Market Division and Spatial Relocation: The Case of Postwar Japan ⋆

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Abstract

This paper empirically investigates the effect of accessibility to markets on economic growth, using a model of new economic geography and the case of the economic division of Japan and Korea after World War II. Korea was a Japanese colony in 1910–45, and gained independence after World War II. This historical relationship between Japan and Korea can be interpreted as an economic integration and division. We focus on the division side and estimate the effect of the loss of the accessibility to the Korean market on the growth of postwar Japanese cities. By using a difference in differences methodology, we confirm that cities located close to Korea showed a relative decline after division of the colonial market, implying that accessibility to markets positively affects economic growth. Moreover, our results suggest that the large Japanese migratory movement observed in 1950–70 can be interpreted as the relocation of industry resulting from the division shock in 1945.

Key words: New economic geography, Market access, Market division, Economic growth, Japan, Korea
JEL classification: F15, O18, R12

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1 Introduction

Economic activities are not necessarily distributed uniformly. Some areas attract many industrial firms and achieve high economic performance, whereas others attract less industrial firms and suffer from low economic performance. New Economic Geography (NEG), which stems from the research of Krugman (1980, 1991), is one of the theories that can explain such unequal geographical economic activity. In NEG theory, accessibility to markets is one of the most important factors that determine the geographical distribution of the economy (Fujita et al., 1999; Baldwin et al., 2003).

This paper investigates how market accessibility influences the geographical distribution of the economic activities using the case of market division between Japan and Korea in 1945. Japan and Korea are very close geographically, and there has been close economic intercourse from over the centuries. In modern ages, the economic relationship between Japan and Korea has become closer than ever after Japan annexed Korea in 1910. After that, Japan governed Korea as a colony and integrated into Japanese economy. However, in 1945, Japan was defeated in the World War II, and then Korea gained independence and deep relationship between Japanese and Korean economies was loosened, especially, the relationship with North Korean markets was completely cut off. This historical relationship between Japan and Korea can be interpreted as the economic integration and division.

It is known that economic integration and division significantly affect trade flows between the interested countries. For example, McCallum (1995) showed the importance of the Canada-U.S. border. Moreover, geographical distributions of economic activities are also affected by economic integration and division. Hanson (1996) investigated the effect of NAFTA conclusion on the distribution of the Mexican apparel industry. Redding and Sturm (2005) explored the division of Germany after World War II, Wolf (2005, 2006) investigated the effect of division of Poland in prewar periods.

This paper focuses on the division side, and investigates the impact of this division on the economic growth in Japanese cities in the postwar era. For Japanese cities, the independence of the Korean colony meant the loss of a large market that was freely accessible. We consider such loss of accessibility to the Korean market as a shock of division.[1] Our hypothesis is that cities located close to Korea suffered a division shock relative to cities located further

[1] Of course, division affects economic growth not only in terms of access to Korean market. For example, it may affect the geographical distribution of economic activity through the accessibility to foreign knowledge. In fact, knowledge spillovers from foreign countries have been known to affect economic growth and are impeded by borders (Peri, 2005; Nakajima, 2006).

from Korea, which negatively affected the economic growth of the former. We theoretically explain such a mechanism following Redding and Strum's (2005) model, and test it by using difference in differences (DD) methodology. Our empirical results suggest that cities close to Korea showed a relative decline in the postwar period because of the decline in accessibility to the Korean market after economic division.

This paper examines one of the reasons for the drastic change of the Japanese city system in the postwar period. Whereas Davis and Weinstein (2002) have found long-term stability for Japanese city-size distributions, Fujita and Tabuchi (1997) and Fujita et al. (2004) have discovered the systematic change of the Japanese city system in the postwar period. They pointed out that a large migratory movement occurred between 1950 and 1970. According to them, this migration occurred because Japanese industrial structure changed drastically from light to heavy industries in 1950–70 terms, and the structural change reinforced agglomeration in the Pacific industrial belt. In addition to the agglomeration force by the Pacific industrial belt, our research identifies another important factor that led to the 1950–70 migration and the change of city system: industry and people relocated as a result of the shock of the economic division between Japan and Korea.

The rest of the paper is organized into six sections. In Section 2, we review the historical background. In Section 3, we present the theoretical model, and some consequences that can be empirically tested. Section 4 employs data and provides empirical strategies. Sections 5 estimates the model and Section 6 discusses about differences in the industrial structures between cities and controls its effect. Section 7 checks robustness, and Section 8 concludes.

2 Historical review and the general situation

In this section, we review the geographic, economic and political relationship between Japan and Korea from the prewar to the postwar period based on Flath (2005) and Asada (1989).

Japan and Korea are very close geographically, as shown by the map in Figure 1. At their closest point, there is only a distance of 50 km between Japan and Korea.

Because of this geographical proximity, the economic relationship between Japan and Korea has been historically close. In 1876, the Japanese government coerced Korea into opening three of its ports to Japanese traders (Japanese-Korean treaty of Kangwa), starting free trade between the two countries. Thereafter, Korea became an important market for Japanese firms and relationship between Japan and Korea deepened. In 1904, the Japanese military occupied Korea after Russo-Japanese War, and started the foreign intervention in Korean domestic affairs. Finally, in 1910, Japan annexed Korea and ruled the country for 35 years as a Japanese colony. During this period, Korean markets were freely accessible to Japanese firms and traders, and many Japanese firms advanced into the Korean market.

The Korean colony was a very important market for Japanese firms. The geographical area of Korea was 58 %, the population was 32 %, and the average gross domestic expenditures (GDE) was 12 % compared to these parameters in Japan in 1933–37. Although Korea was not a very large market, the geographical proximity and the bloc economy during 1930s increased the importance of the market. Hori (1995) pointed that the economy of the Korea depended greatly on the Japanese economy and deepened its dependence through the prewar period. For example, in 1910, the total value of imports was 40 million yen, 63% of which were from Japan. The total value of imports increased with the industrialization of Korea, and in 1942 the total value of imports reached approximately 1.5 billion yen, with Japanese imports accounting for 92.2%. Tables 1 and 2 describe the sectoral breakdown of imports and exports between Japan and Korea. Manufacturing goods account for 80–90% of the exports from Japan to Korea during this period, whereas agricultural and mineral products account for a large share of imports from Korea to Japan. However, the share of manufacturing imports from Korea increased throughout this term.

In 1945, Japan lost access to the Korean market with its defeat in World War II. North Korea was then ruled by the Soviet Union, and South Korea by the United States; both established independence in 1948. Economic dependence between Japan and Korea was suddenly substantially weakened. Figure 2 graphs the Korean share in Japanese total imports and exports. [2] From this figure, we can clearly observe the division of the economic relationship between Japan and Korea. For example, whereas the Korean share in Japanese total exports is nearly 25% in 1940, it sharply decreased to near the 1% level in 1951. This result implies that a border significantly impede trade flows between the countries, which is consistent with McCallum (1995). The purpose of this paper is to examine empirically the effect of this drastic separation on the Japanese spatial distribution of economic activities.

[2] After 1951, we use the data for South Korea, since trade between Japan and North Korea is negligible.

3 Theoretical background

We follow the Redding and Sturm (2005) model which builds on Helpman (1998). In this section we present their model briefly. Their model consists of $i \in \{1, ..., I\}$ cities, two goods (manufacturing and housing) and two inputs (labor and land). The manufacturing sector needs only labor as an input for production with increasing returns technology. The housing sector has constant returns technology with inelastically supplied land input (H_i).

A representative consumer living in city i has a Cobb-Douglas preference on consumption for manufacturing goods C_i^M and housing services C_i^H with a share of manufacturing goods μ. The sub-utility for manufacturing goods is CES form with elasticity of substitution among varieties (σ).

Whereas housing services are not tradable, manufacturing goods are tradable among regions with iceberg transport cost. If one unit of the manufacturing good is shipped from cities i to j, only a fraction $1/T_{ij}$ of the original unit actually arrives.

In this model, two indices of accessibility determine the characteristics of the equilibrium. *Market access* in city i ($MA_i \equiv \sum_j (w_j L_j)(P_j^M)^{\sigma-1}(T_{ij})^{1-\sigma}$) represents the accessibility to the demand market, where w_j is the manufacturing wage, L_j is the population, and P_j^M is the price index in city j. Market access is the transport cost-weighted sum of demands for manufacturing goods in each city adjusted by competition effect P_j^M. *Supplier access* ($SA_i \equiv \sum_j n_j (p_j T_{ij})^{1-\sigma}$) represents the accessibility to the sources of supply, where n_j is the number of manufacturing varieties produced in city j, and p_j is its price. Supplier access is the transport cost-weighted sum of supplies for manufacturing goods in each city i.

Under a such set-up, in a long run equilibrium, the population of labor in city i is an increasing function of market access:

$$L_i = \chi MA_i^{\frac{\mu}{\sigma(1-\mu)}} SA_i^{\frac{\mu}{(1-\mu)(\sigma-1)}} H_i, \tag{1}$$

where χ is the composite of parameters. The transport cost is assumed to be an increasing function of distance. Therefore, the division of an integrated market decreases market access in cities near the boundary, and its effect diminishes according to distance from the boundary.

The division of an integrated market would decrease the market access of cities near the boundary, leading to a relative decrease in the real wage in these cities. This would be accompanied by labor out-migration in the cities involved. However, such labor outflows would decrease the housing rent, which would recover real wages in the cities involved, and real wages should then be equalized across all cities in the long-run equilibrium.

4 Data and empirical strategy

We use panel data for the population of 656 Japanese cities from 1925 to 1985. Population data for Korea are available at prefecture (Doh) level from 1925 to 1940. Distance between cities is measured by the Great Circle Distance between city halls. For more detail, see the data appendix.

Using these data, we empirically investigate the hypothesis derived from the theoretical model that cities located close to the border show a relative decrease in population growth rate compared to cities further from the border. We divide Japanese cities into two groups: *border cities* (treatment group) and *non-border cities* (control group). Cities located close to Korea are included as border cities, and the others are included as non-border cities. We define border cities as those located within 400 km of Pusan, which is the closest Korean city to Japan and has the busiest port in terms of trade between the two countries. The boundary for the border city group is shown as a circle in Figure 1. Pusan is located at the center of the circle, which defines a distance of 400 km. 112 cities are included in border cities, and the rests (544 cities) are in non-border cities. Table 3 lists descriptive statistics for border and non-border cities in 1940. The mean city populations of the border and non-border cities in 1940 are quite similar, and the differences are not significant at the 1% level. These descriptive statistics show that the differences in the city size between border cities and non-border cities are not large enough to affect our estimations.

We compare the population growth rate of these two groups econometrically by using DD methodology. The estimation equation is:

$$PopGrowth_{it} = \beta Border_i + \gamma(Border_i \times Division_t) + DistPort_i + d_t + \varepsilon_{it}, \quad (2)$$

where $PopGrowth_{it}$ is the population growth rate of city i in period t, $Border_i$ is the border dummy, which is zero if city i is a border city, $Division_t = 1$ if $t > 1945$, and d_t is the year dummy to control for common macroeconomic shocks. Unlike in the case of German division, almost all of the trade between Japan and Korea transported by shipping. Therefore, goods are transported through Japanese commercial ports. In order to control such transport system, we include a variable ($DistPort_i$) which is the linear distance to the nearest Japanese commercial port.

Our primary interest is parameter γ. It captures the treatment effect of division on the population growth rate of border cities compared to non-border cities.

If we obtain the result that γ is significantly negative, this implies that there is a decline in the growth rate of border cities compared to non-border cities due to division from Korean market, which is consistent with our theoretical prediction.

We pool the annual rates for population growth in Japanese cities over the periods 1925–30, 1930–35, 1935–40, 1950–55, 1955–60, 1960–65, 1965–70, 1970–75, 1975–80 and 1980–85, and exclude the World War II period of 1940–50. In order to correct downward bias in standard errors for the serial correlation problem, we cluster the standard errors on a city (Bertrand et al., 2004).

Before carrying out econometric estimation, we describe the characteristics of the population of Japanese cities in the postwar period. Figure 3 shows a graph of the total populations of border and non-border cities, where the total city populations of each group in 1925 are normalized to 100. We graph the difference between the two population indices in Figure 4. The population growth rate for each group was very similar before World War II, while its difference increased after World War II, when the population growth rate of non border cities was much higher than that of border cities. This implies that border cities were subject to a negative treatment effect in this period. After 1970, the difference in growth rates between the groups gradually decreased, implying that the negative treatment effect gradually vanishes. These properties are very similar to the graph of German division presented by Redding and Sturm (2005).

5 Estimation

5.1 Basic estimation

The result of estimating eq. (2) is shown in Column (1) of Table 4. The coefficient (γ) for $Border \times Division$ is negative and is highly significant. From this result, we can say that locating within 400km of Pusan negatively affects the postwar population growth rate of the region. This is consistent with the theoretical prediction.

Column (2) shows the difference of the treatment effect over time. We introduce interaction terms between the border dummy and a dummy for the period of division instead of a single interaction term. The coefficients of the interaction terms for 1955–60, 60–65, and 65–70 are negative and statistically significant at the 0.1% level. It implies that border cities mainly declined for 15 years between 1955 and 1970.

Our theoretical model implies that the effects are different among locations. We investigate such heterogeneity of the treatment effect for series of dummies for cities lying within cells 100 km wide at varying distances from Pusan, ranging from 0–300 to 700–800 km. We estimate the equation with these series of dummies and the interaction terms on the division dummy. In the estimation, we restrict sample years to 1970 following the result in Column (2). The results are in Column (3). The coefficients of interaction terms for 0–300 km and 300–400 km are negative and significant at the 0.1% level. On the other hand, the coefficients of the interaction term for 400–500 kilometers, 500–600 kilometers and 600–700 kilometers are negative, but the absolute value and significance level become smaller. We can observe the gradual decrease of the treatment effect along the distance from the border. These results support the theoretical implications.

In order to control for the time-invariant heterogeneity of the cities, Column (4) regresses the eq. (2) including city fixed effects.[3] The coefficient (γ) of $Border \times Division$ hardly changes, and is still highly significant. We thus conclude that the time-invariant heterogeneity of the cities does not affect the main results.

These results support the model result that market division decreases the market access of cities located close to Korea and decreases their populations. However, we cannot identify the cause of such postwar migration outflows from just these results. γ captures all of the negative treatment effects in border cities other than the decline in market access. Thus, we need to identify the effect of the market access on the postwar population outflows in border cities.

5.2 Estimation using market potential

In this subsection, we test the hypothesis that the decrease in the market access due to market division induced population out-migration from border cities. First, we define *market potential* as a proxy for market access , in city i and period t:

$$MP_{it} = \sum_j \left(\frac{I_{ijt}}{dist_{ij}} \right) L_{jt},$$

where I_{ijt} is the dummy variable that takes a value of one if cities i and j are not divided by the border, and otherwise is zero, $dist_{ij}$ is the linear distance between cities i and j, and L_{jt} is the population in city j for period t.

Introducing the market potential growth rate, we estimate the DD estimation function. If eq. (1) holds, there is a positive relationship between the population growth rate and the market potential growth rate. The results are shown

[3] Because of a multicolinearity, we drop DistPort in this specification.

in Table 5. Column (1) shows the benchmark result from Column (1) in Table 3. Column (2) restricts the sample years to 1925–70. We can observe a greater negative effect for this specification. Column (3) shows the result for DD estimation with market potential growth. The coefficient of the market potential growth is significantly positive, implying that the market potential positively affects the population growth rate. Moreover, the coefficient (γ) of *Border* $\times$ *Division* is smaller compared to the benchmark result. This is evidence that the decrease in the market access is an important factor explaining the postwar population outflows in border cities. In column (4), we estimate with same specification as Column (2) and include market potential growth. The coefficient for market potential growth is also positively significant, and the coefficient for *Border* $\times$ *Division* is negative and its effect is smaller than the benchmark result. These results indicate that postwar migration outflows in border cities was mainly caused by the decline in market access for these cities.

Market potential includes various agglomeration effects, such as the Pacific industrial belt agglomeration force pointed out by Fujita and Tabuchi (1997); Fujita et al. (2004). In order to identify the Korean division effect, we define a direct measure of the loss of Korean markets (*loss of Korean market potential*, LKMP) according to Redding and Sturm (2005). This is zero before 1945 and is equal to each city's lost Korean market potential, as measured in 1940, for all years after the division. Introducing this LKMP into the estimation equation, we estimate the effect of loss of the Korean market, as shown in Column (5). The coefficient for LKMP is negatively significant at the 1% level. This suggests that loss of Korean market accessibility negatively affected the population growth in cities. Column (6) shows estimates using the same specification, but restricting the postwar samples to 1950-70. The negative effect of LKMP is greater for this period. In Columns (5) and (6), the coefficients for *Border* $\times$ *Division* are not significant at the conventional levels, implying that LKMP can explain the postwar decline in the population growth rate in border cities. These results indicate that the decline in access to the Korean market reduced the population growth rate, especially during the period 1950–70.

6 Differences in industrial structures

The differences in the industrial structures between cities would affect our results. This subsection checks whether or not the differences in the industrial city structure changes our conclusion. In prewar Japan, industrial activities were concentrated mostly in Tokyo and Osaka, whereas the rest of Japan mainly belonged to industrial peripheries (Fujita and Tabuchi, 1997). Border cities were located in the South-West peripheral areas and may have had a different industrial structure in the prewar period compared with the control cities including the Tokyo and Osaka areas and surrounding cities. Such an initial difference would have led to a subsequent decline in border cities in the postwar period. Moreover, postwar agglomeration into the Pacific industrial belt would have affected the decline in border cities. According to Fujita and Tabuchi (1997) and Fujita et al. (2004), the Japanese city system changed from a Tokyo–Osaka bipolar system to a system centered around the Pacific industrial belt in 1950–1970 period. Due to this agglomeration to the Pacific industrial belt, border cities should have been affected by centripetal forces as well as Korean market-division effects. We therefore should control the former effect in order to examine the latter.

In order to control for the effect of differences in the city structure, we use a matching method. We choose samples of non-border cities as similar as possible to border cities in terms of the industrial structure in 1940. We match the value of gross total products, agricultural products, and manufacturing products for each city by minimizing the difference in 1940 between border and non-border cities by using the nearest neighbor matching method (Lee, 2005). Thus, we can compare border cities to non-border cities that have similar 1940 industrial structures. The data of industrial structure is available for 148 cities (*principal cities*), and 31 cities are included as border cities. Therefore, we choose 31 non-border cities from the rest of 117 cities. Table 6 lists descriptive statistics of the industrial structure for border cities, non-border cities, and matched non-border cities, allowing us to observe the difference in industrial structure between border and non-border cities. Non-border cities have larger manufacturing products.[4] In Column (1) on Table 7, we estimate eq. (2) using all 148 principal cities as the benchmark. The coefficients for ($Border \times Division$) is still negatively significant.

In Columns (2), (3) and (4), we restrict the sample cities to matched cities. Whereas in Column (2), ($Border \times Division$) is still negatively significant, in Column (3), which includes the market potential growth, the treatment effect (γ) is close to zero, and is not significant. It implies that most of the negative treatment effect can be explained by market potential growth. Therefore, by rigidly controlling for the industrial structures of border and non-border cities, we cast light on the negative effect of division more clearly. In Column (4), we obtain a negative sign on the coefficient of LKMP. This also supports our conclusion.[5]

Next, we check the possibility that our treatment effect captures the postwar

[4] The difference is not statistically significant.

[5] The coefficient of LKMP is not significant because of multicolinearity. The correlation coefficient between LKMP and $Border \times Division$ is 0.748. If we drop $Border \times Division$ from this specification, the coefficient of LKMP is negative and significant at the 5 % level.

agglomeration forces into the Pacific industrial belt. If the postwar decline in border cities was caused by agglomeration forces into the Pacific industrial belt, the agglomeration force possibly also affected the other area as well. We designate the peripheral North-East cities as a treatment group [6] and the rest as a control group. The result is shown in Column (4). The coefficient of (*North-East* $\times$ *Division*) signs negatively, but is insignificant, and thus we cannot observe any postwar decline in North-East cities. In Column (5), choosing North-East cities from the matched sample and designating them as a control group, we estimate eq.(2). We obtain significant negative treatment effects in border cities. This suggests that the postwar decline in border cities is still significantly observed even compared with the peripheral North-East cities.

These results imply that the decline of border cities in the postwar period is a specific phenomenon and significantly observed even when controlling for prewar industrial structure and the postwar agglomeration effect into the Pacific industrial belt. This robustly supports our conclusion.

7 Robustness checks

7.1 Differences in city size

Another important consequence of the theoretical model is that small cities suffer a greater regional division effect than large cities. Intuitively, this is because intra-city markets are relatively less important for small cities than markets in other cities. In other words, the economy in a small city depends on markets in other cities more than the economy in a large city does, and hence the loss of the access to the Korean market has a greater impact on small cities than large cities.

In order to test this theoretical prediction, we divide the samples into two sub-samples of small cities and large cities for separate estimation and restrict the sample years to 1925–70. The results are shown in Table 8. Column (1) shows the estimates using all samples as the benchmark result. Column (2) list estimates using the sub-sample of cities with populations less than the median value in 1925. Column (3) estimates the same specification using the sub-sample of cities with populations greater than the median. The coefficients for ($Border \times Division$) for both sub-samples are negative. However, the absolute value of the coefficient for small cities is much greater than that for large cities.

[6] Cities in the treatment group belong to Hokkaido, Aomori, Iwate, Miyagi, Akita, Yamagata and Fukushima prefectures.

This implies that small cities suffered a greater negative effect than large cities. This finding supports the theoretical model and is consistent with the results of Redding and Strum (2005).

All of the estimation results show that division significantly affected both large and small cities negatively, but the negative effect was greater for small cities than for large cities. This robustly supports the theoretical predictions.

7.2 Effects of war devastation

Japanese cities suffered intense bombing during World War II, which may have affected postwar economic growth and our estimation results. In order to control for the war devastation, we introduce interaction terms between per capita war destruction value and year dummies in the estimation equation. Table 9 show the results. Column (1) estimates eq. (2) using interaction terms between war disruption and year dummies. Column (2) estimates the same specification as Column (1) with the inclusion of market potential growth. The coefficients of the interaction terms between war disruption and year dummies in 1950–70 periods are positively significant. This suggests rapid recovery of the cities from bombing damage, which is consistent with Davis and Weinstein (2002). However, the negative treatment effect for border cities still remains significant in Column (1), and the effect disappears when the estimation controls for market potential growth in Column (2). These results are quite similar to the main results obtained in Section 5. We therefore conclude that including the war devastation effect does not alter our main conclusion on the decline for border cities. Summing up these robustness checks, we can conclude that the division of Korea from Japan negatively affected the population growth of border cities.

8 Concluding remarks

This paper empirically examines the effect of market access on economic growth using an NEG model and a DD procedure. From the NEG model, we anticipate that cities located close to Korea suffered greater division shocks because of a decrease in market access. Using the DD procedure, we confirm that border cities showed a significant decrease in population growth rate in the postwar era from 1950 to 1970. Moreover, we confirm that a decrease of access to the Korean market can explain this population outflows in border cities.

Following these results, we conclude that separation of Korea significantly reduced the population growth in Japanese border cities by reducing access to the Korean market for border cities. Moreover, from our research, the large Japanese migration flows in 1950–70, as identified by Fujita and Tabuchi (1997) and Fujita et al. (2004), can be partly attributed to the relocation of manufacturing industries due to the market division shock in 1945.

Although our results are obtained from historical data for Japan and Korea, they may be applicable to modern problems. For example, a free trade agreement (FTA) between Japan and South Korea is negotiated at present. Our result suggests that FTA approval will improve market access in cities located close to Korea, which will positively affect the economic growth in these cities. In the same way, South Korean cities located close to Japan will also have possibilities for growth.

A Data appendix

City population: data for Japanese city populations from 1925 to 1985 are from Toyo Keizai Shinposha (1991). Cities are defined by administrative city area in 1980, and its population is calibrated by the city basis in 1980. Summary statistics are shown in Table A1; data for Korean prefecture populations are from Mizoguchi and Umemura (1988).

Industral structure: data for Japanese city gross total, agricultural, and manufactural products values in 1940 are from Tokyo Shisei Chosakai (1942).

Distance between cities: are Great Circle Distance between city halls, and are calculated by using lat/long information on them.

Commercial ports: are designated ports defined by Japanese Port and Harbor Law.

Trade values: data on long-run import and export values between Japan and Korea are from Yamazawa and Yamamoto (1979)

Trade: data on sectoral trade values between Japan and Colonial Korea are from Mizoguchi and Umemura (1988)

War destruction: data on the war destruction value of Japanese cities are from Nakamura and Miyazaki (1995), and we divide these by the city population in 1940.

References

Asada, S. (Ed.), 1989. Japan and the World 1853-1952. Columbia University Press, New York.

Baldwin, R., Forsild, R., Martin, P., Ottaviano, G., Robert-Nicoud, F., 2003. Economic Geography and Public Policy. Princeton University Press, Princeton.

Bertrand, M., Duflo, E., Mullainathan, S., 2004. How much should we trust differences-in-differences estimates? The Quarterly Journal of Economics 119 (1), 249–275.

Davis, D. R., Weinstein, D. E., 2002. Bones, bombs, and break points: The geography of economic activity. American Economic Review 92 (5), 1269–1289.

Flath, D., 2005. The Japanese Economy. Oxford University Press, New York.

Fujita, M., Henderson, J. V., Kanemoto, Y., Mori, T., 2004. Spatial distribution of economic activities in japan and china. In: Henderson, J. V., Thisse, J.-F. (Eds.), Handbook of Regional and Urban Economics. Vol. 4. Elsevier, pp. 1111–3456.

Fujita, M., Krugman, P., Venables, A. J., 1999. The Spatial Economy: Cities, Regions and International Trade. MIT Press, Cambridge.

Fujita, M., Tabuchi, T., 1997. Regional growth in postwar japan. Regional Science and Urban Economics 27 (6), 643–670.

Hanson, G. H., 1996. Localization economies, vertical organization, and trade. American Economic Review 86 (5), 1266–78.

Helpman, E., 1998. The size of regions. In: Pines, D., Sadka, E., Zilcha, I. (Eds.), Topics in Public Economics. CambridgeUniversity Press, Cambridge.

Hori, K., 1995. Historical Analysis of Industrialization of Korea (in Japanese). Yuikaku, Tokyo.

Krugman, P., 1980. Scale economies, product differentiation, and the pattern of trade. American Economic Review 70 (5), 950–59.

Krugman, P., 1991. Increasing returns and economic geography. Journal of Political Economy 99 (3), 483–99.

Lee, M.-J., 2005. Micro-Econometrics for Policy, Program, and Treatment Effects. Oxford University Press, Oxford.

McCallum, J., 1995. National borders matter: Canada-U.S. regional trade patterns. American Economic Review 85 (3), 615–23

Mizoguchi, T., Umemura, M. (Eds.), 1988. Basic Economic Statistics of Former Japanese Colonies 1895-1938: Estimates and Findings. Toyo Keizai Shinposha.

Nakajima, K., 2006. The effects of knowledge accessibility on international income inequality. Review of Urban and Regional Development Studies 18 (2), 102–117.

Nakamura, T., Miyazaki, M. (Eds.), 1995. Damage Survey Report of the Second World War (in Japanese). the University of Tokyo Press, Tokyo.

Peri, G., 2005. Determinants of knowledge flows and their effect on innovation. The Review of Economics and Statistics 87 (2), 308–322.

Redding, S., Sturm, D. M., 2005. The costs of remoteness: Evidence from german division and reunification. CEP Discussion Papers dp0688, Centre for Economic Performance, LSE.

Tokyo Shisei Chosakai (Ed.), 1942. Japanese City Yearbook (in Japanese). Tokyo Shisei Chosakai, Tokyo.

Toyo Keizai Shinposha (Ed.), 1991. Complete Showa Census Compendium (in

Japanese). Vol. 1. Toyo Keizai Shinposha, Tokyo.
Wolf, N., 2005. Path dependent border effects: the case of poland's reunification (1918-1939). Explorations in Economic History 42 (3), 414–438.
Wolf, N., 2006. Endowments, market potential, and industrial location: Evidence from interwar poland (1918-1939). Explorations in Economic History, Forthcoming.
Yamazawa, I., Yamamoto, Y., 1979. Estimates of Long-Term Economic Statistics of Japan Since 1868, 14: Foreign Trade and Balance of Payments. Toyo Keizai Shinposha.

Figure 1
Map of Japan and Korea

Figure 2
The share of Korea in Japanese total importing and exporting

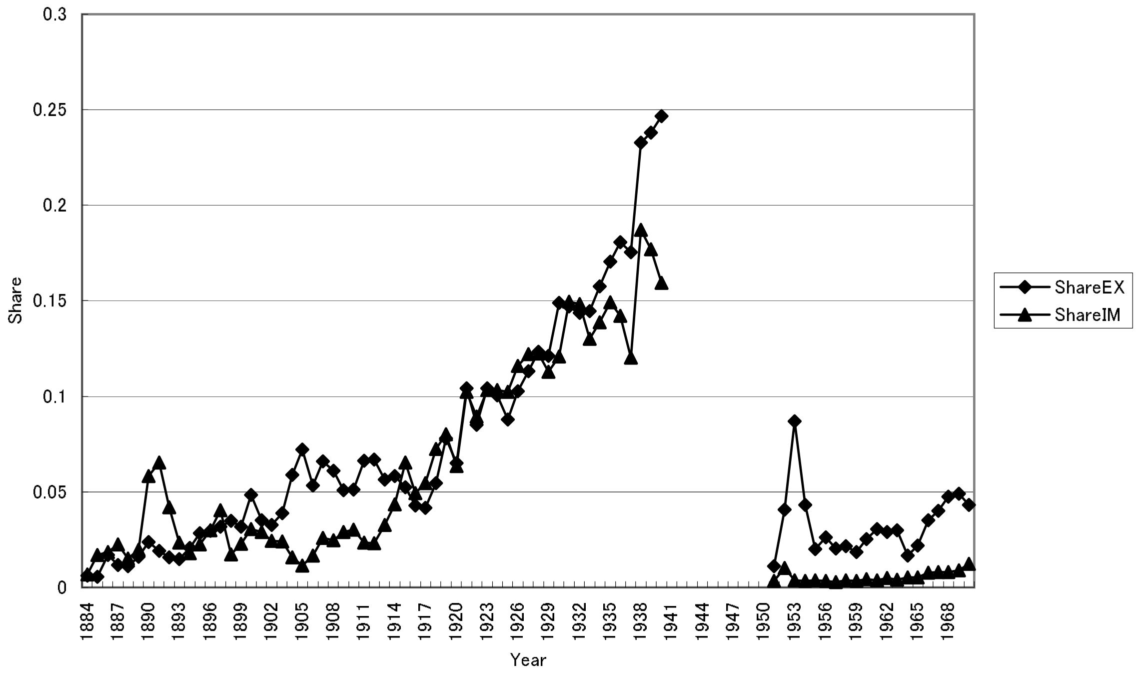

Figure 3
Population index for border (BD) and non-border (NBD) cities

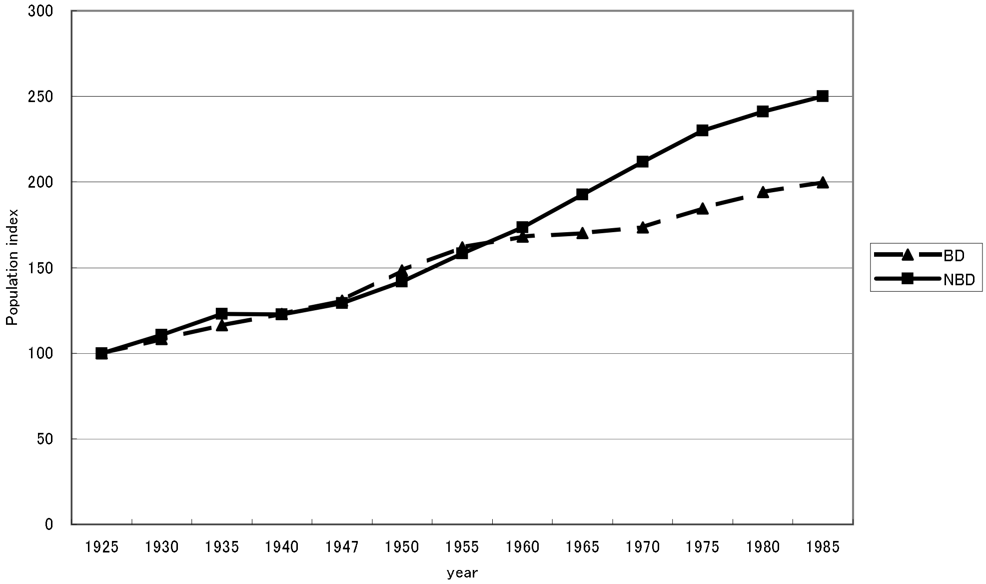

Figure 4
Difference in population indices: border–non-border

Table 1
Exports to Korea from Japan (%)

Year	Agricultural and marine products	Mineral Products	Manufactures
1912-21	4.7	3.9	91.4
1917-26	7.8	3.2	89.0
1922-31	9.4	3.3	87.3
1927-36	8.8	4.2	87.0
1930-39	7.6	4.0	88.4

Table 2
Imports from Korea to Japan (%)

Year	Agricultural products	Marine products	Forest products	Mineral Products	Manufactures
1912-21	71.1	7.9	0	4.7	16.4
1917-26	70.4	7.5	0.4	2.9	18.9
1922-31	69.3	6.7	0.6	2.3	21.2
1927-36	64.5	5.2	0.4	3.4	26.6
1930-39	54.7	4.4	0.3	4.3	36.3

Table 3
1940 population in border and non-border cities

Border cities (N = 112)		Non-border cities (N = 544)	
Mean	SD	Mean	SD
68117	9734	68675	5163

Table 4
The results of DD estimation

	(1) Pop Growth	(2) Pop Growth	(3) Pop Growth	(4) Pop Growth
Border × Division	-0.0078^{****}			-0.0078^{***}
	(0.002)			(0.002)
Border × Year1950-55		-0.0013		
		(0.002)		
Border × Year1955-60		-0.0108^{****}		
		(0.002)		
Border × Year1960-65		-0.0244^{****}		
		(0.003)		
Border × Year1965-70		-0.0217^{****}		
		(0.003)		
Border × Year1970-75		-0.0068^{**}		
		(0.003)		
Border × Year1975-80		-0.0014		
		(0.002)		
Border × Year1980-85		-0.0008		
		(0.002)		
Border0–300 × Division			-0.0104^{****}	
			(0.002)	
Border300–400 × Division			-0.0109^{****}	
			(0.002)	
Border400–500 × Division			-0.0057^{***}	
			(0.002)	
Border500–600 × Division			-0.0071^{***}	
			(0.003)	
Border600–700 × Division			-0.0042^{**}	
			(0.002)	
Border700–800 × Division			0.0137	
			(0.008)	

Border	−0.0055****	−0.0052**		
	(0.001)	(0.002)		
Border0–300			−0.0080****	
			(0.002)	
Border300–400			−0.0097****	
			(0.002)	
Border400–500			−0.0145****	
			(0.001)	
Border500–600			−0.0120****	
			(0.003)	
Border600–700			0.0011	
			(0.003)	
Border700–800			−0.0098	
			(0.008)	
Portdist	−0.0186****	−0.0186****	−0.0269****	
	(0.002)	(0.002)	(0.003)	
Year Effects	Yes	Yes	Yes	Yes
City Effects				Yes
Year Sample	1925–40 & 1950–85	1925–40 & 1950–85	1925–40 & 1950–70	1925–40 & 1950–85
Observations	7204	7204	7204	7204
R^2	0.0353	0.0428	0.0570	0.209

Standard errors are heteroscedasticity-robust and adjusted for clustering on a city. ** denotes significance at the 5% level; *** denotes significance at the 1% level; **** denotes significance at the 0.1% level.

Table 5
Estimation using market potential

	(1) Pop Growth	(2) Pop Growth	(3) Pop Growth	(4) Pop Growth	(5) Pop Growth	(6) Pop Growth
Border × Division	−0.0078***	−0.0112***	−0.0038***	−0.0052***	−0.0033	−0.0050
	(0.002)	(0.002)	(0.001)	(0.002)	(0.003)	(0.004)
Market Potential Growth			0.830***	0.762***		
			(0.177)	(0.180)		
Loss of Korean Market Potential					−0.0037***	−0.0054***
					(0.001)	(0.001)
Border	−0.0055***	−0.0058***	−0.0046***	−0.003**	−0.0057***	−0.0061***
	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)
Portdist	−0.0186***	−0.022***	−0.0178***	−0.020***	−0.020***	−0.025***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.02)	(0.002)
Year Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Sample	1925–40 & 1950–85	1925–40 & 1950–70	1925–40 & 1950–85	1925–40 & 1950–70	1925–40 & 1950–85	1925–40 & 1950–70
City Sample	All cities	All cities	All cities	All cities	All cities	All cities
Observations	7204	5239	7204	5239	7204	5239
R^2	0.0353	0.0389	0.0912	0.0954	0.0381	0.0436

Standard errors are heteroscedasticity-robust and adjusted for clustering on a city.
* denotes significance at the 10% level; ** denotes significance at the 5% level; *** denotes significance at the 1% level.

Table 6
Product characteristics of sample cities (Yens in thousand)

	Border cities (N = 148)		Non-border cities (N = 31)		Matched non-border cities (N = 31)	
	Mean	SD	Mean	SD	Mean	SD
Total products	46244	50851	94608	297652	36157	26605
Agriculture	2001	1935	1675	2108	2217	2614
Manufacture	37466	44277	91328	297386	29957	24356

Table 7
DD results after matching

	(1) Pop Growth	(2) Pop Growth	(3) Pop Growth	(4) Pop Growth	(5) Pop Growth	(6) Pop Growth
Border × Division	−0.0094**	0.0072**	−0.0023	−0.0020		−0.0070*
	(0.004)	(0.003)	(0.003)	(0.006)		(0.004)
Market Potential Growth			0.7928*			
			(0.409)			
Loss of Korean Market Potential				−0.0018		
				(0.002)		
Border	−0.0008	−0.0035	−0.0031	−0.0036		−0.0040
	(0.005)	(0.003)	(0.003)	(0.003)		(0.003)
North–East (NE) × Division					−0.0032	
					(0.005)	
NE					0.0060	
					(0.004)	
Portdist	−0.0097	−0.0077	−0.0098	−0.0090	−0.0080	−0.0070
	(0.007)	(0.011)	(0.010)	(0.010)	(0.005)	(0.014)
Year Effects	Yes	Yes	Yes	Yes	Yes	Yes
City Sample	All principal cities	Matched cities	Matched cities	Matched cities	All principal cities	Matched NE + Border
Year Sample	1925–40 & 1950–70	1925–40 & 1950–70	1925–40 & 1950–70	1925–40 & 1950–70	1925–40 & 1950–70	1925–40 & 1950–70
Observations	1184	496	496	496	1184	320
R^2	0.0152	0.1313	0.2275	0.1350	0.0117	0.2162

Standard errors are heteroscedasticity-robust and adjusted for clustering on a city.
* denotes significance at the 10% level; ** denotes significance at the 5% level; *** denotes significance at the 1% level.

Table 8
Differences in the negative effect between small and large cities

	(1) Pop Growth	(2) Pop Growth	(3) Pop Growth
Border × Division	-0.0112^{***}	-0.0162^{***}	-0.0063^{***}
	(0.002)	(0.003)	(0.002)
Border	-0.0058^{***}	-0.0071^{***}	-0.0044^{*}
	(0.002)	(0.002)	(0.003)
Portdist	-0.019^{***}	-0.023^{***}	-0.021^{***}
	(0.002)	(0.004)	(0.004)
Year Effects	Yes	Yes	Yes
Year Sample	1925–40 & 1950–70	1925–40 & 1950–70	1925–40 & 1950–70
City Sample	All cities	Small cities	Large cities
Observations	5239	2615	2624
R^2	0.0389	0.0836	0.0289

Standard errors are heteroscedasticity-robust and adjusted for clustering on a city. * denotes significance at the 10% level; ** denotes significance at the 5% level; *** denotes significance at the 1% level.

Table 9
Effects of war devastation

	(1) Pop Growth	(2) Pop Growth
Border × Division	-0.0061^{**}	0.0024
	(0.003)	(0.003)
Market Potential Growth		0.4920^{***}
		(0.168)
Border	-0.0072^{***}	-0.0077^{***}
	(0.003)	(0.003)
War Disruption × Year1925–30	$4.0e-05$	0.0002
	(0.002)	(0.002)
War Disruption × Year1930–35	0.0130^{***}	0.0071^{***}
	(0.002)	(0.002)
War Disruption × Year1935–40	-1.3947^{***}	-1.3571^{***}
	(0.002)	(0.014)
War Disruption × Year1950–55	0.0198^{***}	0.0184^{***}
	(0.002)	(0.002)
War Disruption × Year1955–60	0.0123^{***}	0.0081^{***}
	(0.002)	(0.002)
War Disruption × Year1960–65	-0.0133^{***}	-0.0211^{***}
	(0.002)	(0.003)
War Disruption × Year1965–70	-0.0304^{***}	-0.0350^{***}
	(0.002)	(0.002)
Portdist	0.021^{***}	0.019^{***}
	(0.007)	(0.007)
Year Effects	Yes	Yes
Observations	1376	1376
R^2	0.7588	0.7776

Standard errors are heteroscedasticity-robust and adjusted for clustering on a city. * denotes significance at the 10% level; ** denotes significance at the 5% level; *** denotes significance at the 1% level.

Table A1
City populations

City populations (N = 656)				
Year	Mean	SD	Min	Max
1925	111904	1440481	2586	36800000
1940	137369	1765771	3301	45200000
1950	161141	2071414	6265	53000000
1970	235253	3028220	15334	77500000
1985	277582	3573027	9612	91400000