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THORBECKE, Willem
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Understanding the Evolution of Japan's Exports[1]

Willem THORBECKE*
Research Institute of Economy, Trade and Industry

Abstract

This paper uses a gravity model to investigate the evolution of Japan's exports. Before the U.S. housing bubble burst in 2007, Japan's exports to the United States were $40 billion more than predicted each year, but they have moderated since then. Japan's exports to China increased markedly relative to predicted values after China joined the World Trade Organization in 2001. Evidence from disaggregating Japan's exports into ordinary and processing trade indicates that this increase in exports to China was driven by a surge of parts and components for re-export, and that Japan's exports of goods for the Chinese domestic market remained negative outliers. Japan's exports to South Korea and Europe are also much less than predicted. If Japan entered into free trade agreements with China, South Korea, and the European Union, it would significantly increase its exports to these destinations. This would help Japanese companies to diversify their export structure and reduce their exposure to slowdowns in the United States and the Association of Southeast Asian Nations (ASEAN).

Keywords: Japan, Exports, Gravity model
JEL classification: F10, F14, F40

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* 1-3-1 Kasumigaseki, Chiyoda-ku, Tokyo, 100-8901 Japan; Tel.: + 81-3-3501-8248; Fax: +81-3-3501-8414
E-mail: willem-thorbecke@rieti.go.jp

1. Introduction

How have Japanese exports evolved? How has the structure of these exports changed since the Global Financial Crisis? How exposed is Japan to a slowdown in China? What policies would bring more stability to Japanese exports? This paper addresses these and other questions.

To do this it goes beyond examining where Japanese exports flow and considers whether Japanese exports to certain countries or regions are more or less than one would predict. To understand why this approach is useful, consider Japan's exports to China and Thailand. Exports to China are larger than exports to Thailand. However, this is not surprising since Chinese GDP is almost 30 times larger than Thai GDP. To infer whether Japanese exports to a trading partner are disproportionately large or small this paper uses the gravity model. This model is a workhorse for explaining bilateral trade flows, and is one of the most successful empirical models in economics.

Using a variety of specifications to explain Japanese exports, the results indicate that Japanese exports to the U.S. averaged $43 billion more than predicted over the 1988-2006 period. Since the bursting of the U.S. housing bubble and the beginning of the Global Financial Crisis (GFC) in 2007, however, Japanese exports to the U.S. have fallen and Japanese exports to ASEAN countries have increased. By contrast, exports to South Korea and exports to the Chinese domestic market have been much less than predicted. Exports to Europe are also $30 billion less than expected. If Japan could export more to its Northeast Asian neighbors and to the European Union, it would help to diversify Japan's export structure. This in turn could reduce the risks that Japanese corporations face in today's volatile global economy.

The next section discusses the data and methodology used. Section 3 presents the results. Section 4 concludes.

2. Data and Methodology

This paper uses the gravity model to predict Japan's exports. As Anderson (2011, p. 133) observed, the gravity model is one of the most successful empirical models in economics, "ordering remarkably well the enormous observed variation in economic interaction across space in both trade and factor movements." Traditional gravity models assume that bilateral trade between two countries is directly proportional to GDP in the two countries and inversely proportional to the distance between them (see Tinbergen, 1962). These models are analogous to Newton's law of gravitation that states that the force of attraction between two bodies is directly proportional to the product of their masses and inversely proportional to the square of the distance between them. When explaining trade flows gravity models also typically include other factors affecting bilateral trade costs such as whether trading partners share a common language or a free trade agreement (FTA).

Traditional gravity models take the form:

$$\ln Ex_{ijt} = \beta_0 + \beta_1 \ln Y_{it} + \beta_2 \ln Y_{jt} + \beta_3 \ln DIST_{ij} + \beta_4 LANG + \beta_5 FTA_{ij} + \partial_i + \Omega_j + \pi_t + \varepsilon_{ijt} \qquad (1)$$

where Ex_{ijt} represents real exports from country *i* to country *j*, *t* represents time, Y represents GDP, DIST represents the great-circle distance between two countries, LANG is a dummy variables equaling 1 if the countries share a common language and 0 otherwise, FTA is a dummy variable equaling 1 in a year when an FTA is in force between two countries and 0 otherwise, and ∂i , Ωj , and π_t are country *i*, country *j*, and time fixed effects.

Anderson (2011) noted that the gravity model specified in equation (1) lacks strong foundations in economic theory. Anderson and Van Wincoop (2003) showed that exports should depend on multilateral resistance terms. These terms capture the fact that exports and imports between two countries depend, not only on trade costs between the two countries, but also on changing trade costs between third countries. For instance, exports from country *i* to country *j* can be affected if country *i* enters a free trade agreement with a third country *k*.

Theoretically based gravity models can be estimated by the equation:

$$\ln Ex_{ijt} = \beta_0 + \beta_1 \ln DIST_{ij} + \beta_2 LANG + \beta_3 FTA + \partial_i + \Omega_j + \varepsilon_{ijt} \qquad (2)$$

where the variables are as defined above. Here the distance and language variables capture trade costs for exports between countries *i* and *j* and the exporter and importer fixed effects variables capture the outward and inward multilateral resistance terms. Time-varying fixed effects can also be included.

Equations (1) and (2) have traditionally been estimated as log-linear models using panel least squares methods. Santos Silva and Tenreyro (2006) have demonstrated that this approach can produce biased estimates when the error terms are heteroskedastic. They found in many cases that that Poisson pseudo-maximum-likelihood (PPML) estimators perform better both in terms of bias and efficiency.

Since the goal in this paper is to try to predict Japan's exports, a variety of specifications are employed. These include the models in equation (1) and (2) and models estimated using both panel least squares and PPML techniques. The results are similar across these specifications.

Data on exports and GDP are obtained from the CEPII-CHELEM data base. Nominal exports are employed.[2] Data on distance and common language are obtained from www.cepii.fr.

[2] Traditional models have been estimated using real exports while structural models are estimated using nominal exports. The results are similar using either measure. When GDP is included in the estimation here, real GDP is

Distance is measured in kilometers and represents the great-circle distance between economic centers. Data on whether countries had an FTA in place were taken from the World Trade Organization database entitled "Participation in Regional Trade Agreements."[3]

The gravity model is estimated as a panel using annual data for the following countries: Australia, Austria, Brazil, Canada, China, Denmark, Finland, France, Germany, India, Indonesia, Ireland, Italy, Japan, Malaysia, Mexico, the Netherlands, Norway, the Philippines, Poland, Saudi Arabia, Singapore, South Korea, Spain, Sweden, Switzerland, Taiwan, Thailand, Turkey, the United Kingdom, and the United States. The sample period extends from 1988 to 2013.

3. Results

Table 1 presents the results from estimating the gravity models. Columns (1), (3) and (5) present results from PPML estimation and columns (2), (4) and (6) from panel OLS estimation. Columns (1) through (4) present results from estimating equation (2) with various fixed effects specifications and columns (5) and (6) present results from estimating equation (1). The models perform well, with all of the coefficients of the expected signs and statistically significant at the 1% level.

Since the data set contains more than 24,000 observations on trade between 31 countries over 27 years, the volume of output is enormous. To facilitate interpretation, this paper focuses on two summary statistics. Additional results are available on request.

The summary statistics attempt to gauge the extent to which Japan's exports to different countries are more or less than predicted by the gravity model. Both statistics compare Japan's actual exports to each of the 30 countries with predicted exports. For the first statistic, in each of

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employed following previous researchers (e.g., Bénassy-Quéré and Lahrèche-Révil, 2003). The results are again similar using real or nominal GDP.

[3] This database is available at www.wto.org.

the six specifications the value of the difference between Japan's actual and predicted exports to a country is ranked compared to the value of the difference between Japan's actual and predicted exports to the other 29 countries. For instance, if in a given year the difference between actual and predicted exports to Thailand in a particular specification is the second largest, Thailand would be given a rank of two. If in the other five specifications the difference between actual and predicted exports to Thailand is the largest, Thailand would be given ranks of one in each of these five cases. Thailand's numerical ranking across the six specifications can then be averaged. In the example above, this would equal 1.17 (i.e., (2+1+1+1+1+1)/6). The country with the lowest averaged value would be given a ranking on one, the country with the second lowest value a ranking of two, and so on.

The second summary statistic takes the value of the difference between actual and expected exports for each country in a given year in each of the six specifications. For instance, suppose this difference for a given country in specifications one through six equals $10 billion, $11 billion, $12 billion, $13 billion, $14 billion, and $15 billion. The second statistic averages these values across the six specifications. In the example above the average would be $12.5 billion. $12.5 billion would then be compared with the corresponding averages for the other 29 countries. The country with the highest average value would be assigned a ranking of 1, the country with the second highest average value a ranking of 2, and so on.

The two summary statistics move together. To avoid confusion, when comparing results across countries in a single figure the average of the two summary statistics is employed.

Figure 1a presents the value of these two statistics for Japanese exports to the U.S. "Average ranking across 6 specifications" represents the first statistic and "ranking based on average of actual – predicted exports across 6 specifications" represents the second statistic. In both cases, the value for the U.S. equals 1.0 for almost every year from 1989 up until 2005 or 2006. This implies that, before the U.S. housing bubble burst, the difference between actual and predicted exports for all six of the specifications was the largest for Japanese exports to the U.S. Between 1988 and 2006, Japanese exports to the U.S. on average exceeded what was predicted by the gravity model by $43 billion per year. Between 2009 and 2013, on the other hand, Japanese exports to the U.S. on average fell short of what was predicted by the gravity model by $9 billion per year.

Figure 1b presents findings for China. Between 1989 and 2000, Japan's exports to China on average fell short of what was predicted by more than $10 billion per year. Between 2001 and 2005, Japan's exports to China grew rapidly relative to predicted values and became large positive outliers.

To what extent were these changes in Japanese exports to China driven by parts and components that are sent to China for assembly and re-export and to what extent were they driven by Japanese goods destined for the Chinese domestic market? To answer this, the gravity model can be re-estimated with China's processing and ordinary trade included separately. As Gaulier, Lemoine, and Unal-Kesenci (2005) discussed, imports for processing are goods that cannot enter the Chinese market but can only be used to produce goods (processed exports) for re-export. Ordinary imports, on the other hand, are intended primarily for the domestic market and ordinary exports are produced primarily using domestic inputs.

The re-estimated gravity model thus treats China as two separate economies. The first receives imports for processing (parts and components) from other countries and sends processed exports (final assembled goods) to other countries. The second economy receives ordinary imports (imports for the domestic market) from these countries and sends ordinary exports to them.

Data on ordinary and processing trade over the 1992 to 2013 sample period are taken from the China Customs Statistics. These data are obtained for the following countries: Australia, Austria, Brazil, Canada, China (ordinary trade), China (processing trade), Denmark, Finland, France, Germany, Indonesia, Ireland, Italy, Japan, Malaysia, Mexico, the Netherlands, the Philippines, Singapore, South Korea, Spain, Sweden, Taiwan, Thailand, the United Kingdom, and the United States.

Figure 1c presents the results for Japanese exports for processing and ordinary exports sent to China. There are now 25 countries that Japan exports to, and there are only four specifications since the gravity model did not converge in the other two cases. The figures indicate that the increase in Japanese exports to China between 2001 and 2005 that is evident in Figure 1b reflects an increase in parts and components flowing into China to produce goods for re-export. This makes sense because China joined the World Trade Organization in 2001, and after its accession foreign corporations had much more confidence to shift production to China.

Ordinary goods flowing from Japan to China were the largest or second largest negative outlier in almost every year between 1992 and 2008. This changed after the Global Financial Crisis, when Japanese ordinary exports flowing to China increased rapidly relative to predicted values. However, between 2011 and 2013 Japanese ordinary exports to China fell 20 percent and were $5 billion less than predicted in 2013. The value of ordinary exports flowing to China in 2014 remained 20 percent below the value in 2011.

Figure 1d presents results for Japanese exports to South Korea, Taiwan, and Thailand. After the 1997-98 Asian Crisis, Taiwan's average ranking is 2.25 and Thailand's average ranking is 3.75. By contrast, South Korea's average ranking over this period exceeds 15.

Figure 1e presents results for Japanese exports to European countries. Japanese exports to the large European countries (France, Germany, Italy, Spain, and the UK) have been much lower than expected. In 2013 Japanese exports to all of the European countries in the sample were more than $31 billion less than predicted.

4. Discussion and Conclusion

This paper has investigated Japan's changing export patterns. In almost every year from 1989 to 2007, Japan's exports to the U.S. were much more than predicted by gravity models. The lion's share of Japan's exports to the U.S. was finished goods. For instance, 40.5 percent of Japan's exports to the U.S. between 2000 and 2007 were consumption goods and 28.6 percent equipment and capital goods. The preponderance of these exports was in the automotive, electronic, and machinery sectors.

After the emergence of the Global Financial Crisis in 2007, Japan's exports to the U.S. fell relative to predicted values and Japan's exports to Thailand increased. Since 2010 Japan's exports to Thailand have been more than $10 billion above their predicted values in every year. Japan's exports to the other ASEAN-4 countries (Indonesia, the Philippines, and Malaysia) have also been increasing.

Table 2 presents data on the products that Japan exported to ASEAN-4 in 2013. The largest share represents intermediate goods used to produce motor vehicles. These include vehicle components (9.34%) and engines (8.56%). In addition, iron and steel (9.79%) and electronic components (6.47%) are used to produce motor vehicles and other goods. In total, 38 percent of the goods that Japan exported to ASEAN-4 in 2013 were intermediate goods, 27 percent were equipment and capital goods, and only 7 percent were consumption goods. This suggests that Japanese firms are using ASEAN as a place to produce goods.

Japan's exports to ASEAN started increasing at the same time that Japan's exports to the U.S. fell. Are Japanese corporations using ASEAN as an assembly platform to export cars and other finished products to the U.S.? To test for this we can examine where ASEAN motor vehicle exports go. In 2013, 27% flowed to Australia, 26% to other ASEAN-4 countries, and 10 percent to Saudi Arabia. Less than 1% of motor vehicles produced in ASEAN-4 went to the U.S. In addition, less than 10 percent of ASEAN's total exports between 2010 and 2013 went to the U.S., as compared to more than 20 percent between 1988 and 2007.[4] Thus Japanese corporation did not redirect exports from the U.S. to ASEAN after the GFC to re-export goods to the U.S., but rather to find other markets for their products.

In this regard there is room for Japanese companies to expand their exports to China and South Korea. In the case of China, exports of parts and components for re-export have been more than predicted but exports of goods for the domestic Chinese market (ordinary exports) were very large negative outliers until the 2009-2011 period and have fallen since 2011. In the case of Korea, Japan's exports also remain less than predicted.

One implication of the results for China is that Japanese companies are not as exposed to a slowdown in China as they are to a slowdown in countries that imports processed exports from China. Xing (2015) found that China's processed exports flow disproportionately to high income countries. A slowdown in these countries would lead to a drop in China's processed exports and in turn to a drop in parts and components flowing from Japan to China.

[4] These data come from the CEPII-CHELEM database.

Figures 1c and 1d show that Japan's exports to Taiwan are large positive outliers year after year while Japan's ordinary exports to China and Japan's exports to Korea are much less than predicted. As the *Japan Times* (2015) discussed, many Taiwanese have positive attitude towards Japan's occupation of Taiwan while many Chinese and Koreans have negative attitudes. These negative attitudes reduce Japanese exports to China and South Korea. For instance, the anti-Japan riots in China in 2012 probably led to a fall in Japan's exports to China. Anything that Japan can do to improve relations with its two Northeast Asian neighbors would increase exports.

Would a free trade agreement increase Japan's exports to China and South Korea? The results presented in this paper controlled for the fact that there is no FTA between these three countries. If one did not control for this the model would predict that Japanese exports to China after 2009 would be $35 billion higher per year and Japanese exports to Korea $36 billion higher per year.

Kawasaki (2014) has presented formal evidence from a computable general equilibrium model about the beneficial effects of a free trade agreement among Asian countries. He investigated the impacts of both a reduction in tariffs and in nontariff barriers. In his model trade liberalization reduces domestic distortions, improves resource allocation, and decreases the prices of tradable goods. He reported that the income gains to Japan from the proposed Regional Comprehensive Economic Partnership (RCEP) between Japan, China, South Korea, ASEAN, India, Australia and New Zealand equaled 3 percent of GDP. Combining the RCEP with the proposed Trans-Pacific Partnership among 12 Pacific Rim nations would produce even larger income gains for Japan.

The results in this paper also indicate that Japan's exports to Europe are $30 billion less than predicted. Kawasaki (2014b) reported results from a CGE model indicating that an economic partnership agreement between Japan and the European Union would increase Japanese income by 0.8 percent of GDP.

Global liberalization of course would produce the greatest gains for Japan and other countries. Trade liberalization also produces losers in certain sectors, however. It is thus necessary to facilitate labor mobility and the movement of firms from losing to gaining sectors by providing retraining and upgrading for displaced workers and by reducing entry barriers to new firms and facilitating exit through structural reform (see Thorbecke and Yoshitomi, 2006).

From an economic point of view, it would be beneficial to export more to China, Europe, and South Korea. The more diversified the group of countries that Japan exports to, the lower the risk that Japan faces from slowdowns in individual countries or regions. Free trade agreements and improved relations with Asian neighbors could increase exports to Europe and Northeast Asia. These items should thus be high on the Japanese policy agenda.

Table 1. Panel OLS and PPML gravity estimates, 1988-2013						
	(1)	(2)	(3)	(4)	(5)	(6)
Distance	-0.58***	-0.77***	-0.56***	-0.67***	-0.59***	-0.78***
	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)	(0.01)
Common Language	0.28***	0.40***	0.46***	0.62***	0.27***	0.40***
	(0.04)	(0.01)	(0.04)	(0.04)	(0.03)	(0.01)
Free Trade Agreement	0.79***	0.74***	0.85***	0.85***	0.68***	0.72***
	(0.04)	(0.03)	(0.04)	(0.04)	(0.03)	(0.03)
Exporter GDP					0.98***	1.23***
					(0.05)	(0.04)
Importer GDP					0.96***	1.18***
					(0.03)	(0.04)
Constant	17.9***	19.7***	15.5***	15.0***	-14.3***	-20.6***
	(0.23)	(0.18)	(0.17)	(0.50)	(1.03)	(0.90)
Estimation Technique	PPML	OLS	PPML	OLS	PPML	OLS
Fixed Effects Specification	Exporter, Importer, Time	Exporter, Importer, Time	Time-varying exporter, importer	Time-varying exporter, importer	Exporter, Importer, Time	Exporter, Importer, Time
Adjusted R-squared		0.83		0.72		0.84
No. of observations	24164	24130	24164	24130	24164	24130
Sample Period	1988-2013	1988-2013	1988-2013	1988-2013	1988-2013	1988-2013

Notes: The table contains panel OLS and Poisson Pseudo Maximum Likelihood (PPML) estimates of gravity models. Bilateral exports from 31 major exporters to each of the other 30 countries over the 1988-2013 period are included. For the panel OLS estimates, heteroskedasticity-consistent standard errors are in parentheses. For the PPML estimates, Huber-White standard errors are in parentheses.
*** denotes significance at the 1% level.

Table 2. Japan's Exports to ASEAN-4 in 2013

Product	Percent of Japan's Exports to ASEAN
Iron and Steel	9.79
Vehicle Components	9.34
Engines	8.56
Electrical Apparatus	7.02
Miscellaneous Hardware	6.60
Electronic Components	6.47
Nonferrous metals	4.02
Specialized Machinery	3.92
Plastic Articles	3.71
Precision Instruments	3.32
Machine Tools	3.14
Cars and Cycles	2.98
Construction Equipment	2.61
Commercial Vehicles	2.58
Tubes	1.81
Organic Chemicals	1.69
Toiletries	1.50

Note: ASEAN-4 includes Indonesia, Malaysia, the Philippines, and Thailand.
Source: CEPII-CHELEM database.

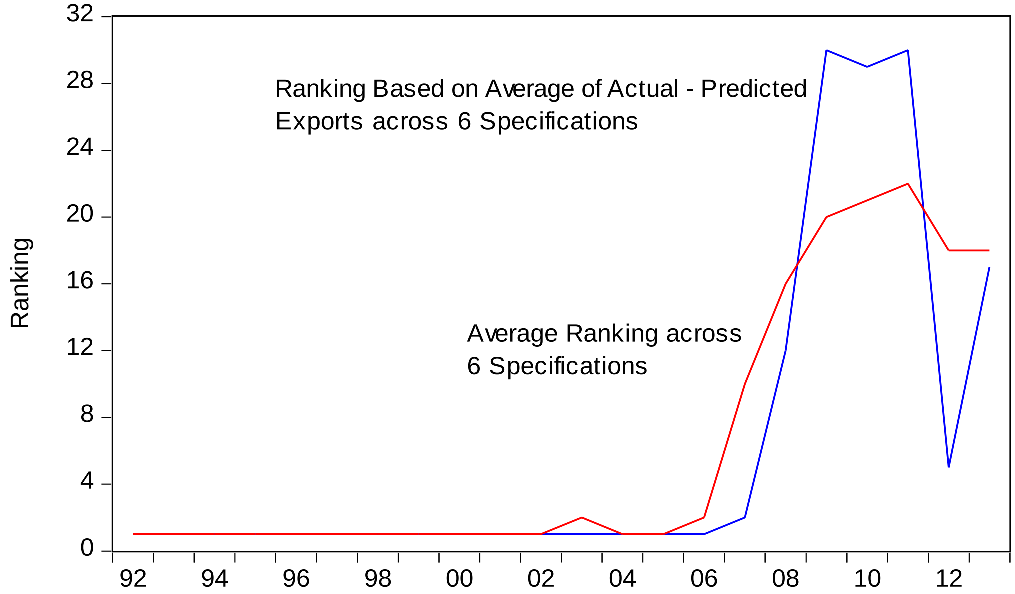

Figure 1a. Ranking of Japan's Actual Exports to the U.S. Relative to Predicted Exports.

Note: Predicted exports are determined by a gravity model for trade between Japan and 30 leading importers over the 1988-2013 period. The gravity model is estimated in 6 specification. Countries are ranked from 1 to 30, where 1 indicates that the country is the largest positive outlier and 30 indicates that it is the largest (in absolute value) negative outlier. "Average ranking across 6 specifications" refers to the country's overall ranking based on the average of the importing country's ranking in each specification. A value of 1 would indicate that Japanese exports to the country are the largest positive outlier and a value of 30 would indicate that in every specification Japanese exports to the country are the largest (in absolute value) negative outlier. The second measure calculates the difference between actual and predicted exports in each of the 6 specifications and takes the average. Countries are then ranked based on these average values. This measure is called the "ranking based on the average of the difference between actual and predicted exports across the 6 specifications." A value of 1 would again indicate that on average Japan's exports to the country in a given year is the largest positive outlier and a value of 30 that it is the largest negative outlier.
Source: Calculations by the author.

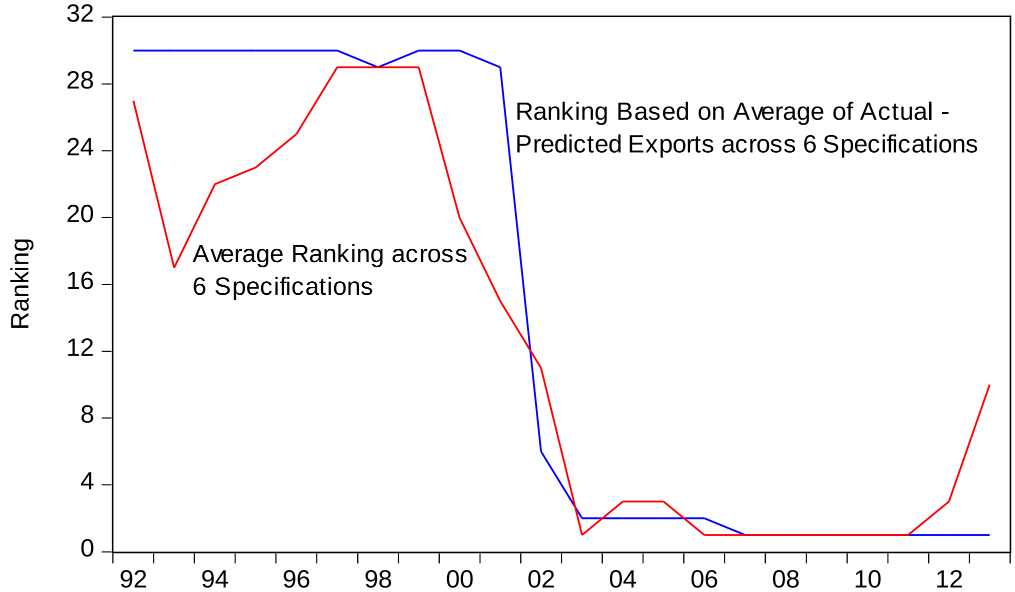

Figure 1b. Ranking of Japan's Actual Exports to China Relative to Predicted Exports.

Note: Predicted exports are determined by a gravity model for trade between Japan and 30 leading importers over the 1988-2013 period. The gravity model is estimated in 6 specification. Countries are ranked from 1 to 30, where 1 indicates that the country is the largest positive outlier and 30 indicates that it is the largest (in absolute value) negative outlier. "Average ranking across 6 specifications" refers to the country's overall ranking based on the average of the importing country's ranking in each specification. A value of 1 would indicate that Japanese exports to the country are the largest positive outlier and a value of 30 would indicate that in every specification Japanese exports to the country are the largest (in absolute value) negative outlier. The second measure calculates the difference between actual and predicted exports in each of the 6 specifications and takes the average. Countries are then ranked based on these average values. This measure is called the "ranking based on the average of the difference between actual and predicted exports across the 6 specifications." A value of 1 would again indicate that on average Japan's exports to the country in a given year is the largest positive outlier and a value of 30 that it is the largest negative outlier.
Source: Calculations by the author.

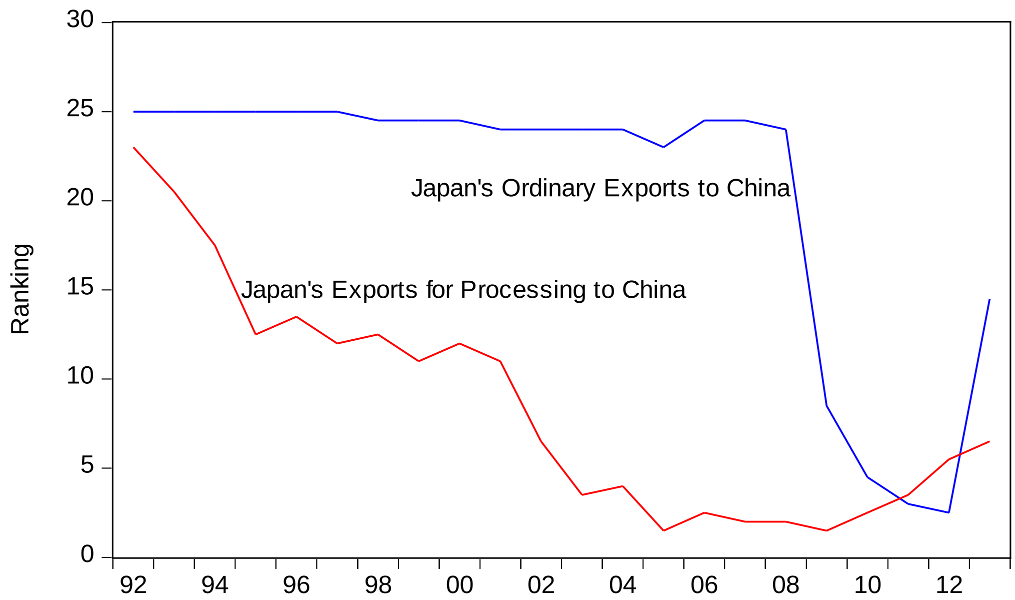

Figure 1c. Ranking of Japan's Actual Ordinary Exports and Exports for Processing to China Relative to Predicted Values.

Note: Predicted exports are determined by a gravity model for trade between Japan and 25 leading importers over the 1992-2013 period. The gravity model is estimated in 4 specification. Countries are ranked from 1 to 25, where 1 indicates that the country is the largest positive outlier and 25 indicates that it is the largest (in absolute value) negative outlier. Two rankings are initially calculated. The first is called "Average ranking across 4 specifications." This refers to the average of the importing country's ranking in each specification. A value of 1 would indicate that Japanese exports to the country are the largest positive outlier and a value of 25 would indicate that in every specification Japanese exports to the country are the largest (in absolute value) negative outlier. The second measure calculates the difference between actual and predicted exports in each of the 4 specifications and takes the average. Countries are then ranked based on these average values. This measure is called "ranking based on the average of the difference between actual and predicted exports across the 4 specifications." A value of 1 would again indicate that on average Japan's exports to the country in a given year is the largest positive outlier and a value of 25 that it is the largest negative outlier. The two ranking measures move together and the table plots the average across the two ranking measures.
Source: Calculations by the author.

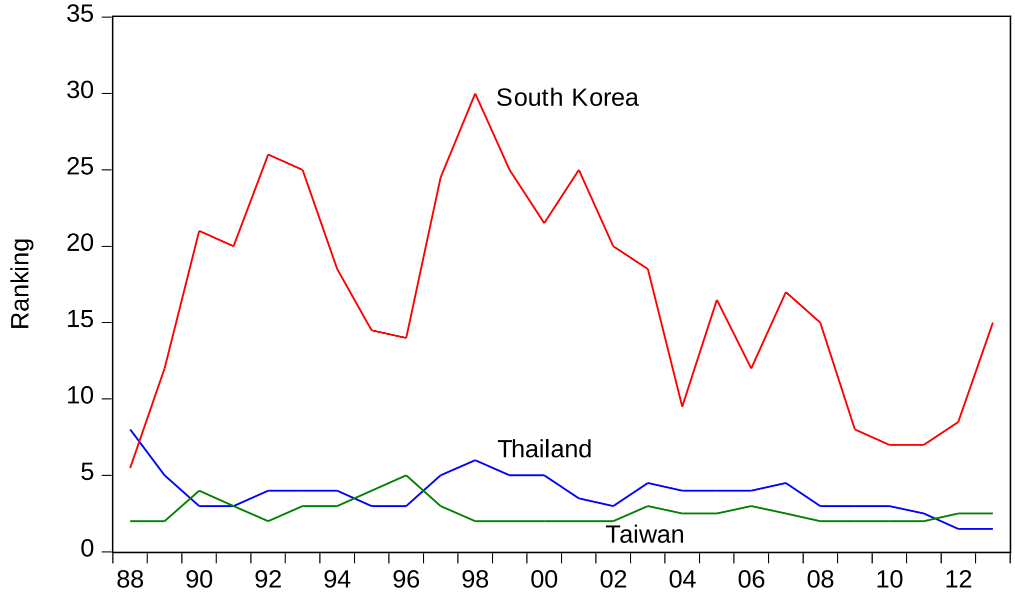

Figure 1d. Ranking of Japan's Actual Exports to South Korea, Taiwan, and Thailand Relative to Predicted Exports.

Note: Predicted exports are determined by a gravity model for trade between Japan and 30 leading importers over the 1988-2013 period. The gravity model is estimated in 6 specification. Countries are ranked from 1 to 30, where 1 indicates that the country is the largest positive outlier and 30 indicates that it is the largest (in absolute value) negative outlier. Two rankings are initially calculated. The first is called "Average ranking across 6 specifications." This refers to the average of the importing country's ranking in each specification. A value of 1 would indicate that in every specification Japanese exports to the country are the largest positive outlier and a value of 30 would indicate that in every specification Japanese exports to the country are the largest (in absolute value) negative outlier. The second measure calculates the difference between actual and predicted exports in each of the 6 specifications and takes the average. Countries are then ranked based on these average values. This measure is called "ranking based on the average of the difference between actual and predicted exports across the 6 specifications." A value of 1 would again indicate that on average Japan's exports to the country in a given year is the largest positive outlier and a value of 30 that it is the largest negative outlier. The two ranking measures move together and the table plots the average across the two ranking measures

Source: Calculations by the author.

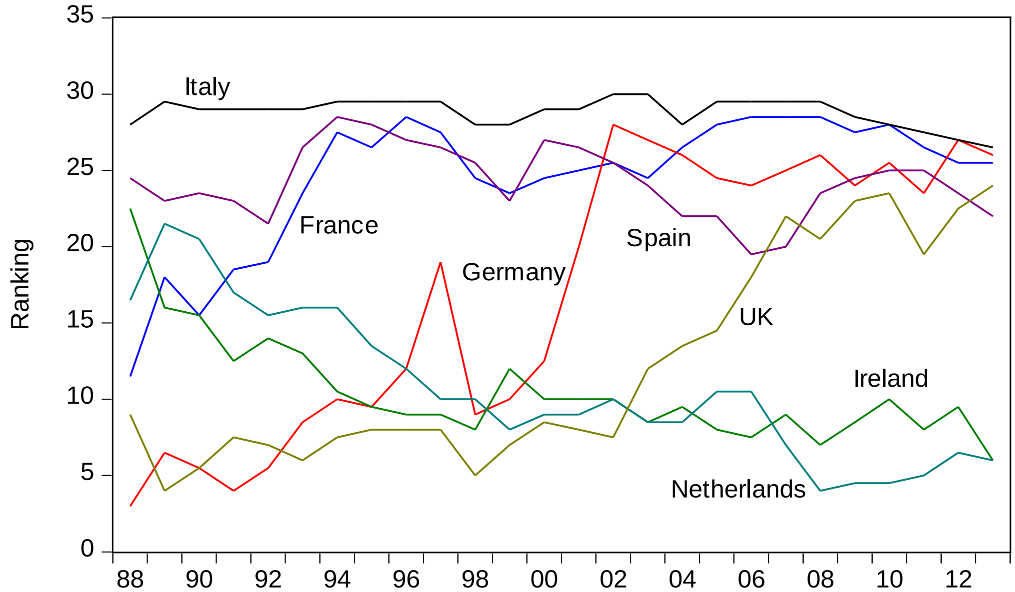

Figure 1e. Ranking of Japan's Actual Exports to Selected European Countries Relative to Predicted Exports.

Note: Predicted exports are determined by a gravity model for trade between Japan and 30 leading importers over the 1988-2013 period. The gravity model is estimated in 6 specification. Countries are ranked from 1 to 30, where 1 indicates that the country is the largest positive outlier and 30 indicates that it is the largest (in absolute value) negative outlier. Two rankings are initially calculated. The first is called "Average ranking across 6 specifications." This refers to the average of the importing country's ranking in each specification. A value of 1 would indicate that in every specification Japanese exports to the country are the largest positive outlier and a value of 30 would indicate that in every specification Japanese exports to the country are the largest (in absolute value) negative outlier. The second measure calculates the difference between actual and predicted exports in each of the 6 specifications and takes the average. Countries are then ranked based on these average values. This measure is called "ranking based on the average of the difference between actual and predicted exports across the 6 specifications." A value of 1 would again indicate that on average Japan's exports to the country in a given year is the largest positive outlier and a value of 30 that it is the largest negative outlier. The two ranking measures move together and the table plots the average across the two ranking measures

Source: Calculations by the author.

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