The Impact of Immigrants on Trade: Evidence from Japan

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Abstract

This paper described on the impact of immigration on Japan's bilateral trade. Past literatures had been focusing on countries with open border, such as US or European countries, where a large population of immigrants have already existed. On the other hand, Japan, an open economy with closed border, provides a unique case. This paper estimates the fixed effects gravity model, using trade data and immigrant data on prefecture-level. The author finds evidence of trade-improvement effect of immigrants on trade. When trade data is split into different type of goods, the link between Consumer Goods is stronger than Industrial Goods. Finally, when the effect on trade is decomposed into intensive margin and extensive margin. There are evidences to support the positive impact that immigrant has on both margins.

Keywords: immigrant, trade, gravity equation, extensive margin, intensive margin

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1. Introduction

Recent literatures have established that immigrants, being able to reduce trade costs with their home country, can improve bilateral trade. Still, "how" immigrants affect trade are still up for debate. One theory is that if immigrants reduce variable trade costs, both intensive margin and extensive margin are improved. If immigrants reduce fixed trade costs, then only extensive margin is improved. However, empirical literatures on this mechanism have been focusing on export, but not import. Furthermore, these lines of studies have been analyzing immigrants' impact on trade of "open border" countries, such as US (Gould,1994; White, 2007, Herander & Saavedra, 2005), or European countries (Girma & Yu, 2002; Hatzigeorgiou & Lodefalk, 2015, Combes et al., 2005). On the other hand, Japan has been an "open market, but closed border" economy: while open to trade, Japan has strict immigration policy. According to the World Bank, in 2015, immigrant-to-total population ratio for Japan, US, and Italy are 1.6%, 14.5%, and 9.7%, respectively. Thus, the question is whether immigrants can similarly increase bilateral trade in Japan.

This paper sheds light on the relationship between immigrants and trade in Japan. Specifically, (i) provide evidence for the relationship between immigrants and trade in economy with strict migration law, (ii) differentiate this link between different categories of goods, and (iii) quantify the effects of immigrants on intensive margin and extensive margin for both export and import.

To achieve these objectives, fixed effects gravity equation is estimated, using trade and immigrant data between 47 prefectures of Japan and 160 countries during 2006 and 2014. Country-pair fixed effects, along with exporter-time and importer-time fixed effects are included to account the multilateral resistance terms. Then, trade data is further divided into Consumer Goods and Industrial Goods to compare the effects between two groups. Intensive margin is studied using the same gravity model, but includes only goods with positive trade value for the whole period. On the other hand, to quantify the effects on extensive margin, the gravity equation is estimated using Poisson pseudo-maximum-likelihood (PPML), using the number of imported (exported) goods as dependent variable.

Using the above methods reveals three important results. First, raising immigrant population from a country by 10% will raise import (export) with that country by 4.49% (3.03%). For robustness checks, dependent variable is defined differently: import (export) as a share of total import (export) of the prefecture, or as a share of the prefecture's GDP. Further tests include removing each fixed effects, exclude China, and exclude Tokyo. All tests return significant and similar coefficients with the main findings. Thus, immigrants, on average, have a positive link with trade value.

Second, when trade data is categorized into Consumer Goods and Industrial Goods, immigrants are found to have a stronger effect on the former. The trend is presence for both import and export. Consumer Goods consist of Food & Direct Consumers, Consumer Non-durable Goods, and Consumer Durable Goods; while Industrial Goods consists of Industrial Supplies and Capital Equipment. These results show immigrants can reduce trade costs more effectively for Consumer Goods. One possible explanation is that information brough by immigrants is more valuable in trading of such goods.

Third, for both import and export, intensive margin (extensive margin) is similarly affected. In other words, an increase in immigrants lead to higher trade value of existing imported (exported) goods, as well as higher variety of imported (exported) goods. It implies that immigrants can decrease both fixed trade costs and variable trade costs. Robustness tests similar with the main findings are conducted (except for extensive margin, for which there is test with different variable). The tests show robust results.

To the best of the author's knowledge, this paper is the first to analyze the effects of immigrant community on bilateral trade of "open market, closed border" economy, such as Japan. Another important contribution is about the mechanism of how immigrants affect trade. Specifically, there are evidences that immigrants increase both intensive margin and extensive margin. Additionally, most of current literatures have been focusing on the relationship between immigrants and export. This paper extends this line of empirical research to import as well.

This work is organized as follows. Section 2 provides a summary of past contributions on the use of gravity equation to study the relationship between immigrants and bilateral trade. Section 3 presents the theoretical foundation of gravity equation, and the corresponding empirical model. Section 4 describes the data used in this paper. Section 5 presents the estimation results, as well as their implications. Section 6 concludes the main finding of this paper.

2. Literature review

2.1. Gravity Equation

Heckscher-Ohlin-Vanek (HOV) model has been used to explain international trade by relating trade to factor endowment: goods that are produced using abundant factor will be exported. However, Trefler (1995) cast doubt on the accuracy of the framework in predicting direction in factor trade service. Leamer and Levinsohn (1995) argue that distance should be included as a determinant of trade, stating that it is contradicting to assume that "countries are both infinitely far apart and infinitely close". Krugman (1995) suggests that something else other than distance must have been influencing bilateral trade by providing the following thought experiment: bilateral trade between two countries would be lower if they were in the middle of Europe, instead of on Mars, even if the distance between the two were the same. McCallum (1995) also concludes that, in addition to distance, national borders do matter in bilateral trade.

Distance and trade cost are suggested to be determinants of bilateral trade in an early version of gravity equation by Anderson (1979). But it had been largely neglected. Anderson and Van Wincoop (2003) provide micro-foundation for the gravity equation, while keeping both distance and border effect in the model. The model has 3 important implications:

1. Trade costs decreases GDP-adjusted trade between large countries more than between small countries.
2. Trade costs increases GDP-adjusted trade within small countries more than within large countries.
3. GDP-adjusted trade within country 1 to GDP-adjusted trade between country 1 and country 2 increases more if 1 becomes smaller, and 2 becomes larger.

Empirically, McCallum (1995) uses dummy variable to indicate border effects when analyzing the inter-national and intra-national trade between US and Canada provinces, and find that the cross-provinces trade for Canada is larger than cross-national trade with US by 22 times and 16.4 times for 1988 and 1993, respectively. Feenstra (2002) repeats the same analysis using additional data in 1993, and also find the effects to be 15.7 times. However, in the same paper, the author points out that the effects are extremely large since the multilateral resistance terms are not controlled for. Anderson and Van Wincoop (2003) estimate the model by calculating the multilateral resistance directly. Using data of trade between Canada and US, the authors find that trade between Canada provinces are 4.3 times larger with the presence of border effects than without, compared to that of 1.05 for US (Implication 2); and trade between provinces are 10 times higher than between countries for Canada, compared to that of 2.6 for US (Implication 3).

Fixed effects is another popular method to estimate the gravity equation (Harrigan, 1996; Redding & Venables, 2000; Rose & Van Wincoop, 2001). This method uses fixed effects to control for multilateral resistance terms. It is easier to implement, and still provides a consistent estimate for the average border effects (Feenstra, 2002). In recent literatures, PPML has been suggested to be a better alternative to the fixed effects model (Santos Silva & Tenreyro, 2006). Different from fixed effects model, PPML allows the inclusion of zero observations, and provides robust results in the presence of heteroskedasticity. However, the method is not without disadvantage. Bratti et al. (2014) argue against using PPML, and instead use the fixed effects model when study the relationship between immigrants and trade of Italy's provinces. Using Monte Carlo simulation, Pfaffermayr (2019) finds that standard error of PPML estimator with dummies suffers from downward bias. For this paper, similar to Bartti el al. (2004), fixed effects model is used since a large number of fixed effects will be included.

2.2. Intensive margin and Extensive margin

The traditional gravity model by Anderson and Van Wincoop (2003) base on the assumption that firms are homogeneous in productivity. When relaxing this assumption, Chaney (2008) decomposes trade costs into variable trade costs (τ_{ijt}) and fixed trade costs (f_{ijt}). Furthermore, the effects of variable trade costs and fixed trade costs on trade value (X_{ijt}) can be categorized into intensive margin and extensive margin, as follows:

$$-\frac{d\,lnX_{ij}}{d\,ln(\tau_{ijt})} = \underbrace{(\sigma - 1)}_{\text{Intensive margin elasticity}} + \underbrace{\left(\gamma - (\sigma - 1)\right)}_{\text{Extensive margin elasticity}} \quad (1)$$

$$-\frac{d\,lnX_{ij}}{d\,ln(f_{ijt})} = \underbrace{0}_{\text{Intensive margin elasticity}} + \underbrace{\frac{\gamma}{\sigma-1} - 1}_{\text{Extensive margin elasticity}} \quad (2)$$

Equation (1) shows that following a change in variable trade costs, both intensive and extensive margin of trade are affected. On the other hand, only extensive margin of trade changes when fixed trade costs change in (2). As such, one can conclude that if immigrants only reduce fixed trade costs, then only the impact on extensive margin of trade is significant. In contrast, if immigrants can lower both the fixed trade costs and variable trade costs, then both intensive and extensive margin of trade expand.

2.3. Immigrants and Trade

Gravity model has been an empirically successful model in identifying the determinants of bilateral trade such as GDP, FTA memberships, or geographic distance. Immigrants from country *j* in country *i* can also be considered as an attractor, facilitating trade between countries. Positive relationship between trade and immigration has been reported in different studies using different analysis methods. When immigrants enter a host country, they can influence trade through two channels: home bias effect, and business and social network effect. The former describes immigrants as having different consumption habits comparing to natives. Since goods from their home country may not be available, or available with high prices, immigrants have an incentive to purchase such goods from their country of origin, effectively increase imports of host country (Gould, 1994**;** White, 2007). Mazzolari and Neumark (2012) study the effects of immigrants on a variety of goods in host country, and find that an increase in immigrants lead to an increase in ethnic restaurants, suggesting that immigrants are more likely to consume goods from their countries of origin.

The latter channel explains the ability of immigrants to lower trade costs (Head & Ries, 1998; Rauch, 2001; Rauch & Trinade, 2002; Wagner et al., 2002; Herander & Saavedra, 2005; Peri & Requena-Silvente, 2010). In this aspect, immigrants can lower the communication barriers because they know the language of their country of origin. Another advantage is that they understand the cultures and consumption habit of their country of origin, allowing for better business opportunities. Moreover, immigrants know who to trust, and how to conduct businesses in their country of origin, because they are better connected with local businesses, and are familiar with the rules and laws. Combes et al. (2005) study the social and business network effect extensively. The study analyzes the effect of immigrant stocks (social network) and production plant network (business network) on the inter-regional and intra-regional trade flow of 94 French regions. By accounting for plant network, the authors attempt to capture only business-related information brought by the immigrants. It shows positive and significant effects for both immigrant stocks and plant networks, and a larger effect on the latter, implying the importance of social networks and business networks possessed by the immigrants.

Two conclusions can be drawn from the above arguments. First, both channels exert positive influences on trade volume. Second, in addition to the business and social network effect, home bias effect cause immigrants to have a larger effect on imports rather than exports. Rauch (2001) argued that the second conclusion explains the higher elasticity for imports compared to exports. White (2007) also reached the same conclusion by studying the effects of immigrants on US trade.

Additionally, certain type of goods is affected more by immigrants than other. Gould (1994) find the pro-trade effects are stronger for consumer manufactured goods than for producer manufactured goods. Dunlevy and Hutchinson (1999) divide imports of 78 commodities into five groups of goods and find significant immigrant-link effects in processed foodstuffs, semi-manufactures, and manufactures for consumption groups, linking this to the home-bias effect by immigrants. The authors repeat the analysis on each individual commodities, and find significant positive effects on 35 commodities. Rauch and Trindade (2002) study the effect of Chinese network's effect on international trade, and also confirm the highest effects for differentiated goods. The study divides all goods into heterogenous goods and homogeneous goods. They argue that since homogeneous goods possessed a reference price, buyers and sellers would make purchase decision based on this price. On the other hand, differentiated goods possess no such reference price. Hence, information brought by immigrants would be more important in trading heterogeneous goods. Hatzigeorgiou (2010) utilizes a large data set of 75 economies and obtains similar results. These studies indicate that if information brought by immigrants is valuable, the effects should be the strongest for differentiated goods, since such goods are different between suppliers.

Compare to country-level data, data of small spatial unit (state or province-level) are used to better control for unobserved heterogeneity as well as dealing with bias caused by Modifiable Areal Unit Problem (MAUP) (Bratti et al., 2014; Wagner et al., 2002; Dunlevy, 2006; Peri & Requena-Silvente, 2010). MAUP, similar to Simpson's paradox (Samuels, 1993), happens when a trend is either disappear (or reverse) when data are grouped together. Further details are described in Section IV.

In summary, past literatures have proved consistently the positive effects of immigrants on trade. By splitting into intensive and extensive margin, it is easier to grasp specifically how trade is influenced. Magnitude of the impact depends on how valuable the information brought by immigrants to the host country. Specifically, the relationship is more significance for differentiated goods.

3. Modelling framework

3.1. Theoretical model

For this paper, gravity model is derived according to Anderson and Van Wincoop (2003). If c_{ij} describes the consumption of goods from country *i* in country *j*, then the CES utility function of a representative consumer in *j* is

$$\left(\sum_i \alpha_i^{\frac{1-\sigma}{\sigma}} c_{ij}^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}} \quad (2)$$

subjected to the budget constraint

$$Y_j = \sum_i p_{ij} c_{ij} \quad (3)$$

α_i is the CES preference parameter, $\sigma > 1$ is the elasticity of substitution among different goods, Y_j is the total output value of *j*, and p_{ij} represents the price at which consumers in *j* pay for goods from *i*. p_{ij} can further be decomposed to $p_{ij} = p_i\, t_{ij}$, where p_i denotes the factory-gate price in *i*, and t_{ij} denotes the iceberg-type trade costs (Samuelson, 1952). Demand function can be solved for immediately. Define world total output value as $Y \equiv \sum_j Y_j$, total value of goods from *i* to *j* is as follow

$$X_{ij} = \frac{Y_i Y_j}{Y} \left(\frac{t_{ij}}{\Pi_i P_j} \right)^{1-\sigma} \quad (4)$$

where $\Pi_i^{1-\sigma} = \sum_j \left(\frac{t_{ij}}{P_j}\right)^{1-\sigma} \frac{Y_j}{Y}$ and $P_j^{1-\sigma} = \sum_i \left(\frac{t_{ij}}{\Pi_j}\right)^{1-\sigma} \frac{Y_i}{Y}$ represents the price index of for *i* and *j*, respectively.

Equation (4) relates trade flow between i and j to economic mass of both countries (Y_i and Y_j), multilateral resistance terms (Π_i and P_j), and trade costs (t_{ij}). An estimation strategy for equation (4), provided by Anderson and Van Wincoop (2003), is to move GDP terms to the left side, then take logs.

$$\ln\left(\frac{X_{ij}}{Y_i Y_j}\right) = (1-\sigma)\ln t_{ij} + \ln(\Pi_i)^{\sigma-1} + \ln\left(P_j\right)^{\sigma-1} + (1-\sigma)\,\epsilon_{ij} \quad (5)$$

Equation (4) is estimated to obtain trade cost, then solve for price indexes simultaneously, all while ensuring that the sum of squared residuals in (4) are minimized. This process is repeated until the estimates converge. Another approach to use fixed effects to account for the price indexes, which provide similar estimates to Anderson and Van Wincoop (Feenstra, 2002). For this paper, the latter approach will be used.

Next, following Felbermayr et al. (2015), determinants of trade costs are composed of geographical distance and information on trading opportunity between *i* and *j.* Since immigrants can reduce trade costs between *i* and *j* using knowledge of their country of origin, information on trading opportunity can be written as a function of immigrants' stock from *i* residing in *j*. Geographical distance is expected increase the trade costs, and immigrants' stock is expected to positively affect the availability of information on trading opportunities, thus, reducing the trade costs.

3.2. Empirical model

Equation (4) can be estimated by taking logs of both side, and fixed effects are included to control for unobserved heterogeneity. Specifically, the model for estimation is as follow:

$$ln\left(1+X_{ijt}\right) = \beta_1 \ln\left(1+N_{ijt-1}\right) + \beta_2 \ln d_{ij} + \beta_3 \ln\left(Y_{it-1}Y_{jt-1}\right) + \beta_4 \ln(Openness_i)$$

$$+\delta_{ct} + \theta_{rt} + \mu_{cr} + \epsilon_{ijt} \quad (5)$$

where X_{ijt} denotes bilateral trade (either export or import) between country *i* and prefecture *j* at time *t*. N_{ijt-1} represents stock of immigrants from i residing in *j* at time *t*-1. d_{ij} is the geographic distance between i and *j*. Y_{it-1} and Y_{jt-1} are GDP of country i and province *j*, respectively, at time t-1. Following Head and Ries (1998), $Openness_i$, measured as the ratio between total trade to the world and country i's GDP, is included to measure the world market integration level. Thus, higher level $Openness$ indicates that a country is more willing to trade. δ_{ct} is continent-year fixed effects, θ_{rt} is region-year fixed effects, and μ_{cr} is country-pair fixed effects, where c indicates the continent of country i, r indicates the region that prefecture j is in.

Since immigrants' stocks are measured in prefecture-level instead of country-level, zero trade between a pair of prefecture-country is very likely. In order to retain zero-trade data, a constant of 1 is added to X_{ijt} (Dunlevy, 2006; Peri & Requena-Silvente, 2010; Artal-Tur et al., 2012). Similarly, a constant of 1 is also added to N_{ijt-1} in order to include all cases where there is trade with country i but no immigrants from said country is presence.

As stated above, fixed effects are used to take into account of multilateral resistance indexes. Following past literatures, exporter-time fixed effects, importer-time fixed effects, and country-pair fixed effects are included (Olivero & Yotov, 2012; Baier & Bergstrand, 2007). Region-year fixed effects permit variation between prefectures while still controlling for unobserved heterogeneity. Similarly, continent-year fixed effects are also included.

3.3. Intensive and Extensive margin of trade

The trade data is disaggregated in 9-digit Harmonized System (HS9). Intensive margin (trade of existing traded goods) can be measured by re-estimating the above fixed effect gravity model using data of only goods that have positive trade value between 2006 and 2014.

To measure the impact on extensive margin (trade of new entrants), the number of traded goods is used as a proxy, following the works of Parson and Vézina (2018), and Kang (2018). PPML method is used instead of fixed effects. PPML is suitable since the dependent variable is a count data, with many zeros, and may suffer from overdispersion problem (variance is greater than mean). Additionally, to avoid the problems that stated in the previous section, PPML is used to estimate the extensive margin, however, province, continent, and year fixed effects are used instead to reduce the number of dummies.

4. Data

Most of the data use in this paper are publicly available. The data covers 160 countries and 47 prefectures between 2006 and 2014. Japan immigration and trade data for are provided by the Ministry of Justice and Japan Customs, respectively. Both are available on the Portal Site of Official Statistics of Japan (e-Stat). For this paper, immigrant is defined as foreigner who holds work visa or long-term visa. Foreigners that are not included in this study include those who come to Japan for "tourism, business, visiting friends or relatives, etc. that does not include remunerative activities" (Ministry of Foreign Affairs of Japan, 2020). The variable of interest here is the stock of immigrants between country of origin (country i) and prefectures of Japan (prefecture j).

Table 1. Immigrants by country (top 10)

Ranking in 2014	Country of origin	Number of immigrants in 2014	% of total immigrants in 2014	Growth from 2006 to 2014 (%)	Ranking in 2006
1	China	654,651	35.1%	16.7%	2
2	Korea	500,451	26.9%	-16.3%	1
3	Philippines	217,533	11.7%	12.4%	4
4	Brazil	175,343	9.4%	-44.0%	3
5	Vietnam	99,822	5.4%	207.3%	8
6	America	51,185	2.7%	-0.3%	6
7	Peru	47,963	2.6%	-18.3%	5
8	Thailand	43,052	2.3%	8.7%	7
9	Nepal	42,341	2.3%	439.8%	7
10	Indonesia	30,196	1.6%	21.5%	9
	Top 10 countries	1,862,537	89.6%		
	Total	2,079,174	100%		

Source: Ministry of Justice

Table 1 shows the top 10 countries of origin with the highest number of immigrants in 2014. These 10 countries account for 89.6% of all immigrants in Japan. Comparing the 2014 ranking (first column from the left) to the ranking in 2006 (first column from the right) gives an overall picture of how the composition of immigrants by country of origin over time. Of these 10 countries, Vietnamese's and Nepali's community have seen the biggest increase in population. China overtakes Korea in to become the largest migrant population.

Figure 1 shows the distribution of immigrants across Japan. Darker colors indicate a bigger immigrant population relative to other prefectures. Although foreign communities in each prefecture get bigger over time, the distribution does not change much.

Trade data is only recorded on custom-level, so trade value for each prefecture need to be calculated. This trade value is redistributed, depending on prefecture's GDP ratio within the group that a specific custom is managing. For example, Osaka Custom Headquarters manages trade coming to and from Osaka, Kyoto, Wakayama, Nara, Naga, Fukui, Ishikawa, and Toyama. So, the export (import) value for Osaka is calculated by multiplying the total export (import) through this custom by the GDP ratio of Osaka in this group. Next, the trade data, originally in Yen, is converted to US dollar using the exchange rate provided by United Nations Commodity Trade Statistic Database. The process is done separately for export and import, annually.

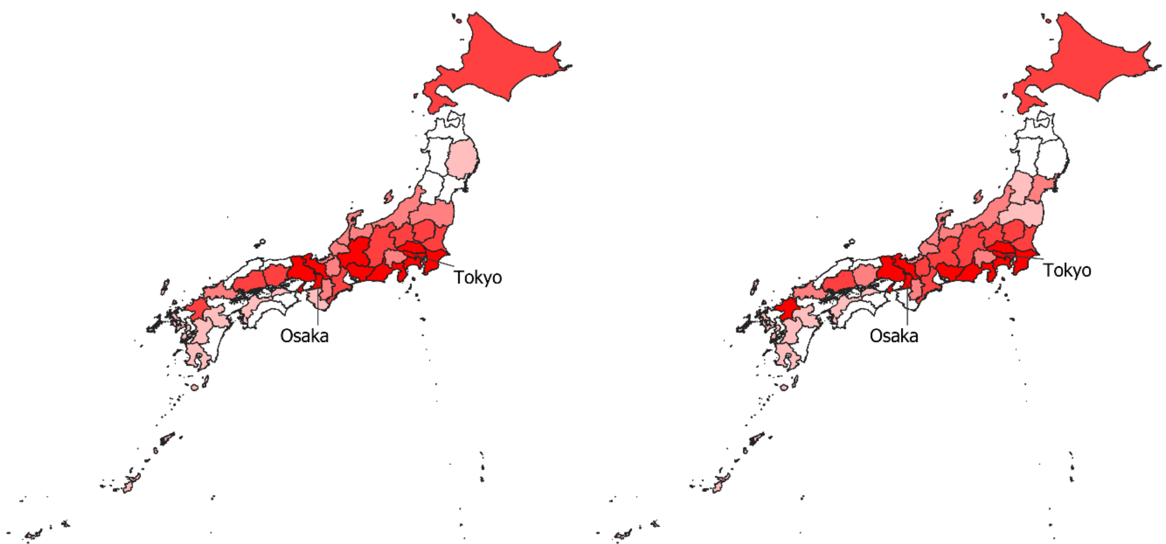

Figure 1: Distribution of immigrants across Japan in 2006 (left) and 2014 (right). *Note*: Prefectures with darker color indicate higher number of immigrants.

Prefectures' GDP is taken from the Japanese Cabinet Office (n.d.), while GDP of each country is taken from World Bank's database. However, since prefectures' GDP are originally in Japanese Yen, the numbers need to be exchanged too US dollar. First, GDP ratio for each Japan prefecture to total GDP is calculated, using the Japanese Cabinet Office data. Then, the ratio is multiplied with Japan GDP taken from World Bank's database, which is originally in US dollar.

Geographical distance between country i and prefecture j is calculated using Great

Circle Distance, using the coordinates of capital city of country *i* and prefectural government office of prefecture *j*. The coordinates of each country's capital city are provided by Mayer and Zignago (2011), while that of prefectural government offices are provided by the Geospatial Information Authority of Japan (GSI) (n.d).

Using the 2-digits, 4-digits, and 6-digits HS code classification by the Japan Customs (n.d.), trade data are categorized into: Food & Direct Consumers, Industrial Supplies, Capital Equipment, Consumer Non-durable Goods, Consumer Durable Goods, and Others. For the purpose of this study, Others category is dropped, while the other 5 categories are grouped into Consumer Goods (Food & Direct Consumers, Consumer Non-durable Goods, Consumer Durable Goods), and Industrial Goods (Industrial Supplies, Capital Equipment).

5. Empirical Result

5.1. Baseline model

Table 2 presents the coefficients and their robust standard errors. The estimates are significant and negative for distance, implying that transportation cost causes by distance can reduce trade between countries. On the contrary, significant and positive sign for GDP implies that countries or prefectures that are large in term of economic mass tend to trade more with each other. Positive coefficients of Openness for both import and export imply countries that are more willing to trade will trade more with Japan. The effect of immigrants on export and import are both positive, confirming that immigrants positively affect Japan's trade. Specifically, a 10% increase in immigrant population leads to a 4.49% (3.03%) increase in import (export) value. All the results are as expected and consistent with past literatures.

Table A.1 and Table A.2 in the Appendix shows the result of robustness check for import and export, respectively. In column (1), the dependent variable is defined differently by changing the measurement from level to share of export (import) to total export (import). In column (2), (3), and (4), each fixed effects are removed before the estimation. These changes do not alter the results in a significant way. Finally, column (5) and (6) test for outliers by removing China and Tokyo, respectively, before estimation. Chinese accounts for a large portion of immigrants, and China is also one of the biggest trading partners of Japan. Similarly, Tokyo houses he largest immigrant population, and is also the economic center of Japan. As such, changes in one or both may largely affect the results. The robustness tests show that the estimation results are consistent even after removing the outliers.

5.2. Consumer Goods and Industrial Goods

Table 3 presents the effect of immigrants on Consumer Goods and Industrial Goods. The coefficients of immigrants are positive for export and import of both categories, and are higher for Consumer Goods than Industrial Goods. Similarly, the same trend is found for

Industrial Goods, where the impacts on imports are higher than export. While this classification is similar to that of Rauch (1999), one big difference is that machinery is classified as heterogeneous goods. However, the results show the relationships between immigrants and trade of Consumer Goods and Industrial Goods correspond to the relationship between homogeneous goods and heterogeneous, respectively. Specifically, since Consumer Goods consist of goods that are significantly different from each other (heterogeneous goods), immigrants can provide important market information to induce more trade.

Table 2. Effects of immigrants on trade volume using gravity equation with fixed effects

	$\ln(1+Import_{ijt})$	$\ln(1+Export_{ijt})$
	(1)	(2)
$\ln(1+N_{ijt-1})$	0.449***	0.303***
	(0.009)	(0.009)
$\ln(distance_{ij})$	-0.769***	-0.726***
	(0.052)	(0.047)
$\ln(Y_{it-1}\ Y_{jt-1})$	1.185***	1.130***
	(0.008)	(0.007)
$\ln(Openness_{jt})$	0.981***	1.299***
	(0.018)	(0.018)
Observations	60,160	60,160
R^2	0.695	0.666

Note: (i): *p<0.1; **p<0.05; ***p<0.01
(ii): Robust SE are reported in parenthesis

5.3. Intensive Margin of Trade and Extensive margin of Trade

Table 4 and Table 5 displays the estimation result for the effects of immigrants on the intensive margin and extensive margin of trade. Column (1) shows the impact of import, while column (2) shows the impact on export. The results show that immigrants positively and significantly affect the intensive margin and extensive margin, but slightly higher for export. Specifically, a 10% increase in immigrants will lead to 2.28% (2.38%) increase in intensive margin of import (export). On the other hand, a 10% increase in immigrants increase extensive margin of import (export) by 1.1% (1.39%).

Table 3. Effects of immigrants on trade of Consumer Goods and Industrial Goods

	$\ln(1+Import_{ijt})$		$\ln(1+Export_{ijt})$	
	Consumer Goods	Industrial Goods	Consumer Goods	Industrial Goods
	(1)	(2)	(3)	(4)
$\ln(1+N_{ijt-1})$	0.720^{***}	0.486^{***}	0.437^{***}	0.290^{***}
	(0.009)	(0.010)	(0.006)	(0.008)
$\ln(distance_{ij})$	-0.661^{***}	-0.399^{***}	-0.706^{***}	-0.762^{***}
	(0.041)	(0.042)	(0.028)	(0.039)
$\ln(Y_{it-1}\ Y_{jt-1})$	0.743^{***}	1.198^{***}	0.655^{***}	1.141^{***}
	(0.007)	(0.009)	(0.005)	(0.007)
$\ln(Openness_{jt})$	0.605^{***}	1.303^{***}	1.000^{***}	1.286^{***}
	(0.019)	(0.018)	(0.013)	(0.018)
Observations	56,870	57,662	56,541	60,160
R^2	0.639	0.683	0.693	0.664

Note: (i): $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$

(ii): Robust SE are reported in parenthesis

Table A.3 and Table A.4 summarize the results of robustness check for intensive margin of import and export, respectively. While the robustness tests for extensive margin are summarized in Table A.5 and Table A.6. Similar methods with the baseline model are adopted, with the exception of different variable tests are not available for extensive margin. The robust results confirm the trade-creation effects that immigrants have on intensive margin and extensive margin for both import and export.

Table 3. Effects of immigrants on intensive margin

	$\ln(1+Import_{ijt})$	$\ln(1+Export_{ijt})$
	(1)	(2)
$\ln(1+N_{ijt-1})$	0.228***	0.238***
	(0.010)	(0.009)
$\ln(distance_{ij})$	-0.532***	-0.542***
	(0.043)	(0.037)
$\ln(Y_{it-1}\ Y_{jt-1})$	1.155***	1.093***
	(0.010)	(0.008)
$\ln(Openness_{jt})$	1.134***	1.215***
	(0.019)	(0.018)
Observations	29,544	37,688
R^2	0.695	0.641

Note: (i): *p<0.1; **p<0.05; ***p<0.01
(ii): Robust SE are reported in parenthesis

Table 4. Effects of immigrants on extensive margin

	Number of imported goods	Number of exported goods
	(1)	(2)
$\ln(1+N_{ijt-1})$	0.110***	0.139***
	(0.007)	(0.004)
$\ln(distance_{ij})$	-0.436***	0.008
	(0.025)	(0.018)
$\ln(Y_{it-1}\ Y_{jt-1})$	0.560***	0.401***
	(0.008)	(0.004)
$\ln(Openness_{jt})$	0.444***	0.479***
	(0.013)	(0.010)
Observations	60,160	60,160
Pseudo R^2	0.784	0.784

Note: (i): *p<0.1; **p<0.05; ***p<0.01
(ii): Robust SE are reported in parenthesis

6. Discussion

The coefficients of immigrants are found to be significant and positive for both imports and exports, suggesting that immigrants can reduce trade costs and promote trade volume. Additionally, the effect is higher for imports (0.449), compared to exports (0.303). Several past studies have also found the same trend (White, 2007; Bratti et al., 2014). This difference is consistent with the theory that imports are affected by both home bias effect, as well as business and network effect, while exports are only affected by the second channel. For Japan, another feasible hypothesis is that manufacturers are producing products abroad, and import back to domestic market. Such companies are dubbed "Factoryless goods producers" (FGP) (see Morikawa (2016) for details study on Japan's FGP). Ministry of Economy, Trade and Industry (2014) noted this trend in its white paper on manufacturing industries, quoting shrinking population is a concern. In other words, decrease in trade costs and increase in business opportunities abroad, due to an increase in immigrant stocks, makes manufacturing more profitable abroad, so goods, even for domestic use, are being produced in foreign countries. The trend seems to be stronger for Consumer Goods than Industrial Goods. As stated above, the pattern is similar to that of heterogeneous goods and homogeneous goods: information is more important in facilitating the trade of former goods

There are mixed-results for the impact of immigrants on intensive margin and extensive margin. Parsons and Vézina (2018) found a positive and significant relationship between Vietnamese and extensive margin of export to Vietnam, using the number of industries with positive export with Vietnam as dependent variable (the authors did not estimate on intensive margin and on import). Kang (2018) analyzed the impact of immigrants on intensive margin (average value of exported goods) and extensive margin (number of exported goods) of export, and found a positive link for both margins. In contrast, Peri and Requena-Silvente (2010), using the same definition of intensive and extensive margin with Kang (2018), concluded immigrants affect export mostly through extensive margin only. Coughlin and Wall (2011) defined intensive margin as positive export for each industry for all periods, estimated using gravity model, and extensive margin as entry/exit for each industry, estimated using fixed effects logit. The authors, however, found only positive link with immigrants and intensive margin of export. Using Japan data, this paper finds evidences of positive relations between immigrants and intensive margin, as well as extensive margin of export. Similarly for import, immigrants can increase both intensive margin and extensive margin. Since past literatures have been focusing mostly on export, the finding concerning import is an important contribution.

The baseline model suggests that immigrants have stronger effect on import than export. However, when trade-creating effect is decomposed into intensive and extensive margin, the effects are similar between export and import. In other words, immigrants lead to similar increase in trade value of existing traded goods, and similar increase in the number of traded goods. One possible implication is that immigrants have stronger effects on new imported goods than new exported goods, in term of trade value.

7. Conclusion

This paper exploit panel data between 47 prefectures of Japan and 160 trade partners to study relationship between immigrants and bilateral trade. The first finding is that, on average, by reducing trade costs, immigrants improve both import and export with their home countries, and the magnitude is stronger for import. The second finding is that the increase in trade is larger for Consumer Goods than Industrial Goods, implying the important of information brought by immigrants. Finally, immigrants lower both fixed trade costs and variable trade costs, and, consequently, raise the trade of value of existed goods, as well as expand the variety of traded goods. An important policy implication from these findings is that immigration policies also have a positive effect on trade creation. By encouraging migration, host country can exploit the business and network effect to reduce bilateral trade costs, and, consequently, promote trade.

However, the trade enhancement effects may be more complexed than just an increase in migrant population will lead to an increase in trade value. For example, while this paper finds stronger effects on import than export, Gould (1994) finds immigrants from some countries lead to the opposite: an additional immigrant from Japan increases import value by $2,965 and export value by $933, versus $29,359 and $47,708 for their counterparts from Singapore. Similarly, Hatzigeorgiou and Lodefalk (2015) find immigrants only affect Sweden's export, not import, citing a large proportion of immigrant is refugees seeking shelter rather than work might be the reason. These two papers suggest that immigrant can have different trade improvement effects depend on their country of origin, or their migration purpose. This paper fails to confirm these results because of missing data. Furthermore, Coughlin and Wall (2011) only find positive effect for extensive margin of export, and suggest firms may have substitute export with FDI. In overall, while immigrants can improve welfare by enhancing trade, further study is needed to identify, for instance, the link between immigrants and movement of capital, or the heterogenous effects of immigration purpose. Then, immigration policy can be further refined for different economic objectives.

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APPENDIX

Table A. 1. Robustness check for Import

	Import share	GDP share	$\ln(1+Import_{ijt})$				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$\ln(1+N_{ijt-1})$	0.383***	0.455***	0.440***	0.448***	0.449***	0.468***	0.455***
	(0.009)	(0.008)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
$\ln(distance_{ij})$	-1.062***	-0.730***	-0.826***	-0.770***	-0.769***	-0.694***	-0.856***
	(0.043)	(0.041)	(0.042)	(0.042)	(0.042)	(0.042)	(0.045)
$\ln(Y_{it-1}\ Y_{jt-1})$	1.078***		1.189***	1.185***	1.184***	1.196***	1.188***
	(0.008)		(0.007)	(0.008)	(0.008)	(0.008)	(0.008)
$\ln(Y_{jt-1})$		1.208***					
		(0.007)					
$\ln(Openness_{jt})$	0.831***	1.008***	0.979***	0.981***	0.971***	0.994***	0.984***
	(0.018)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)
Province-Continent fixed effects	x	x		x	x	x	x
Province-Year fixed effects	x	x	x		x	x	x
Continent-Year fixed effects	x	x	x	x		x	x
Exclude Tokyo						x	
Exclude China							x
Observations	60,160	60,160	60,160	60,160	60,160	58,880	59,784
R^2	0.627	0.675	0.691	0.695	0.695	0.697	0.687

Note: (i) $^{*}p<0.1$; $^{**}p<0.005$; $^{***}p<0.001$
(ii) Robust SE are reported in parenthesis
(iii) Dependent variable is Import as share of prefecture's total import in column (1), Import as share of prefecture's GDP in column (2), and Import in level in column (3)-(7)

Table A. 2. Robustness check for Export

	Export share	GDP share			$\ln(1+Export_{ijt})$		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$\ln(1+N_{ijt-1})$	0.235***	0.399***	0.313***	0.303***	0.303***	0.329***	0.308***
	(0.007)	(0.007)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
$\ln(distance_{ij})$	-1.039***	-0.528***	-0.679***	-0.726***	-0.726***	-0.635***	-0.815***
	(0.036)	(0.038)	(0.038)	(0.039)	(0.039)	(0.039)	(0.041)
$\ln(Y_{it-1}\ Y_{jt-1})$	1.001***		1.125***	1.130***	1.130***	1.141***	1.133***
	(0.006)		(0.006)	(0.007)	(0.007)	(0.007)	(0.003)
$\ln(Y_{jt-1})$		1.020***					
		(0.007)					
$\ln(Openness_{jt})$	1.127***	1.265***	1.301***	1.299***	1.303***	1.325***	1.302***
	(0.017)	(0.018)	(0.018)	(0.018)	(0.017)	(0.018)	(0.018)
Province-Continent fixed effects	x	x		x	x	x	x
Province-Year fixed effects	x	x	x		x	x	x
Continent-Year fixed effects	x	x	x	x		x	x
Exclude Tokyo						x	
Exclude China							x
Observations	60,160	60,160	60,160	60,160	60,160	58,880	59,784
R^2	0.627	0.675	0.691	0.695	0.695	0.697	0.687

Note: (i) $^{*}p<0.1$; $^{**}p<0.005$; $^{***}p<0.001$

(ii) Robust SE are reported in parenthesis

(iii) Dependent variable is Export as share of prefecture's total import in column (1), Export as share of prefecture's GDP in column (2), and Export in level in column (3)-(7)

Table A. 3. Robustness check for intensive margin of import

	Import share	GDP share	ln(1+Import$_{ijt}$)				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ln(1+N$_{ijt-1}$)	0.157***	0.258***	0.203***	0.228***	0.229***	0.236***	0.228***
	(0.010)	(0.008)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
ln(distance$_{ij}$)	-0.914***	-0.444***	-0.622***	-0.532***	-0.529***	-0.468***	-0.570***
	(0.045)	(0.041)	(0.042)	(0.043)	(0.043)	(0.043)	(0.046)
ln(Y$_{it-1}$ Y$_{jt-1}$)	1.021***		1.169***	1.155***	1.153***	1.172***	1.159***
	(0.011)		(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
ln(Y$_{jt-1}$)		1.143***					
		(0.009)					
ln(Openness$_{jt}$)	0.986***	1.150***	1.113***	1.134***	1.128***	1.146***	1.134***
	(0.021)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)
Province-Continent fixed effects	x	x		x	x	x	x
Province-Year fixed effects	x	x	x		x	x	x
Continent-Year fixed effects	x	x	x	x		x	x
Exclude Tokyo						x	
Exclude China							x
Observations	29,544	29,544	29,544	29,544	29,544	28,736	29,168
R^2	0.563	0.626	0.641	0.652	0.651	0.655	0.634

Note: (i) $^{*}p<0.1$; $^{**}p<0.005$; $^{***}p<0.001$

(ii) Robust SE are reported in parenthesis

(iii) Dependent variable is Import as share of prefecture's total import in column (1), Import as share of prefecture's GDP in column (2), and Import in level in column (3)-(7)

Table A. 4. Robustness check for intensive margin of export

	Export share	GDP share			$\ln(1+Export_{ijt})$		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$\ln(1+N_{ijt-1})$	0.150^{***}	0.327^{***}	0.225^{***}	0.238^{***}	0.238^{***}	0.261^{***}	0.239^{***}
	(0.008)	(0.008)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
$\ln(distance_{ij})$	-1.016^{***}	-0.353^{***}	-0.567^{***}	-0.542^{***}	-0.542^{***}	-0.443^{***}	-0.602^{***}
	(0.035)	(0.035)	(0.036)	(0.037)	(0.037)	(0.036)	(0.038)
$\ln(Y_{it-1}\ Y_{jt-1})$	1.015^{***}		1.100^{***}	1.093^{***}	1.093^{***}	1.114^{***}	1.097^{***}
	(0.007)		(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
$\ln(Y_{jt-1})$		0.970^{***}					
		(0.007)					
$\ln(Openness_{jt})$	1.002^{***}	1.168^{***}	1.203^{***}	1.215^{***}	1.128^{***}	1.243^{***}	1.216^{***}
	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
Province-Continent fixed effects	x	x		x	x	x	x
Province-Year fixed effects	x	x	x		x	x	x
Continent-Year fixed effects	x	x	x	x		x	x
Exclude Tokyo						x	
Exclude China							x
Observations	37,688	37,688	37,688	37,688	37,688	37,008	37,312
R^2	0.628	0.599	0.636	0.640	0.640	0.655	0.627

Note: (i) $^{*}p<0.1$; $^{**}p<0.005$; $^{***}p<0.001$

(ii) Robust SE are reported in parenthesis

(iii) Dependent variable is Export as share of prefecture's total export in column (1), Export as share of prefecture's GDP in column (2), and Export in level in column (3)-(7)

Table A. 5. Robustness check for extensive margin of import

	Number of imported goods				
	(1)	(2)	(3)	(4)	(5)
$\ln(1+N_{ijt-1})$	0.099***	0.080***	0.119***	0.126***	0.026***
	(0.007)	(0.006)	(0.007)	(0.007)	(0.007)
$\ln(distance_{ij})$	-0.462***	-0.532***	-0.424***	-0.361***	-0.327***
	(0.024)	(0.016)	(0.025)	(0.025)	(0.027)
$\ln(Y_{it-1}\ Y_{jt-1})$	0.559***	0.632***	0.546***	0.564***	0.560***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.007)
$\ln(Openness_{jt})$	0.431***	0.573***	0.431***	0.431***	0.502***
	(0.014)	(0.012)	(0.014)	(0.014)	(0.013)
Province-Continent fixed effects		x	x	x	x
Province-Year fixed effects	x		x	x	x
Continent-Year fixed effects	x	x		x	x
Exclude Tokyo				x	
Exclude China					x
Observations	60,160	60,160	60,160	58,880	59,784
Pseudo R^2	0.752	0.768	0.782	0.791	0.750

Note: (i) *p<0.1; **p<0.005; ***p<0.001
(ii) Robust SE are reported in parenthesis

Table A. 6. Robustness check for extensive margin of export

	Number of exported goods				
	(1)	(2)	(3)	(4)	(5)
$\ln(1+N_{ijt-1})$	0.109***	0.135***	0.141***	0.144***	0.095***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
$\ln(distance_{ij})$	-0.244***	-0.413***	-0.101***	-0.0.39	-0.858***
	(0.025)	(0.011)	(0.026)	(0.024)	(0.029)
$\ln(Y_{it-1}\ Y_{jt-1})$	0.399***	0.381***	0.389***	0.415***	0.472***
	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)
$\ln(Openness_{jt})$	0.478***	0.317***	0.485***	0.524***	0.516***
	(0.0111	(0.009)	(0.010)	(0.009)	(0.009)
Province-Continent fixed effects		x	x	x	x
Province-Year fixed effects	x		x	x	x
Continent-Year fixed effects	x	x		x	x
Exclude Tokyo				x	
Exclude China					x
Observations	60,160	60,160	60,160	58,880	59,784
Pseudo R^2	0.691	0.748	0.780	0.800	0.784

Note: (i) $^{*}p<0.1$; $^{**}p<0.005$; $^{***}p<0.001$
(ii) Robust SE are reported in parenthesis