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Trade?**

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We use a unique dataset on trading transactions at the firm level to investigate a complementary effect in international transactions between sellers and buyers; trading transactions are more likely to be international when both sellers and buyers are large in size than when either sellers or buyers are large. Our econometric analysis provides evidence for the complementary effect between trading partners on the likelihood of international trade, which is most prominent for exports from North to South.

**Keywords:** Self-selection; Firm heterogeneity; Matching

**JEL classification:** D24; F10

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# Are Trading Partners Complementary in International Trade?

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## 1. Introduction

Since the latter half of the 1990s, self-selection mechanics in firms' trading have received enthusiastic attention in the field of international economics. Melitz (2003) is the theoretical pioneering study on the selection mechanism in firms' exporting. It theoretically demonstrates that exporting firms have relatively high productivity. Since firms with high productivity can obtain high operating profit, they still obtain non-negative gross profit even if they incur sunk costs for exports. This theoretical prediction on self-selection mechanics in exporting has received support from numerous empirical studies, including Bernard and Jensen (1999), Lopez (2005), Greenaway and Kneller (2007), and Wagner (2007). In recent years, moreover, the empirical literature has been extended to investigate the self-selection mechanics of firms to engage in (1) importing and (2) both exporting and importing (Muuls and Pisu, 2009; Castellani et al., 2010; Vogel and Wagner, 2010). The findings are that (1) importers are more productive than non-importers, and (2) firms that engage in both importing and exporting exhibit higher performance than those that engage in either exporting or importing.

In this paper, we exploit a unique dataset on firms' transactions to investigate a complementary effect in international transactions between sellers and buyers; transactions are more likely to be international when *both* their sellers and buyers are large in firm size than when *either* their sellers or buyers are large. All of the previous papers have used firm-level data, which are suitable for examining the complementary effect between exporting and importing activities for each firm. In contrast, our data on seller's and buyer's characteristics at the transaction level allow us to analyze the complementary effect in firm size between trading partners for each international transaction. Focusing on matching of trading partners in accounting for a pattern of international trade, we shed new light on the role of firm characteristics in international trade.

The rest of this paper is organized as follows. The next section explains our unique dataset and reports our empirical results. Based on those results, we discuss some future avenues in Section 3.

## 2. Empirical Analysis

Our data source is the *Establishment Survey on Innovation and Production Network* for selected manufacturing firms in four countries in Southeast Asia for 2008 and 2009: Indonesia, the Philippines, Thailand, and Vietnam. The sample population is

restricted to selected manufacturing hubs in each country.<sup>1</sup> This dataset includes the basic information on three economic agents: a firm, its main supplier, and its customer. This feature of the data allows us to exploit two transactions with seller and customer per reporting firm. To analyze firm-level characteristics, we use employment information to identify relatively large firms with a cutoff of 200 employees. Furthermore, the location of trading firms, sellers, and customers is used to classify each transaction for domestic or international trading. Table 1 reports the number of observations by transaction type and firm size. There are 2,372 observations in our sample; 36% of the sample falls into an international transaction.<sup>2</sup> It is evident that international transactions are most likely to be conducted between large sellers and buyers, followed by pairs of large sellers and small buyers. These patterns could suggest the important role of sellers in accounting for the occurrence of international transactions.

In order to investigate the hypothesis that the size of sellers and buyers affects the likelihood of international trade, conditional on some characteristics of transactions, we specify the probability that firms engage in international trade for transaction flow  $f$ , industry  $i$ , and time  $t$ :

$$\text{Prob}(Trade_{fit} = 1) = \Phi(\beta_1 Seller_{fit} + \beta_2 Buyer_{fit} + \mathbf{X}_{fit}\boldsymbol{\delta} + \theta_1 d_i + \theta_2 d_t),$$

where  $\Phi(\bullet)$  is a cumulative standard normal distribution. The seller (buyer) variable takes on unity if the seller (buyer) in a transaction has over 200 employees, and zero otherwise.  $\mathbf{X}$  is a vector of control variables on transaction-level characteristics. In particular, we include the dummy variable for standard products, which takes on unity if products are classified as standard type (not customized for each customer), and zero otherwise. In addition, we control for an intra-firm transaction; the dummy variable is one if a transaction flow is conducted within related business enterprises, and zero otherwise. Finally, we take into account fixed effects at the industry and year level; the sample contains eight manufacturing industries and years 2008 and 2009.

The probit estimation results of the above equation are reported in Table 2. Column (I) shows that the estimated coefficients for *Seller* and *Buyer* are significantly positive. This implies that international trade is more likely to arise when *either* sellers or buyers are large. The magnitude of the coefficient is larger for the seller variable; the

<sup>1</sup> JABODETABEK area (i.e., Jakarta, Bogor, Depok, Tangerang, and Bekasi) for Indonesia; CALABARZON area (i.e., Cavite, Laguna, Batangas, Rizal, and Quezon) for the Philippines; Greater Bangkok area for Thailand; and Hanoi area and Ho Chi Minh City for Vietnam

<sup>2</sup> In the observations related to international trade, 12% is exports from North to South, 13% is from South to North, and 75% is between Southern countries. North and South mean OECD and non-OECD countries, respectively. Our dataset does not include the data on international transactions between Northern countries.

size of sellers plays a larger role than that of buyers in explaining the occurrence of international transactions. The dummy variable for standard products is significantly negative, indicating that customized products are more likely to be traded across borders. In other words, standard products are more likely to be traded within countries. Finally, the coefficient for the intrafirm variable is not significant.

Based on these results, the bottom rows in Table 2 present the predicted probabilities of international transactions for a pair of large/small buyers and sellers, evaluated at the means of other explanatory variables. The results show that the pair of large seller and small buyer (42%) is more likely to engage in international trade than that of small seller and large buyer (35%). The probability of cross-border trade is 52% when *both* sellers and buyers are large in the number of their employees. Thus, trading partners play a complementary role in accounting for the likelihood of international trade.

From columns (II) to (IV) in Table 2, we present the probit results of different pairs of Northern and Southern countries to examine whether the locations of trading partners influence the likelihood of international transactions. We find that the exporter size is relatively important in trade between Southern countries and exports from South to North. However, there is little difference between exporter and importer contributions for exports from North to South. This suggests that the size of exporters is critical to the likelihood of international trade from South, but the destination of exports plays little role. Additionally, the complementary effects between trading partners appear to be prominent for exports from North to South.

These results on complementary effects can be interpreted from a matching point of view in international transactions. To start international trade, firms must find trading partners in an international market. Large firms prefer trading with large foreign partners because small partners may not be able to make a sufficiently large investment to start costly international transactions. Without substantial investment for trading, the delivery and receipt of goods are likely to be delayed. Late delivery not only yields inventory costs in more downstream products but also may lead to a loss of their sales opportunity. In order to minimize these economic losses, large firms are more likely to trade with large partners that can incur substantial costs for trading. Furthermore, the prominent complementary effect in exports from North to South suggests that potential losses are likely to be substantial in trade with Southern firms, which motivates Northern firms to avoid these losses.

### **3. Concluding Remarks**

This paper employs transaction-level data with seller and buyer characteristics to illustrate a complementary linkage between trading partners in international transactions. While our study sheds light on trading partners in international trade, there are several issues left for future work. The empirical method needs to take into account the effect of learning from trading to identify the direction of causation between firm characteristics and their global activities (Greenaway and Kneller, 2007). As our estimates in part contain learning effects, we need to distinguish them from the selection effects, possibly by employing panel data. Additionally, our results suggest the need for incorporating a matching process between seller and buyer in international trade. The introduction of matching poses a challenge for theoretical modeling, but is a fruitful direction in research.

Table 1. Number of Firms by Transaction Type and Size

Firm Size		(a)	(b)	a/((a+b)	a+b
Seller	Buyer	International Transactions	Domestic Transactions		
Large	Large	268	218	0.55	486
Large	Small	146	191	0.43	337
Small	Large	138	245	0.36	383
Small	Small	299	867	0.26	1,166
Total		851	1,521	0.36	2,372

Table 2. Probit Estimation Results: Marginal Effects

	(I)	(II)	(III)	(IV)	
	ALL	S => S	N => S	S => N	
Coefficient					
Seller	0.161***	0.068***	0.064***	0.142***	
	[0.023]	[0.019]	[0.020]	[0.021]	
Buyer	0.094***	0.019	0.084***	0.031*	
	[0.022]	[0.016]	[0.019]	[0.019]	
Standard	-0.038*	-0.039***	-0.013	0.022	
	[0.020]	[0.013]	[0.016]	[0.016]	
Intrafirm	-0.033	-0.031*	-0.005	0.004	
	[0.024]	[0.015]	[0.018]	[0.019]	
Dummy					
Industry	YES	YES	YES	YES	
Year	YES	YES	YES	YES	
Statistics					
Pseudo R2	0.0723	0.0543	0.093	0.1126	
Number of obs	2,372	1,685	1,787	1,799	
Log pseudolikelihood	-1436	-509	-682	-687	
Probabilities of trading at mean					
Seller	Buyer				
Small	Small	26%	6%	9%	9%
Large	Small	42%	13%	14%	22%
Small	Large	35%	8%	16%	11%
Large	Large	52%	16%	25%	27%

Notes: Heteroskedasticity-consistent standard errors (White) are in parentheses. \*\*\*, \*\*, and \* show 1%, 5%, and 10% significance, respectively. “N” and “S” indicate North and South, respectively.



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