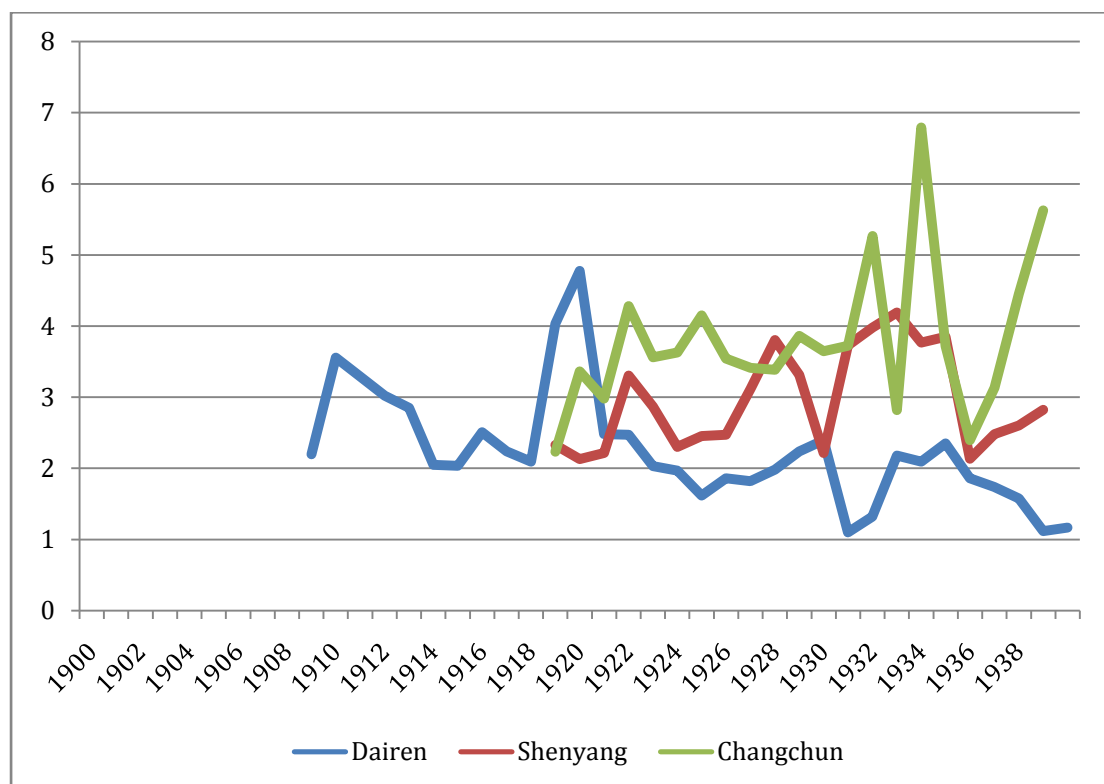


Figure 8 shows that in contrast to Dairen, Shenyang, and Changchun saw workers living standards improve rapidly in the 1920s and 1930s. Thus, on the eve of WWII, unskilled real wages in the two northern Manchurian cities reached a level roughly equal (Shenyang) or even higher (Changchun) to that in Tokyo and at least twice as high as that in Dairen, Seoul, and Taipei.

According to Figures 9, real wages in different cities in Japan did not differ significantly in terms of either trend or level, with the exception of real wages in Fukuoka surging in the early 1920s. As seen in Figure 10, in Korea, real wages rose slowly in Pyongyang, while Seoul or Pusan suffered real wage stagnation, confirming per capita output growing more rapidly in northern than in southern provinces of Korea (Cha and Kim(2012)). In Taiwan, workers in Tainan benefited from faster improvement in living standards than those in Taipei (Figure 11).

Figure 9 Welfare Ratios in Japanese Cities

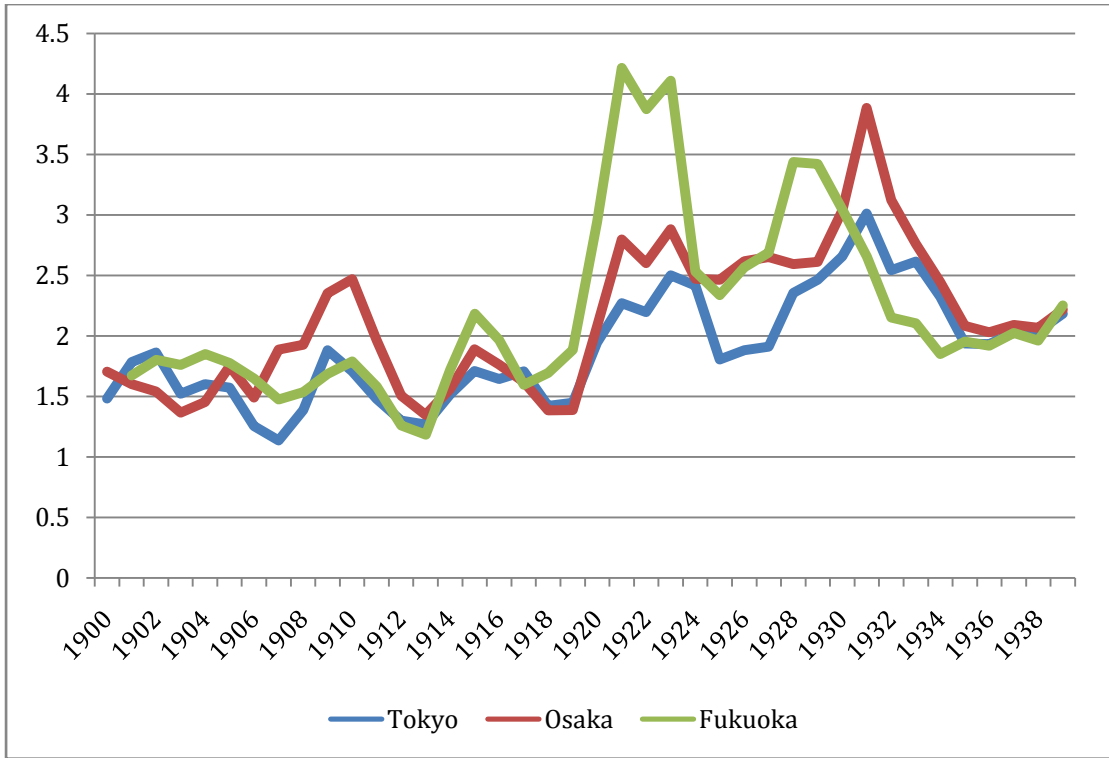
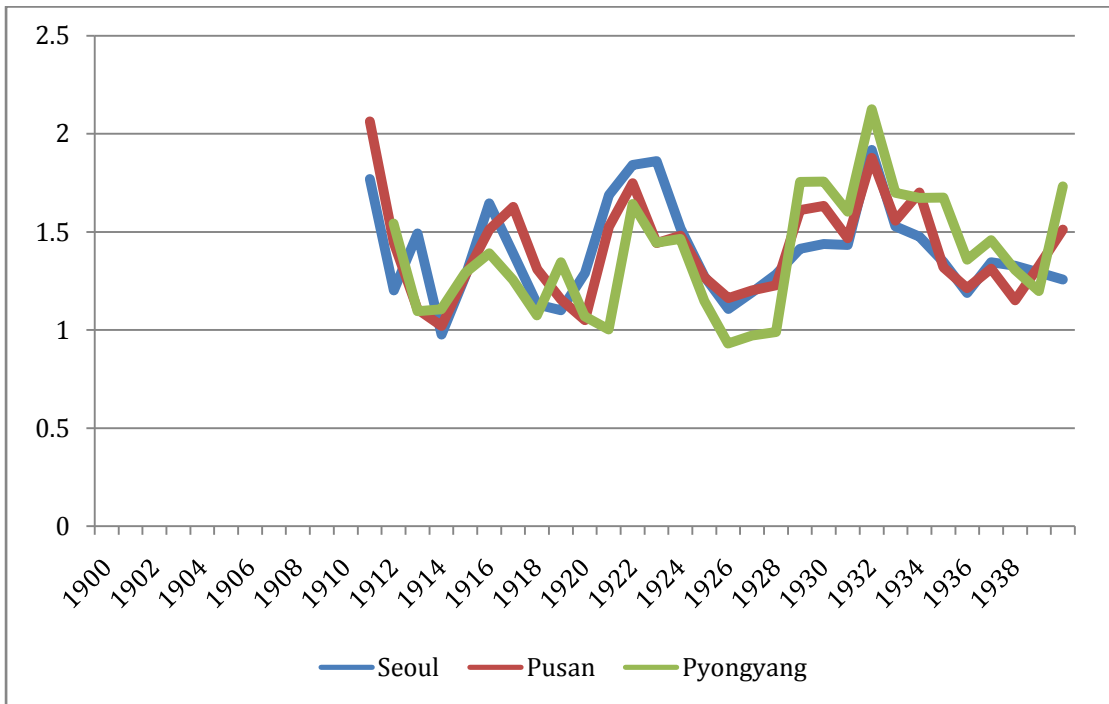
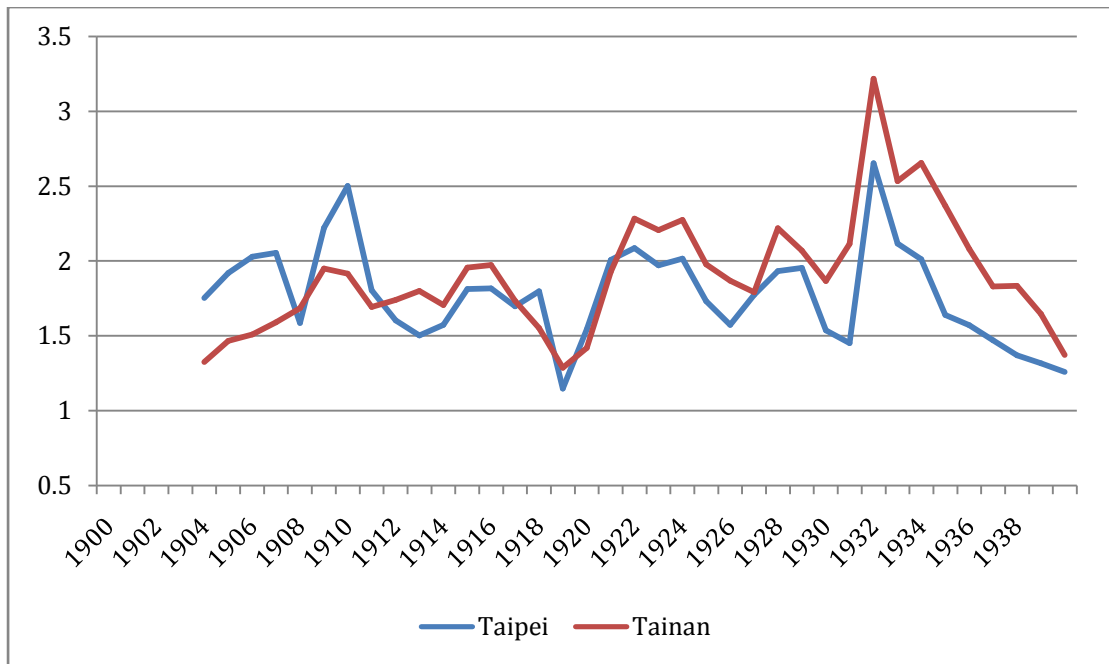


Figure 10 Welfare Ratios in Korean Cities



Source: see text.

Figure 11 Welfare Ratios in Taiwanese Cities



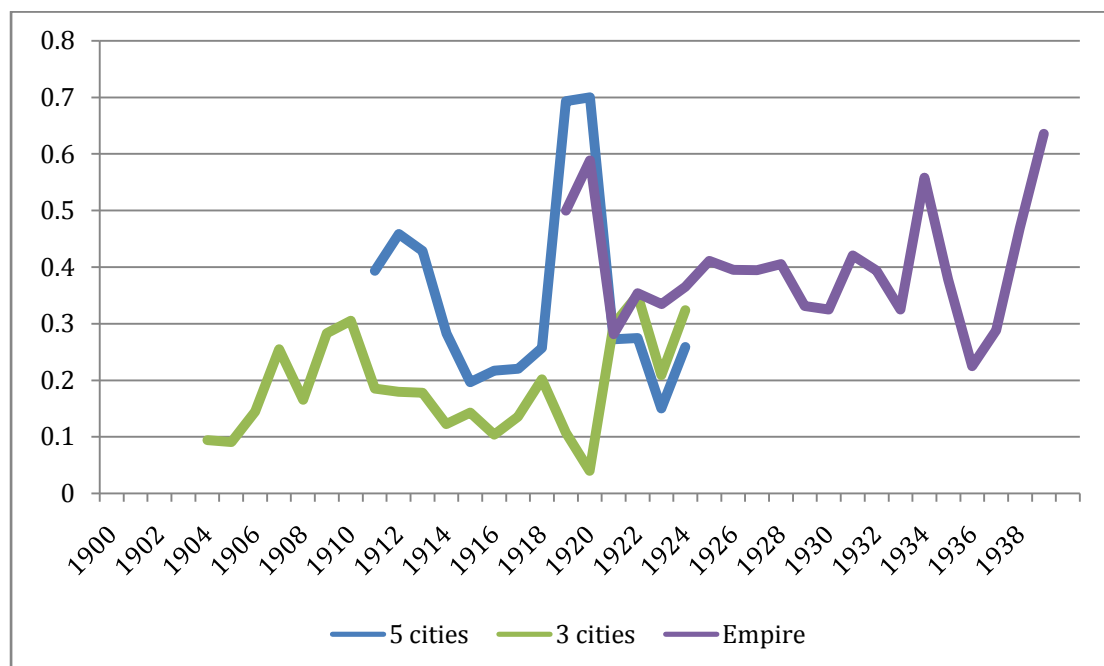
Source: see text.

The evolution of real wage gap among East Asian cities as shown by Figures 7 and 8 is consistent with existing studies, which suggest the affluence of Manchuria relatively to China and prosperity of Taiwan vis-à-vis Korea. A survey conducted in 1941 by the Southern Manchurian Railway Company found that workers' real incomes in Manchuria were between 48 and 118 per cent higher than in northern China depending upon occupations (Toiku(1941: 178, Table 1)). In addition, Ma(2008: 367, Table 3)'s estimation indicated that per capita GDP was 20% higher in Manchuria than in China from 1931-36.

Angus Maddison's estimate of per capita output in 1990 Geary-Khamis dollars (reproduced in Table 3) indicated that Korea was somewhat better off than Taiwan in the mid-1930s. The purchasing power parity(PPP, hereafter) converters Maddison used to derive the per capita output figures were obtained by backward projection and indicated that prices tended to be significantly higher in Taiwan than in Korea. Claiming that the PPP converters suffer from index number bias, Fukao, Ma, and Yuan (2006) estimated PPP converters using direct observation, i.e. prices of more than seventy different goods and service from 1934-36 in Japan, Korea, and Taiwan. The PPP converters included consumer price indices, which remained somewhat lower in Taiwan (4.53) than in Korea (4.75) in 1934/6, a gap, which is in line with that found in Figure 2 above. Applying the set of PPP converters they estimated to

Mizoguchi and Umemura(1988)’s estimates of per capita output in Japan’s colonial territories in the current *yen*, Fukao, Ma, and Yuan (2006) concluded that in 1934/6PPP-adjusted per capita output of Taiwan exceeded that in Korea, which is again consistent with welfare ratio being lower in Seoul than in Taipei as seen in Panel A of Figure 7.¹⁶

Figure 12 Coefficient of Variation of Welfare Ratios



Source: see text.

Note: “5 cities” refer to Tokyo, Seoul, Dairen, Taipei, and Beijing; “3 cities” are Tokyo, Taipei, and Beijing; “empire” refers to eleven imperial cities shown in Figure 1.

Coefficients of variation of welfare ratios relating to three different subsets of the fourteen cities are shown in Figure 1, which suggest living standards neither converged nor diverged in pre-WWII decades. One of the three groups includes

¹⁶Applying the PPP converter estimated for 1934/6 over the three decades from 1910, Fukao, Ma, and Yuan (2006) showed that per capita output in Taiwan remained about twice as high as that in Korea throughout the period. Note however that according to Panel A of Figure 7 workers’ living standards in the two colonies did not differ significantly in the 1910s and tended to widen slowly in the following two decades.

eleven cities in the Japanese empire (“Empire”), where real wage gap appeared to stagnate as a matter of trend in the 1920s and 1930s. Such was also the case between Beijing and the four large imperial cities (“5 cities”) in the 1910s and early 1920s and between Tokyo, Taipei, and Beijing (“3 cities”) in the two decades following 1904.

Discussion and Interpretation

The real wage estimates of this study raise at least three issues worth discussing. First, is the roughly equality in living standards among East Asian cities (except Dairen) at the beginning of the twentieth century consistent with existing studies suggesting that, unlike Q’ing China and dynastic Korea, Tokugawa Japan achieved nontrivial economic development? Second, why did workers’ living standards indifferent cities of East Asia did not become increasingly similar although different parts of East Asia were being economically integrated in the decades preceding WWII? Finally, why did workers migrate from Japan to Korea and Manchuria, which remained as low wage regions relatively to Japan in the 1920s and 1930s?

Limited amount of quantitative evidence exists to suggest that real wages and land rents was on the decline in eighteenth and nineteenth century China and Korea, while Japanese wages at least held their own, and land rents rose slowly in Tokugawa period. Japanese visitors to Korea at the end of the nineteenth century found land productivity in Korea as being about half as high as that in Japan. Finally, the eighteenth century is known as a period of industrious revolution and proto-industrialization in the Japanese economic history.¹⁷

One of few indices of comparative living standards available for East Asia is stature, which confirms the finding that Japanese did not enjoy advantage over either China or Korea in terms of living standards around 1900. In fact, existing records suggest Japanese were shorter than Chinese and Koreans at the end of the nineteenth century. In 1883-92, average height of conscripted Japanese males was about 157 centimeters, and in 1900 the education ministry of Japan conducted a survey to find adult male height to be 160.9 centimeters (Yasuba(1986); Kito (1996: 439)). In 1897, Alfred Burt Stripling, an Englishman working for the dynastic government of Korea, put

¹⁷ On the trends in wages and rents (or agricultural land prices) in China, Japan, and Korea, see Allen, et al. (2011), Cha(2009), Chao (1986), Kusano(1996), and Yasuba (1986).

forward 163.8 centimeters as the average after measuring the height of 1,060 males in Seoul (Bishop (1898)), which is not too different from estimates of Chinese male stature at the end of the nineteenth century (Baten, Ma, Morgan and Wang (2010: 351, 352, Figures 2 and 3)).

The rough parity of living standards between Japan on the one hand and China and Korea on the other need not be seen as conflicting with evidence of only Japan achieving progress before the encounter with the West. For Malthusian model predicts that productivity advance results in the long run in population growth, rather than improvement in per capita output. And this conclusion was found to be consistent with patterns of population growth in different places in the past (Kremer(1993); Ashraf and Galor(2011)).

Put differently, population growth is an index of productivity advance realized by Malthusian economies (Clark(2009)). As seen in Table 1, as of 1935 population density was significantly higher in Japan than in the rest of East Asia, a gap which was even more pronounced in circa 1900, particularly vis-à-vis China.¹⁸ This suggests that faster population expansion occurred in Japan, confirming that the country achieve faster productivity growth than the rest of East Asia in the centuries leading up to 1935.

In the interwar decades, East Asian countries saw the volume of intra-Asian trade as a share of total expand consistently (Sugihara (1996: chapter 4)). Capital flows from Japan to the rest of East Asia --particularly to its colonies-- also boomed (Yamamoto(1992; chapter 6)). Finally, masses of migrant workers crisscrossed the East Asia in an effort to improve living standards. A large number of Koreans left home attracted by higher wages in Japan, registering migration rates reaching levels comparable to those attained by countries taking part in the pre-1914 trans-Atlantic passage (Gill & Chung (2002: 134)) and resulting in nearly two million Koreans settled in Japan at the end of the colonial rule (Kwon(2004: 256: Table 10.2)). Manchurian wage advantage attracted masses of Chinese workers, which generated waves of internal migration sometimes compared to the American westward movement in the nineteenth century. Finally, the 1935 census carried out in colonial

¹⁸Arable land per capita was 0.12 ha in Japan, 0.39 ha in Korea, and 0.22 ha in China circa 1900. Data sources are the same as with Table 1.

Korea revealed the presence of more than seventy thousand Chinese earning higher wages in Korea.

Despite the migration and burgeoning trade and capital flows, gap in workers' living standards in different cities of East Asia neither narrowed nor widened as a matter of trend in early twentieth century (Figure 12). Behind this façade of constancy occurred convergence and divergence in different parts of East Asia. For instance, as shown by Figures 7 and 8, real wage gap between Tokyo and Seoul widened, while real incomes of unskilled workers in Dairen and Tokyo converged. Real wage gap between Japanese cities on the one hand and Shenyang and Changchun on the other was also being closed, but living standards in Chinese cities probably became increasingly deteriorated vis-à-vis Tokyo, Osaka, and Fukuoka.

Explaining the convergences and divergences requires information on input growth and technological progress in different East Asian regions.

Table 5 Growth Accounting, 1910-40

	Japan	Korea	Taiwan	Manchuria
g _Y	3.66%	3.60%	3.69%	4.21%
g _N	1.20%	1.16%	1.71%	3.12%
g _K	4.27%	6.60%	4.63%	n.a.
g _T	0.31%	0.75%	1.82%	2.23%
g _A	1.72%	0.96%	1.08%	n.a.

Notes: Total factor productivity growth (g_A) was obtained applying the identical factor shares for labor, capital, and land, set equal to 0.5, 0.3, and 0.2, respectively to different regions; labor input growth refers to growth of population aged from 15-64, except for Manchuria, where population growth was substituted.

Sources: Ohkawa, et al. (1974), Mizoguchi (1988 & 2008), Cha & Kim (2012), Cha(2012)

Table 5 shows that the four key regions of the Japanese empire differed considerably in terms of input growth and productivity advance. Faster labor input growth in

Manchuria and Taiwan reflected faster demographic expansion as seen in Table 2, which was due to inflow of migrants from China into Manchuria and faster decline of mortality in Taiwan. The more rapid growth in labor probably caused cultivated acreage to expand more rapidly in the two regions. Capital input growth was significantly faster in Korea than either in Japan or in Taiwan largely as a result of the industrialization drive in the 1930s, which was to a great extent motivated by Japan's imperialist ambition about China. Although the rate of capital accumulation in Manchuria remains unknown, it was likely to be closer to that observed in Korea than in Japan, given the narrative evidence of Japan attempting to develop both Manchuria and northern Korea as foothold for the invasion of China. Rawski (1989: 245)'s estimate of "modern-oriented" gross fixed capital formation in Manchuria also suggests rapid accumulation of the Manchurian capital: capital stock as derived by applying perpetual inventory method to Rawski's flow figures grew 16% per year from 1903-36.¹⁹ Finally, estimated rate of productivity progress was fastest in Japan and slowest in Korea. While ignorance of the rate of capital accumulation makes it impossible to estimate TFP growth for Manchuria precisely, substitution of the capital input growth in Korea (6.37%) yielded 0.22% as the growth of Manchurian TFP. Plugging in the slower rate capital accumulation in Japan (4.27%) raises TFP growth in Manchuria rises to 0.92%, which is still lower than that in Korea.

Comparison of Tables 5 and 2 reveals that higher productivity growth was associated with higher primary school enrolment, and vice versa. This correlation is unlikely to be a consequence of failure to take changes in labor quality into account in the growth accounting of Table 5, where labor input indices derived from population figures were used: given that primary schooling spread faster in Korea and Taiwan than in Japan, controlling for faster improvement in labor quality in the two colonies would widen the gap in the estimated productivity growth. The correlation appears as indicating causation running from human capital to productivity advance, rather than in the opposite direction, for even larger human capital gap probably was already in place before 1900. In 1910, about three fifths of school age children attended primary schools in Japan, but only 4% and 9% in Korea and Taiwan, respectively. Europeans arriving in Tokyo and Osaka in the mid-nineteenth century found a surprisingly large

¹⁹ Depreciation rate was set equal to 8%, which is an estimate for colonial Korea. See Cha and Kim (2012).

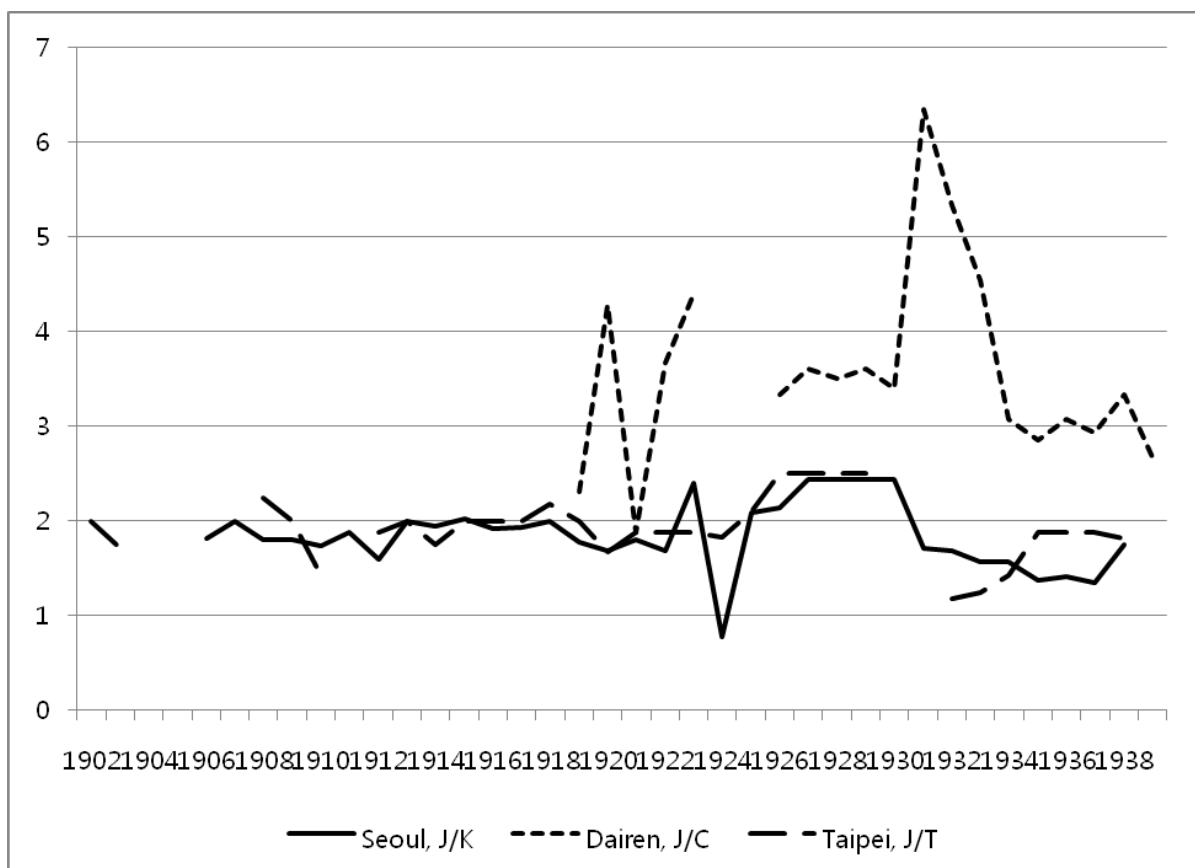
portion of dwellers in the cities – some 80% of males and 60-70% of females – to be literate, which stands in stark contrast with male literacy ratio as low as 22% in Korea as late as in 1947.

Using Table 5, one may draw several conclusions on the reasons why income gaps narrowed or widened in different subsets of the eleven cities of East Asia. First, real wage convergence between Dairen and non-Manchurian cities is attributable to the erosion of wage advantage due to labor inflow from northern China into Dairen. Second, the widening real wage gap between Taiwan and Japan appears primarily as a consequence of faster population growth in Taiwan. Finally, given that population grew at similar speeds in Japan and Korea, and that capital was being accumulated more rapidly in Korea, the divergence between Japan and Korea should be seen as a consequence of faster productivity growth in Japan.

The final question raised at the beginning of this section is about why workers moved not only from richer to poorer regions, but also in the opposite direction. In particular, a significant number of Japanese workers migrated to Korea, Taiwan, and Manchuria. As a consequence, censuses undertaken in 1935 indicated that nearly seven hundred and more than two hundred and seventy thousand Japanese could be identified as staying regularly in Korea and Taiwan, respectively, and that Manchuria embraced more than 1.3 million Japanese in 1942.²⁰ Workers of different ethnic origins could be found in major urban centers of the empire, and my data sources allow comparison of wages paid to Japanese and indigenous labourers earning incomes in Seoul, Dairen, and Taipei.

Figure 13 Ethnic Wage Gap: Ratio of Wages of Japanese to Indigenous Common Laborers

²⁰ See the Report of 1935 Census in Colonial Korea, Barclay (1954: 16), and Yamanaka(2009: 134, Table 8). Little appeared to occur in the way of migration between Korea and Taiwan, the two countries in terms of living standards. According to Barclay(1955: 16), 1,479 Koreans were counted in the 1935 census conducted in Taiwan, while the Korean census of the same year failed to identify any Taiwanese in Korea at all.

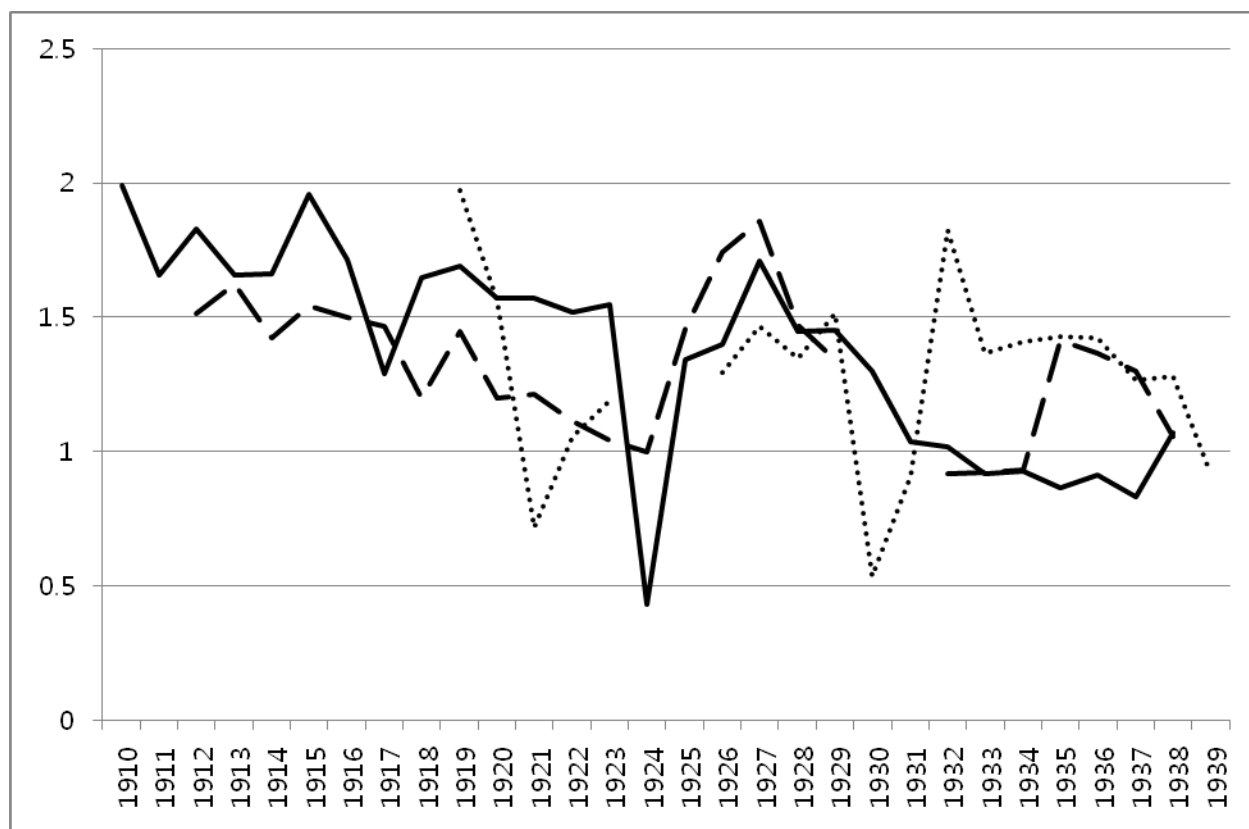


Sources: see Data Appendix.

Figure 13 shows that in both Seoul and Taipei, Japanese labourers were paid twice as highly as indigenous workers in the 1910s and 1920s, an ethnic wage gap which tended to narrow in the following decade. In Dairen, the wage advantage of workers from Japan was even greater, with Japanese workers enjoying living standards about three times as high relatively to Manchurian workers. Given that Japanese and Korean laborers, say, in Seoul, were combined with the same amount of land and capital stock available in the city using identical technology, the ethnic wage gap should reflect ethnic difference in human capital. This inference is consistent with the evidence of Japanese superiority vis-à-vis the three colonies in terms of life expectancy and primary school primary schooling (Table 2). Also, in the 1930s, Korea and Taiwan achieved faster accumulation of human capital than Japan, hence the narrowing of ethnic wage gap in Seoul and Taipei.²¹

²¹ From 1930-35, primary school enrolment rate increased by 13% and 9% points in Korea and Taiwan, respectively, which compares with 7% point increasing occurring in Japan. In Manchuria, primary school enrolment increased by 11% points from 19%

Figure 14 Real Wage Ratio: Expatriate/Non-migratory Japanese Workers



Sources: same as Figure 13.

Notes: wages refer to common laborers; solid, dashed, and dotted lines compare real wages of Japanese workers in Seoul, Taipei, and Dairen, respectively with those earned by Japanese workers in Tokyo.

Figure 14 shows that in the 1910s expatriate Japanese workers in Seoul or Taipei were about twice as well-off as non-migratory Japanese workers in Tokyo. The greater wage advantage enjoyed by Japanese workers in colonies vis-à-vis those remaining home suggests the presence of factors boosting the productivity of expatriate vis-à-vis sedentary Japanese workers, which would include, productivity, capital, and land. First, while estimates of relative productivity in the three countries are unavailable as yet, it appears unreasonable to assume that the metropole suffered TFP disadvantage relatively to the two colonies. Second, while migratory Japanese

to 30%. Korean and Taiwanese males gained 2.5 and 2.3 years in life expectancy from 1925/30 to 1935/40, respectively, while male life expectancy increased by 2.1 year in Japan from 1930-40. The sources of information are the same as in Table 2.

may have been better educated and healthier than those remaining at home, it is at least equally conceivable that less privileged tended to be forced out of Japan into poorer colonies.²² Third, capital, which was more abundantly available in Japan than in the rest of the empire (Table 1), cannot explain the wage advantage of expatriate Japanese. This process of elimination leaves greater land abundance in colonies (Table 2) as the cause to explain the wage advantage of migratory vis-à-vis sedentary Japanese. Land availability mattered, because in both the metropole and in the colonies manufacturing was outweighed by agriculture before the 1930s, when Japan first emerged as an industrialized economy.

Figure 14 shows that the wage advantage enjoyed by migratory vis-à-vis Japanese was being eroded in the decades during the interwar period. Why? One obvious reason would be that out-migration weakened population pressure in Japan, at the same time intensifying that in colonies. Perhaps at least equally important was faster advance in productivity in Japan (Table 5), which raised productivity of non-migrant Japanese.

Conclusions

This article estimated real wages of unskilled workers in the key cities of East Asia to find that until the end of WWI unskilled workers' living standards did not differ significantly outside Manchuria, where significantly higher real wages prevailed. In the interwar decades, real wages grew at different speeds in different cities, which resulted in the convergence of living standards between Dairen and non-Manchurian cities on the one hand and increasing superiority of Japanese cities over cities in China, Korea, and Taiwan on the other. The convergence was most probably driven by mass migration of workers into Manchuria, while faster productivity growth in Japan played an important role in creating the Japanese lead. Productivity growth was positively correlated with educational achievement, which suggests causation running from the latter to the former. For the reverse causation is likely to results in the speed of technological progress being correlated with growth, rather than level, of educational attainment, which did not take place.

²² In the trans-Atlantic migration in pre-WWI decades, literacy tended to encourage workers to move. See Hatton and Williamson (1998).

This study also attributed the real wage advantage enjoyed by Japanese expatriate workers' in colonial cities around 1900 to their superiority in human capital, which was a legacy of Japan's superior growth performance in the eighteenth and nineteenth centuries, as well as a consequence of efficient response to the challenge of the West.²³ At the opposite pole stood China with a limited and slowly growing amount of human capital, which probably allowed productivity to improve only very sluggishly. As a consequence, notwithstanding mass migration to Manchuria, Chinese workers' living standards appeared at best to stagnate in the early twentieth century.

Trends in Korean and Taiwanese living standards were neither so optimistic as in Japan nor so pessimistic as in China. In the two colonies, unskilled real wages improved slowly. Progress was probably somewhat faster in Taiwan than in Korea, which is attributable to faster TFP growth in Taiwan enjoying advantage over Korea in terms of educational attainment. Wage gap between Japanese and indigenous workers in Japan's colonial cities was being closed consistently, as both Korea and Taiwan caught up with Japan in terms of health and schooling.

In all this, human capital figures prominently as a factor driving the evolution of real wage gap in East Asia in the first four decades of the twentieth century. Therefore, it appears warranted to a call for a greater attention to be paid to human capital as a factor to explain the emergence of East Asia as a growth engine in the post-WWII world economy. [to be completed]

²³Europeans arriving in Tokyo and Osaka in the mid-nineteenth century found a surprisingly large portion of dwellers in the cities – some 80% of males and 60-70% of females – to be literate, which is to be contrasted with only 30% of males being literate in China in the 1930s and male literacy ratio as low as 22% in Korea in 1947. Chinese literacy rate is from Rawski(1989: 58), which is John Lossing Buck's estimate as cited in Dwight H. Perkins, "Introduction," in *China's Modern Economy in Historical Perspective*, ed. Dwight H. Perkins.

Appendix: Conversion Ratios

One *koku* (石) = 10 *to* (斗) = 100 *shō* (升) = 1.8 liters

One *shō* (升) = 1kg for soybean and 1.36 kg for rice.

One *kin* (斤) of meat = 600g

One *kin* (斤) of fruit and vegetable = 375 g = 0.1 *kan* (貫) = 100 *monme*.

One *monme* (匁) = 3.75 g

One *chōbo* (町步) of land = 3000 *tsubo* (坪) = 9917.4m²

One *tan* (反) of cotton cloth = 24 *shaku* (尺) long and 9.5 *sun* (寸) wide

One *shaku* (尺) = 10 *sun* (寸) = 30.3 cm

One *kan* (匁, 缶) of oil or kerosene = 18 liters

One ton of coal = 25 million BTU

One kg of firewood = 14071 BTU

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