

***Center for Economic Institutions***  
***Working Paper Series***

***CEI Working Paper Series, No. 2008-26***

***“Comparative Output and Labour Productivity in  
Manufacturing for China, Japan, Korea and the  
United States in Circa 1935 by a Production PPP  
Approach”***

*March 2009*

Kyoji Fukao, Harry X. Wu and Tangjun Yuan



Institute of Economic Research  
Hitotsubashi University  
2-1 Naka, Kunitachi, Tokyo, 186-8603 JAPAN  
Tel: +81-42-580-8405  
Fax: +81-42-580-8333

**COMPARATIVE OUTPUT AND LABOUR PRODUCTIVITY IN  
MANUFACTURING FOR CHINA, JAPAN, KOREA AND THE UNITED STATES  
IN CIRCA 1935 BY A PRODUCTION PPP APPROACH\***

Kyoji Fukao  
Hitotsubashi University

Harry X. Wu\*\*  
The Hong Kong Polytechnic University

Tangjun Yuan  
Hitotsubashi University

**ABSTRACT**

Following the standard methodology for measuring industry-of-origin or production-side PPPs, this study compares the unit values of manufacturing products in China, Japan, Korea and the US to calculate unit value ratios (UVRs) and hence estimates PPPs for individual manufacturing industries using the US as the base country in *circa* 1935. Based on the products that could be matched between these countries, the estimated manufacturing production PPPs for China, Japan and Korea are only from half to two thirds of the prevailing market exchange rates, suggesting much lower cost of production in manufacturing in these countries than in the US. The estimated PPPs are used to calculate industry-level output and labour productivity in China, Japan and Korea relative to those of the US in *circa* 1935. The results show that the size of factory manufacturing in Japan was 12 percent of the US level whereas in China it was only one percent and even lower in Korea. In terms of comparative labour productivity, measured as PPP\$ per hour worked with the US as the reference, Japanese and Korean manufacturing was 24 and 23 percent of the US level, whereas Chinese manufacturing was only 7 percent of the US level.

**Key Words:** Production (industry-of-origin) purchasing power parity (PPP), unit value ratio, comparative output and labour productivity, comparative advantage, economic development

**JEL References:** L60, O47, P52

---

\* The authors are indebted to very helpful comments and suggestions by Steve Broadberry, Debin Ma, Angus Maddison, Thomas Rawski, Osamu Saito, Jeffery Williamson, as well as participants at the Harvard-Hitotsubashi-Warwick Conference in Venice, 2008. Part of this work was preliminarily presented at an international workshop, "Asia Pacific Seminar on World Economic Performance: Past, Present and Future," organized by the Institute of Economic Research (IER) at Hitotsubashi University in Kunitachi, 2007. The China part of the PPP estimation was conducted and the full version of the paper was drafted when Harry Wu visited IER in June and October, 2008. The financial support of the Global COE Program, "Research Unit for Statistical and Empirical Analysis in Social Sciences (Hi-Stat)" of IER to his visits is gratefully acknowledged.

\*\* Send all correspondence to Harry X. Wu at [afhxwu@inet.polyu.edu.hk](mailto:afhxwu@inet.polyu.edu.hk).

## 1. INTRODUCTION

The Post-World War II rapid economic growth of the East Asian economies cannot be well understood without a proper measure of the pre-WWII economic conditions in an internationally comparative framework. What is missing in the conditional convergence literature is a measure on real production costs at industry level especially for producer goods manufacturing that plays a key role in the modern economic development.

Level of a country's real per capita GDP measured by expenditure-side purchasing power parities (PPPs) is by nature a measure of a nation's welfare level relative to that of the benchmark country. While it may suggest the country's relative stage of economic development but does not *directly* measure the level of its industrialization and (industry-specific) labour productivity compared with those of the benchmark country.<sup>1</sup> It has been widely accepted that "industry-of-origin" or production-side PPP approach is a more appropriate direct method for measuring such conditions between countries (see Rostas, 1948; Paige and Bombach, 1959; Maddison, 1970 and 1983).<sup>2</sup> This is because by comparing industry-specific producer prices between countries we can measure the relative real factor costs of production at industry level by taking into account the prices of both tradables and (implicitly) non-tradables, which will shed important light on a country's comparative advantage and international competitiveness.

The current study attempts to fill this gap in literature to measure the pre-WWII East Asia comparative output and labour productivity by constructing production-side PPPs in manufacturing for three major East Asian economies, China, Japan and Korea, with the US as the reference country in *circa* 1935 – the best pre-war period. This is particularly important for the understanding of the pre-WWII economic conditions in China. Compared with Japan and Korea,<sup>3</sup> historical macroeconomic statistics for

---

<sup>1</sup> The expenditure PPP approach was pioneered by Gilbert and Kravis (1954) and developed by Kravis, Heston and Summers in the International Comparison Program (ICP) since the 1960s and resulted in the Penn World Tables (see Kravis, Heston and Summers, 1982; Summers and Heston, 1991).

<sup>2</sup> See Maddison and van Ark (2002) for a comprehensive review of the industry-of-origin PPP approach developed in the International Comparison of Output and Productivity (ICOP) program led by Maddison at University of Groningen.

<sup>3</sup> Among the East Asian economies, the most consistent and reliable long-term GDP series going back to the late-19th century are available only for Japan, partly thanks to the efforts of the Long-Term Economic Statistics (LTES) project under the leadership of Kazushi Ohkawa at the Institute of Economic Research of Hitotsubashi University in Japan, leading to a publication of 14 volumes for Japan (an abridged English version by Ohkawa and Shinohara, 1979). The Hitotsubashi group extended

China are sketchy. Solid economic statistics for standard national accounts are only available for the mid 1930s, thanks to the pioneering work on constructing China's GDP for the period 1931-36 by Ou (1947), Liu (1947), Liu and Yeh (1965) and Yeh (1977). We argue that by benchmarking China with the leading regional (Japan) and international (the US) economies where better and longer time series data are available, together with other social and economic information, we may find a sensible way to quantitatively position China. Of course, focusing on one benchmark (currently 1935) is insufficient to anchor the long historical course of China's industrialization that began in the late period of the Qing Empire following the First Opium War, but it is an important starting point.<sup>4</sup>

Like many production-side PPP studies, the current study concentrates on the manufacturing sector. Although there are generally more data available for manufacturing than for other industries, it is the importance of manufacturing in modern economic development rather than the data availability that is the major motivation behind most studies. Among all industries, manufacturing plays the most important role especially at the early stage of industrialisation. It is the most dynamic sector because manufactured goods have relatively high income elasticity of demand; they are highly tradable and have greater potential to gain from specialisation and economies of scale through trade. Manufacturing growth is also the most important factor behind innovation and hence technological progress. Therefore, as found in many studies, the substantially rising share of manufacturing is almost a universal feature of rapid structural transformation at the early stage of industrialisation (Kuznets, 1971; Chenery, Robinson and Syrquin, 1986).

In addition, a production-side PPP study plays a complementary role in checking any existing expenditure PPP study for the same countries during the same period. In particular, this study may help complement recent studies for Japan/China, Japan/US and China/US in *circa* 1935 using the expenditure PPP approach (see Fukao, Ma and Yuan, 2007, for example).<sup>5</sup> In theory, a country's PPP GDP estimated by expenditure

---

this line of research to two former Japanese colonies, Taiwan and Korea, with the 1988 publication of a statistical volume compiled by Mizoguchi and Umemura. The volume provides annual estimates of GDP and its various components for these two economies during the period of Japanese occupation based on the detailed economic statistics of the colonial administrations.

<sup>4</sup> Such a historical benchmark study is also significant for checking PPP estimates for the modern time Chinese economy. See studies on China/US production PPPs for manufacturing industries by Szirmai and Ren (2000) and Wu (2001).

<sup>5</sup> The recent study by Fukao, Ma and Yuan (2007) for the first time constructs expenditure PPPs for Japan/China, Japan/US and China/US for *circa* 1935. Together with other studies (Fukao, Ma and

and production approach respectively should be the same or at least well reconciled. A production-side PPP study on manufacturing is one important step towards that goal.

This paper proceeds as follows. In Section 2 we provide a general picture of the economies of China, Japan, Korea and the US in terms of output and employment structures as well as foreign trade by major commodity groups, which serves as a useful background for the whole study. Section 3 presents the standard industry-of-origin PPP approach and discusses the key measurement issues concerned. In Section 4, data sources are provided and problems are discussed for individual countries. In Section 5, we report the estimated PPPs and discuss the results against the background of cost conditions in individual industries between countries in comparison. In Section 6, we apply the estimated PPPs to the cross country output and labour productivity comparisons. Finally, in Section 7 we conclude this study with a discussion of the important implications of our findings.

## **2. THE CHINESE, JAPANESE, KOREAN AND THE US ECONOMIES IN THE MID 1930S**

The selected countries in the current study are fairly representative for different stages of modern economic development. By the mid 1930s, while the US was the world's leading industrial power, just recovered from the Great Depression in 1929-33, the Japanese economy had already undergone a rapid catch up with the West in industrialisation that began during the Meiji period (1868-1912).<sup>6</sup> China's modern industrial development was motivated by its consecutive failures in wars with the Western powers since the First Opium War (1840), as well as increasing domestic rebellions,<sup>7</sup> but it had been slow and largely defence-oriented. Japan's rising as the major regional military power in response to China's military build up in the 1860s-1880s and success in defeating the Qing Imperial Navy in 1894 forced China to speed up its industrialization. However, political and social chaos in the early period of the republican China (from 1911 to the mid 1920s) significantly impeded the course of China's industrial development. By the mid-1930s, which is our benchmark period,

---

Yuan, 2006; Yuan and Fukao, 2002), this study also extends the expenditure PPP-based international comparison to Taiwan and Korea for the same period.

<sup>6</sup> The Meiji Restoration (1868) was the catalyst toward industrialization in Japan that led to the rise of the island nation as a major military power by 1905, under the slogan of "Enrich the country, strengthen the military" (*fukoku kyōhei*). See Ohkawa and Shinohara (1989), Beasley (1995), and Fukao and Saito (2006).

<sup>7</sup> Taiping Rebellion (1851-1864) was certainly the most destructive and costly rebellion to the regime. Lesser rebellions at that time include Miao Rebellion (1860-72) and Nien Rebellion (1851-68).

China had just enjoyed its ever first “golden decade” of industrialization, but it was still well below the level of Japan can be seen clearly in Table 1.

The Korean economy in our comparison serves as a different reference. Korea underwent its modern industrial development when it was held as the Japanese colony in 1910-1945. However, the Korean development was typically a colonial type concentrating on agricultural and primary resource-based or labour intensive manufacturing that complemented the resource-hungry Japanese economy (see for example, Fukao, Ma and Yuan, 2007; Kim, 2007; Mitsuhiro Kimura, 2008; Mizoguchi and Umemura, 1988.). The integration of the Japanese and Korean economies through colonialism might be one of the main reasons for Korea to grow more rapidly than China (Table 1).

#### *Income Level and Economic Structure*

Both the level and the structure of GDP in Table 1 suggest different stages of economic development in the countries in our comparison. The US was the largest economy in total and per capita GDP and left all other economies far behind. In *circa* 1935, in terms of total GDP measured by market exchange rate, China was 15 percent of the US level, followed by Japan (7 percent) and Korea (1 percent). If measured by per capita GDP (still at market exchange rate), it will more appropriately reflect the stage of development because of the removal of the population effect. As shown in the table, the per capita GDP was \$450 for the US, \$64 for Japan, \$28 for Korea and \$18 for China.

**TABLE 1**  
**BASIC NATIONAL ACCOUNTS INDICATORS FOR COUNTRIES IN COMPARISON IN CIRCA 1935**

	USA	China <sup>6</sup>	Japan	Korea
Total GDP (in mil US\$) <sup>1</sup>	65,400	9,522	4,445	651
Population (thousand persons)	127,250	528,000	69,254	22,899
GDP per Capita (in US\$)	514	18	64	28
GDP per Capita (Expenditure PPP\$) <sup>2</sup>	514	45	143	66
Maddison GDP per Capita (Expenditure PPP G-K\$) <sup>3</sup>	514	53	199	126
Structure of GDP: (%) <sup>4</sup>	100.0	100.0	100.0	100.0
Agriculture, Fishery, Forestry	11.7	62.5	18.1	49.0
Mining	2.1	0.9	30.3	2.1
Manufacturing <sup>5</sup>	23.4	10.1	10.2	10.2
Construction	2.3	1.7	6.3	3.3
Utilities	3.8	0.7	10.2	2.5
Transportation	6.5	5.7	6.7	6.7
Other Services	50.2	18.4	35.1	26.2

*Sources:* For total GDP, industrial composition of GDP and population, Chinese data are from, Yeh (1977, p.97, Table.1) and Luo (2000, p.27, Table 2), Korea data are from Kim (2008, pp.392-393, Table I-1 and I-2), Japanese data are from Ohkawa, Shinohara and Umemura (1974, p. 202), and the US data are from U.S. Department of Commerce Bureau of the Census (1976, Part I, p.224.). The population estimate for China in the mid 1930s is controversial. Many

researchers (see Ma, 2008, pp. 359-69) adopt the figure as 500 millions from Liu and Yeh (1965). We adopt the estimates by Luo (2000) whose work attempts to adjust the pre-war official estimates to fill gaps in infant and woman statistics, to re-estimate population statistics by the Princeton life-table approach using the 1929-31 survey data and vital statistics, and to include population for Tibet, Inner Mongolia and Manchuria.

*Notes:*

- 1) All figures measured in US\$ in this table are simply converted by the prevailing market exchange rate. In 1935, 1 US\$ was equal to 3.43 Japanese Yen and 3.01 Chinese Yuan. Korean Yen = Japanese Yen.
- 2) Based on Fukao, Ma and Yuan for the average of 1934-36 (2007, Table 8), suggesting a PPP converter as 3.21, 2.23 and 2.36 for China, Japan and Korea, or 31, 45 and 42 percent of the US price level, respectively.
- 3) Derived from Maddison (2003, pp. 88 and 182), assuming that his estimate of \$5,467 for US in constant 1990 GK\$ is equivalent to \$514 at 1935 prices, and his estimates for other countries relative to the US level are held (i.e. deflated by the same price index). This approach is different from Fukao, Ma and Yuan (2007, see Figure 1 for the same comparisons in 1990 PPP\$).
- 4) Industry compositions of GDP are calculated in nominal terms of national currencies. Industry composition data for Japan is based on net domestic product.
- 5) See Table 2 for the structure of manufacturing by factory production.
- 6) Yeh (1977, p.97, Table.1) estimated China's 1935 GDP at 1933 prices. We use weighted agricultural and industrial price indices for 1933-35 to adjust the estimate to 1935 prices.

It is however more sensible to convert these per capita figures into PPPs. By applying the only available bilateral expenditure PPP estimates in Fukao, Ma and Yuan (2007) to the above figures, we can come out with per capita PPP estimates as \$143 for Japan, \$66 for Korea and \$45 for China. It shows that while Japan had already reached to nearly one third of the US level of per capita PPP GDP, China only achieved one tenth of the US level, which was even 30 percent below the Korean level. Here we also compare Fukao-Ma-Yuan estimates with those of Maddison (2003) to show the differences between the two studies.<sup>8</sup>

The GDP structure of these countries also reflects different stages of economic development. As shown in Table 1, in *circa* 1935 China had the largest share in agriculture (62.5 percent), followed by Korea (49.0), Japan (18.1) and the US (11.7). In the same period, one fourth of the US GDP (25.5) was produced by the industrial sector (manufacturing and mining). By contrast, as the country that experienced the most rapid catch up with the US, 30.3 percent of Japanese GDP came from industry, compared with only 12.3 in Korea and 11.0 percent in China. Furthermore, China's relative inferior position in industrialization is also reflected by the development of the so-called facilitating industries such as utilities and transportation. In *circa* 1935, only 6.4 percent of the Chinese GDP was produced by the facilitating industries, whereas the share was over 10 percent in both the US and Japan and about 9 percent in Korea.

---

<sup>8</sup> See discussion in Fukao, Ma and Yuan (2007) about the differences in per capita PPP GDP estimates especially for Korea between Fukao, Ma and Yuan and Maddison (2003).

## *Manufacturing Structure*

The structure of the manufacturing sector in these countries also indicates the different level of development. In Table 2, we first present the share of factory manufacturing in total manufacturing, which indicates to what extent the economy has transformed from traditional to modern manufacturing. We then examine the structure of factory manufacturing among these countries.

TABLE 2  
TOTAL AND PER EMPLOYEE GROSS VALUE ADDED IN MANUFACTURING, AND MODERN  
MANUFACTURING STRUCTURE FOR COUNTRIES IN COMPARISON IN 1935

	USA	China	Japan	Korea
Total manufacturing GVA (in mil US\$) <sup>1</sup>	19,496	1,059	1,575	68
Manufacturing GVA by factory <sup>2</sup> (in mil US\$)	18,616	121	1,138	51
	(95.5)	(11.4)	(72.3)	(75.6)
GVA per factory employee (US\$) <sup>3</sup>	2,246	154	482	307
Structure of factory manufacturing: (%) <sup>4</sup>	100.0	100.0	100.0	100.0
Food, beverage and tobacco	15.0	14.9	11.6	35.8
Textiles, wearing apparel, leather products	13.8	43.1	19.3	11.9
Wood and allied products	4.8	0.2	1.8	3.9
Paper, printing and publishing	6.9	8.1	2.9	4.6
Chemicals and allied products	19.0	13.4	18.6	29.2
Building materials	3.2	6.5	4.3	4.6
Basic and fabricated metals	13.3	4.8	15.9	4.2
Machinery and transportation equipment	19.4	7.8	22.0	2.6
Miscellaneous manufacturing	4.7	1.3	3.6	3.1

*Sources:* US data are from U.S. Department of Commerce (1936), Chinese data from Makino and Kubo (1997), Japanese data from The Ministry of Commerce and Manufacturing (Sho Ko-sho) (1935), Korean data from Kim (2008) and Chosen Government-General (1937).

*Notes:*

- 1) See Table 1 for market exchange rates used for conversion.
- 2) The share of the factory sector is given in the brackets. See Section 4 for the definition of the factory sector.
- 3) Since the employment here is based on numbers employed rather than hours worked, this estimation should not be taken as a strict measure of labour productivity. See Table 6 for the conversion of industry level numbers employed into hours worked.
- 4) Output shares are calculated in national currencies.

As Table 2 shows, the factory share of the US manufacturing was 95.5 percent (as shown in the figures in brackets under manufacturing GVA), compared with 72.3 percent in the case of Japan. Such a difference looks plausible given the stage of their development. Growth is inevitably unbalanced within the manufacturing sector during industrialisation. Empirical studies have found that typically, driven by the significant growth of intermediate demand in total production, investment goods industries are the fastest growing industries, followed by intermediate goods industries and then light industries that mainly produce consumer goods (Nishimizu and Robinson, 1984). Such observations should be confirmed by our country cases in the current study.



To help our examination we can roughly reclassify all manufacturing industries into two groups: one that is agricultural or primary resource-based manufactures that largely concentrated on the production of “consumer goods” (including food, textiles, wood and paper products, excluding miscellaneous) which tended to more labour-intensive and the other that is mineral-based intermediate materials production and machinery manufacturing that focused on the production of “producer goods” (i.e. including chemicals, building materials, metals and machinery) which tended to be more capital-intensive. The re-grouping shows that the share of “consumer goods” in China and Korea was indeed high, about 66 and 56 percent of the total manufacturing, respectively, whereas the same share in the US and Japan was much lower or 40 and 36, respectively. As for the share of “producer goods”, it was low in China (34) and Korea (44), but high in the US (60) and Japan (64). Obviously, the structure of the Chinese and Korean manufacturing was much “lighter” or more labour-intensive than that of the US and Japan because they were still at the earlier stage of industrialization, by contrast, the US and Japanese manufacturing were much “heavier” or capital-intensive.

Furthermore, the structure of the Korean manufacturing does not suggest that Korea was more industrialized than China. Although Korea had smaller “consumer goods” manufacturing than China, 64 percent of the Korean “consumer goods” engaged in “food” whereas in China 65 percent of “consumer goods” were textiles (taking the group total as 100, Table 2). In the case of “producer goods”, 37 percent of the Chinese heavy industries engaged in the production of “metals” and “machinery”, whereas only 16 percent in the case of Korea. By contrast, 59 percent of the Japanese “producer goods” industries engaged in “metals” and “machinery”, even higher than that of the US (55). However, considering the integration of the Japanese and Korean economies, we argue that the overly “heavy” Japanese manufacturing might be complemented by the excessively “light” Korean manufacturing.

### *Trade Patterns*

The history of modern economic development has shown that countries tend to export primary goods to exchange for manufactured goods especially machinery at the early stage of development. Along with industrialization, their exports will become more concentrated on sophisticated manufactured goods and their imports will be mainly primary goods or (simple) manufactured goods that could be produced cheaply in low income countries. This is reflected by the structure of trade of the countries in

our comparison for *circa* 1935. We can divide the commodities traded in Table 3 into three categories: 1) “primary goods” including “food stuff and live animals” and “crude materials, minerals, fuels”, 2) “(relatively) simple manufactured goods” that includes all manufactured goods except “machinery and transport equipment”, and 3) “sophisticated manufactured goods”, that is, “machinery and transport equipment”.

As Table 3 shows, with higher level of industrialization compared with China and Korea, the US and Japan exported more manufactured goods than primary goods. It should be noted here that resource endowment plays a role in determining trade patterns. Since the US is relatively resource rich and Japan is excessively resource scarce, the export of primary goods was extremely low in Japan (only 12 percent compared with 40 percent in the US). The case of China and Korea just shows the opposite: 67 percent of the Chinese exports and 76 percent of the Korean exports were primary goods. Again, the Korean case further supports our postulation about the “colonial integration” of the Korean and Japanese economies. It should be noted that China was also an important importer of primary goods (49 percent of total imports). Although China has a much larger territory than Japan, it is not rich in resource endowment on per capita basis; besides, China’s poor infrastructure back to the 1930s prohibited lost-cost extraction of natural resources.

Table 3 also shows that 81 percent of the Japanese exports focused on simple or less sophisticated manufactured goods, which looked rather excessive compared with the US (37), China (33) and Korea (23). It is clear that in the mid 1930s, the US was the most important, if not the sole, player in the export of machinery and transport equipment, accounting for 23 percent of its total exports. The Japanese machinery export was about 7 percent of its total exports, whereas only one percent for Korea and nothing for China.

**TABLE 3**  
**EXPORT AND IMPORT VALUES FOR CHINA, JAPAN, KOREA AND THE US BY MAJOR COMMODITY GROUP IN CIRCA 1935**  
(In million US dollars; national currencies are converted at market exchange rate<sup>5</sup>)

	USA		China		Japan		Korea	
	Export	Import	Export	Import	Export	Import	Export	Import
Total value	2243.1	2038.9	172.8	222.4	979.6	997.7	160.5	193.3
Food stuffs and live animals <sup>1</sup>	458.7	1074.4	37.1	59.5	97.2	583.9	94.4	32.3
Crude materials, minerals, fuels <sup>2</sup>	432.3	312.2	78.5	48.6	21.6	106.5	27.1	32.0
Chemicals	103.1	68.7	3.5	17.9	92.6	96.3	7.1	15.3
Textiles	456.2	306.9	29.1	18.3	474.7	19.0	17.2	54.2
Manufactured goods classified chiefly by material <sup>3</sup>	195.6	177.2	15.5	32.0	117.5	118.2	5.2	13.9
Machinery and transport equipment	520.9	14.5	0.7	17.9	70.8	46.7	1.5	18.4
Miscellaneous manufactured articles <sup>4</sup>	76.3	85.1	8.3	28.2	105.1	27.1	7.9	27.2
Of which:								
“Primary” <sup>6</sup>	0.40	0.68	0.67	0.49	0.12	0.69	0.76	0.33
“Simple manufactured goods” <sup>6</sup>	0.37	0.31	0.33	0.43	0.81	0.26	0.23	0.57
“Sophisticated manufactured goods” <sup>6</sup>	0.23	0.01	0.00	0.08	0.07	0.05	0.01	0.10
As percentage of Gross Value of Output (%)	3.9	3.6	2.5	3.2	22.0	22.4	24.7	29.7

*Sources:* The US data are for merchandise activities only, including re-export of foreign merchandise, from US Department of Commerce (1936, pp.:466-550, Table 523-524). Data for Japan and Korea are the average of 1934-36, from Yamazawa and Yamamoto (1979, pp. 178-183), IER (2000) and Kim (2008, p.111). Data for China are the average of 1933 and 1938 from IER (2000).

*Notes:*

- 1) Including beverages, tobacco, and animal and vegetable oils and fats.
- 2) Excluding edible materials; including lubricants and related materials.
- 3) Excluding textiles.
- 4) Including other commodities and transactions not classified according to kind.
- 5) See Table 1 for exchange rate in 1935.
- 6) “Primary” includes “food stuffs and live animals”, “crude materials, minerals and fuels”; “simple manufactured goods” includes all manufactured except “machinery and transport equipment”; lastly, “sophisticated manufactured goods” = “machinery and transport equipment”.

Our review so far has drawn a simple background picture about the economic conditions of the countries in comparison in *circa* 1935, including their levels of per capita income, patterns of economic structure, patterns of manufacturing structure, and structures of import and export trade. These patterns are in general logically coherent and suggest different comparative advantages of manufacturing industries in these countries, which will be checked later in our PPP exercise comparing the producer prices or factor costs of producing the same product in these countries.

### 3. METHODOLOGY

Methodologically, we follow the standard approach of constructing the industry-of-origin PPPs developed by the International Comparison of Output and Production Program (ICOP) at University of Groningen led by Angus Maddison (Maddison and van Ark, 1988; van Ark 1993) and its recent practices especially in pre-WWII comparisons including an UK/US comparison by de Jong and Woltjer (2007) and two UK/Germany comparisons by Broadberry and Burhop (2007) and by Fremdling, de Jong and Timmer (2007), all for 1935/36.<sup>9</sup>

The methodology and data used in sectoral comparisons differ significantly from the standard International Comparison Program (ICP) procedures. While price data for ICP are largely obtained from extensive price surveys conducted in the participating countries, the industry-of-origin approach relies on price data implicit in the censuses of manufacturing. Results of separate price surveys are not systematically used. The product lists and specifications are also drawn from the census data. The aggregation methodology used here is quite simple because there are only bilateral comparisons involving two countries at a time. Largely due to data constraints so that we cannot perform complicated multilateral methods to compute PPPs necessary to convert value aggregates. An important aspect of these production-side PPP comparisons is that along with price data, derived in the form of unit values,

---

<sup>9</sup> Besides, Choi (2006) and Kim, Duol and Park (2007) compared the labour productivity levels of the Japanese and the Korean manufacturing sector in the pre-war period. Their analysis is based on [real](#) gross output per worker estimation. Using the approach of Rostas (1948), Yukizawa (1977) compared the labour productivity levels of the Japanese and the U.S. manufacturing sector in the pre-war and the post-war period. Pilat (1994) compared labour productivity levels of the Japanese and the U.S. manufacturing sector for 1939 using his estimates of PPP.

we also have quantity data at the product level. Therefore there is no need to use the concept of basic headings<sup>10</sup> which is central to the ICP work.

Let us begin with some basic notations. Let  $q$  and  $p$  refer to quantity and price, respectively, and superscripts  $B$  and  $X$  represent the base country and the country to be compared, respectively. Subscript  $i$  refers to manufactured product,  $j$  refers to the type of industry, and  $k$  refers to the type of manufacturing branch, which is equivalent to the 2-digit level “manufacturing industry” used in ISIC.<sup>11</sup>

In the standard ICOP industry-of-origin studies, prices are in fact unit values (UVs) as they are derived from data on values ( $v$ ) and quantities ( $q$ ) for specific manufactured products or broad categories of products, thus, for product  $i$ ,  $UV_i = \frac{v_i}{q_i}$ .

We can obtain unit value ratios (UVRs) by a direct comparison of UVs between two countries, which can be used in deriving PPPs at the branch and sectoral levels. In the industry-of-origin approach, a distinction is made between UVRs and PPPs. UVRs refer to product level price information and PPPs refer to price levels at more aggregated levels, e.g. from manufacturing industries to branches and to the whole manufacturing sector.

The production PPPs are derived using a “pyramid” type approach which consists of three steps. The first step involves the derivation of industry-specific PPPs based on prices of manufactured products belonging to a particular industry and aggregated using output or sales quantities as weights. The second step uses these industry-specific PPPs and aggregated to yield branch level PPPs. Finally, the third step uses these branch-level PPPs and aggregated to derive a single PPP for the whole manufacturing sector.

#### *Step I: Industry-specific PPPs*

Let  $p_{ij}$  and  $q_{ij}$ , respectively, denote the price ( $=UV_{ij}$ ) and quantity of manufactured product  $i$  belonging to industry  $j$  that is considered to have matching specifications and quality. For all “matched products” which are considered as typical of the industry to which they belong, the PPP for this industry using either country weights are derived as follows:

---

<sup>10</sup> For the purpose of ICP, basic headings are defined as the lowest level of aggregation at which expenditure share weights are available for the purpose of aggregation.

<sup>11</sup> In this study’s PPP exercise, due to data constraint, we reclassify the 2-digit industries into larger groups within the manufacturing sector.

$$(1) \quad PPP_j^{XB(B)} = \frac{\sum_i^m p_{ij}^X q_{ij}^B}{\sum_i^m p_{ij}^B q_{ij}^B} \quad (i = 1, 2, \dots, m)$$

for the Laspeyres Index using the base country quantity weights, and

$$(2) \quad PPP_j^{XB(X)} = \frac{\sum_i^m p_{ij}^X q_{ij}^X}{\sum_i^m p_{ij}^B q_{ij}^X} \quad (i = 1, 2, \dots, m)$$

for the Paasche Index using the quantity weights of the country to be compared, respectively.

The Fisher index formula is used to compute PPPs at the industry level. Taking the geometric average of the so-constructed Laspeyres and Paasche indices we can obtain PPP for industry  $j$  as a Fisher Index:

$$(3) \quad PPP_j^{XB(\text{Fisher})} = \sqrt{PPP_j^{XB(B)} \times PPP_j^{XB(X)}}$$

The choice of the Fisher index is largely guided by the number of desirable statistical, axiomatic and economic–theoretic properties resulting in labels like the “ideal index” and the “superlative index” (Diewert, 1992).

### *Step II: Branch Level PPPs*

At this stage, the so-constructed  $j$  industry level PPPs are aggregated to  $k$  branch level PPPs. It is obtained by the weighted average of sample industry PPPs using the gross value of output (GVO) of the sample industries as weights. The following formulas are developed especially to take into account the size effect of industries in aggregation (see van Ark, 1993).

The calculation in this step results in two  $k$  level PPPs, one at the quantity weights of the base country or the Laspeyres weights:

$$(4) \quad PPP_k^{XB(B)} = \frac{\sum_j^n [GVO_j^B \times PPP_j^{XB(B)}]}{\sum_j^n GVO_j^B} \quad (j = 1, 2, \dots, n)$$

and the other at the quantity weights of the country to be compared or the Paasche weights:

$$(5) \quad PPP_k^{XB(X)} = \frac{\sum_j^n GVO_j^X}{\sum_j^n [GVO_j^X / PPP_j^{XB(X)}]} \quad (j = 1, 2, \dots, n)$$

Using the same approach to Eq. (3), the Fisher PPP for  $k$  branch can be derived as follows:

$$(6) \quad PPP_k^{XB(\text{Fisher})} = \sqrt{PPP_k^{XB(B)} \times PPP_k^{XB(X)}}$$

### *Step III: Deriving PPP for the Manufacturing as a Whole*

The derivation of the PPP for total manufacturing follows a similar approach to Step II whereby PPPs are aggregated from the branch level to total manufacturing using the base country and alternative country branch level weights, respectively. The geometric mean of the so-constructed Laspeyres and Paasche indices finally gives the total manufacturing PPP.

These PPP estimation procedures require detailed product as well as industry-level data and involve intensive work in matching, weighting and aggregating at different levels. Product specification and quality are essential for unbiased estimation, but in most cases they could only be justified by limited information. Typical data problems are discussed in the next section.

## **4. DATA FOR CONSTRUCTING PPPS**

Three types of data are used in this study: 1) product data for constructing unit values (UVs) and hence deriving PPPs, 2) sub-industry and industry data for weighting and aggregating in PPP estimation, and 3) value added and employment data for industry-level productivity analysis. Ideally, at each level the data should be available for “modern” and “traditional” components. In reality, survey or census data only cover the modern sector. In this section, we concentrate mainly on the data that are used in constructing PPPs, including sources, coverage and definition, industrial and sectoral classification, problems and how we deal with the problems. Detailed notes on sources and data handling, often given in technical details, are provided in notes to the tables. Problems on various aggregate data for international comparison are already

discussed in Section 2 and the data problems for productivity analysis are handled in Section 6.

### *Coverage*

For the PPP-based direct comparison at industry level, we could only and sensibly cover the “modern” component of each industry in these countries. For the comparison of aggregate economy, wherever possible we cover both the “modern” and “traditional” components and sectors. First of all, we need to report how the “modern” and “traditional” sectors are defined in official statistics of each country, and if there is any problem in terms of compatibility and availability.

It is not surprised to see only the modern sector is recorded in historical statistics. Data on traditional economy are only estimates based on national censuses or limited scope surveys by researchers or authorities. Modern manufacturing in this study is conceptually defined as the production of products that is organized in factories where workers concentrate in a building or buildings to manufacture goods or supervise machines processing one product into another. However, as we can see below, the official criteria for “factory” vary greatly in the early 20<sup>th</sup> century because of the lack of international coordination in statistical standards.

In the US *Biennial Census of Manufactures 1935*, “factory” was defined as any enterprise that produced \$5,000 or more output a year (U.S. Department of Commerce, 1938, pp. 4-6). By comparing the US census with other sources of official statistics, we have found that over 95 percent (Table 2) of US manufacturing were operated in factories. In the Japanese *Census of Factories 1935*, it was defined as any enterprise that hired five or more workers and used machine power (Statistical Division of the Ministry of Commerce and Manufacturing Minister’s Office, 1937, “Preface”, p. 1). In Korea, as explained in the *Statistics on Manufactured Products for 1935*, a factory was defined as any enterprise that hired at least 10 workers in production (Chosen Government-General, 1937, “Preface”). Despite strong Japanese influence the Korean manufacturing statistics somehow doubled the employment criterion for factories.

In the case of China, its first national industrial census under the leadership of D.K. Lieu (Liu Ta-chün) (NRC, 1937) conceptually followed the Chinese first *Factory Law*, passed in 1929<sup>12</sup> that defined a factory as an enterprise that hired at least 30 workers

---

<sup>12</sup> The author and publication date of the *Factory Law* are unclear. As cited in *Pacific Affairs* in February 1929 (Vol. 2, No.2, pp. 73-76, *Pacific Affairs*, University of British Columbia), according to a



and also employed machine power. Work on manufacturing by Liu and Yeh (1965) is largely based on Lieu's three-volume survey report. According to the report, the actual survey ended up including many factories that did not meet the *Factory Law* criteria. Volumes 2 and 3 also report data from those factories that did not meet the *Factory Law* criteria, but did not process such data seriously and compare them with those that met the criteria. In fact, Lieu's factory survey focused on large firms. The survey was conducted under the National Resource Committee (NRC) that belonged to the Military Committee of the Chinese Nationalist Government. The genuine purpose for the survey was a preparation for China's national defence rather than statistics because large factories could be used for military production. In the current study, our calculations are based on a study by Makino and Kubo (1997) who attempt to adjust Liu and Yeh's estimates using Lieu's survey data. However, Makino and Kubo mainly adjusted Liu and Yeh's estimates for data overlapping and inconsistencies in Lieu's three volumes of survey data but did not attempt to work out estimates taking into account the data from the factories that did not meet the *Factory Law* criteria.

To check the compatibility of factory criteria among the countries in our comparison we use our PPP estimates in Section 5 and estimates for hours worked and output per worker in Section 6 to calculate the gross value of output (GVO) in 1935 PPPs for an enterprise that meet the minimum criteria for "modern factory" in China, Japan and Korea, respectively. Compared with the \$5,000 GVO criterion in the US statistics, the implicit GVO criterion was \$6,431 for Japan, \$19,389 for China, and \$7,356 for Korea.<sup>13</sup> If the estimate for China is now assumed to be lowered by two thirds to include the factories below the *Factory Law* criteria,<sup>14</sup> which means 10 workers per factory on constant productivity, it will give an estimate of \$6,463, almost the same as the above estimate for Japan. Since the minimum employment

---

Kuo Min News dispatch from Nanking on December 3, 1928, China's first *Factory Law* had been drafted by the Ministry of Industry, Commerce and Labour and discussed by the Legal Commission of the Ministry. According to the citation in the *Cambridge History of China*, Vol. 12 (Part I) (Footnote 14, p. 42), the *Factory Law* was issued in 1929. However, the official record shows that the *Factory Law* was promulgated on December 30, 1932, and published by Commercial Press in *Comprehensive Collection of Laws and Regulations of the Republic of China*, Volume 3 (1935, pp. 3410-14).

<sup>13</sup> We first calculate output in PPPs based on estimates reported in Tables 4, 7 and 8, which give PPP\$12,609 for Japan, PPP\$30,296 for China and PPP\$16,346 for Korea, and we then convert the results to the US dollars by market exchange rate/PPP exchange rate ratios that are also available in Table 4.

<sup>14</sup> This assumption is not too strong because only 20 percent of the factories in Lieu's survey could meet the *Factory Law* standard, i.e. 3,450 out of 18,000 (NRC, 1937).

criteria for a Japanese factory is 5 workers, it appears that to produce the same output as in Japan, a Chinese factory had to hire 10 workers whereas a Korean factory has to hire 8.5 workers (implied by 85 percent of minimum \$7,356 GVO for Korea). These rough estimates suggest that the underlying minimum output requirement for factories might be quite similar among the three East Asian economies.<sup>15</sup> It should be noted that this exercise by no means suggests that factory data of individual countries used in this study can be converted to the same standards; rather it provides useful reference for understanding the estimates.

### *Industrial Classification*

Statistical classification of industries only and inevitably covers factory-based data, excluding traditional activities in manufacturing. In the current study, we classify modern (factory) manufacturing into 9 industries as used firstly in Table 2 and then throughout the study. Our classification is based on the Japanese standard,<sup>16</sup> which is largely compatible with the two-digit or some combination of the two-digit industries as defined in ISIC (International Standard of Industrial Classification). As the Korean classification follows the Japanese standard, what we need to do is only to reconcile the Chinese and US data with the Japanese standard. For the US data, this is not a difficult task because they contain detailed data on sub-industries and hence easy for us to check compatibility and to re-classify them into broader industrial groups as used in this study.

There are two main sources for the Chinese data. The first one was China's first national income account constructed by Ou Pao-san during 1941-46, which resulted in a two-volume publication in Chinese in 1947 (Ou, 1947).<sup>17</sup> The work concentrated mainly on 1933, reflecting the detailed survey data for that year which had been previously compiled by D.K. Lieu in 1937 (see NRC, 1937). Since Ou's work

---

<sup>15</sup> It would be unrealistic to assume factories in any of these Asian economies were close to the US standard on average in 1935. In fact, the data on US total manufacturing output and employment implies that based on average productivity, a US firm only needed to hire one worker to be qualified as a "factory" in the official statistics, which suggests that the US traditional, non-factory manufacturing had largely disappeared by 1935.

<sup>16</sup> There are also some adjustments to the Japanese data. For example, paper industry is included in chemicals in the Japanese classification, which has to be re-classified into paper, printing and publishing industry.

<sup>17</sup> See an English-language summary of the work that is published in the *Journal of Political Economy* (Ou, 1946).

followed the western concepts of national income,<sup>18</sup> his industrial classification is acceptable. The second source was the work jointly made by two US-based economists Liu Ta-chung and Yeh Kung-chia (1965)<sup>19</sup>, which subsequently revised Ou's work. Liu-Yeh's estimates raised China's GDP for 1933 by 37 percent, that is, from Ou's 21.77 billion yuan to 29.88 billion yuan at 1933 prices (p.66). The differences between Liu-Yeh and Ou appear to be mainly in agriculture, factory manufacturing and handicrafts. They are basically empirical rather than conceptual differences.

#### *Commodity Data for Constructing PPPs*

Following the standard production-side PPP approach, as explained in the methodology section, to derive the relative price of a product (or unit value ratio) between two countries at the same time we need to match the same product between the two countries in comparison and then derive unit value for the product in national currency for each country. This will be an impossible task without detailed census or survey data on manufacturing. Fortunately, by the mid-1930s advanced countries had conducted manufacturing census regularly and some countries at their earlier stages of industrialisation had began such census. For the US, Japanese and Korean data on value and quantity of manufactured products, we rely on the US *Bicentennial Census of Manufactures 1935* (US Department of Commerce, 1938), the Japanese *Census of Factories 1935* (Statistical Division of the Commerce and Manufacturing Minister's Office, 1937), and the Korean *Statistics on Manufactured Products 1935* (Chosen Government-General, 1937<sup>20</sup>). All of these sources refer to our benchmark 1935. We derive unit prices for matched products from these census data.

---

<sup>18</sup> Ou's short bibliography by Trescott (1996) explains how his work was likely highly influenced by the western concepts of national income: "Ou Pao-san went to Harvard for graduate study in 1936 and completed an MA concentrating on agricultural economics. He then spent a year studying in Berlin, visited Cambridge and became acquainted with Piero Sraffa. Returning to Harvard in 1939, he received a strong exposure to Keynes's ideas from Alvin Hansen and Seymour Harris. He perceived the potentialities for national-income estimation after reading Simon Kuznets's work, as well as pioneering studies of the national incomes of Sweden and Hungary. Ou returned to China in 1940 ... [and helped by] five assistants from recent university graduates, [his] national-income project began in 1941 and extended until 1946. ... In 1947, support from the Rockefeller Foundation enabled Ou to return to Harvard to complete a PhD. John Black directed his dissertation, which dealt with capital formation and consumers' outlay in China, making use of the national income estimates."

<sup>19</sup> Estimates in Yeh (1977) are basically the same as those in Liu and Yeh (1965). However, Yeh provides a time series for 1931-36, of which the data for 1935 are used in this study.

<sup>20</sup> No official publication date is available. We put "1937" as a guessed publication date because the Japanese census for 1935 was published in 1937.

The Chinese data used in this study are, however, not straightforward and hence deserving more detailed explanations. We rely on three sources of data: 1) D.K. Lieu's *Report on a Survey of China's Industry*, Volume 2 (NRC, 1937); 2) *Archive Materials for Studies of Industrial and Agricultural Commodity Prices*, Shanghai Volume, compiled by Office for Industrial and Agricultural Price Survey (OIAPS, 1956-57); and 3) Zhen Chen's *Study Materials of Industrial History in Contemporary China*, Volume 4, Parts 1 and 2 (1961). To derive unit prices of matched products, we make the best use of Lieu's data as reported in Table 4 (Volume 2), referring to products produced by factories that hired at least 30 workers. Lieu's data cannot fully satisfy our needs. The gaps in products are filled or supplemented by the information available in Chen (1961) and in OIAPS (1956). However, both Lieu's and Chen's data are for 1933. To convert prices from 1933 to 1935, we calculate wholesale price indices for 1933-35 using product price data available in OIAPS.

We use gross value of output (GVO) weights to aggregate unit value ratios (UVRs) from product level to sub-industry and then to industry level to derive industry-level PPPs (see Appendix tables for the levels of aggregation). As already mentioned, we based on the Japanese classification to group all manufacturing activities into 9 industries. The US, Japanese and Korean GOV data at industry and sub-industry levels are available from these countries' census data. The Chinese industry and sub-industry level GVO data available in Lieu (NRC, 1937) are incomplete. In a study on China's industrial output in 1933, Makino and Kubo (1997) estimated factory output by industry, which conforms to the Japanese standard of industrial classification. Therefore, we use their GVO data as weights in aggregation, supplemented by data from Chen (1961).

## 5. DISCUSSION OF THE ESTIMATED PPPS

Following the standard methodology for constructing industry-of-origin PPPs, we first conducted three comparisons, namely, China/Japan and Korea/Japan with Japan as the reference country, and Japan/US with the US as the reference country. The details of these comparisons are reported in Appendix Tables A1, A2 and A3, respectively.<sup>21</sup> As expected, the coverage ratio between a less developed country and a more developed country can be very different. In the China/Japan comparison, about 72 percent of

---

<sup>21</sup> Table A1 is published in the Appendix as an example for our work in matching producer prices. Due to limited space, Tables A2 and A3 are available on request.

Chinese products and 30 percent of Japanese products are covered, and in the Japan/US comparison, the ratio is about 32 percent for Japan and 10 percent for the US. However, in the Korea/Japan comparison, the ratios are very close, 41 and 45 percent, respectively.

In Table 4, to make our PPP estimates easy to follow we use Japan as the bridge country to re-base China and Korea to the US, and report a summary of the US\$-based PPP estimates and relative price level by industry.

**TABLE 4**  
SUMMARY OF ESTIMATED PURCHASING POWER PARITIES BY MANUFACTURING INDUSTRY,  
CHINA/US, JAPAN/US AND KOREA/US, IN 1935

	China/US		Japan/US		Korea/US	
	PPP Yuan/\$ (Fisher) <sup>1</sup>	Relative Price level (MER =3.01)	PPP Yen/\$ (Fisher) <sup>1</sup>	Relative Price level (MER =3.42)	PPP Korean Yen/\$ (Fisher) <sup>1</sup>	Relative Price level (MER =3.42)
Total manufacturing	1.91	0.64	1.75	0.51	1.54	0.45
Food, beverage & tobacco	1.95	0.65	2.80	0.82	2.35	0.69
Textiles, wearing apparel <sup>3</sup>	1.70	0.57	1.24	0.36	1.52	0.44
Wood & allied products	1.86	0.62	2.19	0.64	1.55	0.45
Paper, printing & publishing	1.56	0.52	1.38	0.40	1.75	0.51
Chemicals & allied products	1.57	0.52	1.36	0.40	0.97	0.28
Building materials	1.30	0.43	1.42	0.41	1.39	0.41
Basic & fabricated metals	2.43	0.81	2.35	0.69	1.82	0.53
Machinery <sup>4</sup>	2.39	0.80	2.02	0.59	1.07	0.31
Miscellaneous	0.89	0.29	0.63	0.18	0.95	0.28

Source: Authors' estimation. See Appendix Table A1-A3 for details.

Notes:

- 1) Fisher PPP is a geometric mean of Laspeyres and Paasche PPPs (see Eq. 3 for industry PPPs and Eq. 6 branch PPPs).
- 2) Including leather products.
- 3) Including transportation equipment.

The results in Table 4 show that the PPP for total manufacturing is the highest for China (1.91 yuan/\$), followed by Korea (1.54 yen/\$) and Japan (1.75 yen/\$). Compared with the prevailing market exchange rate (MER), the PPP-implied relative price level for Chinese manufacturing (i.e. yuan PPP divided by yuan MER) is 0.64, suggesting that for the *matched* manufactured products the cost level (as reflected by producer prices in the comparison) of Chinese manufacturing was 36 percent lower than the US level as suggested by the market exchange rate. By the same calculation, the price level in Korean manufacturing (0.45) and Japanese manufacturing (0.51) was 55 and 49 percent lower than the US price level, respectively.

To assess the plausibility of the production PPP estimates, we compare them with the expenditure PPPs in Fukao, Ma and Yuan (2007, Table 4) for China, Japan and Korea in *circa* 1935 that also use the US as the reference country. It turns out that the production PPP-implied price levels for manufacturing are 100, 13 and 5 percent higher than the expenditure PPP-implied price levels for these countries. Despite such large cross country variations, it is generally in line with what can be predicted by the theory that the non-tradables (included in the expenditure PPPs) in less developed countries tend to be cheaper than the tradables. Fukao, Ma and Yuan (2007) also estimate the price level of the tradables in the final consumption of these countries. In the case of Japan and Korea our production PPP estimates are very close to their results, but this is not the case of China, which is 60 percent higher than the price level for tradables estimated using the expenditure approach.

Theoretically, the price differences between the US and these East Asian economies are just as explained by the Balassa-Samuelson theorem. Balassa (1964) and Samuelson (1964) argue that because the productivity growth in the non-tradable goods sector is generally and substantially lower than the productivity growth in the tradable goods sector during the development process, there is the secular trend of the prices of non-tradable goods rising relative to the prices of tradable goods. Since the US economy was much more developed and industrialized than other countries in the comparison, such a higher price level in US is expected due to higher cost of the non-tradables.

However, two questions have emerged from our production PPP estimates. The first one is why the gap between the PPP-implied price level and the market exchange rate appear to be too large to be in line with the empirical findings in general or what could be predicted by the production PPP theory. Manufactures are generally tradable goods and by nature their PPPs are close to the market exchange rates (see Rao and Timmer, 2003). If no serious sample bias towards low price products in our unit value matching exercise, our tentative conjecture is based on two likely factors: 1) a stronger demand for imports in these East Asian countries than the foreign demand for exports from these countries, hence driving up the exchange rate of foreign currencies (the US dollar) and 2) net capital outflows from these countries that also depreciated domestic currencies. Both deserve a separate research agenda.

Our second question is why China's price level appears to be much higher than the Japanese price level. Our assessment is from two sides. On the one hand, the

initial cost of industrialization in China was very high because of the high learning cost – China was then unquestionably at the lower portion of the learning curve than Japan. More importantly, the Chinese market for the new manufactured goods was less competitive because of required high initial investment in both physical and human capital which were likely more expensive in China than in Japan.<sup>22</sup> On the other hand, the Japanese economy had by then more or less passed the initial stage of industrialization and enjoyed more efficient factor market. Japan's integration with the Korean economy through colonialism might also lower its cost of inputs. Here our focus will be on the recent studies on the comparison of real wages which seem to have lent some support to our conjecture on the low cost of Japanese manufacturing.

Studies by Bassino and Eng (2002) and Bassino (2005) find that daily nominal wages for unskilled workers and carpenters in Tokyo in 1935 were not much higher than those in Bangkok, Singapore, or Penang in British Malaya. As consumer price levels, particularly food prices, were much lower in those Southeast Asian cities, their studies suggest that real wages in Tokyo were lower than in those cities. Bassino's wage data show that the skill premium for carpenters vis-à-vis unskilled workers in Tokyo was smaller than in any of the Southeast Asian cities, indicating the existence of a large pool of skilled workers in Japan in comparison with Southeast Asia.<sup>23</sup> This appears to be supported by Godo and Hayami (2003) who reveal that in the 1930s, average years of schooling in Japan were already over 60% of the U.S. level despite the much greater lag in per capita income. Studies by Williamson have shown the cost position of Japan from a different perspective (1998, Table 1 and 2002, Table 3). His estimates suggest that although Japan's wage was higher than Korea and other Asian countries, there was a substantial drop in wage-rental ratio in Japan by 35 percent in 1935-38 from the level of 1930-34, which was not matched in Korea and other Asian countries during the same period.

It is interesting to examine our production PPP estimates for individual industries. It is not surprised to find that “metals” and “machinery” in China, “metals” in Japan, and “food” in Japan and Korea were most expensive to produce. For China, this seems to suggest high learning cost, whereas for Japan and Korea, suggest high cost

---

<sup>22</sup> For example, to make a pair of sport shoes it would cost a Chinese factory 12 yuan but only cost a Japanese factory 9.5 yuan in China (Chen, 1962, p. 700, Table 5).

<sup>23</sup> See more discussions on the wage gap between Japan and other countries with supporting data in Bassino and Ma (2005) and Allen et al. (2005).

of scarce resources. On the other hand, “textiles” in Japan and Korea, and “building materials” in all the three countries were cheapest compared with those of the US. The case of “textiles” may suggest higher productivity in both Japan and Korea. The case of “building materials” may suggest lower labour costs in all the three countries compared with that of the US. Besides, “building materials” are less affected by prices of international market because they are mainly traded in domestic market and used in construction which is largely non-tradable.

Since the level of economic development in China was closer to that of Japan than to that of the US, and historically, China and Japan were competitors, it would be very meaningful to examine the industry-level PPPs using Japan as the benchmark, which are in fact our primary results (Table A1). After re-basing the PPP results of individual countries to Japan we present the relative price level for each country in total manufacturing and individual industries in Table 5.

**TABLE 5**  
RELATIVE PRICES OF CHINESE, KOREAN AND US MANUFACTURING BY INDUSTRY IN 1935  
(Japan = 1)

	Chinese	Korea	USA
Total manufacturing	1.24	0.88	1.96
Food, beverage & tobacco	0.79	0.84	1.22
Textiles, wearing apparel	1.56	1.23	2.76
Wood & allied products	0.96	0.71	1.56
Paper, printing & publishing	1.28	1.26	2.47
Chemicals & allied products	1.31	0.71	2.52
Building materials	1.04	0.98	2.42
Basic & fabricated metals	1.17	0.77	1.45
Machinery	1.35	0.53	1.69
Miscellaneous manufacturing	1.61	1.51	5.46

*Sources and Notes:* See Table 4.

First of all, such a re-basing explicitly shows that for the *matched* products the US price level was higher than that of Japan in all industries. As already pointed out, this is expected because for what could be produced in low income countries the US began to lose comparative advantage, if its productivity level cannot offset its high cost which will be examined next, and move into other higher value added and newly invented more sophisticated manufactures (which of course have no counterparts in the low income economies).

Our focus here is, however, China. In the case of China, almost all industries, except for “food” and “wood”, had higher factor costs (reflected by producer prices) than those of Japan. This is not observed in the case of Korea, thanks to its colonial



integration with the Japanese economy, the cost of “machinery” in Korea was much lower than in Japan.<sup>24</sup> The results for China suggest that the high costs in Chinese modern manufacturing industries made it difficult to compete with foreign manufactured goods as well as with the domestic goods that could be produced with traditional technology. On the other hand, we may also expect that the implicit high profits as suggested by the high prices could be one of the major factors that attracted foreign traders and hence motivated them to lobby for government interventions, including using military power, for the opening up of the China market.

## 6. COMPARATIVE OUTPUT AND LABOUR PRODUCTIVITY

In this section, we apply the industry-specific PPPs in a cross country comparison of output and labour productivity. Output (in terms of gross value added) in PPPs provides an indicator for the size of an industry relative to the base country. Labour productivity measured as output per hour worked in PPPs reflects the level of capital deepening and the level of efficiency compared with the base country. Compared with the output conversion based on market exchange rate, the two indicators are more proper measures of the level of industrialization in an international comparison framework.

The data work required for deriving these indicators is by no means easier than that required for the price comparisons in constructing PPPs because available historical statistics were not compiled in the concept of value added and data required for estimating value added are insufficient. The data work and results reported below are preliminary and will be finalised when the further improvement is done.

### *Gross value added in PPPs*

There are no gross value added data readily available for any country. Based on the available cost data recorded for factories, we define gross value added (GVA) as gross value of output (GVO) minus the cost of materials ( $M$ ) and the cost of energy or electricity ( $E$ ), that is,

$$(7) \quad GVA_i^F = GVO_i^F - M_i^F - E_i^F,$$

---

<sup>24</sup> We find the data for Korea and Japan matching may have some problems. For example, there are huge price differences between the two countries in water tube boilers, steam engines, water turbines, winding machines and pumps blowers (Appendix Table A3 – available on request). However, after assuming their prices in the domestic market were the same as export prices, the Korean price level is about 80 percent of the Japanese level. Mismatching in quality and function of these machines could be a problem.

where subscript  $i$  indicates industry and superscript  $F$  stands for “factory”, because only factory data can satisfy data requirement for the estimation. This approach is similar to what used in the Japanese Long-Term Economic Statistics (Ohkawa, Shinohara and Umemura, 1972). To be consistent, we apply the same approach to all countries.

Since it is impossible to have cost break down data for non-factory or handicraft manufactures, we apply value added ratio (VAR) derived from the factory sector to estimate GVA for handicraft manufactures, that is,

$$(8) \quad GVA_i^N = GVO_i^N \times VAR_i^F = GVO_i^N \times \frac{GVA_i^F}{GVO_i^F}.$$

where the superscript  $N$  stands for non-factory or handicraft manufacturing. However, since value added ratio in the handicraft sector may be different from that in the factory sector and the difference may vary across industries, such a treatment may distort the real GVA and labour productivity for some handicraft industries, hence industries as a whole (factory plus handicraft). This is certainly an area that deserves further research.<sup>25</sup>

For the factory sector, the Japanese manufacturing GVA by industry are estimated based on data from the *Census of Factories 1935* (Statistical Division of the Commerce and Manufacturing Minister’s Office, 1937, pp. 20-40), the US manufacturing GVA by industry are estimated using data from the *Bicentennial Census of Manufactures 1935* (US Department of Commerce, 1938, pp. 22-38.), and the Korean manufacturing GVA by industry are based on data constructed by Kim for 1935 (2008, p. 111).

The case of China is a bit more complicated as explained in Section 4. The most important information is from China’s first factory census conducted by Lieu (NRC, 1937). Lieu’s census intended to cover all factories as defined by *Factory Law*, i.e. enterprises that hired 30 or more workers and used machine power. However, the census went beyond the original scope to include enterprises with less than 30 workers. This was because in most locations there were many enterprises that could

---

<sup>25</sup> Ideally, if we can find some cost information on handicraft industry  $i$  that allows the derivation of a parameter  $\lambda$  to adjust the existing value added ratio derived from the factory sector of the same industry, we can better estimate VAR for the handicraft industry, i.e.  $VAR_i^N = \lambda_i \frac{GVA_i^F}{GVO_i^F}$ . This  $\lambda$  may be applied to other handicraft industries that likely have similar value added ratios.

not satisfy the *Factory Law* criteria. The number of factories participated the census was eventually over 18,000, of which 3,450 met the *Factory Law* standard. The total number is not certain because there are some overlapping of the two categories as detected by Makino and Kubo (1997). In this study we directly use the revised data from Makino and Kubo.

Table 6 first presents the so-constructed GVA data in national currencies for individual manufacturing industries and then converts the data to PPPs reported in Table 4. To include the handicraft manufacturing, in the lower panel of Table 6 we report GVA for individual industries as a whole (factory plus handicraft). Besides, to compare with the US, in the last column of each country panel, a country/US index is provided for all industries.

It shows that for the factory sector, the size of Japanese manufacturing was 12 percent of the US level in PPP terms, whereas for China and Korea it was only 1 and 0.6 percent, respectively. However, given China's size and extremely uneven development across regions, it is useful to bear in mind that in the mid 1930s the so-call "lower Yangtze" (Shanghai, Nanjing, Jiangsu and Zhejiang) produced 66 percent of total factory output in China proper (excluding Manchuria) (see Ma, 2008, Appendix Table 2).

If putting factory and handicraft manufactures together, the size of Japanese manufacturing raised to 16.6 percent of the US level, whereas for China the ratio increased to 10.9 percent of the US level, for Korea it is basically unchanged. (The coverage of the available data for the Korean handicraft sector is apparently insufficient. Yet it is difficult to gauge with available information.)

It is also meaningful to examine the industries in each country that were distinctly larger than the relative size to the US for the manufacturing as a whole. If excluding "building materials" (highly non-tradable), they were "textiles" in China; "textiles" and "chemicals" in Japan; and "food" and "chemicals" in Korea. Note that fertilisers were one of the main "chemicals" products in Japan and Korea that were used for farm production (food and textiles), which explains why "chemicals" were relatively larger in size.

**TABLE 6**  
GROSS VALUE ADDED IN NATIONAL CURRENCIES AND IN PPPS BY MANUFACTURING INDUSTRY,  
CHINA, JAPAN AND KOREA IN COMPARISON WITH THE US, IN 1935

	China			Japan			Korea			US GVA
	GVA <sup>2</sup> (mil. Yuan)	GVA (mil. PPP\$)	GVA (US=1)	GVA <sup>2</sup> (mil. Yen)	GVA (mil. PPP\$)	GVA (US=1)	GVA <sup>2,3</sup> (mil. Yen)	GVA (mil. PPP\$)	GVA (US=1)	
<i>Factories</i>										
Total manufacturing <sup>1</sup>	364	190	0.010	3,893	2,230	0.120	176	114	0.006	18,616
Food, beverage & tobacco	54	28	0.010	453	162	0.058	63	27	0.010	2,789
Textiles, wearing apparel	157	92	0.036	750	605	0.236	21	14	0.005	2,563
Wood & allied products	1	0	0.0004	71	32	0.037	7	4	0.005	886
Paper, printing & publishing	29	19	0.015	111	80	0.063	8	5	0.004	1,286
Chemicals & allied products	49	31	0.009	725	534	0.151	51	53	0.015	3,534
Building materials	24	18	0.031	167	118	0.199	8	6	0.010	594
Basic & fabricated metals	17	7	0.003	617	262	0.106	7	4	0.002	2,469
Machinery	28	12	0.003	857	424	0.117	5	4	0.001	3,614
Miscellaneous manufacturing	5	5	0.006	140	224	0.254	5	6	0.007	882
<i>Factory plus handicraft</i>										
Total manufacturing <sup>1</sup>	3,881	2,030	0.109	5,387	3,087	0.166	233	120	0.006	18,616
Food, beverage & tobacco	2,707	1,389	0.498	955	341	0.122	109	46	0.017	2,789
Textiles, wearing apparel	746	438	0.171	974	786	0.307	34	23	0.009	2,563
Wood & allied products	71	38	0.043	117	53	0.060	5	3	0.003	886
Paper, printing & publishing	59	38	0.030	171	124	0.096	7	4	0.003	1,286
Chemicals & allied products	116	74	0.021	859	633	0.179	41	32	0.009	3,534
Building materials	46	36	0.060	231	163	0.274	8	5	0.009	594
Basic & fabricated metals	43	18	0.007	630	268	0.108	9	5	0.002	2,469
Machinery	66	28	0.008	1,434	709	0.196	6	6	0.002	3,614
Miscellaneous manufacturing	26	29	0.033	180	287	0.326	10	11	0.012	882

*Source:* Both factory and traditional GVA data are from the same sources as in Table 2. PPP converters are the estimates in Table 4.

*Notes:*

- 1) For more details of the classification see Table 2.
- 2) Chinese, Japanese and Korean GVA figures are estimated based on the GVA/GVO ratios of individual countries which are calculated by the authors using information from Statistical Division of the Ministry of Commerce and Manufacturing (1937), Kim (2008) and Ou (1946).
- 3) Korean Yen = Japanese Yen.

### *Hours worked*

Numbers employed can be very different from hours worked. It is due to institutional and political factors such as laws and regulations and labour unions, labour market conditions that are related to demand and supply factors, nature of industry, i.e. level of safety or health hazard, as well as culture or tradition that developed in history because of climate conditions and farming customs. Since these factors and conditions vary greatly among countries, it is important to convert numbers employed to hours worked in international comparison.

In the current study, data on working hours for Japan, Korea and the US are directly adopted either from government statistics or other studies. The Japanese working hours in manufacturing for 1935 are obtained from the government *Handbook of labour statistics* compiled by the Statistical Division of Cabinet Office (1935, pp. 96-99). The Korean working hours in manufacturing for 1939 are obtained from Chosen Government-General, *Statistics on Manufactured Products* (1941, pp: 4-5). As for the US data on working hours, we use estimates by de Jong and Woltjer (2007, p. 23, Table 5).

The Chinese data on working hours are not straightforward. The 1935 issue of *China Economic Annals*, compiled by the Ministry of Industry (1935, pp. Q13-16), is perhaps the only official publication that collected almost all then available surveys on working hours and working days in China in different industries and regions over the period 1932-34. Based on the data from these surveys, we estimate total and average annual working hours for individual industries for *circa* 1935.

The results are reported in Table 7. It indeed shows that annual hours worked per person were very different among these countries and across industries. On average, the Korean manufacturing workers worked 2,431 hours per year, compared with 2,807 hours in China and 3,132 hours in Japan, which were 34, 54 and 72 percent higher than the US of 1,817 hours, respectively. Intuitively, the working hours in Japan might be overestimated whereas in the US might be underestimated. Some studies have found that long working hours in Japan were indeed a long tradition and only changed very recently (ref, Japan Industrial Productivity Database-JIP2008). On the other hand, the estimation for the US by de Jong and Woltjer (2007) seems too low. If using the standard of eight hours per working day and six days per week, the

average US manufacturing workers only worked for 38 weeks, by contrast the Japanese had to work for 65 weeks a year!

If taking a closer look at some industries in China and Korea, our findings suggest that the long working hours in Japanese manufacturing might not be impossible. In the case of “chemicals” in China the average annual working hours per worker were 3,167, even slightly more than the Japanese average. In the case of “wood” in Korea, it was 3,097, very close to the Japanese average, but in the case of Korean “paper” industry, it was as high as 3,690 or 18 percent more than the Japanese average working hours. Therefore, if the estimates for Japan, China and Korea are plausible for *circa* 1935, the estimates by de Jong and Woltjer (2007) for the US may be too low and hence may exaggerate the labour productivity in the US in 1935.

**TABLE 7**  
**NUMBERS EMPLOYED, HOURS WORKED AND ANNUAL HOURS WORKED PER PERSON BY MANUFACTURING INDUSTRY,**  
**CHINA, JAPAN, KOREA AND THE US, IN 1935 (FACTORY ONLY)**

	China			Japan			Korea			US		
	Numbers employed (x1000)	Hours worked (x1000)	Hours per person	Numbers employed (x1000)	Hours worked (x1000)	Hours per person	Numbers employed (x1000)	Hours worked (x1000)	Hours per person	Numbers employed (x1000)	Hours worked (x1000)	Hours per person
Total manufacturing <sup>1</sup>	784	2,201	2,807	2,361	7,394	3,132	167	407	2,431	8,290	15,062	1,817
Food, beverage & tobacco	71	183	2,577	158	468	2,958	49	108	2,209	929	1,823	1,962
Textiles, wearing apparel	505	1,439	2,850	1,007	3,231	3,209	31	80	2,551	1,806	3,203	1,774
Wood & allied products	2	4	2,790	85	253	2,975	6	23	3,690	632	1,237	1,958
Paper, printing & publishing	44	129	2,914	61	197	3,256	7	22	3,097	475	901	1,896
Chemicals & allied products	63	201	3,167	229	716	3,133	43	83	1,930	1,218	2,304	1,892
Building materials	30	78	2,559	93	278	3,003	10	26	2,573	263	476	1,812
Basic & fabricated metals	23	66	2,895	218	671	3,081	7	19	2,696	1,121	2,032	1,813
Machinery	38	114	2,974	367	1,160	3,158	7	20	2,758	1,492	2,698	1,809
Miscellaneous manufacturing	8	20	2,535	144	443	3,075	6	14	2,380	355	596	1,682

*Source* and Notes: See discussion in the text.

### *Labour productivity in PPPs*

Based on the estimates for gross value added in Table 6 and hours worked in Table 7, we can easily calculate labour productivity in PPPs in Table 8. Note that the estimates are only for the factory sector. To compare with the US labour productivity, we can also calculate relative labour productivity for China, Japan and Korea with the US as the reference (= 1). It shows that on average, the Japanese and Korean labour productivity in manufacturing in 1935 was very close, or PPP\$0.30 and 0.28 per hour, respectively, whereas China was only 0.09 PPP\$ per hour. In relative terms, in 1935 the labour productivity in Japanese and Korean manufacturing was about 23-24 percent of the US level (= \$1.24 per hour), whereas the labour productivity in Chinese manufacturing was less than 7 percent of the US level. Clearly, even if there were underestimation of the hours worked in the US manufacturing, it may not change the pattern significantly. Given all other indicators for the level of economic development, especially per capita income, we feel that the Japanese labour productivity would not be more than one third of the US level in any case, which gives a useful reference for assessing the level of other economies.

At the industry level in individual countries, it shows that some industries enjoyed higher labour productivity than others as compared with the country average. Importantly, in Japan, we find almost all heavy or “producer goods” industries (i.e. “chemicals”, “building materials”, “metals” and “machinery”) had higher labour productivity than light or “consumer goods” industries, suggesting heavy industries had already played a major role at that stage of Japan’s industrialization. This was, however, neither in the case of China nor Korea. In China, only “wood” and “building materials” enjoyed better labour productivity than the manufacturing average, whereas in Korea only “food” and “chemicals” enjoyed better labour productivity than the manufacturing average. The findings reflect different stages of economic development in these countries and are in line with our findings on relative prices for individual industries.



**TABLE 8**  
**COMPARATIVE LABOUR (MANHOUR) PRODUCTIVITY IN PPPS BY MANUFACTURING INDUSTRY,**  
**CHINA, JAPAN AND KOREA IN COMPARISON WITH THE US, IN CIRCA 1935 (FACTORY ONLY)**

	China <sup>2</sup>		Japan		Korea		US
	Labour productivity (in PPP\$)	Labour productivity (US=1)	Labour productivity (in PPP\$)	Labour productivity (US=1)	Labour productivity (in PPP\$)	Labour productivity (US=1)	Labour productivity (in PPP\$)
Total manufacturing <sup>1</sup>	0.09	0.07	0.30	0.24	0.28	0.23	1.24
Food, beverage & tobacco	0.15	0.10	0.35	0.23	0.25	0.16	1.53
Textiles, wearing apparel	0.06	0.08	0.19	0.23	0.17	0.22	0.80
Wood & allied products	0.09	0.12	0.13	0.18	0.19	0.27	0.72
Paper, printing & publishing	0.15	0.10	0.41	0.29	0.21	0.15	1.43
Chemicals & allied products	0.15	0.10	0.75	0.49	0.64	0.42	1.53
Building materials	0.23	0.19	0.42	0.34	0.23	0.18	1.25
Basic & fabricated metals	0.11	0.09	0.39	0.32	0.21	0.17	1.22
Machinery	0.10	0.08	0.37	0.27	0.21	0.16	1.34
Miscellaneous manufacturing	0.27	0.18	0.50	0.34	0.41	0.28	1.48

*Source:* See Tables 6 and 7.

*Notes:*

- 1) See Table 2 for more details of the classification of manufacturing industries.
- 2) For China, estimation is based on 1933 nominal GVA and 1933-35 price changes.

## 7. CONCLUDING REMARKS

Following the standard methodology for measuring industry-of-origin or production-side PPP, this study compares the unit values of manufacturing products in China, Japan, Korea and the United States, derives unit value ratios (UVRs) and hence estimates relative price levels for individual manufacturing industries in *circa* 1935 with the US as the reference country. Unlike the expenditure PPP approach, this production approach allows us to more rigorously examine the pre-WWII economic conditions in East Asia from the production side in terms of producer costs and labour productivity in manufacturing relative to those in the US.

Based on estimated production PPPs as well as estimated gross value added and hours worked for these countries, we find that in *circa* 1935 the producer price level in China, Japan and Korea was 64, 51 and 45 percent of the US level in manufacturing the same products as implied by the prevailing market exchange rates of these countries' currencies against the US dollar, but the labour productivity in these countries was only 7, 24 and 23 of the US level, respectively. Apparently, the higher price level in the US is justified by its much higher labour productivity implying more advanced technology. However, a comparison among the three East Asian countries reveals some inconsistencies. Japan and Korea had almost the same productivity and their producer price levels were close. By contrast, China's productivity was not much more than one third of the level of Japan and Korea but had a much higher price level than that of Japan and Korea. Such a striking finding for China raises two challenging questions: Did Chinese manufacturing produce in line with its comparative advantage? If not, what drove China's earlier industrialization?

Let us think about the first question. In order to understand price gaps and comparative advantage, we need to assume that Japan's exports and China's exports were not perfect substitutes. Even if China's prices were higher than Japan's, China could still export substantial amount of textiles if they were cheaper in comparison with the world average prices. To properly explain price level gaps, we need to take into account two factors, factor cost and the level of technology (as reflected by labour productivity, input/output ratio of intermediate inputs, and unit capital cost). China's factor costs might be much higher than those in Japan. Since China's per capita GDP was about one third of the Japanese level (Table 1), it is reasonable to assume that China's wage level might be one half of the Japanese level. If China's

labour productivity in textiles was one third of the Japanese level (Table 8), then China's unit labour cost or wage-labour productivity ratio must be 50 percent higher than that of Japan. On the other hand, China's unit intermediate input cost could also be higher than that in Japan because of higher prices of cotton yarns and inefficient production process. Therefore, we can expect that China's price level of textiles would be higher than that in Japan.

The Heckscher-Ohlin theory usually assumes identical technology, but in the 1930s the technology level was very different as discovered in Table 8. If we consider the factor cost differences and technological differences simultaneously, we can expect that China's comparative advantage mainly existed in primary industries and labour-intensive products including some types of textiles and garments. Table 3 shows that China's net exports mainly concentrated in crude materials, minerals, fuels as well as textile products, which are very consistent with our conjecture.

Let us now turn to our second question what might drive China's earlier industrialization if it was indeed costly as suggested by our cost comparisons. Countries begin their modern economic development at different times, which means that late comers may face very different conditions from the pioneers which enjoy first-mover advantage even if the initial resource endowments are the same. When some countries have already industrialized or developed with modern technologies and industries, less developed countries tend to pursue a state-supported take-off or even some non-market approach for industrialization. This is because to many less developed countries comparative advantage is equivalent to cheap labour and land which, as some believe, would not easily lead to a fast catch up with developed countries. History has indeed shown us that large developing countries might use their comparative disadvantage to catch up though seldom efficient and successful.

Small countries in modernization seek to maximize their benefits by using their comparative advantage (niche services or unique natural resources) to pay for manufactured goods made in advanced countries because developing capital goods industries is inefficient due to diseconomies of scale. Small countries may also seek political-military allies so that they do not have to develop their own defence-oriented heavy industries. Large countries are different. Their potentially huge domestic markets attract those domestic investors who could afford for the high initial costs of learning and imitating, though they usually require state support. Politicians in such countries tend to have strong incentives to lend support or to pursue a state-involved

industrialization because of political returns and national defence pressures. Some countries may rely on political support or state power to develop capital goods manufacturing and R&D while using their comparative advantage to pay for the cost, whereas some may go extreme by adopting forced saving and hence forced heavy industrialization through totalitarian controls and central planning like what happened in the Soviet Union and the Maoist China.

Our costs and productivity analyses have suggested that China did not produce in its comparative advantage, which lends tentative support to our conjecture. On the one hand, China's huge potential market was attractive to investors who could afford for initial high costs due to underdeveloped market institutions and infrastructures for modern industries. On the other hand, government involvement in China's initial development of heavy industries was inevitable because of the treats of foreign powers including its neighbour Japan as well as political and military conflicts at home.

## REFERENCES

- Allen, Bob, Jean-Pascal Bassino, Debin Ma, Christine Moll-Murata, and Jan Luiten van Zanden (2005) "Wages, Prices and Living Standards in China, Japan and Europe", downloadable at <http://gpih.ucdavis.edu/Papers.htm>.
- Balassa, Bela (1964) "The Purchasing Power Parity Doctrine: A Reappraisal." *Journal of Political Economy* Vol.72: 584-96.
- Bassino, Jean-Pascal, and Pierre van der Eng (2002) "Economic Divergence in East Asia: New Benchmark Estimates of Levels of Wages and GDP, 1913-1970," paper presented at the XIII Economic History Congress, July 22-26, 2002, Buenos Aires.
- Bassino, Jean-Pascal, and Debin Ma (2005) "Japanese Wages for Unskilled Labourers in 1730-1910: an International Perspective," forthcoming in *Research in Economic History*.
- Bassino, Jean-Pascal (2005) "How Poor Was Asia before the Industrialization?" unpublished manuscript, Tokyo: Maison Franco-Japonaise.
- Beasley, W.G. (1995). *The Rise of Modern Japan: Political, Economic and Social Change since 1850*. New York: St. Martin's Press
- Broadberry, Stephen and Carsten Burhop (2007), "Comparative Productivity in British and German Manufacturing Before World War II: Reconciling Direct Benchmark Estimates and Time Series Projections", *The Journal of Economic History*, Vol. 67, No. 2, pp. 315-349.
- Chen, Zhen (ed.) (1961), *Zhongguo Jindai Gongyeshi Ziliao* (Study Materials of Industrial History in Contemporary China), Vol. 4 (1) and (2). Beijing: Shenghuo-Dushu-Xinzhi Sanlian Shudian (Press)
- Chenery, Hollis, Sherman Robinson and Moshe Syrquin (1986), *Industrialization and Growth: A Comparative Study*, published for the World Bank by Oxford University Press.
- Choi, Seong-jin (2006), "Stature and the Standard of Living in Korea, 1910-1945 (in Korean)," *Review of Economic History (Kyungje Sahak)*, Vol. 40, pp. 82-116.
- Chosen Government-General (Chosen Sotoku-fu) (1937), *Statistics on Manufactured Products 1935* (Chosen Kosan Tokei showa 10nen), Chosen Government-General (Chosen Sotoku-fu)
- Chosen Government-General (Chosen Sotoku-fu) (1941), *Statistics on Manufactured Products* (Chosen Kosan Tokei, showa 14nen), Chosen Government-General
- Diewert, W.E. (1992), "Fisher ideal output, input, and productivity indexes revisited", *Journal of Productivity Analysis*, No. 3, 211-248 (September).
- Fremdling, Rainer, Herman de Jong and Marcel Timmer (2007), "British and German Manufacturing Productivity Compared: A New Benchmark for 1935-36 Based on Double Deflated Value Added," *Journal of Economic History*, Vol. 67, No. 2, pp. 350-378.
- Fukao, Kyoji, Debin Ma and Tangjun Yuan (2007), "Real GDP in Pre-War East Asia: A 1934-36 Benchmark Purchasing Power Parity Comparison with the U.S.," *Review of Income and Wealth*, Vol. 53, No. 3, pp. 503-537.

- Fukao, Kyoji and Osamu Saito (2006) “Japan’s Alternating Phases of Growth and Outlook for the Future,” Hi-Stat Discussion Paper Series, No. 196, Institute of Economic Research, Hitotsubashi University.
- Gilbert, M. and I.B. Kravis (1954), *An International Comparison of National Products and the Purchasing Power of Currencies*, Paris, OEEC
- Godo, Yoshihisa, and Yujiro Hayami (2002) “Catching Up in Education in the Economic Catch-up of Japan with the United States, 1890-1990” *Economic Development and Cultural Change*, vol. 50, no. 4, pp. 961-78.
- IER (Institute of Economic Research, Hitotsubashi University) (2000), *Asian Historical Statistical Database*, by the Institute of Economic Research, Hitotsubashi University, some of the data are available at <http://hi-stat.ier.hit-u.ac.jp/english/research/database/ashstat.html>
- Japan Industrial Productivity Database-JIP 2008, available at <http://www.rieti.go.jp/en/database/JIP2008/index.html>
- Jong de, Herman and Pieter Woltjer (2007), “Measuring Divergence. A New Estimate of Real Output and Productivity in British and American Manufacturing in 1935,” paper prepared for the Seventh Conference of the European Historical Economics Society, Lund, 29 June-1 July 2007.
- Kim, Duol and Ki-Joo Park (2007), *Colonialism and Industrialization: Factory Labour Productivity of Colonial Korea, 1913-37*, mimeo, Korea Development Institute, forthcoming in *Australian Economic History Review*.
- Kim, Nak Nyeon (ed.) (2006), *Economic Growth in Korea* (in Korean), Seoul National University Press, Seoul (Japanese Translation by Moon, Ho Il and Kim, Seung Mi, published by University of Tokyo Press, 2008)
- Kravis, Irving B., A. Heston and R. Summers (1982), *World Product and Income: International Comparison of Real Gross Product*, John Hopkins, Baltimore
- Kuznets, S. (1971), *Economic Growth of Nations - Total Output and Production Structure*, Cambridge MA: Harvard University Press
- Lieu, D.K. (Liu Ta-chün) (1955), *Industrial Development in Communist China*, New York, Sino-American Amity
- Liu, Ta-chung (1946) *China’s National Income 1931-36, An Exploratory Study*, Washington, D.C.: the Brookings Institution.
- Liu, Ta-chung, and Kung-chia Yeh (1965), *The Economy of the Chinese Mainland: National Income and Economic Development, 1933-1959*, Princeton University Press, Princeton
- Luo, Huanzhen (2000), Re-estimates of Population of the Republic of China: 1912-36, *COE Working Paper WP89*, Institute of Economic Research, Hitotsubashi University.
- Ma, Debin (2008), “Economic growth in the lower Yangzi region of China in 1911-1937: A quantitative and historical analysis”, *Journal of Economic History*, vol. 68 (2): 355-392.
- Maddison, Angus (1970), *Economic Progress and Policy in Developing Countries*, Allen and Unwin, London and Norton, New York.

- Maddison, Angus (1983), "A Comparison of Levels of GDP per capita in Developed and Developing Countries", *Journal of Economic History*, March, pp.2-41
- Maddison, Angus (2003), *The World Economy: Historical Statistics*, OECD Development Centre
- Makino, Fumio and T. Kubo (1997), Industrial Output and Index Estimates in Republic China, *Working Paper D97-18*, Institute of Economic Research, Hitotsubashi University
- Ministry of Industry, National Government (1935), *Zhongguo Jinji Nianjian 1935 (China Economic Annals)*, Shanghai: Commercial Press.
- Mitsuhiko Kimura, 2008, "The economics of Japanese imperialism in Korea, 1910-1939", *The Economic History Review*, Volume 48 Issue 3, Pages 555 - 574
- Mizoguchi, T. and M. Umemura (1988) *Basic Economic Statistics of Former Japanese Colonies, 1895-1938, Estimates and Findings*, (in Japanese), Tokyo: Toyo Keizai Shinpo Sha.
- Nishikawa, Shunsaku and Hisao Koshihara (1981), "Input-Output Table for 1935, Estimation and Implications (1935-nen no Tonyu-Sanshutu-hyo: Sono Suikei to Ganni," in Ryuei Nakamura (eds.), *An Analysis of Japan's Economy During the Interwar Period* (Senkan-ki no Nihon Keizai Bunseki), Yamakawa Shuppan-sha, Tokyo.
- Nishimizu, M. and S. Robinson (1984), "Trade policies and productivity change in semi-industrialised countries," *Journal of Development Economics* 16 (1-2): 177-206.
- NRC (National Resource Commission of Nationalist Government) (1937), *Chung-kuo kung-yeh tiao-ch'a pao-kao* (Report on A Survey of China's Industry), Three Volumes in Chinese. Nanjing: National Resource Commission of Nationalist Government.
- Ohkawa K. and M. Shinohara, eds. (1979) *Patterns of Japanese Economic development: A Quantitative Appraisal*, New Haven, Conn.: Yale University Press.
- OIAPS (Gongnongye Shangpin Bijia Wenti Diaocha Yanjiu Ziliao Bangongshi [Office for Industrial and Agricultural Price Survey]) (1956-57) "Gongnongye Shangpin Bijia Wenti Diaocha Yanjiu Ziliao Huibian (*Archive Materials for Studies of Industrial and Agricultural Commodity Prices*)", Shanghai Volume (1956)
- Ou (Wu) Pao-san (1947), *1933 Chung-Kuo Kuo-min So-te* (China's National Income 1933), 2 Vols. in the Series of Institute of Social Science, Central Academy of Scientific Research. Shanghai: Zhonghua Shuju (China Press)
- Ou (Wu) Pao-san (1948), *Capital formation and consumers' outlay in China*, Harvard University, PhD thesis
- Ou (Wu) Pao-san (1946), "A New Estimate of China's National Income," *Journal of Political Economy*, 54:6 (Dec., 1946), pp. 547-554.
- Ou (Wu) Pao-san (1947), *National Income of China, 1933, 1936 and 1946*, Academia Sinica, Nanking
- Paige, D. and G. Bombach (1959), *A Comparison of National Output and Productivity*, Paris: OEEC.

- Perkins, H. Dwight, "Growth and changing structure of China's twentieth century economy", in Perkins (ed.), *China's Modern Economy in Historical Perspective*
- Pilat, D. and Prasada Rao, D.S. (1996), "Multilateral Comparisons of Output, Productivity and Purchasing Power Parities in Manufacturing", *Review of Income and Wealth*, July, pp. 113-130
- Pilat, Dirk (1994) *The Economics of Rapid Growth: The Experience of Japan and Korea*, Edward Elgar, Aldershot, U.K., and Brookfield, U.S.
- Rao, D.S. Prasada, and M.P. Timmer (2003), "Purchasing Power Parities for Manufacturing Sector Price Comparisons Using New Multilateral Index Number Methods", *Review of Income and Wealth*, 49, 4, 491-512
- Rostas, L. (1948), *Comparative Productivity in British and American Industry*. Cambridge, UK: Cambridge University Press.
- Shinohara Miyohe (1972), "Mining and Manufacturing", Vol. 10 in Ohkawa, K. Shinohara M. and Umemura M. (eds.), *Long-Term Economic Statistics*, Tokyo, Keizai Shinposha
- Statistical Division of Cabinet Office (1935) *Handbook of Labour Statistics 1935* (Showa 10 nen, Roudou Tokei Youran). Tokyo: Statistical Division of Cabinet Office
- Statistical Division of the Commerce and Manufacturing Minister's Office (Sho Ko Daijin Kanbo Tokei-ka) (1937), *Census of Factories 1935*, (Showa 10nen, Kojo Tokei Hyo). Tokyo: Statistical Division of the Commerce and Manufacturing Minister's Office
- Samuelson, P. A. (1964) "Theoretical notes on trade problems." *The Review of Economics and Statistics*, Vol. 46, No. 2 (May): 145-54.
- Summers, Robert, and Alan Heston (1991), "The Penn World Table (mark 5): an expanded set of international comparisons, 1950-1988", *Quarterly Journal of Economics*, 106, 2, 337-68
- Szirmai, A. Ren, R., (2000). Comparative performance in Chinese manufacturing, 1980-1992. *China Economic Review* 11, 16-53.
- Trescott, Paul B., "How Keynesian Economics Came to China", *Discussion Paper Series No. 96-02*, Department of Economics, Southern Illinois University, January, 1996
- U.S. Department of Commerce (1938), *Bicentennial Census of Manufactures 1935*, United States Government Printing Office, Washington D.C.
- U.S. Department of Commerce (1936), *Statistical Abstract of the United States 1936*, United States Government Printing Office, Washington D.C.
- U.S. Department of Commerce, Bureau of the Census (1976), *Historical Statistics of the United States, Colonial Times to 1970*, Parts 1 and 2 (Bicentennial Edition), Washington D.C.: Bureau of the Census
- U.S. Bureau of Foreign and Domestic Commerce (1936), *Statistical Abstract of the United States 1936*, United States Government Printing Office.
- Williamson, Jeffery G. (1998), Real Wages and Relative Factor Prices in the Third World Before 1940: What Do they Tell Us about the Sources of Growth? Presented at the Conference on Growth in the 19th and 20th Century: A Quantitative Economic History, December 14-15, 1998, Valencia, Spain.



- Williamson, Jeffery G. (2002), "Land, labor, and Globalization in the Third World, 1870-1940", *Journal of Economic History*, Vol. 62 (1): 55-85.
- Wu, Harry X., (2001), "China's comparative labour productivity performance in manufacturing 1952-1997: Catching up or falling behind? *China Economic Review*, 12 (1): 162-189
- Yamazawa, Ippei and Yuzo Yamamoto (1979), *Foreign Trade and Balance of Payments* (in Japanese), Vol. 15, in Ohkawa, K. Shinohara M. and Umemura M. (eds.), *Long-Term Economic Statistics*, Tokyo, Keizai Shinposha.
- Yukizawa, Kenzo (1977), *Rodo Seisansei no Kokusai Hikaku Nichibei Kogyo wo Chushin to Shite* (International Comparison of Labour Productivity, Focused on the Japanese and the U.S. Manufacturing Sector), Tokyo: Sobunsha.

APPENDIX TABLES

TABLE A1: CALCULATION OF CHINESE PRICE LEVEL RELATIVE TO JAPAN IN 1935 (JAPAN = 1)

	Japanese weight			Chinese weight			Japanese		Chinese			Chinese/ Japanese	Chinese price level		
	I	II	III	I	II	III	Unit	Price	Unit	Price	Source		Japanese weight	Chinese weight	Fisher average
All industries													1.547	1.001	1.244
Food and kindred products	0.108			0.251									0.967	0.647	0.791
Liquor		0.494			0.234								0.615	0.666	0.640
	Liquor ( <i>bai jiu</i> )		0.768		0.500		100l	40.057	dan	9.445	b	0.536			
	Beer		0.232		0.500		100l	46.599	dan	18.000	b	0.878			
Flour and Starch		0.217			0.497								0.513	0.513	0.513
	Wheat flour		1.000		1.000		Kg	0.152	50kg	1.710	a	0.513			
Cooking oil		0.044			0.134								0.862	0.763	0.811
	Rap oil		0.475		0.340		kg	0.367	dan	13.646	b	0.844			
	Sesame oil		0.081		0.330		kg	0.508	dan	13.327	b	0.596			
	Soybean oil		0.444		0.330		kg	0.356	dan	14.537	a	0.929			
Sugar		0.173			0.019								0.803	0.949	0.873
	Brown sugar		0.130		0.500		kg	0.230	dan	14.500	a	1.430			
	White sugar		0.870		0.500		kg	0.239	dan	7.453	a	0.710			
Salt		0.037			0.036								6.985	6.985	6.985
	Salt		1.000		1.000		kg	0.046	dan	14.070	a				
Tea		0.020			0.008								3.345	3.869	3.597
	Green tea		0.943		0.500		kg	0.524	dan	75.125	b	3.259			
	Black tea		0.057		0.500		kg	0.533	dan	111.708	b	4.760			
Other food		0.015			0.073								3.282	3.282	3.282
	Ice		1.000		1.000		kg	6.306	tons	18.211	a	3.282			
Textiles and their products	0.310			0.474									1.778	1.371	1.561
Silk		0.160			0.117								0.929	0.929	0.929
	Raw silk		1.000		1.000		kg	11.352	dan	463.963	a	0.929			
Yarn		0.367			0.502								1.003	1.137	1.068
	Cotton		0.748		0.340		kg	1.247	jian	162.100	a	0.814			
	Silk		0.058		0.330		kg	5.847	dan	323.951	a	1.259			
	Woolen		0.194		0.330		kg	2.437	jian	642.301	a	1.651			
Fabrics		0.431			0.268								2.761	2.840	2.800
	Cotton twill		0.135		0.295		m	0.132	shichi	0.087	b	2.250			
	Poplin		0.125		0.295		m	0.177	shichi	0.166	b	3.200			
	Calico		0.269		0.295		tan (10m)	0.526	shichi	0.062	b	4.018			
	Serge		0.471		0.114		m	1.617	m	2.948	b	2.072			
Knitgoods		0.024			0.082								1.612	1.612	1.612
	Cotton underwear		1.000		1.000		dozen	3.957	dozen	5.613	b	1.612			
Cotton		0.018			0.030								1.834	1.834	1.834
	Cotton wadding		1.000		1.000		kg	0.592	dan	47.782	a	1.834			
Wood products	0.023			0.003									0.964	0.964	0.964
Wood board		1.000	1.000		1.000	1.000	3.3 sqm	1.980	3.3sq.m	1.680	d	0.964	0.964	0.964	0.964
Paper and allied industries	0.041			0.045									1.368	1.205	1.284
Paper		0.827	1.000		0.542	1.000	kg	0.232	kg	0.294	c	1.443	1.443	1.443	1.443
Paperboard		0.173	1.000		0.458	1.000	kg	0.104	kg	0.093	c	1.008	1.008	1.008	1.008

	Japanese weight			Chinese weight			Japanese		Chinese			Chinese/ Japanese	Chinese price level		
	I	II	III	I	II	III	Unit	Price	Unit	Price	Source		Japanese weight	Chinese weight	Fisher average
<b>Chemicals and allied products</b>	<b>0.147</b>			<b>0.070</b>									<b>2.010</b>	<b>0.859</b>	<b>1.314</b>
Acid		0.292			0.015								2.956	2.900	2.928
			0.758		0.740		tons	38.087	tons	92.247	a	2.752			
			0.069		0.250		tons	36.934	50kg	5.553	b	3.417			
			0.173		0.009		tons	110.220	tons	355.420	a	3.664			
Soda		0.082			0.105								0.873	0.987	0.929
	Carbonated soda		0.048		0.334		kg	0.126	tons	99.562	a	0.900			
	Caustic soda		0.829		0.333		kg	149.906	tons	99.562	a	0.755			
	Bleaching powder		0.123		0.333		tons	67.397	50kg	4.928	b	1.662			
Other ind. chemicals		0.066			0.044								3.333	1.872	2.498
	Naphthalene		0.266		0.250		kg	0.085	tons	221.452	b	2.977			
	Alcohol		0.208		0.250		kg	0.756	gallon	1.114	a	8.844			
	Silicate		0.355		0.250		kg	0.070	dan	4.616	a	1.500			
	Alum		0.170		0.250		kg	77.818	tons	67.034	b	0.979			
Dye, Paint & Pigment		0.082			0.130								2.052	0.912	1.368
	Blue sulfide		0.492		0.334		kg	0.370	jin	0.421	a	2.587			
	Lacquer		0.095		0.333		kg	3.252	pounds	0.553	a	0.426			
	Paint		0.413		0.333		kg	0.540	pounds	0.385	a	1.788			
Oil		0.087			0.010								3.774	1.947	2.711
	Gasoline		0.255		0.200		tons	59.976	kg	0.323	b	6.120			
	Kerosene		0.178		0.200		tons	61.487	kg	0.218	b	4.029			
	Lubricants		0.470		0.200		tons	91.928	kg	0.211	b	2.608			
	Asphalt		0.068		0.200		tons	27.636	tons	89.982	b	3.700			
	Gelatin		0.029		0.200		kg	1.149	dan	33.644	a	0.665			
Vegetable oil and fat		0.045			0.016								1.040	1.170	1.103
	Cotton seed oil		0.572		0.334		kg	0.339	dan	10.671	b	0.715			
	Coconut oil		0.419		0.333		kg	0.274	tons	352.603	b	1.460			
	Tung oil		0.009		0.333		kg	0.427	dan	39.294	b	2.092			
Fertilizer		0.191			0.401								0.681	0.681	0.681
	Bean cake		1.000		1.000		tons	80.573	dan	2.415	a	0.681			
Soap		0.030			0.121								1.001	1.001	1.001
	Soap		1.000		1.000		kg	0.189	Box/30kg	5.000	a	1.001			
Pulp		0.028			0.007								2.789	2.789	2.789
	Pulp		1.000		1.000		kg	93.260	tons	228.914	a	2.789			
Tannery		0.047			0.081								0.777	0.844	0.810
	Cowhide		0.800		0.500		pieces	7.660	pieces	3.874	a	0.575			
	Acacia extract		0.200		0.500		kg	0.428	gong-dan	59.679	a	1.586			
Coke, coal		0.052			0.070								0.789	0.817	0.803
	Coke		0.763		0.500		tons	14.995	tons	10.040	a	0.761			
	Coal		0.237		0.500		kg	20.753	tons	16.090	b	0.881			
<b>Stone, clay, and glass products</b>	<b>0.026</b>			<b>0.032</b>									<b>1.242</b>	<b>0.876</b>	<b>1.043</b>
	Glass		0.284		0.141								0.997	0.997	0.997
	Glass plate		1.000		1.000		box	7.567	box	6.640	b	0.997			
Brick and Tile		0.131			0.207								0.936	0.893	0.914
	Black brick		0.127		0.334		numbers	0.014	numbers	0.008	a	0.648			
	Common brick		0.724		0.333		numbers	0.071	numbers	0.046	a	0.742			
	Tile		0.148		0.333		numbers	0.043	10000ge	807.117	b	2.135			
Cement		0.420			0.430								0.610	0.610	0.610
	Cement		1.000		1.000		barrel	3.213	tons	38.192	b	0.610			
Lime		0.025			0.014								4.074	4.074	4.074
	Lime		1.000		1.000		tons	6.997	dan	1.254	a	4.074			
Enamelware		0.140			0.208								3.417	3.417	3.417
	Washbasin or Cup		1.000		1.000		numbers	0.082	dozen	2.957	b	3.417			

	Japanese weight			Chinese weight			Japanese		Chinese			Chinese price level			
	I	II	III	I	II	III	Unit	Price	Unit	Price	Source	Chinese/ Japanese	Japanese weight	Chinese weight	Fisher average
<b>Metals and metal products</b>	0.174			0.046									1.392	0.984	1.171
<b>Metal smelting materials</b>	0.714			0.113									1.501	1.414	1.457
Pig iron			0.079			0.250	tons	35.956	tons	64.477	b	2.038			
Steel Plate			0.777			0.250	kg	0.093	tons	124.458	b	1.524			
Copper casting, rough			0.090			0.125	tons	738.087	tons	624.542	b	0.962			
Tinplate			0.014			0.125	kg	0.303	tons	351.677	b	1.317			
Lead			0.012			0.125	kg	0.253	dan	14.592	a	1.309			
Aluminum			0.027			0.125		1.507	tons	1653.450	b	1.247			
<b>Casting</b>	0.077			0.095									1.334	1.334	1.334
Cast-iron pipe		1.000			1.000		kg	0.089	pounds	0.047	a	1.334			
<b>Other metal products</b>	0.209			0.792									1.040	0.916	0.976
Nail		0.649			0.250		barrel	7.097	pounds	0.059	a	0.937			
Nib		0.083			0.250		gross	4.200	gross	1.950	b	0.528			
Umbrella bone		0.060			0.250		dozen	1.274	dozen	1.556	a	1.388			
Zinc plate		0.208			0.250		kg	0.186	tons	239.417	b	1.462			
<b>Machinery</b>	0.135			0.049									1.216	1.490	1.346
<b>Machinery</b>	0.721			0.171									0.941	0.993	0.967
Generators		0.230			0.300		numbers	997.064	numbers	514.771	a	0.587			
Motor *		0.754			0.300		numbers	115.957	numbers	104.882	b	1.028			
Fans		0.016			0.400		numbers	20.1114	numbers	34.701	a	1.961			
<b>Battery and Light bulb</b>	0.026			0.266									2.111	1.259	1.630
Accumulator		0.050			0.300		numbers	14.5720	numbers	22.500	b	1.755			
Battery		0.278			0.300		numbers	0.11980	dozen	0.794	a	0.628			
Light bulb		0.672			0.400		numbers	0.065	numbers	0.158	a	2.751			
Thermometer		0.063			0.300		numbers	0.575	numbers	2.000	b	3.950			
AC voltage table		0.380			0.300		numbers	13.665	numbers	12.750	b	1.060			
Clock		0.557			0.400		numbers	1.594	numbers	5.290	a	3.771			
<b>Vehicle</b>	0.226			0.296									1.811	1.811	1.811
Bicycle		1.000			1.000		numbers	24.768	numbers	39.475	a	1.811			
<b>Miscellaneous industries</b>	0.035			0.031									2.221	1.165	1.608
Thermos bottle	0.125	1.000		0.125	1.000		numbers	0.331	numbers	0.628	a	2.160	2.160	2.160	2.160
Toothbrush	0.125	1.000		0.125	1.000		dozen	0.491	numbers	0.162	a	4.505	4.505	4.505	4.505
Handkerchief	0.125	1.000		0.125	1.000		dozen	0.476	dozen	0.202	a	0.482	0.482	0.482	0.482
Straw hat	0.125	1.000		0.125	1.000		dozen	3.634	dozen	16.926	a	5.293	5.293	5.293	5.293
Matches	0.125	1.000		0.125	1.000		gross	0.383	box	54.356	a	0.806	0.806	0.806	0.806
Pen	0.125	1.000		0.125	1.000		dozen	12.247	dozen	17.01	b	1.578	1.578	1.578	1.578
Pencil	0.125	1.000		0.125	1.000		dozen	0.071	dozen	0.145	b	2.322	2.322	2.322	2.322
Parasol	0.125	1.000		0.125	1.000		numbers	2.373	dozen	15.505	a	0.619	0.619	0.619	0.619

Sources: See the data section.

Notes: a) D.K. Lieu's Report on a Survey of China's Industry, Volume 2 (NRC, 1937); b) Archive Materials for Studies of Industrial and Agricultural Commodity Prices, Shanghai Volume, compiled by Office for Industrial and Agricultural Price Survey (OIAPS, 1956-57); and c) Zhen Chen's Study Materials of Industrial History in Contemporary China, Volume 4, Parts 1 and 2 (1961).

TABLE A2: CALCULATION OF JAPANESE PRICE LEVEL RELATIVE TO THE US IN 1935 (US = 1)

	Japanese weight			US weight			Japanese		US		Yen/US\$	Japanese price level		
	I	II	III	I	II	III	Unit	Price	Unit	Price		US weight	Japanese weight	Fisher average
All industries	0.108			0.208								0.632	0.412	0.510
Food and kindred products	0.108			0.208								0.817	0.819	0.818
Grain-mill and products		0.223			0.282							0.540	0.569	0.555
	Wheat flour		0.966		0.84	kg	0.152	barrels	6.67	0.590				
	Noodles, macaroni, spaghetti, etc		0.034		0.16	kg	0.162	pounds	0.07	0.286				
Liquors		0.490			0.222							2.023	2.075	2.049
	Wines		0.020		0.09	100 liters	42.540	gallons	0.42	1.129				
	Beer		0.980		0.91	100 liters	46.599	barrels	8.76	2.111				
Sugar		0.172			0.156							0.726	0.736	0.731
	Sugar cane		0.130		0.06	kg	0.230	2000 pounds	65.85	0.926				
	Refined sugar		0.870		0.94	kg	0.239	2000 pounds	88.53	0.714				
Cooking oils		0.044			0.067							0.625	0.534	0.578
	Vegetable cooking oils		0.959		0.62	kg	0.385	pounds	0.10	0.526				
	Miscellaneous animal oils and fats		0.041		0.38	kg	0.351	pounds	0.06	0.789				
Other products		0.071			0.272							0.220	0.257	0.238
	Canned Vegetables					kg	0.771	case						
	Salt		0.262		0.01	kg	0.046	pounds	0.01	0.566				
	Ice		0.738		0.99	tons	6.306	2000 pounds	3.88	0.215				
Textiles and their products	0.310			0.132								0.385	0.341	0.362
Silk and yarn		0.545			0.216							0.476	0.533	0.504
	Raw silk		0.335		0.01	kg	11.352	pounds	2.09	0.718				
	Cotton yarn		0.603		0.86	kg	1.247	pounds	0.34	0.482				
	Spun silk for sale		0.047		0.09	kg	5.847	pounds	2.23	0.347				
	Twisted silk yarn		0.015		0.03	kg	10.558	pounds	2.22	0.629				
Fabrics		0.431			0.757							0.351	0.234	0.287
	Jeans		0.041		0.03	m	0.132	sq. yards	0.12	0.287				
	Drills		0.070		0.13	m	0.195	sq. yards	0.10	0.496				
	Other wide cotton fabrics		0.775		0.28	m	0.168	sq. yards	0.21	0.210				
	All silk fabrics		0.065		0.56	m	0.425	sq. yards	0.29	0.389				
	Jute bagging		0.002		0.00	m	0.282	sq. yards	0.07	1.067				
	Rayon fabrics		0.046		0.00	m	0.269	sq. yards	0.19	0.371				
	Rayon and cotton mixed fabrics		0.000		0.00	m	0.227	sq. yards	0.20	0.311				
Hosiery		0.024			0.027							0.586	0.380	0.472
	Underwear		0.074		0.64	doz.	13.925	doz.	5.71	0.711				
	Total gloves		0.926		0.36	doz.	2.330	doz.	1.85	0.366				
Wood & allied products a	0.023			0.036								1.130	0.364	0.641
Wood		0.700			0.675							1.612	1.595	1.603
	Pine, yellow, flooring, mill*		0.500		0.500	19.2m	2.000	1000ft	36.02	1.447				
	Pine, yellow, flooring, mill*		0.500		0.500	120 Syaku	1.550	1000ft	22.75	1.776				
Wage		0.300			0.325							0.130	0.130	0.130
	Wage for Furniture maker		1.000		1.000	daily	1.800	hourly	0.50	0.130				
Paper, printing & publishing	0.041			0.081								0.432	0.379	0.404
Paper		0.500			0.410							0.728	1.070	0.882
	Printing paper		0.675		0.077	kg	0.207	2000 pounds	35.19	1.547				
	Writing paper		0.041		0.164	kg	0.297	2000 pounds	139.20	0.560				
	Wrapping paper		0.082		0.295	kg	0.220	2000 pounds	77.85	0.741				
	Paperboard		0.202		0.464	kg	0.104	2000 pounds	42.61	0.642				
Printing		0.500			0.580							0.230	0.230	0.230
	Newspaper		1.000		1.00	1 issue	0.050	1 issue	0.06	0.230				

	Japanese weight			US weight			Japanese		US		Yen/US\$	Japanese price level		
	I	II	III	I	II	III	Unit	Price	Unit	Price		US weight	Japanese weight	Fisher average
	0.147			0.157								0.317	0.497	0.397
Chemicals & allied products														
Chemicals not else where classified		0.254			0.029							0.904	0.854	0.878
	Sulfuric acid		0.411			0.39	tons	14.232	tons	7.11	0.584			
	Nitric acid		0.013			0.03	tons	142.928	tons	87.46	0.476			
	Soda ash		0.522			0.35	tons	74.998	tons	15.19	1.440			
	Iodine		0.005			0.00	kg	8.887	pounds	1.19	0.986			
	Chlorine		0.025			0.10	kg	0.102	tons	38.39	0.776			
	Carbon dioxide		0.007			0.06	kg	0.145	pounds	0.05	0.371			
	Alcohols		0.017			0.08	kg	0.756	pounds	0.12	0.803			
Ink, printing and writing		0.095			0.013							0.416	0.416	0.416
	Printing and lithographing inks		1.000			1.00	kg	0.680	pounds	0.22	0.416			
Soap		0.078			0.085							0.618	0.553	0.585
	Laundry soap (bar)		0.793			0.39	kg	0.189	pounds	0.05	0.528			
	Laundry soap (powder)		0.207			0.61	kg	0.225	pounds	0.04	0.675			
Oil		0.217			0.205							0.320	0.318	0.319
	Fuel oil		0.235			0.62	tons	61.487	gallons	0.23	0.123			
	Paraffin wax		0.177			0.02	tons	294.822	gallons	0.19	0.705			
	Asphalt		0.090			0.04	tons	27.636	2000 pounds	10.79	0.747			
	Cotton seed oil		0.301			0.16	kg	0.339	pounds	0.08	0.542			
	Linseed Oil		0.158			0.07	kg	0.410	pounds	0.09	0.606			
	Miscellaneous animal oils and fats		0.039			0.08	kg	0.351	pounds	0.06	0.789			
Fertilizers		0.220			0.137							0.363	0.799	0.539
	Chemicals fertilizers		0.835			0.01	tons	55.206	tons	14.75	1.092			
	Fish scrap		0.012			0.05	kg	0.083	tons	25.52	0.943			
	Bone meal		0.009			0.02	tons	75.087	tons	25.11	0.872			
	Oil cake, and meal		0.144			0.92	tons	78.517	2000 pounds	33.46	0.311			
Leather		0.028			0.433							0.141	0.144	0.142
	Cattle leather		0.971			1.00	pieces	7.660	sides half and whole fronts	15.93	0.140			
	Horse,		0.029			0.00	pieces	5.912		1.74	0.990			
Gelatin and glue		0.006			0.010							0.669	0.622	0.645
	Gelatin		0.670			0.68	kg	0.428	pounds	0.07	0.777			
	Glue		0.330			0.32	kg	1.149	pounds	0.34	0.442			
Coke-oven		0.101			0.084							0.567	0.567	0.567
	Cokes		1.000			1.00	tons	14.995	short tons	6.99	0.567			
Wood distillation and Charcoal		0.000			0.003							0.815	0.815	0.815
	Charcoal		1.000			1.00	tons	36.487	bushels	0.12	0.815			
Stone, clay, glass products		0.026			0.021							0.373	0.459	0.414
Cement		0.500			0.030							0.619	0.618	0.618
	Portland cement		0.985			0.99	casks	3.213	barrels	1.51	0.621			
	Natural, puzzolan, and masonry cement		0.015			0.01	casks	2.136	barrels	1.42	0.438			
Lime		0.029			0.057							0.276	0.276	0.276
	Lime		1.000			1.00	tons	6.997	tons	7.39	0.276			
Glass		0.338			0.693							0.361	0.361	0.361
	Shade Globes		1.000			1.00	numbers	0.061	doz.	0.59	0.361			
Clay products		0.132			0.220							0.405	0.405	0.405
	Common brick, Building brick		1.000			1.00	numbers	0.014	thousands	10.07	0.405			

	Japanese weight			US weight			Japanese		US		Yen/US\$	Japanese price level		
	I	II	III	I	II	III	Unit	Price	Unit	Price		US weight	Japanese weight	Fisher average
<b>Metals and metal products</b>	0.174			0.130								0.732	0.648	0.689
Metals	0.714			0.506								0.644	0.624	0.634
	Pig iron		0.229			0.62	tons	35.956	tons*	16.95	0.618			
	Ferro-alloys		0.065			0.08	kg	0.221	tons*	73.67	0.876			
	Steel plains		0.173			0.09	kg	0.093	tons*	70.92	0.381			
	Copper casting, rough		0.076			0.01	tons	738.087	tons	168.91	1.274			
	Copper plate		0.042			0.04	kg	0.816	tons	281.07	0.846			
	Copper wire		0.165			0.03	kg	0.783	pounds	0.14	0.763			
	Copper tubing, seamless, and pipe		0.021			0.02	kg	1.006	tons	354.19	0.828			
	Other copper metals		0.004			0.00	kg	0.756	pounds	0.21	0.473			
	Zinc casting, rough		0.035			0.01	kg	0.303	tons	98.02	0.903			
	Zinc plates and sheets		0.011			0.01	kg	0.259	tons	162.84	0.465			
	Lead		0.001			0.02	kg	0.253	tons	88.24	0.837			
	Lead plates		0.022			0.00	kg	0.265	tons	133.20	0.579			
	Lead tubing		0.021			0.00	kg	0.273	tons	145.91	0.545			
	Aluminum products		0.098			0.05	kg	1.507	pounds	0.35	0.573			
	Tin		0.038			0.00	kg	3.617	tons	987.77	1.068			
Metal products		0.286			0.494							0.821	0.717	0.767
	Cast-iron pipe fitting		0.241			0.14	kg	0.089	2000 pounds	47.53	0.544			
	Nails, brads, and spikes		0.248			0.12	casks	7.097	kegs	3.20	0.647			
	Timplate		0.511			0.74	kg	0.310	pounds	0.05	0.900			
<b>Machinery, including transportation equipment</b>	0.135			0.177								0.963	0.363	0.591
Engines and turbines	0.148			0.042								0.777	0.560	0.660
	Steam engines		0.056			0.08	numbers	7774.67	numbers	3117.31	0.727			
	Steam turbines		0.532			0.65	numbers	56423	numbers	5178.39	1.000			
	Internal combustion engines (General gasoline)		0.334			0.06	numbers	186.070	numbers	137.29	0.395			
	Water wheels and water turbines		0.078			0.22	numbers	12432	numbers	15466.3	0.234			
Electric Machinery		0.412			0.404							0.872	0.206	0.424
	Power transformers		0.612			0.14	numbers	68.758	numbers	144.10	0.139			
	Fans		0.028			0.06	numbers	20.111	numbers	4.83	1.213			
	Storage batteries		0.046			0.58	numbers	14.572	numbers	4.09	1.039			
	Dry batteries		0.257			0.14	numbers	0.120	numbers	0.03	1.053			
	Elevators, winding machines		0.057			0.08	numbers	2914	numbers	2034.48	0.418			
Transportation equipment		0.440			0.554							1.043	0.891	0.964
	Steam-railroad cars		0.121			0.28	numbers	63050	numbers	2828.70	1.000			
	Electric-railroad cars		0.005			0.04	numbers	16588	numbers	14119.4	0.343			
	Motor vehicles		0.386			0.15	numbers	2588	numbers	331.38	2.277			
	Bicycles		0.012			0.13	numbers	24.768	numbers	18.36	0.393			
	Steel ships		0.451			0.26	numbers	249187	numbers	123932	0.586			
	Wooden ships, etc		0.025			0.14	numbers	2018.25	numbers	402.33	1.463			
<b>Miscellaneous industries</b>	0.035			0.058								0.210	0.159	0.183
Hats	0.732			0.711								0.151	0.149	0.150
	Felt hats		0.893			0.81	doz.	6.418	doz.	12.76	0.147			
	Straw hats		0.107			0.19	doz.	3.634	doz.	6.22	0.170			
Pens and pencils		0.268			0.289							0.356	0.198	0.265
	Pens		0.341			0.51	doz.	12.247	gross	77.70	0.551			
	Pencils		0.659			0.49	doz.	0.071	gross	1.67	0.149			

Sources: See the data section. Notes: \*1 ton = 2240 pounds.

TABLE A3: CALCULATION OF KOREAN PRICE LEVEL RELATIVE TO JAPAN IN 1935 (JAPAN = 1)

	Japanese weight			Korean weight			Units	Prices		Korean/ Japanese	Korean price level		
	I	II	III	I	II	III		Japanese	Korean		Japanese weight	Korean weight	Fisher average
All industries											1.021	0.764	0.884
Food and kindred products	0.108			0.549							0.959	0.737	0.841
Liquors		0.436			0.615						0.996	0.707	0.839
			0.653		0.234		100/	38.658	39.768	1.029			
			0.022		0.000		100/	56.290	37.161	0.660			
			0.085		0.628		100/	40.057	23.811	0.594			
			0.235		0.131		100/	46.599	50.555	1.085			
			0.005		0.006		100/	42.540	34.766	0.817			
Soy Sauce		0.070	1.000		0.003	1.000	100/	13.815	1.125	0.081	0.081	0.081	0.081
Miso (bean paste)		0.021	1.000		0.015	1.000	kg	0.103	0.141	1.368	1.368	1.368	1.368
Vinegar		0.002	1.000		0.001	1.000	100/	7.596	18.622	2.452	2.452	2.452	2.452
Sake lees		0.007	1.000		0.009	1.000	kg	0.087	0.012	0.136	0.136	0.136	0.136
Flours		0.178			0.110						1.035	1.035	1.035
			1.000		1.000		kg	0.152	0.157	1.035			
Starch		0.014			0.030						1.637	1.637	1.637
			1.000		1.000		kg	0.147	0.240	1.637			
Sugar		0.153			0.135						0.858	0.858	0.858
			1.000		1.000		kg	0.239	0.205	0.858			
Food cans		0.050			0.038						1.571	1.099	1.314
			0.104		0.032		kg	0.903	1.557	1.723			
			0.001		0.005		kg	0.331	1.181	3.568			
			0.059		0.094		kg	0.363	0.275	0.759			
			0.045		0.001		kg	0.349	0.556	1.591			
			0.208		0.226		kg	0.203	0.835	4.123			
			0.009		0.066		kg	0.635	2.045	3.220			
			0.278		0.482		kg	1.113	0.993	0.892			
			0.148		0.001		kg	0.379	0.104	0.275			
			0.146		0.094		kg	0.327	0.208	0.635			
Seafood		0.033			0.028						0.733	0.633	0.681
			0.401		0.900		kg	0.046	0.028	0.619			
			0.426		0.071		kg	2.592	2.280	0.879			
			0.172		0.029		kg	1.109	0.704	0.634			
Tea		0.018			0.000						1.305	1.211	1.257
			0.897		0.828		kg	0.524	0.585	1.117			
			0.055		0.074		kg	0.322	0.368	1.140			
			0.049		0.098		kg	0.533	2.636	4.942			
Ice made		0.013	1.000		0.008	1.000	ton	6.306	6.913	1.096	1.096	1.096	1.096
Noodles		0.006	1.000		0.009	1.000	kg	0.162	0.175	1.080	1.080	1.080	1.080
Textile and their products	0.310			0.119							1.360	1.104	1.225
Yarn		0.225			0.192						0.930	0.931	0.931
			0.946		0.964		kg	11.352	10.453	0.921			
			0.023		0.001		kg	7.423	5.488	0.739			
			0.030		0.035		kg	2.409	3.269	1.357			
Spun silk		0.098			0.212						0.800	0.814	0.807
			0.973		0.998		kg	1.247	1.015	0.815			
			0.010		0.002		kg	1.093	0.534	0.489			
			0.016		0.000		kg	0.998	0.114	0.114			
		0.025			0.009						2.721	3.752	3.195
			0.490		0.049		kg	1.275	1.304	1.023			
			0.510		0.951		kg	1.265	5.506	4.353			



	Japanese weight			Korean weight			Units	Prices		Korean/ Japanese	Korean price level		
	I	II	III	I	II	III		Japanese	Korean		Japanese weight	Korean weight	Fisher average
Fabrics		0.605		0.331							1.437	1.313	1.374
Cotton	Shirting		0.400		0.095		m	0.158	0.178	1.125			
	Sheeting		0.089		0.848		m	0.161	0.210	1.309			
	Ogura sheeting		0.039		0.000		m	0.283	0.526	1.857			
	Miscellaneous wide cotton fabrics		0.068		0.004		m	0.145	0.421	2.910			
	Canvas		0.029		0.006		m	0.432	0.517	1.197			
	White cotton cloth		0.043		0.000		tan	0.526	1.351	2.568			
	Stripe cotton cloth		0.023		0.000		tan	0.953	1.361	1.429			
	Woven color cotton		0.006		0.004		tan	0.948	1.153	1.216			
	Towel s		0.025		0.000		dozen	1.071	0.800	0.747			
Spun silk fabrics			0.011		0.002		m	0.300	0.363	1.211			
	Miscellaneous silk fabrics		0.001		0.000		m	0.221	0.259	1.168			
	Narrow silk crepes		0.113		0.000		tan	7.418	9.000	1.213			
	habutae silk		0.023		0.001		tan	5.183	4.615	0.890			
	Raw woven silk gauze and gossamer		0.007		0.001		tan	6.230	3.061	0.491			
	Meisen fabric		0.036		0.000		tan	4.462	8.333	1.868			
	Shaku Miscellaneous		0.013		0.000		tan	8.390	2.449	0.292			
	Japanese-style apparel												
	Hakama		0.005		0.000		tan	7.760	2.809	0.362			
	Flat silk		0.000		0.001		tan	3.339	3.727	1.116			
	Miscellaneous narrow raw silk and white silk fabrics		0.007		0.003		tan	2.991	3.424	1.145			
Silk-cotton mixed fabrics			0.004		0.002		tan	2.610	2.059	0.789			
Hard and bast fiber fabrics			0.002		0.001		tan	2.142	4.476	2.090			
	Stripe flax fabrics		0.001		0.000		tan	2.965	4.000	1.349			
Rayon fabrics			0.040		0.014		m	0.153	0.327	2.133			
	shaku		0.014		0.000		tan	1.895	4.000	2.111			
Rayon filament mixed fabrics			0.001		0.011		m	0.175	1.916	10.933			
Hosiery		0.033		0.043							3.369	0.848	1.690
	Cotton textile underwear		0.364		0.024		dozen	1.195	8.554	7.157			
	Woolen, woolen-cotton mixed underwear		0.193		0.007		dozen	15.619	24.443	1.565			
	Cotton socks		0.268		0.906		dozen	1.463	1.203	0.822			
	Woolen, woolen-cotton mixed socks		0.092		0.001		dozen	3.566	3.704	1.039			
	Cotton gloves		0.041		0.063		dozen	1.088	1.000	0.919			
	Woolen, woolen-cotton mixed gloves		0.042		0.000		dozen	2.326	6.000	2.579			
Floss silks		0.000	1.000		0.000	1.000	kg	1.150	4.403	3.828	3.828	3.828	3.828
Wadding		0.014	1.000		0.213	1.000	kg	0.592	0.942	1.592	1.592	1.592	1.592
Wood & allied products		0.023		0.024							0.715	0.697	0.706
Wage		0.3		0.3							0.900	0.900	0.900
	Wage for Carpenter		1.000		1.000		daily	2.000	1.800	0.900	0.635	0.635	0.635
Wood	Firewood	0.7	1.000	0.7	1.000	1.000	10kg	26.600	16.900	0.635	0.635	0.635	0.635
Paper, printing & publishing		0.041		0.028							1.545	1.032	1.263
Paper		0.500		0.280							2.090	1.124	1.533
	printing paper		0.377		0.001		kg	0.207	0.903	4.354			
	writing paper a		0.575		0.119		10 pieces	7.400	5.000	0.676			
	wrapping paper		0.048		0.880		kg	0.220	0.271	1.234			
Printing		0.500		0.720							1.000	1.000	1.000

	Japanese weight			Korean weight			Units	Prices		Korean/ Japanese	Korean price level				
	I	II	III	I	II	III		Japanese	Korean		Japanese weight	Korean weight	Fisher average		
	<i>Newspaper b</i>														
Chemicals and allied products	0.147		1.000		0.187		1.000	1 issue	5.000	5.000	1.000		0.733	0.691	0.712
Chemicals		0.253			0.141								0.374	0.277	0.322
			0.107			0.288	ton	14.952	14.157	0.947					
			0.161			0.001	ton	149.906	34.719	0.232					
			0.001			0.001	kg	8.887	7.229	0.813					
			0.042			0.019	m3	0.221	0.003	0.013					
			0.006			0.015	kg	0.336	0.080	0.238					
			0.154			0.462	kg	0.223	0.069	0.308					
			0.006			0.040	ton	0.360	0.273	0.757					
			0.005			0.002	ton	0.085	0.028	0.331					
			0.004			0.002	kg	0.756	1.050	1.388					
			0.039			0.141	kg	0.991	1.295	1.308					
			0.001			0.000	ton	81.551	80.000	0.981					
			0.474			0.028	kg	1.626	0.417	0.256					
Synthetic dyes		0.027			0.001								0.579	0.579	0.579
			1.000			1.000	kg	3.567	2.067	0.579					
Paints		0.027			0.000								0.880	0.922	0.901
			0.017			0.278	kg	0.783	0.833	1.065					
			0.983			0.722	dozen	1.236	1.083	0.877					
Soap		0.044			0.009								0.787	0.820	0.803
			0.459			0.036	dozen	0.837	0.769	0.920					
			0.070			0.005	kg	0.242	0.170	0.703					
			0.373			0.958	kg	0.189	0.157	0.831					
			0.097			0.001	kg	0.225	0.012	0.051					
Oil		0.099			0.024								0.890	0.997	0.942
			0.067			0.147	ton	25.184	19.567	0.777					
			0.060			0.136	ton	234.376	173.509	0.740					
			0.005			0.000	ton	349.728	299.250	0.856					
			0.030			0.003	ton	50.867	49.914	0.981					
			0.481			0.008	ton	113.223	79.414	0.701					
			0.072			0.054	ton	59.976	84.009	1.401					
			0.132			0.191	ton	91.928	110.240	1.199					
			0.068			0.058	ton	29.044	34.999	1.205					
			0.038			0.050	ton	294.822	141.370	0.480					
			0.022			0.080	ton	15.878	20.986	1.322					
			0.026			0.274	ton	48.741	64.780	1.329					
Vegetable oils		0.062			0.017								0.930	0.978	0.954
			0.080			0.060	kg	0.508	0.663	1.304					
			0.186			0.603	kg	0.339	0.324	0.955					
			0.439			0.336	kg	0.356	0.348	0.978					
			0.295			0.001	kg	0.503	0.372	0.740					
Animal oils and fats		0.011			0.108								1.076	1.293	1.179
			0.085			0.992	kg	0.133	0.172	1.294					
			0.093			0.001	kg	0.159	0.090	0.566					
			0.530			0.007	kg	0.185	0.259	1.404					
			0.018			0.000	kg	0.194	0.153	0.789					
			0.273			0.000	kg	0.406	0.229	0.565					

	Japanese weight			Korean weight			Units	Prices		Korean/ Japanese	Korean price level		
	I	II	III	I	II	III		Japanese	Korean		Japanese weight	Korean weight	Fisher average
Candles		0.004	1.000		0.002	1.000	kg	0.466	0.562	1.207	1.207	1.207	1.207
Processed oil		0.027			0.121						0.946	0.950	0.948
Hydrogenated oils			0.770			0.806	ton	0.234	0.233	0.996			
Hydrogenated wax			0.010			0.071	kg	0.287	0.240	0.835			
Stearin			0.220			0.123	kg	0.302	0.235	0.777			
Rubbers		0.104			0.095						0.614	0.614	0.614
	Miscellaneous Rubber shoes		1.000			1.000		0.525	0.322	0.614			
Fertilizers		0.219			0.418						0.918	0.970	0.943
	Soybean cakes		0.140			0.021	ton	80.573	75.817	0.941			
	Fish scraps		0.015			0.160	ton	0.083	0.069	0.838			
	Pupa cakes		0.004			0.001	ton	0.076	0.053	0.699			
	Bone meal		0.012			0.001	ton	75.087	71.143	0.947			
	Super-phosphate		0.348			0.028	ton	31.212	30.581	0.980			
	Ammonium phosphate		0.000			0.164	ton	41.036	98.835	2.409			
	ammonium sulfate		0.481			0.625	ton	93.520	81.304	0.869			
Leather		0.027			0.012						1.643	1.421	1.528
	Cattle leather		0.523			0.365	sheets	7.660	15.598	2.036			
	Sole leather		0.477			0.635	sheets	24.828	30.071	1.211			
Gelatin and glue		0.006			0.000						1.060	1.060	1.060
	Gelatin and glue		1.000			1.000	kg	0.428	0.453	1.060			
Others		0.087			0.051						0.673	0.671	0.672
	cokes												
	Miscellaneous		0.672			0.673	ton	17.417	12.163	0.698			
	Briquettes and briquette balls		0.328			0.327	ton	20.753	12.912	0.622			
Stone, clay and glass products		0.026			0.025						1.151	0.841	0.984
Clay		0.237			0.065						1.385	1.385	1.385
	Clay pipes		1.000			1.000	numbers	0.186	0.258	1.385			
Glass		0.046			0.033						1.104	1.104	1.104
	Shade, globes		1.000			1.000	dozen	0.061	0.067	1.104			
Bricks		0.065			0.083						0.913	1.036	0.972
	Building brick		0.250			0.822	numbers	0.014	0.015	1.085			
	Fire bricks		0.750			0.178	numbers	0.071	0.060	0.856			
Tiles		0.023			0.016						0.766	0.760	0.763
	Smoked roofing tile		0.790			0.992	numbers	0.043	0.033	0.759			
	Miscellaneous roofing tiles		0.210			0.008	numbers	0.051	0.040	0.791			
Cement (including Portland cement)		0.479			0.637						1.087	1.087	1.087
Cement products		0.046			0.057						0.354	0.161	0.239
	Cement Tiles		0.142			0.513		0.047	0.057	1.207			
	Cement pipes		0.576			0.198		1.481	0.430	0.290			
	Cement slates		0.282			0.289		1.419	0.080	0.056			
Lime		0.028			0.020			6.997	8.285	1.184	1.184	1.184	1.184
Enameled iron		0.077			0.089						1.630	1.630	1.630
	Tableware		1.000			1.000		0.082	0.134	1.630			
Metal and metal products		0.174			0.035						0.783	0.760	0.771
Metals		1.000			1.000						0.783	0.760	0.771
	Pig Iron		0.076			0.415	ton	35.956	27.389	0.762			
	S t e e l (cast)		0.295			0.348	ton	57.939	51.182	0.883			
	Steel (Miscellaneous sheets)		0.163			0.167	ton	0.108	0.063	0.579			
	Steel (Miscellaneous )		0.466			0.069	ton	0.092	0.073	0.794			

	Japanese weight			Korean weight			Units	Prices		Korean/ Japanese	Korean price level		
	I	II	III	I	II	III		Japanese	Korean		Japanese weight	Korean weight	Fisher average
<b>Machinery, including transportation</b>	<b>0.135</b>			<b>0.015</b>							<b>0.648</b>	<b>0.433</b>	<b>0.530</b>
Boilers		0.108			0.005						0.058	0.041	0.048
			0.797		0.368		numbers	55025.596	928.571	0.017			
			0.203		0.632		numbers	2047.217	447.200	0.218			
Engines and turbines		0.216			0.063						0.983	0.750	0.858
			0.045		0.019		numbers	7774.674	666.667	0.086			
			0.002		0.007		numbers	3090.000	1500.000	0.485			
			0.266		0.904		numbers	186.070	529.308	2.845			
			0.626		0.067		numbers	3623.782	1286.364	0.355			
			0.062		0.002		numbers	12431.677	50.000	0.004		1.000	0.000
Elevators		0.006	1.000		0.000	1.000	numbers	2913.606	40.000	0.014	0.014	0.014	0.014
Winding machines		0.078			0.019						0.031	0.031	0.031
			1.000			1.000	numbers	9607.574	293.423	0.031			
Pumps		0.004	1.000		0.006	1.000	numbers	1121.285	40.828	0.036	0.036	0.036	0.036
Blowers		0.012	1.000		0.001	1.000	numbers	316.427	2.618	0.008	0.008	0.008	0.008
Measures		0.033			0.105						1.019	1.077	1.048
			0.181		0.063		numbers	0.123	0.103	0.837			
			0.099		0.285		numbers	0.852	1.128	1.324			
			0.720		0.652		numbers	2.658	2.718	1.023			
General lighting bulbs											0.155	0.155	0.155
		0.063	1.000		0.004	1.000	numbers	0.065	0.010	0.155			
Railroad cars and locomotives		0.159	1.000		0.487						0.794	0.823	0.808
				0.509		0.023	numbers	63050.548	43640.000	0.692			
				0.050		0.040	numbers	6346.336	13333.333	2.101			
			0.442		0.890		numbers	3952.248	3023.548	0.765			
Motor vehicles		0.023	1.000		0.128	1.000	numbers	829.996	452.912	0.546	0.546	0.546	0.546
Bicycles		0.007	1.000		0.006	1.000	numbers	24.768	19.764	0.798	0.798	0.798	0.798
Miscellaneous cars		0.016			0.021		numbers				1.514	1.514	1.514
			1.000			1.000	numbers	20.566	31.131	1.514			
Ships		0.273			0.154						0.817	0.817	0.817
			1.000			1.000	numbers	2018.251	1648.333	0.817			
<b>Miscellaneous industries</b>	<b>0.035</b>			<b>0.017</b>							<b>1.536</b>	<b>1.484</b>	<b>1.510</b>
Tatami matting		0.002	1.000		0.001	1.000	sheets	0.676	0.800	1.183	1.183	1.183	1.183
Straw products		0.064			0.101						3.336	3.336	3.336
			1.000			1.000	sheets	0.684	2.283	3.336			
Leather products		0.437			0.707						2.296	2.290	2.293
			0.916		0.926		numbers	2.800	6.348	2.267			
			0.084		0.074		numbers	2.776	7.263	2.616			
Brushes		0.063			0.022						0.872	0.872	0.872
			1.000			1.000	dozen	1.132	0.988	0.872			
Hats		0.414			0.168						0.548	0.545	0.546
			0.357		0.216		dozen	2.624	1.476	0.562			
			0.643		0.784		dozen	3.634	1.962	0.540			
Japanese-style umbrellas		0.020	1.000		0.001	1.000		0.400	0.680	1.701	1.701	1.701	1.701

Sources: See the data section.

## Center for Economic Institutions Working Paper Series

- 2000-1 Jean Tirole, "Corporate Governance," January 2000.
- 2000-2 Kenneth A. Kim and S. Ghon Rhee, "A Note on Shareholder Oversight and the Regulatory Environment: The Japanese Banking Experience," January 2000.
- 2000-3 S. Ghon Rhee, "Further Reforms after the "BIG BANG": The Japanese Government Bond Market," June 2000.
- 2000-4 Stijn Claessens, Simeon Djankov<sup>^</sup>, Joseph Fan, and Larry Lang, "Expropriation of Minority Shareholders in East Asia," July 2000.
- 2000-5 Stijn Claessens, Simeon Djankov<sup>^</sup>, Joseph Fan, and Larry Lang, "The Costs of Group Affiliation: Evidence from East Asia," July 2000.
- 
- 2001-1 Masaharu Hanazaki and Akie Takeuchi, "An International Comparison of Corporate Investment Behavior -Some Implications for the Governance Structure in Japan-," February 2001.
- 2001-2 Katsuyuki Kubo, "The Determinants of Executive Compensation in Japan and the UK: Agency Hypothesis or Joint Determination Hypothesis?" February 2001.
- 2001-3 Katsuyuki Kubo, "Changes in Directors' Incentive Plans and the Performance of Firms in the UK," March 2001.
- 2001-4 Yupana Wiwattanakantang, "Controlling Shareholders and Corporate Value: Evidence from Thailand," March 2001.
- 2001-5 Katsuyuki Kubo, "The Effect of Managerial Ownership on Firm Performance: Case in Japan," March 2001.
- 2001-6 Didier Guillot and James R. Lincoln, "The Permeability of Network Boundaries: Strategic Alliances in the Japanese Electronics Industry in the 1990s," March 2001.
- 2001-7 Naohito Abe, "Ageing and its Macroeconomic Implications-A Case in Japan-," May 2001.
- 2001-8 Yupana Wiwattanakantang, "The Equity Ownership Structure of Thai Firms," July 2001.
- 2001-9 Megumi Suto, "Capital Structure and Investment Behaviour of Malaysian Firms in the 1990s--A study of Corporate Governance before the Crisis--," August 2001.
- 2001-10 Naohito Abe, Noel Gaston, and Katsuyuki Kubo, "Executive Pay in Japan : The Role of Bank-Appointed Monitors and the Main Bank Relationship," September 2001.
- 2001-11 Colin Mayer, "The Financing and Governance of New Technologies," September 2001.
- 2001-12 Masaharu Hanazaki and Akiyoshi Horiuchi, "Can the Financial Restraint Hypothesis Explain Japan's Postwar Experience?" September 2001.
- 2001-13 Shin-ichi Fukuda, "The Role of Long-term Loans for Economic Development: Empirical Evidence in Japan, Korea, and Taiwan," September 2001.

- 2001-14 S. Ghon Rhee, "Further Reforms of the JGB Market for the Promotion of Regional Bond Markets," September 2001.
- 2001-15 Stijn Claessens, Simeon Djankov, Joseph P. H. Fan, and Larry H. P. Lang, "The Benefits and Costs of Internal Markets: Evidence from Asia's Financial Crisis," September 2001.
- 2001-16 Kenneth A. Kim and John R. Nofsinger, "Institutional Herding, Business Groups, and Economic Regimes: Evidence from Japan," September 2001.
- 2001-17 Mitsuhiro Fukao, "Financial Deregulations, Weakness of Market Discipline, and Market Development: Japan's Experience and Lessons for Developing Countries," September 2001.
- 2001-18 Akio Kuroda and Koichi Hamada, "Towards an Incentive Compatible Financial System: Accounting and Managing the Non-Performing Loans," September 2001.
- 2001-19 Randall Morck and Bernard Yeung, "Japanese Economic Success and the Curious Characteristics of Japanese Stock Prices," September 2001.
- 2001-20 Miguel A. García-Cestona, "Ownership Structure, Banks and the Role of Stakeholders: The Spanish Case," September 2001.
- 2001-21 Joseph P. H. Fan and T. J. Wong, "Corporate Ownership Structure and the Informativeness of Accounting Earnings in East Asia," September 2001.
- 2001-22 Heather Montgomery, "The Effect of the Basel Accord on Bank Lending in Japan," September 2001.
- 2001-23 Naoyuki Yoshino, Sahoko Kaji, and Ayako Suzuki, "The Basket-peg, Dollar-peg and Floating---A Comparative Analysis of Exchange Rate Regimes," September 2001.
- 2001-24 Colin Mayer, Koen Schoors, and Yishay Yafeh, "Sources of Funds and Investment Strategies of Venture Capital Funds: Evidence from Germany, Israel, Japan and the UK," September 2001.
- 2001-25 Yukinobu Kitamura, Megumi Suto, and Juro Teranishi, "Towards a New Architecture for the Japanese Financial System: Participation Costs, Intermediated Ownership and Wealth Distribution," September 2001.

- 
- 2002-1 Evgeni Peev, "The Political Economy of Corporate Governance Change in Bulgaria: Washington Consensus, Primitive Accumulation of Capital, and Catching-Up in the 1990," March 2002.
- 2002-2 Naohito Abe, "Saving, Capital Flows, and the Symmetric International Spillover of Industrial Policies," June 2002.
- 2002-3 Masaharu Hanazaki and Akiyoshi Horiuchi, "A Review of Japan's Bank Crisis from the Governance Perspective," July 2002.
- 2002-4 Chutathong Charumirind, Raja Kali and Yupana Wiwattanakantang, "Crony Lending: Thailand before the Financial Crisis," September 2002.
- 2002-5 Maitreesh Ghatak and Raja Kali, "Financially Interlinked Business Groups," September 2002.
- 2002-6 Tarun Khanna, Joe Kogan, and Krishna Palepu, "Globalization and Similarities in Corporate

- Governance: A Cross-Country Analysis,” September 2002.
- 2002-7 Chongwoo Choe, “Delegated Contracting and Corporate Hierarchies,” September 2002.
- 2002-8 Tarun Khanna and Yishay Yafeh, “Business Groups and Risk Sharing around the World,” September 2002.
- 2002-9 Yitae Kim, Kwangwoo Park, Ronald A. Ratti, and Hyun-Han Shin, “Do Main Banks Extract Rents from their Client Firms? Evidence from Korean Chaebol,” September 2002.
- 2002-10 Armen Hovakimian, Edward J. Kane and Luc Laeven, “How Country and Safety-Net Characteristics Affect Bank Risk-Shifting,” September 2002.
- 2002-11 Vidhan K. Goyal and Takeshi Yamada, “Asset Price Shocks, Financial Constraint, and Investment: Evidence from Japan,” September 2002.
- 2002-12 Clive S. Lennox, “Opinion Shopping and Audit Committees,” September 2002.
- 2002-13 Seki Obata, “Pyramid Business Groups in East Asia: Insurance or Tunneling? ,” September 2002.
- 2002-14 Ishtiaq Pasha Mahmood and Will Mitchell, “Two Faces: Effects of Business Groups on Innovation in Emerging Economies,” September 2002.
- 2002-15 Kwangwoo Park, “Foreign Ownership and Firm Value in Japan,” September 2002.
- 2002-16 Adrian van Rixtel, Yupana Wiwattanakantang, Toshiyuki Souma, and Kazunori Suzuki, “Banking in Japan: Will “To Big To Fail” Prevail?” December 2002.
- 2002-17 Stijn Claessens and Leora F. Klapper, “Bankruptcy around the World: Explanations of its Relative Use,” December 2002.
- 
- 2003-1 Anya Khanthavit, Piruna Polsiri, and Yupana Wiwattanakantang, “Did Families Lose or Gain Control after the East Asian Financial Crisis?” February 2003.
- 2003-2 Hidenobu Okuda, Hidetoshi Hashimoto, and Michiko Murakami, “The Estimation of Stochastic Cost Functions of Malaysian Commercial Banks and Its Policy Implications to Bank Restructuring,” February 2003.
- 2003-3 Masaharu Hanazaki and Liuqun, “Asian Crisis and Corporate Governance, (in Japanese)” March 2003.
- 2003-4 Fukuju Yamazaki and Hiroyuki Seshita, ”Economic Analysis of Bankruptcy law in Japan, (in Japanese)” February 2003.
- 2003-5 Hirofumi Uchida and Hiroshi Osano, “Bank Monitoring and Corporate Governance in Japan, (in Japanese)” March 2003.
- 2003-6 Fukunari Kimura and Kozo Kiyota, “Foreign Ownership and Corporate Performance: Evidence from Japanese Micro Data, (in Japanese)” March 2003.
- 2003-7 Yukinobu Kitamura, “Corporate Profit and Debt- Panel Data Analysis of The Japanese Firms in the 1990s, (in Japanese)” March 2003.
- 2003-8 Chaiyasit Aunchitworawong, Toshiyuki Soma, and Yupana Wiwattanakantang, "Do Families Control Banks Prevail after the East Asia Financial Crisis? Evidence from

- Thailand" March 2003.
- 2003-9 Junko Maru, Yasuhiro Yonezawa and Yuki Matsumoto, "Corporate Governance by Foreign Investors in East Asia Corporations (in Japanese)" March 2003.
- 2003-10 Sui Qing-yuan, "Declining Firm's Dependence upon Bank Borrowing and Corporate Performance (in Japanese)" March 2003.
- 2003-11 Katsumi Matsuura, "Changes in Ownership Structures and Their Impacts upon Corporate Performance in Japan (in Japanese)" March 2003.
- 2003-12 Kathy S. He, Randall Morck and Bernard Yeung, "Corporate Stability and Economic Growth," May 2003.
- 2003-13 Robert Dekle and Heajin Ryoo, "Exchange Rate Fluctuations, Financing Constraints, Hedging, and Exports: Evidence from Firm Level Data," June 2003.
- 2003-14 Tsun-Siou Lee, Yin-Hua Yeh and Rong-Tze Liu, "Can Corporate Governance Variables Enhance the Prediction Power of Accounting-Based Financial Distress Prediction Models?," June 2003.
- 2003-15 Hideaki Miyajima and Yishay Yafeh, "Japan's Banking Crisis: Who has the Most to Lose?," June 2003.
- 2003-16 Guifen Pei, "Asset Management Companies in China," June 2003.
- 2003-17 Takeshi Nagase, "The Governance Structure of IPO Firm in Japan," July 2003.
- 2003-18 Masaharu Hanazaki and Qun Liu, "The Asian Crisis and Corporate Governance — Ownership Structure, Debt Financing, and Corporate Diversification —," July 2003.
- 2003-19 Chutatong Charumilind, Raja Kali and Yupana Wiwattanakantang, "Connected Lending: Thailand before the Financial Crisis," July 2003.
- 2003-20 Gilles Hilary and Tomoki Oshika, "Shareholder activism in Japan: social pressure, private cost and organized crime," August 2003.
- 2003-21 Sanghoon Ahn, "Technology Upgrading with Learning Cost," September 2003.
- 2003-22 Masaharu Hanazaki and Akiyoshi Horiuchi, "Have Banks Contributed to Efficient Management in Japan's Manufacturing?," November 2003.
- 2003-23 Chongwoo Choe and In-Uck Park, "Delegated Contracting and Corporate Hierarchies," November 2003.
- 2003-24 Bruno Dallago, "Comparative Economic Systems and the New Comparative Economics: Foes, Competitors, or Complementary?," November 2003.
- 2003-25 Adrian van Rixtel, Ioana Alexopoulou and Kimie Harada, "The New Basel Capital Accord and Its Impact on Japanese Banking: A Qualitative Analysis," November 2003.
- 
- 2004-1 Masaharu Hanazaki, Toshiyuki Souma and Yupana Wiwattanakantang, "Silent Large Shareholders and Entrenched Bank Management: Evidence from Banking Crisis in Japan," January 2004.
- 2004-2 Ming Ming Chiu and Sung Wook Joh, "Bank Loans to Distressed Firms: Cronyism, bank



- 2004-3 Keun Lee, Keunkwan Ryu and Jungmo Yoon, "Corporate Governance and Long Term Performance of the Business Groups: The Case of Chaebols in Korea," January 2004.
- 2004-4 Randall Morck and Masao Nakamura, "Been There, Done That –The History of Corporate Ownership in Japan," March 2004.
- 2004-5 Dong-Hua Chen, Joseph P. H. Fan and T. J. Wong, "Politically-connected CEOs, Corporate Governance and Post-IPO Performance of China's Partially Privatized Firms," March 2004.
- 2004-6 Jae-Seung Baek, Jun-Koo Kang and Inmoo Lee, "Business Groups and Tunneling: Evidence from Private Securities Offerings by Korean Chaebols," March 2004.
- 2004-7 E. Han Kim, "To Steal or Not to Steal: Firm Attributes, Legal Environment, and Valuation," March 2004.
- 2004-8 Yin-Hua Yeh and Tracie Woidtke, "Commitment or Entrenchment?: Controlling Shareholders and Board Composition," June 2004.
- 2004-9 Hugh Patrick, "Thoughts on Evolving Corporate Governance in Japan," June 2004.
- 2004-10 Utpal Bhattacharya and Hazem Daouk, "When No Law is Better than a Good Law", June 2004.
- 2004-11 Sanghoon Ahn, Utpal Bhattacharya, Taehun Jung and Giseok Nam, "Do Japanese CEOs Matter?", June 2004.
- 2004-12 Megumi Suto and Masashi Toshino, "Behavioural Biases of Japanese Institutional Investors; Fund management and Corporate Governance", July 2004.
- 2004-13 Piruna Polsiri and Yupana Wiwattanakantang, "Business Groups in Thailand: Before and after the East Asian Financial Crisis", August 2004.
- 2004-14 Fumiharu Mieno, "Fund Mobilization and Investment Behavior in Thai Manufacturing Firms in the Early 1990s", August 2004.
- 2004-15 Chaiyasit Anuchitworawong, "Deposit Insurance, Corporate Governance and Discretionary Behavior: Evidence from Thai Financial Institutions", September 2004.
- 2004-16 Chaiyasit Anuchitworawong, "Financial fragility under implicit insurance scheme: Evidence from the collapse of Thai financial institutions", September 2004.
- 2004-17 Chaiyasit Anuchitworawong, "Ownership-based Incentives, Internal Corporate Risk and Firm Performance", September 2004.
- 2004-18 Jack Ochs and In-Uck Park, "Overcoming the Coordination Problem: Dynamic Formation of Networks", September 2004.
- 2004-19 Hidenobu Okuda and Suvadee Rungsomboon, "Comparative Cost Study of Foreign and Thai Domestic Banks 1990–2002: Estimating Cost Functions of the Thai Banking Industry," February 2005.
- 2004-20 Hidenobu Okuda and Suvadee Rungsomboon, "The Effects of Foreign Bank Entry on the Thai Banking Market: Empirical Analysis from 1990 to 2002," March 2005.

- 2004-21 Juro Teranishi, "Investor Right in Historical Perspective: Globalization and the Future of the Japanese Firm and Financial System," March 2005.
- 2004-22 Kentaro Iwatsubo, "Which Accounts for Real Exchange Rate Fluctuations, Deviations from the Law of One Price or Relative Price of Nontraded Goods?," March 2005.
- 2004-23 Kentaro Iwatsubo and Tomoyuki Ohta, "Causes and effects of exchange rate regimes (in Japanese)," March 2005.
- 2004-24 Kentaro Iwatsubo, "Bank Capital Shocks and Portfolio Risk: Evidence from Japan," March 2005.
- 2004-25 Kentaro Iwatsubo, "On the Bank-led Rescues Financially Distressed Firms in Japan," March 2005.

- 
- 2005-1 Yishay P. Yafeh and Tarun Khanna, "Business Groups in Emerging Markets: Paragons or Parasities?," September 2005.
- 2005-2 Renee B. Adams and Daniel Ferreira, "Do Directors Perform for Pay?," September 2005.
- 2005-3 Qun Liu, Shin-ichi Fukuda and Juro Teranishi, "What are Characteristics of Financial Systems in East Asia as a Region?," September 2005.
- 2005-4 Juro Teranishi, "Is the Financial System of Postwar Japan Bank-dominated or Market Based?," September 2005.
- 2005-5 Hasung Jang, Hyung-cheol Kang and Kyung Suh Park, "Determinants of Family Ownership: The Choice between Control and Performance," October 2005.
- 2005-6 Hasung Jang, Hyung-cheol Kang and Kyung Suh Park, "The Choice of Group Structure: Divide and Rule," October 2005.
- 2005-7 Sangwoo Lee, Kwangwoo Park and Hyun-Han Shin, "The Very Dark Side of International Capital Markets: Evidence from Diversified Business Groups in Korea," October 2005.
- 2005-8 Allen N. Berger, Richard J. Rosen and Gregory F. Udell, "Does Market Size Structure Affect Competition? The Case of Small Business Lending," November 2005.
- 2005-9 Aditya Kaul and Stephen Sapp, "Trading Activity and Foreign Exchange Market Quality," November 2005.
- 2005-10 Xin Chang, Sudipto Dasgupta and Gilles Hilary, "The Effect of Auditor Choice on Financing Decisions," December 2005.
- 2005-11 Kentaro Iwatsubo, "Adjustment Speeds of Nominal Exchange Rates and Prices toward Purchasing Power Parity," January 2006.
- 2005-12 Giovanni Barone-Adesi, Robert Engle and Lorian Mancini, "GARCH Options in Incomplete Markets", March 2006.
- 2005-13 Aditya Kaul, Vikas Mehrotra and Blake Phillips, "Ownership, Foreign Listings, and Market Valuation", March 2006.
- 2005-14 Ricard Gil, "Renegotiation, Learning and Relational Contracting", March 2006.
- 2005-15 Randall Morck, "How to Eliminate Pyramidal Business Groups -The Double Taxation of

Inter-corporate Dividends and other Incisive Uses of Tax Policy-”, March 2006.

- 2005-16 Joseph P.H. Fan, T.J. Wong and Tianyu Zhang, “The Emergence of Corporate Pyramids in China”, March 2006.
- 2005-17 Yan Du, Qianqiu Liu and S. Ghon Rhee, “An Anatomy of the Magnet Effect: Evidence from the Korea Stock Exchange High-Frequency Data”, March 2006.
- 2005-18 Kentaro Iwatsubo and Junko Shimizu, “Signaling Effects of Foreign Exchange Interventions and Expectation Heterogeneity among Traders”, March 2006.
- 2005-19 Kentaro Iwatsubo, “Current Account Adjustment and Exchange Rate Pass-Through(in Japanese)”, March 2006.
- 2005-20 Piruna Polsiri and Yupana Wiwattanakantang, “Corporate Governance of Banks in Thailand”, March 2006.
- 
- 2006-1 Hiroyuki Okamuro and Jian Xiong Zhang, “Ownership Structure and R&D Investment of Japanese Start-up Firms,” June 2006.
- 2006-2 Hiroyuki Okamuro, “Determinants of R&D Activities by Start-up Firms: Evidence from Japan,” June 2006.
- 2006-3 Joseph P.H. Fan, T.J. Wong and Tianyu Zhang, “The Emergence of Corporate Pyramids in China,” August 2006.
- 2006-4 Pramuan Bunkanwanicha, Jyoti Gupta and Yupana Wiwattanakantang, “Pyramiding of Family-owned Banks in Emerging Markets,” September 2006.
- 2006-5 Bernardo Bortolotti and Mara Faccio, “Reluctant privatization,” September 2006.
- 2006-6 Jörn Kleinert and Farid Toubal, “Distance costs and Multinationals’ foreign activities”, October 2006.
- 2006-7 Jörn Kleinert and Farid Toubal, “Dissecting FDI”, October 2006.
- 2006-8 Shin-ichi Fukuda and Satoshi Koibuchi, “The Impacts of “Shock Therapy” on Large and Small Clients: Experiences from Two Large Bank Failures in Japan”, October 2006.
- 2006-9 Shin-ichi Fukuda, Munehisa Kasuya and Kentaro Akashi, “The Role of Trade Credit for Small Firms: An Implication from Japan’s Banking Crisis”, October 2006.
- 2006-10 Pramuan Bunkanwanicha and Yupana Wiwattanakantang, “Big Business Owners and Politics: Investigating the Economic Incentives of Holding Top Office”, October 2006.
- 2006-11 Sang Whi Lee, Seung-Woog(Austin) Kwang, Donald J. Mullineaux and Kwangwoo Park, “Agency Conflicts, Financial Distress, and Syndicate Structure: Evidence from Japanese Borrowers”, October 2006.
- 2006-12 Masaharu Hanazaki and Qun Liu, “Corporate Governance and Investment in East Asian Firms -Empirical Analysis of Family-Controlled Firms”, October 2006.
- 2006-13 Kentaro Iwatsubo and Konomi Tonogi, “Foreign Ownership and Firm Value: Identification through Heteroskedasticity (in Japanese)”, December 2006.

- 2006-14 Kentaro Iwatsubo and Kazuyuki Inagaki, “Measuring Financial Market Contagion Using Dually-Traded Stocks of Asian Firms”, December 2006.
- 2006-15 Hun-Chang Lee, “When and how did Japan catch up with Korea? –A comparative study of the pre-industrial economies of Korea and Japan”, February 2007.
- 2006-16 Kyoji Fukao, Keiko Ito, Shigesaburo Kabe, Deqiang Liu and Fumihide Takeuchi, “Are Japanese Firms Failing to Catch up in Localization? An Empirical Analysis Based on Affiliate-level Data of Japanese Firms and a Case Study of the Automobile Industry in China”, February 2007.
- 2006-17 Kyoji Fukao, Young Gak Kim and Hyeog Ug Kwon, “Plant Turnover and TFP Dynamics in Japanese Manufacturing”, February 2007.
- 2006-18 Kyoji Fukao, Keiko Ito, Hyeog Ug Kwon and Miho Takizawa, “Cross-Border Acquisitions and Target Firms' Performance: Evidence from Japanese Firm-Level Data”, February 2007.
- 2006-19 Jordan Siegel and Felix Oberholzer-Gee, “Expropriators or Turnaround Artists? The Role of Controlling Families in South Korea (1985-2003)”, March 2007.
- 2006-20 Francis Kramarz and David Thesmar, “Social Networks in The Boardroom”, March 2007.
- 2006-21 Morten Bennedsen, Francisco Pérez-González and Daniel Wolfenzon, “Do CEOs matter?”, March 2007.
- 
- 2007-1 Ichiro Iwasaki, “Endogenous board formation and its determinants in a transition economy: evidence from Russia\*”, April 2007, Revised on October 2007.
- 2007-2 Joji Tokui, Tomohiko Inui, and Katsuaki Ochiai, “The Impact of Vintage Capital and R&D on Japanese Firms' Productivity”, April 2007.
- 2007-3 Yasuo Nakanishi and Tomohiko Inui, “Deregulation and Productivity in Japanese Industries”, April 2007.
- 2007-4 Kyoji Fukao, “The Performance of Foreign Firms and the Macroeconomic Impact of FDI”, May 2007.
- 2007-5 Taku Suzuki, “The Role of the State in Economic Growth of Post-Communist Transitional Countries”, June 2007.
- 2007-6 Michiel van Leuvensteijn, Jacob A. Bikker, Adrian A.R.J.M. van Rixtel and Christoffer Kok-Sørensen\*, “A new approach to measuring competition in the loan markets of the euro area”, June 2007.
- 2007-7 Sea Jin Chang, Jaiho Chung, and Dean Xu, “FDI and Technology Spillovers in China”, July 2007.
- 2007-8 Fukunari Kimura, “The mechanics of production networks in Southeast Asia: the fragmentation theory approach”, July 2007.
- 2007-9 Kyoji Fukao, Tsutomu Miyagawa, Miho Takizawa, “Productivity Growth and Resource Reallocation in Japan”, November 2007.
- 2007-10 YoungGak Kim, “A Survey on Intangible Capital”, December 2007.

- 2007-11 Sea-Jing Chang and Jay Hyuk Rhee, “Rapid International Expansion Strategy of Emerging Market Enterprises: The Interplay between Speed and Competitive Risks on International performance”, November 2007.
- 2007-12 Ishtiaq Mahmood, Will Mitchell, and Chi-Nien Chung, “The Structure of Intra-Group Ties: Innovation in Taiwanese Business”, January 2008.
- 2007-13 Kyoji Fukao, Tomohiko Inui, Shigesaburo Kabe and Deqiang Liu, “ An International Comparison of the TFP Levels of Japanese, Korean and Chinese Listed Firms“, March 2008.
- 2007-14 Pramuan Bunkanwanicha and Yupana Wiwattanakantang, “Allocating Risk Across Pyramidal Tiers: Evidence from Thai Business Groups”, March 2008.
- 

- 2008-1 Rüdiger Fahlenbrach and René M. Stulz, "Managerial Ownership Dynamics and Firm Value", April 2008.
- 2008-2 Morten Bennesen, Kasper Meisner Nielsen, and, Thomas Vester Nielsen, “Private Contracting and Corporate Governance: Evidence from the Provision of Tag-Along Rights in an Emerging Market”, April 2008.
- 2008-3 Joseph P.H. Fan, Jun Huang, Felix Oberholzer-Gee, and Mengxin Zhao, “Corporate Diversification in China: Causes and Consequences”, April 2008.
- 2008-4 Daniel Ferreira, Miguel A. Ferreira, Clara C. Raposo, “Board Structure and Price Informativeness”, April 2008.
- 2008-5 Nicola Gennaioli and Stefano Rossi, “Judicial Discretion in Corporate Bankruptcy”, April 2008.
- 2008-6 Nicola Gennaioli and Stefano Rossi, “Optimal Resolutions of Financial Distress by Contract”, April 2008.
- 2008-7 Renée B. Adams and Daniel Ferreira, “Women in the Boardroom and Their Impact on Governance and Performance”, April 2008.
- 2008-8 Worawat Margsiri, Antonio S. Melloy, and Martin E. Ruckesz, “A Dynamic Analysis of Growth via Acquisition”, April 2008.
- 2008-9 Pantisa Pavabutra and Sukanya Prangwattananon, “Tick Size Change on the Stock Exchange of Thailand”, April 2008.
- 2008-10 Maria Boutchkova, Hitesh Doshi, Art Durnev, and Alexander Molchanov, “Politics and Volatility”, April 2008.
- 2008-11 Yan-Leung Cheung, P. Raghavendra Rau, and Aris Stouraitis, “The Helping Hand, the Lazy Hand, or the Grabbing Hand? Central vs. Local Government Shareholders in Publicly Listed Firms in China”, April 2008.
- 2008-12 Art Durnev and Larry Fauver, “Stealing from Thieves: Firm Governance and Performance when States are Predatory”, April 2008.
- 2008-13 Kenneth Lehn, Sukesh Patro, and Mengxin Zhao, “Determinants of the Size and Structure of Corporate Boards: 1935-2000”, April 2008.

- 2008-14 Ishtiaq P. Mahmood, Hong-Jin Zhu and Edward J. Zajac, "Where Can Capabilities Come From? How the Content of Network Ties Affects Capability Acquisition", April 2008.
- 2008-15 Vladimir I. Ivanov and Ronald W. Masulis, "Corporate Venture Capital, Strategic Alliances, and the Governance of Newly Public Firms", May 2008.
- 2008-16 Dick Beason, Ken Gordon, Vikas Mehrotra and Akiko Watanabe, "Does Restructuring Pay in Japan? Evidence Following the Lost Decade", July 2008.
- 2008-17 Pramuan Bunkanwanicha and Yupana Wiwattanakantang, "Big Business Owners in Politics", August 2008.
- 2008-18 Lincoln R. James, "Innovation and Change in the Process of Alliance Formation in the Japanese Electronics Industry", February 2009.
- 2008-19 Lincoln R. James, "Strategic Alliances in the Japanese Economy: Types, Critiques, Embeddedness, and Change", February 2009.
- 2008-20 Dick Beason, Ken Gordon, Vikas Mehrotra and Akiko Watanabe, "Does Restructuring Pay in Japan? Evidence Following the Lost Decade", March 2009.
- 2008-21 Andrew Burke and André van Stel, "The Entrepreneurial Adjustment Process in Disequilibrium: Entry and Exit when Markets Under and Over Shoot", January 2009.
- 2008-22 Luca Grilli, "When Things Get Tough Do the Tough Get Going? Founders' Pre-entry Work Experience and High-tech Start-up Survival during an Industry Crisis", March 2009.
- 2008-23 Jolanda Hessels and André van Stel, "Export-Driven New Ventures and Economic Growth", March 2009.
- 2008-24 Chi-Nien Chung, Ishtiaq Mahmood and Will Mitchell, "Political Connections and Business Strategy: The Impact of Types and Destinations of Political Ties on Business Diversification in Closed and Open Political Economic Contexts", November 2007.
- 2008-25 Robert Dekle and Kyoji Fukao, "The Japan-U.S. Exchange Rate, Productivity, and the Competitiveness of Japanese Industries", March 2009.
- 2008-26 Kyoji Fukao, Harry X. Wu and Tangjun Yuan, "Comparative Output and Labour Productivity in Manufacturing for China, Japan, Korea and the United States in Circa 1935 by a Production PPP Approach", December 2008.
- 2008-27 Kyoji Fukao, Tsutomu Miyagawa, Kentaro Mukai, Yukio Shinoda, and Konomi Tonogi, "Intangible Investment in Japan: New Estimates and Contribution to Economic Growth", December 2008.
- 2008-28 Sanghoon Ahn, Kyoji Fukao and Keiko Ito, "The Impact of Outsourcing on the Japanese and South Korean Labor Markets: International Outsourcing of Intermediate Inputs and Assembly in East Asia", October 2008.