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Trade Bloc Formation in Interwar Japan –A Gravity Model Analysis (Forthcoming in Journal of the Japanese and International Economies)

Toshihiro Okubo
Graduate Institute of International Studies

Abstract

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--A Gravity Model Analysis--

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Graduate Institute of International Studies, Geneva

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Correspondence: okubo3@hei.unige.ch Tel +41-22-908-5918 Fax +41-22-733-3049

ABSTRACT.

The purpose of this paper is to discuss the trading system in the interwar period concerning the Japanese Empire by means of border effect analysis in the gravity model. The results show sizeable and steadily increasing trading bloc border effects from the 1910s through the 1930s. This sizeable border effect might have resulted from many possible factors: trade diversion and creation due to increased protectionism and industrialisation in Korea and Formosa, certain political factors, and Japanese migration to Korea and Formosa, which contributed to a 52% increase of bloc border effects in mainland Japan.

JEL Classification: F10, F15, N70. **Keywords**: Trade Blocs; Gravity Model; Bloc Border Effect; Trade Diversion and Creation, Migration.

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1 INTRODUCTION

World War I was a huge shock to the world economy and trading system. Although trade recovered steadily in the 1920s, the trade system had been unstable and gradually turned to protectionism, causing the emergence of a world wide block economy after the Depression. Previous literature has extensively studied the impact of protectionism on the interwar world trade system through quantitative and historical analysis. This paper discusses the interwar period more intensively and more in detail: We aim at providing econometric evidence of the Japanese empire's trade in the interwar period by means of border effect analysis in the gravity model.

To support our discussion, we review briefly the most relevant existing literature and highlight the main issues. Kindleberger (1973), one of the most familiar and excellent studies on world trade during the interwar period, presented a well-known spiral diagram that vividly portrays the shrinkage of world trade that occurred from 1929 to 1933. In dealing with the Depression, it is often said that countries attempted to form bloc economies all over the world through raising their tariff rates and imposing quotas.[1] Protectionism and regionalism in international trade thus became widespread all over the world, causing a sharp contraction of world trade. World trade decreased by 8% due to tariff and by 6% due to non-tariff barriers (Madsen, 2001).[2] Kindleberger

[1] In the British Commonwealth, the Imperial Economic Conference at Ottawa was held in 1932 and the United Kingdom, its dominions and India ratified reciprocal trade agreements and some agreements on tariffs. Macdougall and Hutt (1954) studied the quantitative effect of the Ottawa Agreements. Also, in several European countries import quotas were imposed. By contrast, in the United States, the Smooth-Hawley Tariff Act was passed in 1930, and the Reciprocal Trade Agreements Act was passed in 1934, which promoted bilateral trade agreements with specific countries. (Hiscox, 1999; Bailey, Goldstein and Weingast, 1997)

[2] Madsen (2001) showed that world trade decreased by 14% due to the decrease in income. Crucini and Kahn (1999) suggested that, even if the share of trade was small, the increases in tariff rates had a significantly negative impact on GDP in the 1930s.

also drew attention to the rise of trade between the major countries and their politically close trading partners as a sign of the emergence of blocs after the Depression.[3]

Indeed, the Depression caused increased protectionism, but for the Japanese case it is useful to investigate longer periods with considering rapid economic growth. Figure 1 shows the total amount of Japan's trade, with its colonies (consisting of Formosa and Korea), and with all non-bloc countries. We can clearly observe increased intra-empire trade as compared to Japan's trade with non-bloc countries. Interestingly, the rise of intra-empire trade (trade among mainland Japan, Korea and Formosa) had already started in the 1910s and 1920s. At the same time, GDP growth was substantial within the Japanese Empire all over the inter-war period. Furthermore, the Japanese Empire's economic growth had outstripped every other country, as can be seen in Figure 2, which could more or less explain increasing intra-empire trade throughout the interwar period.

Accordingly, to separate out the effects of GDP growth and sort out the different forces affecting trade, we use border effect analysis in a gravity-model (McCallum, 1995; Helliwell, 1996; 1998), which takes into account GDP growth. Eichengreen and Irwin (1995) estimated a gravity-model in pre-war blocs: the British Commonwealth, the Central European trade bloc, the Sterling area, the Gold bloc, and the exchange control countries. They found significant and positive bloc border effects in two trading blocs: the British Commonwealth and the Central European trade bloc. They also observed an increase in the bloc border effect during the Depression, reflecting increased protectionism. Their econometric results are persuasive; however, their study estimated only three periods: 1928, 1935 and 1938, which makes it hard for

[3] Miyazaki et al. (1981) estimated that the proportion of UK exports to British Empire nations increased from 30% in 1929 to 42% in 1937 and likewise imports grew from 44% to 50%. The ratios of Korea, Formosa, and Manchuria in the total trade of Japan increased from 20% of exports in 1929 to 41% in 1937 and from 24% to 55% of imports over the same period.

us to draw broad conclusions on the formation of bloc economies. In addition, they did not analyze the Japanese Empire due to data problems.[4]

For these reasons, this paper focuses on the Japanese Empire in the whole inter-war period using other trade data resources.[5] In order to take into account the peculiar increasing trade within the empire and economic growth in the 1910s and 1920s, different from Eichengreen and Irwin, we explore a much longer period from 1915 through 1938, the whole inter-war period, to arrive at more general conclusions.

This paper investigates the extent to which a border effect existed in the Japanese Empire and how this effect might have changed over time. We find increased and sizeable border effects in the whole inter-war period. We identify three possible reasons that could be responsible for the sizeable border effect: 1) trade diversion and trade creation through industrialisation in Korea and Formosa and increased protectionism, 2) political factors, and 3) the Japanese immigrants in Korea and Formosa, who contributed to an increase of the trade with mainland Japan.

The remainder of this paper is structured as follows. Section 2 presents a brief history of the period from 1889 to 1937 and some stylised facts, and Section 3 discusses the econometric methodology and the results of the estimations. Section 4 explores possible reasons for the sizeable bloc border effects. Conclusions are presented in Section 5.

[4] The 1942 League of Nation data categorise the members of the Japanese Empire as one region; intra-empire trade and foreign trade data for industrialised countries within the Empire is unavailable.
[5] See Data Appendix 2.

2 A BRIEF HISTORY AND STYLISED FACTS

2.1 Brief History

From a constitutional perspective, the Empire of Japan refers to the 1889 to 1946 period.[6] Japan acquired its first colony, Formosa (Taiwan), in 1895 as a result of the Sino-Japanese war. Korea was annexed in 1910 as a consequence of the Russo-Japanese War. Due to data limitations, the intra-Empire trade we consider involves only trade between Japan on the one hand and Korea and Formosa on the other. This paper's primary goal is to find statistical evidence of an intra-Empire trade effect, so it is worth considering qualitative historical facts that suggest that such an effect might be present in the data.

The Japanese government installed colonial governments in Korea and Formosa (*Chosen Soutokuhu* in Korea and *Taiwan Soutokuhu* in Formosa) and thus controlled the military and administrative authorities. Japan sought to promote assimilation of its colonies through education, the development of infrastructure and industrialisation. The industrialisation of Korea and Formosa was promoted by Japanese colonial policies, the leading *Zaibatsu* (i.e. Japanese business conglomerates) and semi-public companies such as *Toyo Takushoku* in Korea and *Taiwan Seitou* in Formosa. Expansion of the Japanese population at the time created pressures for emigration and almost nine hundred thousand Japanese migrants settled in Korea and Formosa in 1935, in addition to two hundred thousand in South America (Figure 3). This concentration on intra-Empire migration was affected by contemporaneous US restrictions on Japanese immigrants.

Due to these political, economic and migration policies, mainland Japan had a tight relationship with Korea and Formosa when the Great Depression the financial crises of 1929-

[6] For more information on the facts in this section, see Dolan and Worden (1992).

1930 struck. The reaction in Japan, as in the rest of the world, was to increase protection between the Japanese Empire and the rest of the world, but not within the Empire itself.

Although they are not considered in our empirical work below, we note that the Japanese empire extended to other Chinese provinces. The so-called Manchurian Incident in 1931 led to the foundation of the Japanese-controlled Manchurian government in 1932 and sparked war between China and Japan in 1937.

2.2 Stylised Facts

Before turning to formal econometrics, this section reviews the Japanese Empire's trade in the interwar period. Mainland Japan's aggregate share of trade with the largest five non-Empire partners declined over time, from 92.8 % in 1873 to 69.5 % in 1930 for exports and from 97.4% in 1873 to 63.8 % in 1930 for imports.[7] Early in the inter-war period mainland Japan's trade was mainly with Europe and the United States, but it was progressively re-oriented towards partners in Asia and Oceania increased. By contrast, trading partners of Korea and Formosa were originally limited to a few countries, with China's share increasing strongly over time.[8]

Turning to the commodity level, textiles were one of the main exports for mainland Japan, as Table 1 shows, with most silk and cotton textile exports going to non-Empire countries. In addition, Korea and Formosa drastically increased rice and sugar exports to mainland Japan in exchange for silk and cotton textile.

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[7] In exports, the five major trading partners were Great Britain (23.9%), China (22.1%), the United States (19.5%), France (16.8%), and Italy (10.5%) in 1873. Note that each percentage represents the share of each trading partner (non-bloc members) in total exports. In 1930, they were United States (34.4%), China (17.7%), British India (8.8%), Dutch India (4.5%), and Great Britain (4.1%). In imports, they were Great Britain (42.3%), China (35.1%), France (8.8%), Germany (7.2%), and the United States (3.6%) in 1873,and the United States (28.6%), British India (11.7%), China (10.5%), Germany (6.9%), and Australia (6.1%) in 1930. The data come from Mizoguchi and Umemura (1988) and *Nihon Boueki Seiran* (1935).

[8] China's shares in Korean exports/imports were 54.5%/27.1% in 1911, 85.7%/70.7% in 1920 and 83.7%/65.9% in 1930. Those in Formosan exports/imports were 32.4%/59.9% in 1915, 33.8%/47.5% in 1920, and 44.3%/50.2% in 1930. We can conclude that Korean and Formosan trade was dominated by trade with China.

Note that trade diversion and trade creation can be observed in many commodities. Figure 1 shows that Japan's intra-empire trade ratio increased substantially. Table 1 shows a similar pattern at the commodity level. Mainland Japanese imports of rice and sugar from non-bloc countries fell drastically. For example, rice and sugar ranked as third and fourth largest import goods in 1914, but were no longer ranked as main import commodities at the end of the period. At the same time, Korean and Formosan exports of rice to Japan increased drastically, while exports of rice to non-bloc members decreased. While Korean rice exports to non-bloc members decreased from 2,124,000 (nominal) yen in 1910 to 158,000 (nominal) yen, Korean exports to mainland Japan increased from 4,153,000 yen in 1910 to 109,506,000 yen in 1930. Likewise, Formosan rice exports to non-bloc members fell sharply from 121,000 yen in 1910 to 2,000 yen, but on the other hand, exports to mainland Japan grew from 6,875,000 yen in 1910 to 38,695,000 yen in 1930. Other agricultural exports to Japan also dramatically increased, such as sugar from Formosa and beans from Korea.[9] Furthermore, Korean industrialisation during this period resulted in exports to Japan and non-Empire nations in some products related to the textile industry, for example, cocoons and ginned cotton. As a response to industrialisation, Korean imports of iron and steel rose over time.

Although we do not have sufficiently detailed data to check the direct causal links between this trade diversion and the rising protectionism of the 1930s, we note that mainland Japan's tariff rates rose during this period, as Table 2 and Figure 4 show (the tariff rates shown are average, i.e. tariff revenue divided by total imports).[10]

[9] Korean exports of beans to mainland Japan increased from 5,593,000 (nominal) yen in 1910 to 18,371,000 yen in 1930. Formosan exports of sugar to mainland Japan saw a similar trend: a drastic increase from 34,771,000 yen in 1910 to 141,865,000 yen in 1930.

[10] Note that this method of calculating tariff rates tends to underestimate average tariff rates applied to non-Empire nations since lower tariff rates were applied to imports from Korea and Formosa. Average tariff rates at commodity level are shown in Table 2. Rates of many products increased over time and some of them are finally no longer imported. On average the dutiable tariff rates might fall, as seen in the peak of Figure 4. While the tariff data are

3 ECONOMETRIC ANALYSIS

To investigate the above hypothesis econometrically, we employ a gravity model analysis to check for 'border effects' on intra-Empire versus extra-Empire trade.

We have data for the trade of three parts of the Japanese Empire (mainland Japan, Korea and Formosa) with 24 non-Empire countries, namely India, the Netherlands Indies, China, Russia, the United Kingdom, Canada, Australia, New Zealand, Norway, Denmark, Sweden, Switzerland, Italy, Germany, France, Belgium, the Netherlands, Spain, Argentina, Mexico, Brazil, the United States, Chile, and Peru. We do not employ data on trade among the 24 non-Empire nations. The data are for 1915, 1920, 1925, 1930, 1935 and 1938.

3.1 Border Effect Analysis

Our econometric strategy is to adopt an empirical specification based on the 'border effect' approach of McCallum (1995) and Helliwell (1996; 1998).[11] Our empirical model pools all years (1915, 1920, 1925, 1930, 1935 and 1938) and estimates yearly border effects by introducing one border dummy for each year. [12]

The estimating equation for the specification is:

$$(1)\ TRADE_{i,j,t} = \alpha_0 + \alpha_1 GDP_{i,t} + \alpha_2 GDP_{j,t} + \alpha_3 DIS_{i,j} + \alpha_4 CAP_{i,t} + \alpha_5 CAP_{j,t} + \sum_{\tau=1915}^{1938} \alpha_{6\tau} BORDUM_{i,j,\tau} + \sum_{\tau=1920}^{1938} \alpha_{7\tau}\, YEARDUM_{\tau} + \varepsilon_{i,j,t}$$

available in Japanese imports, the uniform data set on tariff rates in the Japanese trade in all foreign countries is not available.

[11] See Evans (2000), Brown (2003) and Anderson and van Wincoop (2003) for more recent studies on the border effect. See Okubo (2004) and Fukao and Okubo (2004) on the Japanese border effect in the post-war period.

[12] The results in a cross sectional estimation for each year from 1915 to 1938, shown in an early version of our draft, are consistent to those in the panel estimations of pooled data in our current version.

The dependent variable (*TRADEijt*) is a single year's logarithm of nominal trade in yen from country or region i to country or region j in year t.[13] In other words, it denotes exports or imports of mainland Japan, Korea and Formosa with each trading partner as well as the six intra-Empire trade flows (imports and exports between the three nations). We do not have trade data among the non-Empire nations. The first five right-hand side variables are the classic control variables for the gravity equation. *GDP* denotes the logarithm of the GDP, DIS indicates bilateral distance (in km) between the capitals or the seats of government, and *CAP* indicates GDP per capita for the exporting country (subscript 'i') and the importing country (subscript 'j'). The GDP and population data from Maddison (1995).

The variable of interest in this regression equation is *BORDUM*. It takes on a value of unity for intra-empire trade (trade among mainland Japan, Formosa and Korea) and zero for non-Empire trade flows. Following McCallum (1995) and Helliwell (1996; 1998) we take the coefficient on *BORDUM* as testing for a border effect within the Japanese Empire, indicating that trade within the Japanese bloc was higher than would be expected, controlling for standard gravity equation factors. The border effect dummy has a year subscript since we estimate a separate border effect for each of our six years of data. The aim of this is to investigate the evolution of the border effect on intra-Empire trade. We also allow for year-specific fixed-effects to control for unobservable factors that are common across all pairs by including year dummies (*YEARDUM*); to avoid perfect collinearity with the constant, we drop the 1915 year dummy.

Our sample includes 75 trade pairs compromised of 72 trade pairs between the 3 Empire countries and 24 non-Empire nations plus the 3 intra-Empire trade flows. Since we have import

[13] The dependent variable is constructed as ln(1+values of trade). The trade data are from: Mizoguchi and Umemura (1988), Foreign Trade of Japan-a statistical Survey (Nihon Boueki Seiran) (1935, 1975), A Statistical Table on Korean Exports and Imports for Three Years (Chosen Yuishutunyu hin 3 nen Taishouhyou) (1941), Returns of the Trade of Taiwan for Forty Years (Taiwan Boueki 40 nen Hyou) (1936), and Foreign Trade of Taiwan (Taiwan Gaikoku Boueki Gaikyou) (1940).

and export data separately for each pair, there are 150 'columns' in the panel. There are six years in our data so the total number of observations is 900 (i.e. 150 times 6).

3.2 Estimation Strategy and Results

To compare our results with McCallum (1995) and Okubo (2004), various ways of estimations are employed for specification (1): an ordinary-least squares (OLS) estimation, a random-effects estimation, a feasible generalised least-squares (FGLS) panel estimation, and a Tobit estimation.

3.2.1 Estimators

We perform the estimation for the border effect using the following estimators, by pooling all of the years:

- a single border effect (Column 1 of Table 3);
- yearly border dummies with OLS (Column 2 of Table 3);
- yearly border dummies with a random-effects model applied to country pairs (Column 3 of Table 3);
- yearly border dummies with FGLS panel estimation where we allow heteroskedastic variances across panels but no cross-sectional correlation in the error structure (Column 4 of Table 3);
- yearly border dummies with a Tobit panel estimator (Column 5 of Table 3);

3.2.2 Estimation Results

All of our estimation results of the border effect are shown in Tables 3 and 4. All of the border effect dummies are significant and positive except those in 1915 for the random-effects model

regression (Column 3 of Table 3) and the 1915 and 1920 border dummies in the Tobit panel regressions (Column 5 of Table 3). In the pooled OLS estimation, as shown in Table 4, trade within the intra-Empire trade was 21.1 times as large as non-bloc countries trade in 1915 and 49.7 times in 1920 with the number rising drastically in 1925 (more than 400 times more trade) and subsequent years as the world fell into economic crisis and protectionism soared. The figures in 1930 and 1938 are, respectively, 800 times and 1397 times. Clearly, the bloc border effect exponentially increased as the world economic crisis turned towards open warfare (the values of the bloc-border effect in all of the estimations, which are an exponential of the coefficients on the bloc dummy, are summarised in Table 4). As inspection of the other columns show, the above results are generally supported.

It is evident that the values of the border effect take on extremely high positive values over the years, drastically increasing since 1920. These results definitely contrast with the results of Eichengreen and Irwin's Commonwealth blocs (3-5 times), McCallum's current US-Canadian border effect (22 times) and Okubo's post-war Japanese border effect (around 10 times). However, a dramatic increase in the border effect between 1925 and 1935 is not observed in the Japanese data. This contrasts with the remarkable increase in the border effect in the other blocs after the Depression that Eichengreen and Irwin (1995) found.[14]

3.2.3 Allowing for Country Fixed Effects

It might be argued that the gravity model is too simple to capture some of the idiosyncratic aspects of the nations in our data sample. For example, some of the nations were primary good exporters while others were exporters of manufactured goods. To allow for such country-specific

[14] Matsumoto (1996) calculated measures of trade intensity difference, and provided another interpretation: the trade intensities in the Japanese Empire gradually decreased over time, in spite of the political suppressions.

unobserved variation, we introduce country specific fixed effects in the spirit of Rose and van Wincoop (2001) as a robustness check.

Specifically, we include one dummy per nation, C_k. in the pooled OLS estimation. If country (or region) k is either an exporter or importer in trade, C_k is one and vice versa. The estimation equation is as follows:

$$(2)\ TRADE_{i,j,t} = \alpha_0 + \alpha_1 GDP_{i,t} * GDP_{j,t} + \alpha_2 DIS_{i,j} + \alpha_3 BORDUM_{i,j} + \sum_k \alpha_{4,k} C_k + \varepsilon_{i,j,t}$$

where C_k=1 if k=i or j. $GDP_{i,t} * GDP_{j,t}$ stands for the logarithm of the product of GDPs in exporters and importers. All variables are taken the logarithm. Since there was relatively little time-series variation in the GDP and CAP variables, and inclusion of the country dummies wipes out the cross-section variation, the point estimates on the GDP and CAP variables became unruly. Following Rose and van Wincoop (2001) we discipline these coefficients by including only the product of the two GDPs.

A second attempt to control for country-specific unobservables leads us to introduce two dummies per nation, one for pairs where the nation is the exporter and one where it is the import. The specification is thus:

$$(3)\ TRADE_{i,j,t} = \alpha_0 + \alpha_1 GDP_{i,t} * GDP_{j,t} + \alpha_2 DIS_{i,j} + \alpha_3 BORDUM_{i,j} + \sum_k \alpha_{4,k} Ex_k$$

$$+ \sum_k \alpha_{5,k} Im_k + \varepsilon_{i,j,t}$$

where Ex_k=1 if k=i *and* Im_k=1 if k=j. If country (or region) k is an exporter in trades, Ex_k is one and vice versa. Similarly, if country k is an importer, Im_k is one and vice versa. This estimation can assess border effect in eliminating specific factors in imports and exports of each country.

Table 5 reports the result. The second column shows the result for country dummies and the last column reports the one for exporter and importer dummies. Both bloc border dummies are still significant and high positive values. In other words, even after eliminating unobservable country-specific factors, positive bloc border effects can be observed. This implies that trade within the bloc could be discriminatively active due to some political control within the Empire.

3.2.4 Distance and Border Effect

Columns 2 and 3 in Table 5 propose interesting intuitions: country dummies drive down the magnitude of distance elasticities and instead boost border effects. Reflecting the results in Disdier and Head (2005), distance elasticities in our results are abnormally high, compared with any other empirical evidences (Table 3 and column 1 in Table 5).[15] This suggests that high distance elasticities drive down predicted trade with non-bloc member countries relative to predicted intra-empire trade, because most of the non-bloc member countries are distant. Therefore, with high distance elasticities, there is less unexplained intra-empire trade relative to trade with non-bloc member countries to be captured by border dummies. Indeed, allowing for country fixed effects lowers distance elasticities, as shown in columns 2 and 3 in Table 5. Instead, the border effects increase fourfold relative to the column 1. Accordingly, there is the possibility of much higher border effects than those observed in the standard border effect analysis as seen in Table 3.

[15] Disdier and Head (2005) examined 1467 distance effects in the gravity models estimated in 103 papers and then found that distance elasticities range from 0.04 to -2.33 and the mean across the 1467 estimates is -0.9.

4 THE CAUSES OF SIZEABLE BORDER EFFECTS

This section discusses possible reasons for the sizeable border effects, which we found in the previous section.

4.1 Trade System, Trade Creation and Diversion

The first reason stems from the characteristic of a colonial economy, which serves as a market for the 'mother' nation's manufactured exports and a supply of natural resources (colonies tended to specialize considerably in agricultural goods or natural resources). This leads to an increase in the volume of trade between the mother country and the colonies, and increases the bloc-border effect. According to Yamamoto (1987a), more than 50% or 60% of the imports by mainland Japan from Formosa consisted of sugar, and more than 80% of mainland Japan's exports to Formosa were textiles. More than 50% of imports from Korea consisted of rice, while more than 85% of Japan's exports to Korea were manufactured goods.[16] This structure was typical of colonial trade and was totally different from the relationship among the members of the British Commonwealth in Eichengreen and Irwin (1995).[17] There, trade was mainly between dominions. Among the dominions, widely spread networks in the public and private sectors connected their economies, which is different from colonial trade. The reason why the border effect was much lower than that of Japan is that dominions may have been somewhat independent of the United Kingdom as they were located far away and were permitted some degree of autonomy, particularly Canada, Australia, and New Zealand.

[16] Yanaihara (1929) suggested that Formosa played a crucial role as sugar supplier to the Japanese empire.
[17] In their estimations, the British Commonwealth consists of the United Kingdom, Canada, Australia, New Zealand, South Africa, India, and Ireland.

More importantly, trade diversion and creation as already mentioned in section 2.2 could have boosted the border effect. The imports of rice and sugar in Japan reduced from non-bloc members and instead increased from Korea and Formosa after the annexation. Furthermore, the industrialisation in Korea and Formosa created trade with Japan. The industrialisation of sugar production in Formosa promoted the sugar trade with Japan. The development of agriculture and cotton industries promoted Korean exports to Japan. Since Korea and Formosa had a limited export market originally, and probably due to political control, as seen in section 2, the increasing amount of products are traded within the Empire. Together these reasons could lead to a sizeable border effect.

4.2 The Transitional Change of the Trade System

To test whether the change of trade system could have boosted the border effect, we conduct additional estimations that allow us to test for differences between mainland Japan on the one hand, and its colonies, Korea and Formosa, on the other hand. To this end, we separate BORDUMs as two dummies:

$$(4)\ TRADE_{i,j,t} = \alpha_0 + \alpha_1 GDP_{i,t} + \alpha_2 GDP_{j,t} + \alpha_3 DIS_{i,j} + \alpha_4 CAP_{i,t} + \alpha_5 CAP_{j,t} + \sum_{\tau=15}^{38} \alpha_{6\tau} KOFODUM_{ij\tau,} + \sum_{\tau=15}^{38} \alpha_{7\tau} JPNDUM_{i,j,\tau} + \sum_{\tau=20}^{38} \alpha_{8\tau} YEARDUM_{\tau} + \varepsilon_{i,j,t}$$

The new variable, *KOFODUM* is a dummy for intra-empire trade between Korea and Formosa, i.e. colonial trade. The other new variable, *JPNDUM*, is a dummy for mainland Japan's trade with Korea and Formosa. This allows the border effect to be different for mainland Japan than it was for its colonies. Equation (4) separates *BORDUM* as *JPNDUM* and *KOFODUM* for each

period. The change in the coefficients on $KOFODUM_{i,j,\tau}$ can capture the evolution of colonial trade. If the values significantly increase over time with a slight increase or an almost constant level of *JPNDUM*s, mainland Japan's intra-empire trade relatively shrank and Korea and Formosa's intra-empire trade relatively increased.

Two facts can be observed from columns 1-(1) to 1-(4) in Table 6. One is that although *JPNDUM*s are almost all significant and positive; no drastic increase can be observed in the 1920s and 1930s. On the other hand, the *KOFODUM*s become positive and significant in the 1920s and drastically increase. This means that, while mainland Japan still traded with Korea and Formosa very actively, the intra-colony trade between Formosa and Korea relatively increased due to industrialisation in the two regions. This contributed to the fast increasing bloc border effect.

Next, we re-estimate the *KOFODUM*s and the *JPNDUM*s with a country-fixed effect as a robustness check. As seen in columns 2-(1) to 2-(4) in Table 6, significant *KOFODUM*s and *JPNDUM*s are observed.[18] The results generally support those of columns 1-(1) to 1-(4).

These results are to some extent consistent with Matsumoto (1996), which noted the symptoms of a conversion from a satellite trading system, that is, colonial trade, to a network trading system, that is, horizontal intra-empire trade. He suggested that industrialisation in Korea and Formosa resulted in a switch from monoculture and trade with Japan to trade with each other, although the active colonial trade with mainland Japan continued. Another point is the change in trading partners. As Yamamoto (1987a;b) mentioned, mainland Japan's trading partners were diversified throughout the 1920s and 1930s. The level of exports to Asian countries increased, while the dependence on the United States declined. Furthermore, the level of imports from

[18] The variables on CAP are excluded in the estimations. As before (the country-fixed effect estimations in Table 5), since there is relatively little time-series variation in the CAP variables, and inclusion of the country dummies wipes out the cross-section variation, all of the estimates on CAP variables were insignificant and became unruly.

South American countries, Africa and Oceania increased. This diversification may thus have prevented a large increase in the *JPNDUM*s in the 1920s and 1930s in equation (4).

4.3 Political Factors

One political factor is that Japan sought to exercise some control over its colonies' trading partners. China, of prime importance to Japanese diplomatic policy and territorial expansion, was the most important trading partner of both Korea and Formosa. Furthermore, the share of trade with China strongly increased over time. The central Japanese government sought to influence China through China's trading relations with the Japanese colonies. To this effect, Japan encouraged Korea and Formosa to specialise in trade with China. One consequence of this was a reduction of Korean and Formosan trade with non-bloc member countries and an increase in the border effect. Japan's influence on the trade of its colonies was paralleled by that of other empires, which at the time actively sought to control the trade of their colonies and promoted trade within their empires. In turn, the policies of other empires accentuated the tendency for Korean and Formosa to trade primarily within the Japanese bloc

Another factor is the control of the terms of trade by the central government in Tokyo. It is said that the terms of trade in colonial trade were likely to have been controlled by the trade policies of the colonizing country and may have deviated widely from market prices and the terms of trade in external trade.[19] Japan may have set much lower prices in intra-empire trade, and then imposed high tariff rates on its non-bloc countries trade while trade with colonies like Korea and Formosa was totally exempt from tariff. This price gap between colonial and trade with non-bloc countries may have caused a bias towards intra-empire trade and thus contributed to the high bloc-border effect.

[19] See Lewis (1978).

Finally, the other plausible factor might be assimilation. Through education and cultural policies, preferences might have been changed to the Japanese style. This could have promoted Korean and Formosan trade with mainland Japan.[20] According to *Foreign Trade of Japan-a statistical Survey* (1935), Korean and Formosan imports of original Japanese products and Japanese publication rose over time.[21] From this evidence, we might say that assimilation created trade with Japan for original Japanese products, and might also make a contribution to the increased border effect.

4.4 Japanese Emigration

The presence of Japanese nationals in Korea and Formosa increased from just over few hundred thousand in 1920 to almost nine hundred thousand in 1935, as illustrated in Figure 3. During this period, North America found an immigration policy that was prohibitive to Japanese nationals. We conjecture that this growth in the presence of Japanese nationals might have led to an increase in the border effect. To take an example from the present day, ethnic Chinese networks lead to increases bilateral trade (Gould, 1994), and in general immigrants are likely to promote bilateral trade with their home countries (Head and Ries, 1998; Rauch and Trindade, 2002). If this is true in pre-war Japan, the surge in Japanese migration would have been associated with increased trade with mainland Japan. This section considers whether the Japanese migrants in Korea and Formosa contributed to the sizeable bloc border effect.

To measure the impact of migration into Korea and Formosa from mainland Japan, we focus on mainland Japan's trade in the years from 1920 to 1935, which are the years prior to the start of

[20] The discussion might not be so robust and not so crucial. The impact of assimilation on trade might become ambiguous, if we take into account historical evidences such as some nationalist movements and racial culture campaigns in Korea and Formosa.

[21] The value of Formosan imports of *Sake* and Soy sauce from mainland Japan in 1930 was 3.3 times and 7.6 times larger than in 1900. The increases of Korean imports from 1915 to 1930 in *Kimono* (Japanese traditional clothes), *Tabi* , Japanese books and journals and Japanese beer are respectively 9.5 times, 3.2 times, 10.6 times and 5.5 times.

the large scale state-sponsored migration to Manchuria: the five year program of 1937. The following equation is estimated:[22]

$$(5)\ TRADE_{i,j,t} = \alpha_0 + \alpha_1 GDP_{i,t} + \alpha_2 GDP_{j,t} + \alpha_3 DIS_{i,j} + \alpha_4 CAP_{i,t} + \alpha_5 CAP_{j,t}$$

$$+ \sum_{\tau=20}^{35} \alpha_{6\tau}\ BORDUM_{i,j,\tau} + \alpha_7 MIGRATION_{k,t} + \sum_{\tau=25}^{35} \alpha_{8\tau}\ YEARDUM_{\tau} + \varepsilon_{i,j,t}$$

where $MIGRATION_{k,t}$ is the logarithm of the number of Japanese residents in country (or region) k (the Japanese trading partner, i.e. i or j) of the year t: i.e. the stock base of Japanese migrants. We take the data from the *Japan Statistical Year Book* (*Nihon Toukei Nenkan*) and *Japanese Empire Statistical Year Book* (*Dainihon Teikoku Toukei Nenkan*) of each year.

Table 7 reports the results. In the estimation, *MIGRATION* has a positive sign, which means that the increase in Japanese overseas residents promoted trade with mainland Japan. Next, to measure the contribution of migration to the increase in the border effect, we estimate the gravity equations without *MIGRATION* term:

$$(6)\ TRADE_{i,j,t} = \alpha_0 + \alpha_1 GDP_{i,t} + \alpha_2 GDP_{j,t} + \alpha_3 DIS_{i,j} + \alpha_4 CAP_{i,t} + \alpha_5 CAP_{j,t}$$

$$+ \sum_{\tau=20}^{35} \alpha_{6\tau}\ BORDUM_{i,j,\tau} + \sum_{\tau=25}^{35} \alpha_{7\tau}\ YEARDUM_{\tau} + \varepsilon_{i,j,t}$$

Now we examine the contribution of Japanese migration to the increased border effect. From the coefficients of *BORDUM*s in 1920 and 1935 in column 1 in Table 7, we conclude that the migration into Korea and Formosa contributed to a 52.10% increase of bloc border effect in mainland Japan from 1920 to 1935.[23] Thus, the data suggests that Japanese migrants in Korea and

[22] Observations are mainland Japan's exports and imports with non-bloc countries and with Korea and Formosa.

[23] The border effects without MIGRATION, equation (6), are exp(2.862)=17.496 times in 1920 and exp(3.542)=34.535 times in 1935. The increase in border effects is (34.535-17.496)/17.496= 0.973 = 97.3% (in other words, the border in 1935 was 1.973 times higher than that of 1920). To eliminate of the border effect via increased Japanese migration, MIGRATION term is introduced in the estimation, equation (5). The estimated border effect coefficients are exp(1.620)=5.053 in 1920 and exp(2.003)=7.411 in 1935 and thus the increase is (7.411-5.053)/5.053= 0.4666 = 46.6%. If we consider the impact of MIGRATION, the increase of border effects is reduced. Comparing these percentages, the increased Japanese residence in Korea and Formosa can explain a 52.10% of the

Formosa played a role in promoting intra-empire trade at the possible expense of trade with countries outside the bloc. Also, the results are supported in fixed-country effect estimations (see column 2 in Table 7). Note that all insignificant BORDUMs imply that Japanese migration can perfectly explain increased intra-empire trade.

5 CONCLUSION

We show that the Japanese Empire, or at least the parts of it for which we have trade data (mainland Japan, Korea and Formosa) had a sizeable bloc-border effect, which means large exclusionary effects. Furthermore, the bloc border effect appears to increase over time, taking into account the industrialisation in Korea and Formosa and economic growth in the Japanese Empire. This paper highlighted three possible causes of the sizeable border effect and tested whether it was significant for each cause: 1) The annexations of Korea and Formosa caused a trade diversion effect, and the industrialisation in both regions created trade within the Empire. 2) Political factors might also have boosted the border effect. 3) Increased Japanese migration also might be responsible. Prior to World War II, Japanese emigration took place as a consequence of the explosion of the Japanese population. Japanese emigration to Korea and Formosa contributed to a 52.10 % increase in the border effect in mainland Japan. Together, all these three factors could have affected Japanese trade and increased the border effect.

increased border effect ((46.6-97.3)/97.3 =-52.10%). See Appendix 2 for the detail. Although using flow base of migration, Head and Ries (1998) estimated the elasticity of trade in terms of immigration, suggesting "a 10 per cent increase in immigrants is associated with a 1 per cent increase in Canadian exports to the immigrant's home country and a 3 per cent increase in imports."

DATA APPENDIX

Data Appendix 1 Components of All Non-bloc Countries and the Japanese Empire

Non-bloc countries (24 countries): India, the Netherlands Indies, China, Russia, the United Kingdom, Canada, Australia, New Zealand, Norway, Denmark, Sweden, Switzerland, Italy, Germany, France, Belgium, the Netherlands, Spain, Argentina, Mexico, Brazil, the United States, Chile, Peru.

The Japanese Empire (3 regions): Mainland Japan (Japan), Korea, Formosa (Taiwan).

Data Appendix 2 Sources of Data

Definition and data source of each variable used in the regression analysis.

TRADE (Unit: Japanese yen, nominal prices)

The variable TRADE is the logarithm of exports or imports of Mainland Japan, Korea and Formosa with each trading partner, ln(1+values of exports and imports). The intra-empire trade data in the Japanese Empire come from Mizoguchi and Umemura (1988), and the data of the trade with non-bloc countries come from "Nihon Boueki Seiran (Foreign trade of Japan: a statistical survey)"(Toyo Keizai Shinpousha, 1935; 1975), "Chosen Yuishutunyu hin 3 nen Taishuouhyou (A statistical table on Korean exports and imports for three years)"(Chosen Soutokuhu (Government of Korea), 1941), and "Taiwan Boueki 40 nen Hyou (Returns of the trade of Taiwan for forty years)"(Taiwan Soutokuhu (Government of Taiwan), 1936) “Taiwan Gaikoku Boueki Gaihyou (Foreign Trade of Taiwan)”(Taiwan Soutokuhu (Government of Taiwan), 1940).

GDP (Unit: Japanese yen, 1935)

GDP represents the logarithm of the gross domestic product (GDP) of the exporting country or the importing country. All the data on *GDP* are taken from Maddison (1995). However, since Maddison's data is based on the 1990 Geary-Khamis dollar, we converted them into yen using a conversion ratio of the 1990 Geary-Khamis dollar into the 1935 Japanese yen. The conversion ratio employed GDP per capita as of 1935 represented by both units: The GNP per capita for 1935 in yen comes from Yamazawa and Yamamoto (1974) and Ohkawa and Shinohara (1979) and the GDP per capita of 1990 Geary-Khamis dollar is taken from Maddison (1995). It must be noted that Maddison's data has a problem. As Fukao and Yuan (2002) pointed out, the change in the terms of trade is not taken into account and thus a deviation from the real value may occur in the early period if there has been a long-term deterioration in the terms of trade.

GDP data for China in 1915, 1920, and 1925, as well as for Russia in 1915 are not available in Maddison (1995). Thus, we estimated them from the available data (the GDP in 1913, 1928, 1929 1930, 1931, 1932, and 1933 for the Russian estimation, and data from 1820, 1870, 1890, 1900, 1913, 1929, 1930, 1931, 1932, 1933, 1934, 1935, 1936, 1937, and 1938 for the Chinese GDP estimation) under the assumption that the economy exponentially increased at a constant growth rate in each country. $Y_t = e^{\alpha+\lambda t}$ was estimated for each country (Y: GDP, t: time, λ : growth rate, α : constant).

DIST (Unit: km)

The variable *DIST* is the logarithm of the geographical distance between capitals of the trading partners. Seoul is regarded as the capital of Korea, where the Japanese colonial government (Chosen Soutokuhu) was located from 1910 to 1945. Also, Taipei is considered as the capital of Formosa, where the colonial government (Taiwan Soutokuhu) was located from 1895 to 1945.

CAP (Unit: Japanese yen, 1935)

The variable *CAP* denotes the GDP per capita in the exporting or importing countries. GDP data is divided by the population taken from Maddison (1995).

BORDUM (0 or 1)

The variable is taken to be one if trade is intra-empire trade among mainland Japan, Korea and Formosa.

JPNDUM (0 or 1)

The variable is taken to be one if trade is intra-empire trade with mainland Japan.

KOFODUM (0 or 1)

The variable is taken to be one if trade is intra-empire trade between Korea and Formosa.

YEARDUM (0 or 1)

The year dummies, $YEARDUM_{\tau}$, are taken to be one if time of the data is τ.

C_k (0 or 1)

The time-invariant country dummies are taken to be one, if country (or region) k is an exporter or importer (i.e. i or j). The dummies can represent country-specific factors such as price index and political factors in each country.

EX_k , IM_k (0 or 1)

The time-invariant export country dummies, EX, are taken to be one, if country k is exporter (i.e. i). Similarly, importer dummies, IM, are taken one if k is importer (i.e. j).

MIGRATION (the number of Japanese overseas residents)

The variable *MIGRATION* denotes the logarithm of the Japanese population in mainland Japan's trading partners, including Korea and Formosa. The number of overseas Japanese residents is taken from "Dainihon Teikoku Toukei Nenkan (Japanese Empire Statistical Year Book)" (Cabinet Office) and "Nihon Teikoku Toukei Nenkan (Japan Statistical Year Book)" (in each year) (Cabinet Office).

APPENDIX 1 SCOPE OF OUR RESEARCH

In our estimations, Korea and Formosa are selected to represent Japanese colonies. But the Japanese Empire also acquired territories other than Korea and Formosa: South Sakhalin after the Russo-Japanese War and Micronesia after World War I. As Mizoguchi and Umemura (1988) pointed out, their economies were much smaller than Korea and Formosa and trade in these two regions was very small, and was mainly with mainland Japan. They supplied natural resources and agricultural goods to mainland Japan. In econometric analysis, data qualification would be problematic. GDP data are not available in Maddison (1995). External trade data with other destinations, much smaller than their trade with mainland Japan, are not also available in Mizoguchi and Umemura (1988). Inclusion of these two regions might have increased the border effect, but the increase would have been small due to the small size of the economies in question.

Manchuria (1931-1945) could not be included in our estimations due to a lack of data. GDP data are not available in Maddison (1995). Further, even now it is often said that Manchuria was a puppet government of Japan, and thus Manchuria was excluded from our sample due to the difficulty in identifying its position in the world economy and politics of the 1930s and 40s.

APPENDIX 2 THE CONTRIBUTION OF MIGRATION

With respect to the regressions for mainland Japan, border effects without *MIGRATION* are respectively exp(2.862)=17.496 in 1920 and exp(3.542)=34.535 in 1935, which means intra-empire trade was 17.496 times and 34.535 times larger than Japanese non-bloc countries trade, respectively. Similarly, border effects with *MIGRATION* are exp(1.620)=5.053 in 1920 and exp(2.003)=7.411 in 1935. Comparing these results, the increase in border effects from 1920 to

1935 is (34.535-17.496)/17.496= 0.973 = 97.3% without *MIGRATION* and (7.411-5.053)/5.053= 0.4666 = 46.6% with *MIGRATION*. Further, comparing these percentages, (46.6-97.3)/97.3 = -52.10%. This implies that the increase of the border effect with *MIGRATION* is 52.10% smaller than that without *MIGRATION*. That is, migration contributed to a 52.10% increase of the border effect.

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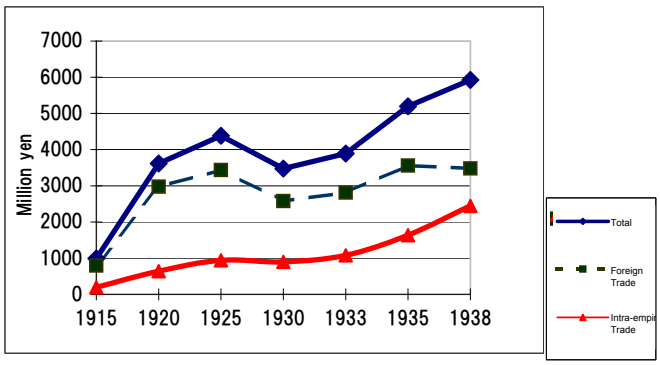
Figure

Figure 1: Japan's Trade, 1915-1938



Source: Mizoguchi and Umemura (1988),
Nihon Boueki Seiran (Foreign Trade of Japan a statistical survey),
Chosen Yusyutu 3-nen Taisyouhyou (Government of Taiwan),
Taiwan Boueki 40-nen Hyou (Government of Taiwan).

Figure 2: GDP Growth Ratio in the World

The growth ratio represents GDP compared to the GDP level of 1915. Source: Maddison (1995).
The GDP of 1915 in each country is set to one.

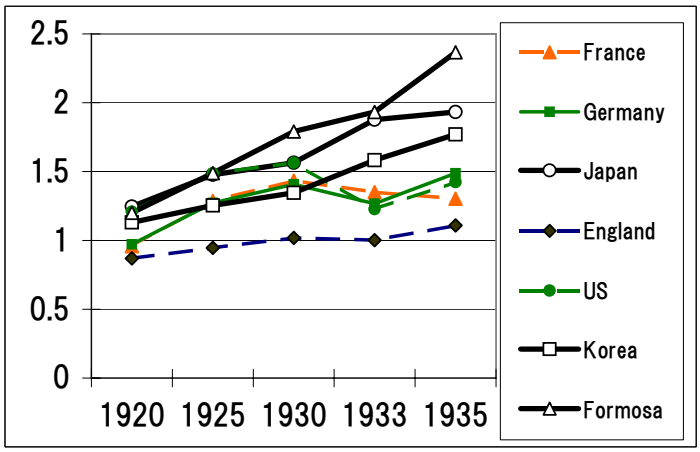
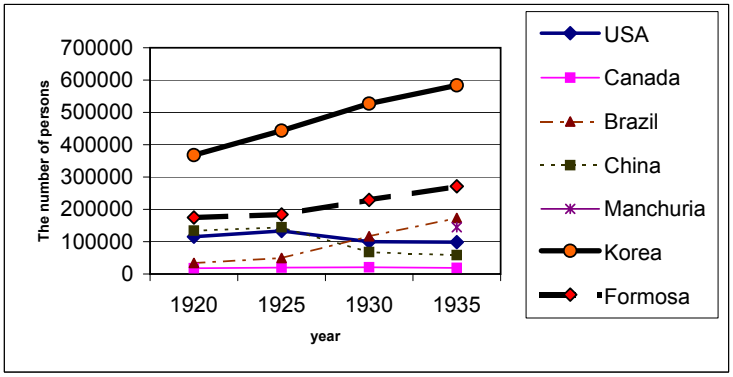
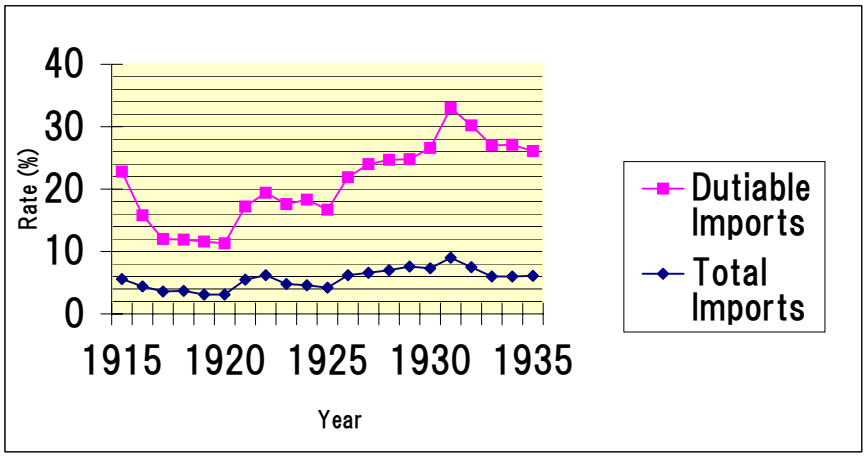


Figure 3: The Number of Japanese Residents



Sorce: Dainihon Toukei Nenkan (Japan Statistical Year Book)(Cabinet Office)
Nihon Teikoku Nenkan (Japanese Empire Statistical Book)(Cabinet Office)

Figure 4: Average Tariff Rates



Source: Yamazawa and Yamamoto (1974).

Table 1: The Change in the Commodity Composition of Trade (Mainland Japan)

Note: the percentage is the share of each comoddity in Japan mainland's exports or imports with non-bloc members.

Ranking of import goods

	1914		1920		1926		1931		1929		1935	
Ranking	Commodities	%	Commodities	%	Commodities	%	Commodities	%	Commodities	%	Commodities	%
1	Cotton Ginned	36.57	Cotton Ginned	30.83	Cotton Ginned	30.53	Cotton Ginned	23.98	Cotton Ginned	25.86	Cotton Ginned	28.90
2	Bean Cake (for manure)	5.00	Bean Cake (for manure)	5.71	Oil Cake (for manure)	5.22	Wool	6.97	Iron (others)	5.79	Wool	7.76
3	Rice and Puddy	4.17	Wool	5.21	Lumber	4.38	Machinery parts	4.12	Machinery parts	5.46	Iron (others)	6.67
4	Sugar	3.94	Iron	3.80	Iron	4.30	aburakasu	3.59	Wool	4.59	Oil	4.32
5	Ammonium Sulphate	2.54	Iron	2.59	Wheat	3.93	Lumber	3.51	Lumber	4.01	Machinery part	4.25
			6th Sugar	2.58								

Source: Yamamoto 1987, pp40

Ranking of export goods

	1914		1920		1926		1931		1929		1935	
Ranking	Commodities	%	Commodities	%	Commodities	%	Commodities	%	Commodities	%	Commodities	%
1	Silk	27.37	Silk	19.64	Silk	35.90	Silk	30.90	Silk	26.35	Cotton fabrics	19.85
2	Cotton yarns	13.29	Cotton fabrics	17.19	Cotton fabrics	20.36	Cotton fabrics	17.33	Cotton fabrics	19.21	Silk	15.49
3	Silk fabrics	5.23	Silk fabrics	8.13	Silk fabrics	6.51	Silk fabrics	7.22	Silk fabrics	6.98	Artificial Silk Fabrics	5.13
4	Copper	4.60	Cotton yarns	7.82	Cotton yarns	3.46	Knitted goods	1.85	china	1.72	Silk fabrics	3.10
5	Coal	4.05	Coal	2.32	Sugar	1.66	Paper	1.83	Knitted goods	1.71	Iron	2.63
							6th Rice and pac	1.38	6th Sugar	1.40		
							7th. Sugar	1.30				

Source: Yamamoto 1987 pp38

Table 2: Average Tariff Rates (%)

	1918	1924	1928	1933	1938
Rice	9.92	0.72	13.98	41.24	28.20
Wheat	8.80	2.90	17.09	9.38	11.47
Flours, Meals, and Starches	15.60	17.93	27.48	36.41	17.13
Sugar	34.56	14.50	13.27	1.90	6.64
Cotton Ginned	0	0	0	0	0
Cotton Yarns	3.37	1.19	3.77	3.02	0.04
Artificial Silk	12.82	21.55	53.85	60.85	32.62
Cotton Fabrics	3.59	3.18	14.23	0.81	
Undershirts	13.25	7.22	25.52	25.16	4.35
Hosiery	16.73	29.49			
Ammonium Sulphate	0	0	0	0	0
Pig Iron	0.54	2.63	3.77	15.23	
Iron and Steel (Bar, Rod, Shapes	3.16	5.16	18.00	24.13	
Iron and Steel (plates)	1.78	1.27	16.87	23.51	
Total imports	3.76	4.65	7.06	6.03	6.60

Note: Average Tariff rates (%)= (Tariff Revenue)/(Imports)
Note: blank represents no imports
Source: Yamazawa and Yamamoto (1974).

Table 3: Results of Estimation (panel data analysis)

	1	2	3	4	5
GDPI	0.958	2.328	2.184	2.298	2.080
	[8.53]**	[20.84]**	[10.01]**	[45.04]**	[10.15]**
GDPE	1.551	2.688	2.756	2.697	2.765
	[13.81]**	[24.02]**	[12.62]**	[46.11]**	[23.09]**
GDPCAPI		0.855	0.839	1.136	2.321
		[3.32]**	[1.86]*	[9.25]**	[4.29]**
GDPCAPE		1.941	1.255	2.249	3.176
		[7.53]**	[2.79]**	[15.82]**	[7.27]**
DIS	-3.251	-2.554	-2.449	-2.627	-4.504
	[-10.40]**	[-9.76]**	[-4.7]**	[-21.37]**	[-11.67]**
BORDUM	2.349				
	[2.15]**				
BORDUM 1915		3.051	2.922	3.939	1.016
		[1.7]*	[1.46]	[3.21]**	[0.64]
BORDUM 1920		3.905	3.809	4.683	1.5128
		[2.17]**	[1.9]**	[3.82]**	[0.97]
BORDUM 1925		6.113	6.483	5.348	4.227
		[3.38]**	[3.2]**	[4.35]**	[2.49]**
BORDUM 1930		6.684	6.565	6.466	4.260
		[3.72]**	[3.28]**	[5.28]**	[2.75]**
BORDUM 1935		6.723	6.667	5.828	4.198
		[3.74]**	[3.34]**	[4.76]**	[2.7]**
BORDUM 1938		7.242	7.202	6.038	4.785
		[4.03]**	[3.61]**	[4.93]**	[3.07]**
Year1920		0.700	0.762	0.139	1.029
		[1.43]	[2.38]**	[0.65]	[2.42]**
Year1925		-0.433	-0.296	-0.804	-0.449
		[-0.87]	[-0.86]	[-3.73]**	[-1.02]
Year1930		-0.353	-0.182	-1.179	-0.017
		[-0.71]	[-0.5]	[-5.44]**	[-0.04]
Year1935		-1.382	-1.142	-2.085	-1.330
		[-2.72]**	[-2.85]**	[-9.49]**	[-2.91]**
Year1938		-19.206	-17.239	-20.951	-24.873
		[-16.37]**	[-8.66]**	[-39.79]**	[-13.88]**
Const	-17.111	-92.431	-88.065	-94.171	-86.782
	[-3.70]**	[-19.4]**	[-9.4]**	[-47.11]**	--
	Pooled OLS	Pooled OLS	Random	FGLS panel	Tobit panel
Observations	900	900	900	900	900
Group of Samples			150	150	150
Chi squared			482.78		137307.13
Uncensored sample					657
Censored sample					243
R-squared	0.3997	0.641	0.644		
F	150.67	101.36			

1. FGLS denotes Feasible GLS with panel heteroskedasticity.
(Observations are assumed to be heteroskedastic across panels but no cross-sectional correlation.)
2. **/*: statistically significant at 5/10 % level.
3. Adjusted t statistics in brackets in Pooled OLS.
4. z statistics in brackets in FGLS, Tobit, and Random-effect models.

Table 4: Border Effect

	1915	1920	1925	1930	1935	1938
Border (pooled OLS)	21.1	49.7	451.7	799.5	831.3	1396.9
Border (Random)	18.6	45.1	653.9	709.8	786.0	1342.1
Border (FGLS)	51.4	108.1	210.2	642.9	339.7	419.1
Border (Tobit, panel)	2.8	4.5	68.5	70.8	66.6	119.7

Table 5: Country Fixed Effect

	1	2	3
GDPI*GDPE	1.254	0.163	0.163
	[17.97]**	[2.75]**	[2.93]**
DIS	-3.251	-0.103	-0.081
	[-10.34]**	[-0.13]	[-0.11]
BORDUM	2.349	8.447	8.291
	[2.14]**	[5.06]**	[4.99]**
Country Dummies	None	Country dummies	Exporter and Importer dummies
Observations	900	900	900
R squared	0.3949	0.7613	0.7969
F	194.89	99.21	61.39

1.Country dummies and constant terms are ommited from the table.
2. **/*: statistically significant at 5/10 % level.
3. OLS regression is employed in each estimation.

Table 6: The Transitional Change of the Trade System

	1-(1)	1-(2)	1-(3)	1-(4)	2-(1)	2-(2)	2-(3)	2-(4)
GDPI	1.530	1.508	1.360	1.609	0.451	1.246	0.421	0.224
	[12.52]**	[4.22]**	[5.79]**	[22.97]**	[2.07]**	[2.43]**	[1.15]	[1.86]*
GDPE	1.886	2.354	1.912	2.018	1.044	2.020	1.055	0.792
	[15.56]**	[5.57]**	[8.18]**	[33.91]**	[4.80]**	[4.39]**	[2.88]**	[6.00]**
GDPCAPI	0.378	1.004	0.392	0.265				
	[1.54]	[1.99]**	[0.93]	[2.17]**				
GDPCAPE	1.482	1.765	0.874	1.474				
	[6.03]**	[3.85]**	[2.06]**	[11.40]**				
DIS	-3.358	-4.914	-3.291	-3.394	-0.063	0.871	-0.216	0.415
	[-15.32]**	[-10.38]**	[-7.61]**	[-34.34]**	[-0.08]	[0.43]	[-0.16]	[0.89]
KOFODUM 1915	-7.864	-33.864	-8.149	-7.776	-9.458	-34.007	-9.465	-10.231
	[-2.78]**	[-0.00]	[-2.75]**	[-3.94]**	[-3.94]**	[-0.00]	[-3.52]**	[-5.31]**
KOFODUM 1920	-2.599	-3.024	-2.862	-2.310	-4.060	-2.926	-4.066	-4.864
	[-0.92]	[-1.05]	[-0.97]	[-1.17]	[-3.94]**	[-1.03]	[-1.51]	[-2.52]**
KOFODUM 1925	5.496	6.015	5.223	5.692	4.004	6.018	3.998	3.231
	[1.94]*	[2.13]**	[1.76]*	[2.88]**	[1.67]*	[2.16]**	[1.49]	[1.68]*
KOFODUM 1930	5.899	5.673	5.619	6.647	4.393	5.670	4.387	4.279
	[2.09]**	[2.02]**	[1.90]*	[3.37]**	[1.83]*	[2.04]**	[1.63]	[2.22]**
KOFODUM 1935	6.563	6.405	6.348	7.252	5.425	6.715	5.421	5.225
	[2.32]**	[2.32]**	[2.15]**	[3.67]*	[2.26]**	[2.41]**	[2.01]**	[2.71]**
KOFODUM 1938	7.350	7.377	7.144	7.838	6.274	7.707	6.271	5.888
	[2.60]**	[2.68]**	[2.42]**	[3.97]**	[2.61]**	[2.76]**	[2.33]**	[3.06]**
JPNDUM 1915	2.023	4.153	2.292	2.536	4.607	4.617	4.635	5.558
	[2.84]**	[3.37]**	[2.81]**	[7.32]**	[5.96]**	[3.35]**	[4.34]**	[12.52]**
JPNDUM 1920	4.885	6.761	5.184	4.399	7.618	7.425	7.647	7.027
	[6.81]**	[5.32]**	[6.26]**	[12.65]**	[9.72]**	[5.22]**	[7.01]**	[15.93]**
JPNDUM 1925	4.924	7.008	5.286	4.487	7.793	7.704	7.823	7.392
	[6.85]**	[5.51]**	[6.35]**	[12.77]**	[9.92]**	[5.46]**	[7.15]**	[16.58]**
JPNDUM 1930	4.260	5.601	4.550	4.302	6.923	6.236	6.952	7.200
	[5.96]**	[4.49]**	[5.54]**	[12.27]**	[8.93]**	[4.46]**	[6.48]**	[16.44]**
JPNDUM 1935	4.753	6.276	5.034	5.158	7.352	6.886	7.380	7.878
	[6.67]**	[5.05]**	[6.17]**	[14.90]**	[9.57]**	[4.97]**	[6.97]**	[18.19]**
JPNDUM 1938	4.925	6.646	5.226	5.157	7.553	7.212	7.585	7.791
	[6.88]**	[5.23]**	[6.35]**	[14.80]**	[9.72]**	[5.12]**	[7.04]**	[17.89]**
Year1920	-0.056	0.159	-0.004	-0.279	0.272	0.336	0.275	0.376
	[-0.10]	[0.30]	[-0.01]	[-0.85]	[0.58]	[0.66]	[0.73]	[1.54]
Year1925	-0.884	-1.015	-0.760	-1.039	-0.996	-0.496	-0.094	0.050
	[-1.56]	[-1.78]*	[-1.93]*	[-3.17]**	[-0.21]	[-0.88]	[-0.23]	[0.20]
Year1930	-0.346	0.183	-0.177	-1.076	0.759	0.873	0.767	0.311
	[-0.60]	[0.30]	[-0.42]	[-3.27]**	[1.54]	[1.44]*	[1.67]*	[1.19]
Year1935	-1.222	-1.039	-0.978	-1.932	0.359	-0.029	0.371	0.130
	[-2.09]**	[-1.50]	[-2.11]**	[-5.78]**	[0.69]	[-0.04]	[0.69]	[0.46]
Year1938	-13.394	-16.427	-11.516	-14.115	-3.383	-7.938	-3.326	-2.333
	[-10.51]**	[-5.20]**	[-5.51]**	[-22.06]**	[-2.65]**	[-2.95]**	[-1.65]*	[-3.16]**
Const	-45.963	-48.634	-40.443	-49.521	-20.532	-65.509	-18.998	-13.470
	[-8.73]**	[-2.43]**	[-4.03]**	[-18.97]**	[-1.82]*	[-2.53]**	[-1.01]	[-1.96]**
Country Dummies	None	None	None	None	Country Dummies	Country Dummies	Country Dummies	Country Dummies
	Pooled OLS	Panel Tobit	Random	FGLS panel	Pooled OLS	Panel Tobit	Random	FGLS panel
Observations	900	900	900	900	900	900	900	900
Group of Samples		150	150	150		150	150	150
Chi squared		554.05	655.82	12666.76		1031.16	1149.19	17469.69
Uncensored sample		657				657		
Censored sample		243				243		
Log likelihood		-1947.256		-2201.686		-1906.587		-2035.638
R-squared	0.69		0.69		0.78		0.79	
F	89.4				75.23			

FGLS denotes Feasible GLS with panel heteroskedasticity. Observations are assumed to be heteroskedastic across panels but no cross-sectional correlation.
**/*: statistically significant at 5/10 % level.
Adjusted t statistics in brackets in Pooled OLS.
z statistics in brackets in FGLS and Random-effect models.

Table 7: The Effect of Migration

	1		2	
with/without MIGRATION	Without	With	Without	With
GDPI	1.084	0.881		
	[12.32]**	[11.86]**		
GDPE	0.909	0.698		
	[8.98]**	[7.20]**		
GDPCAPI	0.181	0.773		
	[1.72]*	[6.64]**		
GDPCAPE	0.484	1.036		
	[3.93]**	[8.11]**		
GDPI*GDPE			1.457	1.177
			[2.38]**	[1.85]*
DIS	-1.071	-1.114	-1.280	-0.482
	[-7.22]**	[-8.74]**	[-1.81]*	[-0.59]
BORDUM 1920	2.862	1.620	3.367	2.598
	[4.89]**	[2.68]**	[1.42]	[1.06]
BORDUM 1925	3.500	2.202	3.868	3.035
	[5.98]**	[3.65]**	[1.61]	[1.23]
BORDUM 1930	3.269	1.996	3.943	3.223
	[5.59]**	[3.33]**	[1.64]*	[1.30]
BORDUM 1935	3.542	2.003	3.867	3.069
	[6.2]**	[3.38]**	[1.73]*	[1.34]
MIGRATION		0.264		0.228
		[10.90]**		[2.23]**
Year1925	-0.438	-0.457	-0.487	-0.370
	[-2.8]**	[-3.10]**	[-2.05]**	[-1.49]
Year1930	-0.814	-0.853	-0.905	-0.876
	[-5.11]**	[-5.70]**	[-2.68]**	[-2.58]**
Year1935	-0.866	-0.767	-0.848	-0.638
	[-5.21]**	[-4.86]**	[-1.84]*	[-1.39]
Const	-22.98	-21.432	-39.808	-35.231
	[-4.99]**	[-5.45]**	[-1.17]	[-1.01]
Country Dummies	None		Country dummies	
	FGLS	FGLS	FGLS	FGLS
Observations	190	190	190	190
Group of samples	48	48	48	48
Wald Chi squared	798.45	1098.16	3653.45	2945.02
Log Likelihood	-311.67	-288.562	-216.143	-212.8877

1. **/*: statistically significant at 5/10 % level.
2. z statistics are in brackets.
3. Data are unbalanced panel due to the lack of migration data.
The number of observations per group: minimum is 3, average is 3.958, and max is 4.
4. The sample is mainland Japan's imports and exports with 24 non-bloc members plus Korea and Formosa for 4 perioc
5. The estimations 'WITH' used the same sample as 'WITHOUT' (unbalanced panel)
for the caluculation of contribution shares.

Table 8: Descriptive Statistics

	Samples	Mean	Standard Dev	Min	Max
Trade (All)	900	9.6	6.9	0.0	20.7
Trade (positive)	657	13.1	4.4	0.7	20.7
GDP	900	22.4	1.7	19.6	27.4
CAP	900	5.8	1.1	2.1	8.9
DIS	900	9.1	0.7	6.9	10.1
MIGRATION	190	7.6	3.1	0.7	13.3
JAPAN	900	0.3	0.5	0	1
BLOC	900	0.0	0.2	0	1

Note: Trade (All) represents all samples, including zero trade samples. Trade (positive) refers to non-negative samples.
Japan and BLOC are dummy variables
Note: 243 Zero Trade samples out of 900 samples. 232 out of 243 zero samples are in Korean and Formosan
trades, while 11 samples are in mainland Japan's trade.