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The Choice of Export Destinations and Its Determinants: Evidence from Korean Exports

Kichun Kang*

Empirical evidence shows that zeros in a bilateral export matrix are very common and non-zeros are extremely concentrated across destinations. According to the simple version of Melitz (2003) model, variations in market size, as well as variable and fixed trade costs across destinations are potential candidates for explaining the stylized facts on the incidence of zeros and non-zeros in a trade matrix. Using Korean disaggregate export data (HS 10-digit level), this paper finds that export participation depends on destination-specific factors such as destination income, distance, local distribution cost, and fixed entry costs associated with the destination language, institution, and information. In line with this theory, the empirical findings suggest that destination-specific factors are important for shaping the country's export entries.

JEL Classification: F10, F14
Keywords: Zeros and Non-zeros, Destination Heterogeneity, Export Participation

I. Introduction

Most of micro trade datasets provide two stylized facts: most of firms do not export their products to foreign markets, and only few firms export to a large number of destinations.[1] Thus, an exporting country does export only some products it produces to some foreign countries. According to the finding by Baldwin and Harrigan (2011), the U.S. exported 8,880 10-digit goods to 230 different destinations in 2005. Of these goods, 82% are zeros. The median number of export

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* School of Economics and Finance, Yeungnam University, 280 Daehak-ro Gyeongsan-si Gyeongsangbuk-do Korea 712-749 (Email:kikang@ynu.ac.kr, Tel/Fax: 82-53-810-2845). The author would like to thank two anonymous referees for valuable comments and suggestions. This work was supported by the 2011 Yeungnam University Research Grant. All remaining errors are my own.

[1] Bernard *et al.* (2007) provided the statistics that the average U.S. exporting firm in 2000 shipped goods to only 3.5 countries from a total of 229. Ninety-eight percent of potential firm-country trade flows are zero. Bernard *et al.* (2011) said "One of the most striking features of the micro-data is that firm participation in international trade is exceedingly rare".

markets is 35, where a quarter of the goods were exported to at least 59 markets. Only 1% of the goods were sent to a unique partner. Zeros in a bilateral export matrix are very common and non-zeros are extremely concentrated across destinations. This raises a question: How to explain the finding? In this paper I investigate what determines the choice in export destinations.

The earlier new trade model, initiated by Krugman, has not explained the stylized facts that zeros in the bilateral export matrix are very common and non-zeros are extremely concentrated across destinations. Baldwin and Harrigan (2011) proposed a variant of the Melitz (2003)[2] model that can account for all of the facts. Along the lines suggested by Melitz (2003), Helpman, Melitz, and Rubinstein (2008)[3] presented a model yielding the asymmetry in bilateral trade flows between country pairs and the high prevalence of zeros. The two previous studies provided a model yielding asymmetric trade flows between country pairs, whereas this paper introduces a simple model to explain the asymmetric trade flows from an exporting country to its many destinations.

This paper translates the model by Melitz (2003) into a specification for a country's export expansions across its destinations. Assuming that a firm's productivity remains constant over time, the firm expands its destinations as a consequence of the changes in the destination specific characteristics. The simple model explains the extreme concentration of the existence of export products in different destinations. Destinations with high income, low variable trade and fixed entry costs, and lower overall price attract a product since they provide the monopolistically competitive firms with positive profits.

Some empirical researches have argued on what factors determine the expansion of exports.[4] Evenett and Venables (2002) noted the falling number of zeros in bilateral trade matrices that has occurred since 1970 in 23 developing countries. Much of the spread of the trade is driven by market size, proximity, and experience gained in both the destination and the proximate markets. Dennis and Shepherd (2007) showed that trade costs, distance, and entry restrictions are inversely related

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[2] The Melitz (2003) model is the most important model of selection. The most productive firms are able to overcome the additional costs of entering foreign markets. When trade barriers fall, firms with high productivity expand but firms with low productivity exit.

[3] They developed a simple model of international trade with heterogeneous firms that is consistent with a number of stylized features of the data. The model predicts positive as well as zero trade flows across pairs of countries, and it allows the number of exporting firms to vary across destination countries. This model yields a generalized gravity equation that accounts for the self-selection of firms into export markets and their impact on trade volumes.

[4] One strand of microeconomic-trade literature on firm's market entry decision has emphasized sunk cost and heterogeneity of firm characteristics (Baldwin, 1988; Baldwin and Krugman, 1989; Dixit, 1989; Roberts and Tybout, 1997; Bernard and Jensen, 1999; Bernard and Jensen, 2004). However, another strand of literature has emphasized the effect of destination- specific characteristics on firm's market entry.

to export diversification while country size, which is measured by GDP, is positively related to export diversification. Baldwin and Harrigan (2011) found that the incidence of zero is strongly correlated to the distance to and the size of the importing country. The country size has a significant effect, with a 10% increase in the real GDP of the importing country lowering the probability of a zero by 8%.

This paper makes an important contribution to the empirical literature by extending the regressions by adding more variables representing the destination specific characteristics. Baldwin and Harrigan (2011) showed that the incidence of non-zero exports increases with destination size and decreases with distance. However, this paper goes beyond them. According to the implication from the model, a firm exports its product to the destination with a high income, low per-unit and fixed export costs, and a higher overall price. To control for low per-unit and fixed export costs, this paper includes the effects of tariff rate and non-tariff barrier, local distribution infrastructure, institution quality, and the presence of export promotion agency (EPA) overseas sponsored by governments, as potential determinants.

The empirical implementation will be done by examining bilateral trade flows from Korea to its destinations over a particular time frame (2000 to 2006). Export diversification is particularly important for developing countries as argued by Hausmann and Rodrik (2003). Thus, this paper focuses on the export growth of a developing country. Korea is a successful developing country that has made great strides in its exports. Korea is a best example country to expand its exports by the growth of the export extensive margin, as argued by some papers such as Besedes and Prusa (2011), and Kang (2004, 2009). This paper uses the most detailed Korean trade statistics to provide what factors have contributed to differences in non-zeros (or zeros) across its destinations.

This paper reviews the Korean product-level data in 2006, which is classified by the Harmonized System (HS) 10-digit level. Korea exported 8,601 goods that are classified using the HS 10-digit code to 229 different destinations. Of a total of about 2 million potential exports flows, 7.3% were non-zero. Almost 51% of the products were exported to 2-10 countries. The zeros in Korea's bilateral export matrix are very common, and the non-zeros are extremely concentrated across destinations. To discover what factors have a significant impact on export participations across destinations, this paper uses the estimation equation suggested by the simple model. I employ a probit model to estimate the decision to engage in export markets. This paper shows that the destination GDP, distance, local distribution costs, language, institution quality, and the presence of an EPA's foreign office are correlated with the probability of exporting. Export participation depends on destination-specific factors such as destination income, per-unit trade cost, and fixed entry costs.

The paper is organized in the following manner. Section 2 shows the prevalence

and the pattern of zeros in Korea's bilateral export matrix. Section 3 provides a simple model for empirical analysis. Section 4 presents the model specification, data, and estimation results. Section 5 contains our concluding remarks.

II. Zeros and Non-Zeros

2.1 Zeros and Non-Zeros in World Trade Flows

Evenett and Venable (2002) first documented the disappearance of the zeros in bilateral trade matrices for 23 developing countries during 1970-1997. They found that the geographic spread of trade is important because it accounts for one third of developing economies' export growth. However, they did not focus on the prevalence and pattern of the zeros in trade matrices. Baldwin and Harrigan (2011) showed that the zeros are almost as common in the import and export data in the United States trade in 2005. The U.S. imported products in nearly 17,000 different 10-digit HS categories from 228 countries, with a total of 3.8 million potential trade flows. Over 90% of these potential trade flows are zeros. The U.S. exported 8,880 goods to 230 different countries, for a total of more than 2 million potential trade flows. Of these exports, 82% are zeros.

Zeros in firm-level trade flows shows a similar pattern. Bernard *et al.* (2008) showed that 64% of the U.S. manufacturing firms that export shipped the products to a single destination country in 2000. The firms exporting to five and more destinations account for just 13.7% of exporters, but they account for 92.9% of export value. The top 1% of trading firms by value (by the sum of imports and exports) accounted for over 80% of the value of the total trade and the top 10 percent of trading firms accounted for over 95% of the value of total trade.

Helpman, Melitz, and Rubinstein (2008) examined the country-level zeros in the gravity equation. All possible country pairs are partitioned into three categories. The fraction of country pairs that do not trade with one another is about 50%, the fraction of those that trade in both directions (they export to one another) is about 40%, and the fraction of those that trade in one direction only (one country imports from, but does not export to, the other country) is about 10%. Of all potential country pairs, only about 50% have positive trade in either direction.

2.2 Zeros and Non-Zeros in Korean Export Flows

This section explores the prevalence of product-level zeros in an exporting country (Korea). This paper uses the dataset from the *Korea Customs Service* reporting data for all trading partners classified by the Harmonized System (HS)

10-digit level. I look at the extensive margin of products at the most highly disaggregated level.[5]

Table 1 reports the incidence of zeros and non-zeros in Korea's exports.[6] In 2006, Korea exported 8,601 goods that are classified using the HS 10-digit code to 229 different destinations. Of a total of about 2 million potential exports flows, 7.3% were non-zero. When I restrict attention to 77 countries that have full macro-economic data over the period 2000-2006, Korea exported 8,555 goods to them. Of a total of about 658,735 potential exports flows, 18.2% were non-zero.

[Table 1] Incidence of Non-Zeros in Korean Exports (2006)

	227 Destinations	77 Destinations
HS 10 Products	8,601	8,555
Potential Export Flows	1,969,629	658,735
Non-Zeros	143,820	120,151
Percent of Non-zeros	7.3	18.2

Notes: The statistics are based on HS 10-digit level. This paper restricts attention to the 77 destinations because of data un-availability of some macro-economic variables.

[Table 2] Distribution of Export Products by Market Coverage (2006)

# of Export Destinations	# of Export Products	Ratio (%)
2∼10	4,400	51.15
10∼20	1,673	19.45
20∼50	1,810	21.04
50∼100	634	7.37
100∼150	73	0.84
150∼186	11	0.12
187∼	0	0
Total	8,601	100

Note: The statistics are based on HS 10-digit level.

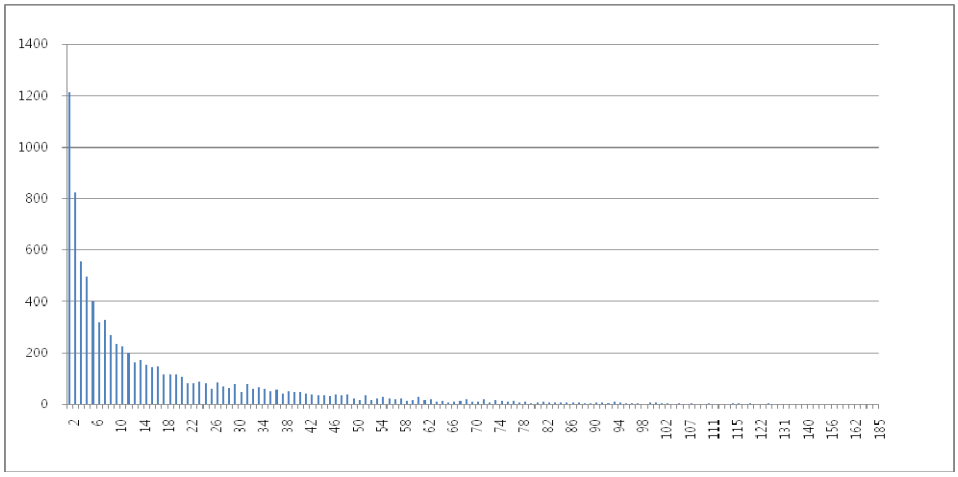
Table 2 presents a summary of the market coverage of the Korean export products. The distribution of the number of export products by market coverage is also shown in Figure 1. Almost 51% of the products were exported to 2-10 countries. I show that 1,212 products were exported to 2 countries. The product, 'other

[5] The HS code is up-dated every 5 to 6 years (HS 1996, HS 2002, and HS 2007). The revisions cause new or disappearing product categories, which may bias the measurement of "zero export". To avoid the impact of the HS revision on "zero export", this paper uses the export data classified by HS 2002 for the period from 2000-2006.

[6] This paper defines the value of exports less than $1,000 as "zero exports". Evenett and Venables (2002) used $ 50,000 as the cut-off in order to identify "zero export" in the 3-digit SITC level. Baldwin and Harrigan (2011) used the HS 10 digit categories where the cut-off for imports was $250, and the cut-off for exports was 10 times higher, at $2500.

automobile parts', which is classified by the code HS 8708999000, had the largest number of destinations (185). Table 3 presents the number of products by destination. Korea exported the largest number of products to China (6,432), followed by Japan (5,572), and the United States (5,121).

[Figure 1] Distribution of Export Products by Market Coverage (2006)



Notes: X axis- number of export destination. Y axis- number of export products.

[Table 3] The Number of Products by Destination (2006)

Destination	Products	Destination	Products	Destination	Products
CHINA	6,432	BRAZIL	1,672	JORDAN	787
JAPAN	5,572	S. AFRICA	1,612	NIGERIA	787
UNITED STATES	5,121	PAKISTAN	1,543	MYANMAR	760
VIETNAM	3,916	BANGLADESH	1,496	LIBYA	717
HONG KONG	3,908	ISRAEL	1,413	ROMANIA	695
TAIWAN	3,658	BELGIUM	1,281	NORWAY	676
INDONESIA	3,428	EGYPT	1,277	VENEZUELA	649
SINGAPORE	3,271	POLAND	1,263	LEBANON	616
THAILAND	3,168	CHILE	1,226	UZBEKISTAN	592
PHILIPPINES	2,991	SRILANKA	1,224	PANAMA	569
MALAYSIA	2,929	KUWAIT	1,185	IRELAND	562
GERMANY	2,890	SWEDEN	1,126	BULGARIA	554
AUSTRALIA	2,886	GREECE	1,120	DOMINICAN R.	518
INDIA	2,826	SWITZERLAND	1,114	KENYA	498
RUSSIAN FED.	2,657	FINLAND	1,058	MOROCCO	460
CANADA	2,475	ARGENTINA	1,056	OMAN	452
UK	2,416	DENMARK	962	URUGUAY	432
ITALY	2,197	KAZAKHSTAN	950	SLOVENIA	426
UAE	2,155	COLOMBIA	941	CROATIA	378
MEXICO	2,144	AUSTRIA	931	ALGERIA	361

FRANCE	2,008	GUATEMALA	923	PARAGUAY	317
NETHERLANDS	1,952	PERU	864	IRAQ	228
SPAIN	1,878	UKRAINIAN	846	COTE D'IVOIRE	200
TURKEY	1,820	HUNGARY	827	ZIMBABWE	102
IRAN	1,765	CZECHO R.	808	HAITI	89
SAUDI ARABIA	1,747	PORTUGAL	798		

Note: The statistics are based on HS 10-digit level.

The above calculation provides us with the facts that the zeros in Korea's bilateral export matrix are very common, and the non-zeros are extremely concentrated across the destinations. From this point onward, this paper shall seek to discover which variables are related to the incidence of zeros. In the below section, I first provide a framework for the answers.

III. The Simple Model from Melitz (2003)

As mentioned by Bernard *et al.* (2007), observed international trade flows are small relative to the levels predicted by both old and new trade theories. In old trade theory, the amount of trade predicted by cross-country differences in factor endowments is a good deal greater than observed value of the trade. In standard new trade models, as long as the demand for varieties is sufficiently strong, all varieties are traded for any finite value of trade costs. Old and new trade models do not consider firm participation in export market.

The recent new trade models by Bernard *et al.* (2003) and Melitz (2003) emphasized the importance of firm heterogeneity in generating international trade. The models, which are often called the "second generation new trade model", take into account the fact that not all firms export their goods. The model by Melitz (2003) introduced firm heterogeneity into Krugman's (1980) model of intra-industry trade. This modeling approach by Melitz (2003) has received the greatest attention because of the tractability of analysis into the effects of firm heterogeneity for issues in international trade. One of properties is that it can explain the presence and disappearance of the zeros in the trade matrix. Helpman, Melitz, and Rubinstein (2008) presented a model that yields the asymmetry in bilateral trade flows between country pairs and the high prevalence of zeros.

The model below is a simple monopolistic competition model with a CES function and fixed costs in exporting to account for foreign market entry. Heterogeneous firms provide their own horizontally differentiated goods for international markets if their destination incomes are above a cutoff level due to per-period fixed costs as well as per-unit trade costs. The explanation for the concentration of trade across destinations involves a relatively simple extension of

the recent heterogeneous firm model. The simple model allows for asymmetries in country income, market entry costs, and trade costs. The following explanation investigates the cause of the difference in export participation of an exporting country across its different destinations. This paper uses the "cutoff productivity" to examine the participation of exporting firms as in the Melitz (2003) model.

Heterogeneous firms provide their own horizontally differentiated goods with the domestic market if their productivities are above a cutoff level due to the fixed cost. A firm entering with less than the cutoff level of productivity immediately exits the domestic market.[7] Let a_t^* be the lowest productivity level of producing firms, which yields $\pi_{i,t}(a_t^*) = 0$. Re-arranging for a zero profit condition gives:

$$a_t^* = \frac{1}{P_t \rho}\left(\frac{f_t \sigma}{Y_t}\right)^{\frac{1}{\sigma-1}} \tag{1}$$

An entering firm with $a_i > a_t^*$ produces. Even if the firms' productivities do not change over time, the cutoff productivity for zero profit decreases due to an increase in domestic income or decrease in fixed production cost over time. Thus more firms produce for their domestic market.

In order for firms to enter international markets, they have to pay a fixed entry cost which does not vary with export volume or per-unit cost. The per-unit cost τ_t^c is modeled by the formation of Samuelson's iceberg assumption. This paper is trying to identify market entry and expansion of extensive margins for several destination countries, $c \in (1,\ldots,C)$. The profit $(\pi_{i,t})$ from the domestic market and exports to all destinations is

$$\pi_{i,t} = \pi_{i,t}^d + \sum_{c=1}^{C} \pi_{i,t}^c \tag{2}$$

The firm i's profit from destination c (π_i^c) is

$$\pi_i^c = \frac{Y^c (\tau^c)^{1-\sigma} (P^c \rho a_i)^{\sigma-1}}{\sigma} - f^c \tag{3}$$

where Y^c is the income in the destination country c, P^c is the overall price, τ^c is the per-unit trade cost, f^c is the per-period fixed cost associated with entry, and a_i is the exporting firm i's productivity. The elasticity of the substitution between products is $\sigma = 1/(1-\rho)$, which is greater than one $(\sigma > 1)$.

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[7] As in Melitz (2003), this paper considers steady state equilibria in which each firm's productivity does not change over time. Thus an entering firm would immediately exit if the profit were negative.

Cutoff Productivity and Export Participation (Self-Selection Effect):

Heterogenous firms provide their own horizontally differentiated goods for the international markets if the productivities are above a cutoff level due to the per-period fixed cost as well as the per-unit trade cost. The additional exporting cost involves a higher productivity level of threshold.[8] Since this paper examines a country's exports to all trading partners with different income, as well as fixed and variable trade costs, the required cutoff productivities across destinations are not equal. Let a_t^{c*} be the lowest productivity level of exporting firms for foreign country $c \in (1,.....,C)$ in period t, which yields: $\pi_t^c(a_t^{c*}) = 0$.

$$\pi_t^c(a_t^{c*}) = \frac{Y_t^c(\tau_t^c)^{1-\sigma}(P_t^c \rho a_t^{c*})^{\sigma-1}}{\sigma} - f_t^c = 0$$

$$a_t^{c*} = \frac{\tau_t^c}{P_t^c \rho}\left(\frac{f_t^c \sigma}{Y_t^c}\right)^{\frac{1}{\sigma-1}} \quad \text{where } c \in (1,.....,C) \tag{4}$$

The assumption that $\tau_t^c (f_t^c)^{\frac{1}{\sigma-1}} > (f^d)^{\frac{1}{\sigma-1}}$ leads us to the stylized fact that the cut-off level (a_t^{c*}) for exporting firms is greater than that for domestic supplying firms $(a_t^*): a_t^{c*} > a_t^*$ where $c \in (1,.....,C)$. Because of the additional entry cost and the per-unit trade cost, the firms with higher productivities can provide their products for international markets. Some firms with $a_i > a_t^{c*}$ export to foreign country c since the profit from the foreign market is non-negative. The firms with productivity levels between a_t^* and the export cut-off level only provide for their domestic market. Some firms with $a_i > a_t^{c*}$ export to foreign country c since the profit from the foreign market is non-negative. The destination income, and the fixed and per-unit trade costs explain the self-selection of firms into the export market.

Different Export Participation across Destinations (Destination-Selection Effect):

We are now in a position to examine the decision of the destination country across several potential countries in a time period. Suppose that country l has a higher income, lower trade and fixed costs, and a higher overall price while country k has a lower income, higher trade and fixed costs, and a lower overall price. The following equations represent the profits from the two destinations:

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[8] The empirical findings by Bernard and Jensen (1999), Clerides *et al.* (1998), and Aw *et al.* (2000) showed that exporters are more productive than non-exporters. Bernard *et al.* (2003) and Melitz (2003) suggested that the theoretical model to account for the fact that the plants that export appear to be more productive. They argued that exporting does not itself improve productivity.

$$\pi_{i,t}^{l} = \frac{Y_t^l (\tau_t^l)^{1-\sigma} (P_t^l \rho a_i)^{\sigma-1}}{\sigma} - f_t^l, \qquad \pi_{i,t}^{k} = \frac{Y_t^k (\tau_t^k)^{1-\sigma} (P_t^k \rho a_i)^{\sigma-1}}{\sigma} - f_t^k \tag{5}$$

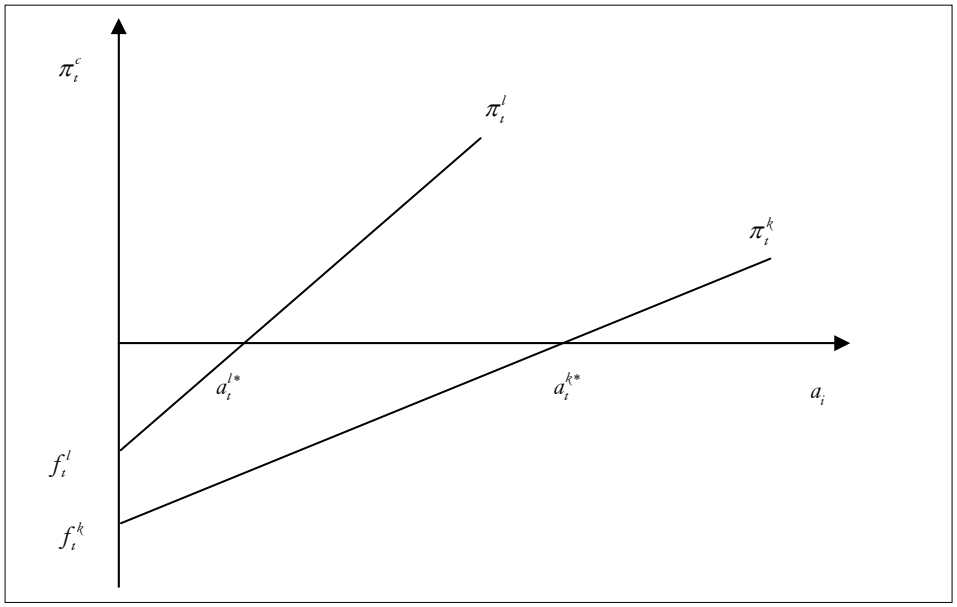
The difference in profits from the two destination markets is due to the gap between their income (Y_t^c), per-unit trade cost (τ_t^c), fixed entry cost (f_t^c), and overall price index (P_t^c).

The cut-off productivities for the two destinations are

$$a_t^{l*} = \frac{\tau_t^l}{P_t^l \rho} \left(\frac{f_t^l \sigma}{Y_t^l} \right)^{\frac{1}{\sigma-1}} < a_t^{k*} = \frac{\tau_t^k}{P_t^k \rho} \left(\frac{f_t^k \sigma}{Y_t^k} \right)^{\frac{1}{\sigma-1}} \tag{6}$$

Because of the assumption, $Y_t^l > Y_t^k$, $\tau_t^l < \tau_t^k$, $f_t^l < f_t^k$ and $P_t^l > P_t^k$, the required cut-off productivity for country l (a_t^{l*}) is smaller than that for country k (a_t^{k*}): $a_t^{l*} < a_t^{k*}$, so the firm can enter into country l. As seen in Figure 2, the slope of the zero profit line for country l is steeper due to a higher income and lower trading costs and the zero profit line is above country k's due to a lower fixed cost. The favorable external conditions in a destination induce firms to enter into the market. The difference in the destination characteristics generates a destination-selection effect.

[Figure 2] Export Participation across Destinations



Notes: l denotes the destination country with a high income and small exporting costs, while k denotes the destination country with a low income and high exporting costs.

Proposition 1: *Suppose that* $Y_t^l > Y_t^k, \tau_t^l < \tau_t^k$, $f_t^l < f_t^k$, *and* $P_t^l > P_t^k$, *the required cut-off productivity for country* l (a_t^{l*}) *is smaller than that for country* k (a_t^{k*}). *A firm can enter into country* l *instead of country* k. *A firm exports its product to the destination with a high income, low per-unit and fixed export costs, and a higher overall price.*

IV. Empirical Implementation

4.1 Model Specification and Data

This section links the indicator variable to some factors argued by the above trade model as trade determinants. In this study, I employ a probit model to estimate the decision to engage in export markets. Thus,

$$\Pr(E_t^c = 1) = \Phi(\beta' Z_t)$$

where $E_{i,t}^c$ is a binary variable that takes a value of one if product i begins to be exported to destination c in period t, and Pr stands for outcome probability. Φ is a normal cumulative distribution function of the error term which is assumed to lie between the range of 0 and 1. Z_t is a vector of the determinants of export participation. As implied by the theory in Section 3, export market entries can be significantly related to four kinds of destination- specific factors. (1) importer's GDP, (2) per-unit trade costs including tariff rate, non-tariff barrier, and transport costs, (3) fixed costs including costs associated with the use of different languages, contract enforcement costs, and information costs, (4) an overall price index in the available set of goods (domestic goods plus imported goods) in a destination country.

The importer's GDP data is taken from the *IMF's International Financial Statistics (IFS) database*. I use the tariff rate aggregated by the country level from the World Bank.[9] I use this data since it is impossible to collect all the tariff rates imposed on the Korean export goods at the 10-digit HS level to 77 investigating destinations. Since the tariff data is available from 1981 to 2005, I choose to use the data from the year 2005 for 2006. The tariff rate is based on un-weighted averages for all goods in ad valorem rates, or applied rates, or MFN rates. Strictly speaking, the tariff rate from the World Bank is not data on the Korean export goods at the 10-digit HS level. The non-tariff barrier (NTB) aggregated by the country level coming from the World Bank is used. The data on the non-tariff barrier is based on

[9] World Bank Trade Databases: http://siteresources.worldbank.org/INTRES/Resources/4692321107449- 512766/tar2005a.xls

un-weighted and imported weighted averages of core NTBs which are defined as data that include quantity and price restrictions. Because of data availability, I use the statistics on NTB at specific years, as reported by the original data set.

Transport costs are divided into international transport cost and local distribution cost. Distance is often used as a proxy for international transport cost. For local distributions, this paper uses three proxies: airport infrastructure, phone services, and paved roads. First, I use the 'foreign airport infrastructure index', which is obtained from Micco and Serebrisky (2004). The foreign airport infrastructure index' corresponds to the logarithm of the ratio between the number of airports (square) with runaways of at least 1500m long per country, and the product between the country surface and the country population. The information used to construct the data was obtained from the CIA World Fact Book, 1990-2001. The data on phone services is taken from the *World Bank*, *World Development Indicators*. The phone variable corresponds to fixed lines and mobile phone subscribers per 100 people. The data on the paved road is also taken from the *World Bank*, *World Development Indicators*.

The fixed entry costs include the three different costs associated with the use of different languages, contract enforcement costs, and information costs. First, to control for the fixed cost incurred by using an unfamiliar language, this paper considers a language dummy. Because Korea is the only country that uses the Korean language, it is advisable to make a binary dummy variable unlike other studies in which the variable is 1 if both countries have a common language. Most high schools in Korea have chosen English as their first foreign language, and one of the languages such as Chinese, Spanish, Japanese, French, and German as a second language. Therefore, the binary dummy variable is 1 if Korea's destination country uses one of the languages such as English, Chinese, Spanish, Japanese, French, or German, and 0 if the destination country uses another language.[10]

Second, the fixed entry costs associated with contract enforcement costs would be dependent on institution quality in a destination country. I use three proxies from Kaufmann, Kraay, and Mastruzzi (2003): 'Regulatory Quality', 'Rule of Law', and 'Government Efficiency'.[11] The 'Regulatory Quality' measures the extent of

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[10] The World Bank database provides the official language and language spoken by at least 20% of the population of the world countries. The language dummy is 1 if the official language or language spoken by at least 20% of the population of a country is one of the languages such as English, Chinese, Spanish, Japanese, French, or German. For example, since more than 20% of people in India can speak English, the language dummy for India is 1.

[11] Kaufmann, Krray, and Mastruzzi (2003) presented estimates of the six dimensions (Voice and Accountability, Political Stability and Lack of Violence, Government Effectiveness, Regulatory Quality, Rule of Law, and Control of Corruption) of governance covering 199 countries and territories for four time periods (1996, 1998, 2000, and 2002). These indicators are based on several hundred individual variables measuring perceptions of governance. They are drawn from 25 separate data sources constructed by 18 different organizations.

market-friendly policies such as price controls or inadequate bank supervision, as well as the perceptions of the burdens imposed by excessive regulation in areas such as foreign trade and business development. The 'Rule of Law' measures the quality of the enforceability of law by the concepts of property rights, the black market, trust in the judiciary system, the police and the legal system. The 'Government Efficiency' measures the quality of the public service provision, the quality of the bureaucracy, the competence of civil servants, the independence of the civil service from political pressures, and the credibility of the government's commitment to policies. As the data are in years, 1996, 1998, 2000, and 2002, I use 2000 for 2000 to 2002, and 2002 for 2003 to 2006.

Third, firms face the problem of market failure such as asymmetric information or externalities to enter the foreign market. The government introduces export promotion agencies (EPAs) to facilitate and encourage exports. As a form of interventions, EPAs have established a network of offices abroad. The major EPA in Korea is the *Korea Trade and Investment Promotion Agency (KOTRA)*, which was founded in 1962. *KOTRA* established its first offices overseas in 1962, and it has 97 locations in 2008.[12] This paper estimates the effect of the foreign offices of an export promotion agency on export participation.[13]

In the equation below, we make an estimation using a pooled probit estimator (2000 to 2006), which corrects for clustering.[14]

$$\begin{aligned}\Pr(E_{i,t}^{c}=1)=\Phi(&\beta_0+\beta_1\ln GDP_t^c+\beta_2\ln Tar_t^c+\beta_3\ln NTB_t^c+\beta_4\ln Dis^c\\&+\beta_5\ln LDC_t^c+\beta_6 Lang^c+\beta_7\ln InsQu_t^c+\beta_8 EPAO_t^c\\&+\beta_9\ln P_t^c+\varepsilon_{i,t}^c)\end{aligned}\tag{7}$$

where c denotes an export country's destination, and the variables are defined as:

- GDP_t^c is destination c's GDP,
- Tar_t^c is the tariff rate in destination c,
- NTB_t^c is the non-tariff barrier in destination c,
- Dis^c is the distance to destination c,
- LDC_t^c is the local distribution cost in destination c,

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[12] According to the *KOTRA*, the main activities include (1) facilitating international trade (2) powering business success through information, and (3) bolstering the trade-investment infrastructure.

[13] Rose (2007) suggested that the presence of a foreign mission (embassies and consulates) is associated with higher exports. Gil *et al.* (2008) showed that Spanish regional agencies, a network of offices abroad with the aim of providing support for companies wishing to trade and invest in foreign markets, increase trade. Kang (2011) demonstrated that the network of EPA offices abroad has been a critical factor in the success of Korea's exports. An increase of 10% in the budgets of EPA's overseas offices has been shown to increase exports by 2.45∼ 6.34 %.

[14] In the pooled sample data, clustering allows the observations to be independent between goods, but not necessary within goods since the observations on goods have repeated.

- $Lang^c$ is a dummy variable that is 1 if destination c uses a language that is familiar to the Korean people,
- $InsQu^c$ is a variable for the fixed cost incurred by the destination institution,
- $EPAO^c$ is a dummy variable that is 1 if the office of the export promotion agency is established in destination c, and
- P^c is the overall price index in the available set of products in destination c.

The error term consists of two parts where $\varepsilon_{i,t}^c = \mu^c + \nu_{i,t}$. μ^c is the destination's individual unobserved heterogeneity error and $\nu_{i,t}$ is the idiosyncratic error or time-varying error for product i. Within the panel data set, there is an unobserved destination heterogeneity, which has to be modeled as a random effect or fixed effect. Since the distance is time-invariant, and tariff rate, non-tariff barrier, and some fixed cost variables are time-invariant for some period, this paper estimates the equation with a random effect.

4.2 Estimation Results

Table 4 provides estimates of the above specification relating non-zeros (zeros) in trade matrices to a variety of explanatory factors for the sample of years (2000-2006) and Korea's trade partners. To provide an interpretation of the coefficients, I have calculated the marginal effects to indicate the expected change in the probability of export participation when the independent variables are changed by one standard deviation increase or a change from 0 to 1 in the case of a dummy variable. The paper first estimates equation (7) excluding some independent variables to assess whether the equation works well and how it is affected by including more variables.

As expected, the destination GDP is an important determinant of the export decision. As shown in specification 1, one unit increase in destination income increases the chance of export participation by 0.82. However, the tariff rate and non-tariff barrier (NTB) aggregated by the country level are insignificant. This may be not data on the Korean export goods at the 10-digit HS level, but they are an average for all goods.[15]

For the distance between Korea and its destination, it is clear that the distance is negatively correlated with the probability of exporting goods. Hence, nearby countries are more likely to become Korea's export destinations. The probability to

[15] However, some papers showed that market participation depends on tariffs. Alvarez *et al.* (2008) showed that tariffs are negatively correlated with the probability of introducing new products, using data on Chilean firms during the period from 1991-2001. Baldwin and Gu (2004) showed that as trade barriers fell, more Canadian plants entered the export market. Debaere and Mostashari (2010) showed that tariffs tend to have a statistically significant but small impact on the extensive margins: at best 5% of the increasing extensive margin for 1989–1999 and 12% for 1996–2006 is explained by tariff reductions.

export is increased by 0.71. The distance effect is an indicator of the extent of transport cost between countries. International transport charges are a greater barrier to the entry of foreign markets.

[Table 4] Benchmark Estimation Results

Independent Variable	Specification 1	Specification 2	Specification 3
GDP_t^c	0.82***	0.80***	0.82***
	(0.008)	(0.009)	(0.008)
Tar_t^c	-0.03	-0.03	
	(0.03)	(0.02)	
NTB_t^c	0.01	0.01	
	(0.03)	(0.03)	
Dis^c	-0.71***	-0.74***	-0.74***
	(0.02)	(0.02)	(0.01)
LDC_t^c	-0.04***	-0.04***	-0.03***
	(0.00)	(0.01)	(0.00)
$Lang^c$	0.081**	0.085***	0.085***
	(0.001)	(0.001)	0.001)
$InsQua_t^c$		0.004***	0.006***
		(0.001)	(0.001)
$EPAO_t^c$			0.02***
			(0.000)
P_t^c	-0.001	0.002	0.002
	(0.01)	(0.002)	(0.002)
Random Effect	YES	YES	YES
Time Dummies	YES	YES	YES
Observations	658,735	658,735	773,661
Pseudo R-squared	0.71	0.70	0.77
Log likelihood	-33,671	-31,300	-29,405

Notes: Numbers in parentheses are robust t-statistics. The coefficients are marginal changes. The local distribution cost is measured by the airport infrastructure index. Institution quality is measured by regulatory quality. ** significant at 5%, and ***significant at 1%.

As expected, destination's local distribution cost measured by the airport infrastructure index is also an important determinant of the export decision. The negative and significant coefficient indicates that as local distribution cost becomes lower, it is more likely that the country will be a destination. Language is also a factor that determines the probability of exporting. Countries that use a familiar language are more likely to be a Korean export destination. A country using one of the languages such as English, Chinese, Spanish, Japanese, French, and German would be more likely to become Korea's export destination. The probability to export is increased by about 0.08.

The result in specifications 2 shows that the institution quality has a positive effect on the probability of exporting goods. The coefficient on regulatory quality

index is high statistically significant. Since the coefficients on the tariff rate and non-tariff barrier (NTB) are insignificant, and they are an average for all goods, I exclude them in specification 3. The existence of an export promotion agency's foreign office has a positive effect on the probability of exporting goods. If there is an export promotion agency (EPA) overseas that searches for information on the local market, fixed costs are reduced and the probability of exporting goods is higher.

As can be seen from the table, a number of specification checks are applied to ensure that the results are robust. The coefficients are almost identical and consistent across all three specifications. Most of all coefficients carry the expected signs. The GDP, language, institution quality, and export service variables are negatively associated with the export market entry, while the distance and local distribution infrastructure variables exhibit a positive association.

[Table 5] Estimation Results by Alternative Measure

Independent Variable	Specification 1	Specification 2	Specification 3
GDP_t^c	0.84***	0.87***	0.84***
	(0.007)	(0.007)	(0.006)
Tar_t^c	-0.03	0.002	0.001
	(0.027)	(0.031)	(0.072)
NTB_t^c	0.01	0.01	0.02
	(0.030)	(0.032)	(0.032)
Dis^c	-0.74***	-0.74***	-0.78***
	(0.020)	(0.017	(0.009)
LDC_t^c	-0.04***	-0.03***	-0.02**
	(0.009)	(0.006)	(0.01)
$Lang^c$	0.085***	0.082***	0.082***
	(0.001)	(0.001)	(0.001)
$InsQua_t^c$	0.004***	0.005***	0.004***
	(0.001)	(0.000)	(0.001)
$EPAO_t^c$	0.03***	0.03***	0.02***
	(0.000)	(0.000)	(0.000)
P_t^c	0.002	0.002	0.003
	(0.002)	(0.002)	(0.002)
Random Effect	YES	YES	YES
Time Dummies	YES	YES	YES
Observations	808,327	802,881	681,763
Pseudo R-squared	0.72	0.71	0.75
Log likelihood	-23,809	-23,001	-25,300

Notes: Numbers in parentheses are robust t-statistics. The coefficients are marginal changes. Tariff rate and NTB are the 'Trade Restrictive Index' supplied by Kee *et al.* (2008, 2009). In Specification 1, local distribution cost is phone service, and institution quality is rule of law. In Specification 2, local distribution cost is paved roads, and institution quality is government efficiency. In Specification 3, local distribution cost is paved roads, institution quality is government efficiency, and the presence of EPA overseas is 2 year lagged variable. ** significant at 5%, and ***significant at 1%.

As an another sensitivity check, this paper investigates the effect of some independent variables on the probability of exporting goods by using different measure of the variables. Table 5 shows that my results are not sensitive to alternative measure of some variables. Instead of tariff rates and non-tariff barrier (NTB) from the World Bank, I use the 'Trade Restrictiveness Index' for tariff and non-tariff barrier (NTB) by Kee *et al.* (2008, 2009).[16] The first column uses phone service and rule of law to proxy for local distribution cost and institution quality, respectively. Even though there are some changes in the size of the estimated coefficients, the substance of the results is not changed. The second column uses pave roads and government efficiency to proxy for local distribution cost and institution quality, respectively. The estimated signs and significance level are the same as them from the previous results.

When using the presence of export promotion agency's overseas office, a potential endogeneity problem emerges.[17] When there is a greater degree of export participation into a specific destination, it may spur Korea to establish offices of an export promotion agency in the destination. There may be a reverse causality from the export participation to the dummies for export promotion agency's foreign office. Thus, I use a two-year lagged variable. As shown in column (3), the results are almost identical to the first and second columns.

I can deal with the reverse causality from the existence of trade flows to the presence of export promotion agency overseas in another way. I regress the specifications using instrumental variables estimation. This paper proxies the probability of setting up an export promotion agency overseas on a set of variables that capture the market opportunity of a country. The first set of instruments includes the number (in an import destination country) of Condé-Nast top 100 destinations, Zagat surveys, Luxury hotels (Westin, Sheraton, St. Regis, and W hotels, all owned by Starwood hotels), Baedeker travel guides, Blue guides, Lonely Planet guides, Michelin guides, and Economist city guides, as in Rose (2007).[18] As a robustness check, this paper extends the instruments by including Co2 emissions (metric tons of per capita), electric power consumption (kWh per capita), fixed line and mobile phone subscribers per 100 people, market capitalization of listed companies (% of GDP), FDI net inflows, and high technology exports (% of

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[16] They provide a measure of trade restrictiveness that is well grounded in trade theory and accounts for different forms of trade protection. Countries are revealed to be 30 percent more restrictive than their simple or import-weighted average tariffs. Poor countries have more restrictive trade regimes, and also show that NTBs contribute to a large share of trade restrictiveness across countries.

[17] As mentioned by Gil *et al.* (2008), if the decision to open a foreign trade office is not based on past exports, but on the existence of market opportunity, no endogeneity problem arises. Rose (2007) chose instrumental variables in terms of a two-pronged strategy: the potential geo-political importance of a country and the desirability of residing in a country.

[18] http://faculty.haas.berkeley.edu/arose/RecRes.htm#Trade.

manufactured exports), as in Kang (2011).[19] At first, I estimate a probit for the presence of an export promotion agency abroad on the two instrument sets. Table 6 shows the results for the first stage regression. Using the predicted probabilities, I re-estimate my baseline specifications. According to Table 7, the results across the two instrument variable sets are quite similar. Taking all these results together, destination GDP, distance (international transport costs), local distribution costs, language, institution quality, and the presence of an EPA's foreign office are correlated with the probability of exporting. The estimation results are quite robust to model specifications, alternative measure of explanatory variables, and endogeneity issues.

[Table 6] The Strength of Instrumental Variables

	IV Set 1	IV Set 2
# Zagat's guides	0.17***	0.14***
	(0.01)	(0.00)
# Condé-Nast top 100 destinations	0.001	0.02**
	(0.12)	(0.11)
# Luxury hotels	0.02**	0.02***
	(0.01)	(0.00)
# Baedeker Travel guides	0.13**	0.24**
	(0.07)	(0.07)
# Blue guides	0.24***	0.06**
	(0.03)	(0.03)
# Lonely Planet guides	0.10***	0.20***
	(0.02)	(0.01)
# Michelin guides	0.04***	0.02***
	(0.00)	(0.00)
# Economist city guides	0.05***	0.02***
	(0.01)	(0.00)
Co2 emissions		0.000**
		(0.000)
electric power consumption		0.004***
		(0.000)
fixed line and mobile phone subscribers		-0.006***
		(0.015)
market capitalization of listed companies		0.01
		(0.03)
FDI net inflows		0.000**
		(0.000)
Observations	1038	945

Notes: Dependent variable is the presence of export promotion agency overseas in an importing country. These are probit estimates with a constant and random effect. The coefficients are marginal changes. Robust standard errors are in parentheses. ** significant at 5%, and ***significant at 1%.

[19] http://data.worldbank.org.

[Table 7] Estimation Results by Instrumental Variables

Independent Variable	IV Set 1	IV Set 2
GDP_t^c	0.92***	0.90***
	(0.02)	(0.02)
Tar_t^c	-0.00	-0.00
	(0.01)	(0.01)
NTB_t^c	0.01	0.02
	(0.03)	(0.03)
Dis^c	-0.06***	-0.07***
	(0.01)	(0.01)
LDC_t^c	-0.01***	-0.02***
	(0.00)	(0.00)
$Lang^c$	0.03***	0.03***
	(0.01)	(0.01)
$InsQua_t^c$	0.002**	0.001**
	(0.000)	(0.000)
$EPAO_t^c$	0.03**	0.02***
(Instrumented)	(0.00)	(0.00)
P_t^c	0.001	0.000
	(0.003)	(0.003)
Random Effect	Yes	Yes
Time Dummies	Yes	Yes
Observations	808,327	808,327
Pseudo R-squared	0.69	0.71
Log likelihood	-32,180	-34,029

Notes: Numbers in parentheses are robust t-statistics. The coefficients are marginal changes. Tariff rate and NTB are the 'Trade Restrictive Index' supplied by Kee *et al*. (2008, 2009). Local distribution cost is phone service, and institution quality is rule of law.

V. Conclusion

Some earlier literature primarily focused on whether or not firms are exporters. However, recent literature has focused on where firms send their goods. This new interest has been provoked by the real statistics. Zeros in the bilateral export matrix are very common, and non-zeros are extremely concentrated across destinations. The simple version of the Melitz model shows that variations in the market size, as well as variable and fixed trade costs across destinations are potential candidates for explaining the stylized fact on the incidence of zeros and non-zeros in the trade matrix. The model implies that a firm exports its product to large economies with lower trade barriers (variable and fixed costs), and a lower overall price.

This paper has provided evidence on the factors driving the incidence of zeros

and non-zeros in Korean bilateral trade matrix. Destination GDP, distance, local distribution costs, language, institution quality, and the existence of an EPA's foreign office are correlated with the probability of exporting. In other words, export participation depends on destination-specific factors such as destination income, per-unit trade cost, and fixed entry costs. My results turn out to be quite robust to model specifications, alternative measure of explanatory variables, and endogeneity issues. However, the effects of tariff rate and non-tariff barrier (NTB) on the export probability are insignificant. It may be, as previously mentioned, that they are an average for all goods. I leave for future research to address more fully by exploiting detailed tariff rate and non-tariff barrier (NTB) data.

The empirical findings would provide several implications for policy makers who are interested in promoting exports. Export performance and diversification is particularly important for developing countries. This paper focuses on the export growth of Korea, which is a successful developing country that has made great strides in exports, and shows what factors are important determinants of geographical export diversification. Policies aimed at reducing fixed entry costs are promising to promote export diversification across destinations.

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