Heterogeneity of Goods and Methods of International Trade: Wholesale, Intra-Firm, or Arms-Length.

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Abstract

We look for evidence that heterogeneity of goods influences how the goods are traded internationally, whether via an intermediary in the form of a wholesaler, within the firm via intra firm trade, or at arms-length between firms. Making use of a unique data set of U.S. industries we find that trade among wholesalers is associated with homogenous goods, whereas intra-firm trade is associated with heterogeneous goods. These results are robust with respect to several different estimation methods.

1 Introduction

There has been a growing field of research recently on firm heterogeneity and intermediaries in international trade. Intermediaries are known to contribute a significant amount to total trade. From 2005 to 2007, intermediaries accounted for 41% of Chilean imports (Blum et. al., 2010). Wal-Mart alone accounts for 15% of consumer good exports from China to the U.S. (Basker and Van, 2008). In 2005, 22% of Chinese exports were by intermediaries; which is likely an underestimate due to misidentifying intermediaries based on firm name and licensing agreements before China's entry into the WTO (Ahn et. al., 2011). Also in 2005 17% of all Turkish exports were traded by an intermediary (Abel-Koch, 2011). Bernard et al. (2010a) finds that pure intermediaries (wholesalers and retailers) accounted for 9% of U.S. exports by value.

With respect to trade intermediaries, Bernard et al. (2010a) finds significant heterogeneity amongst exporters with respect to firm employment, volume/value of trade, and number of countries they export to. They find that firms that engage solely in

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wholesale or retail trade have lower employment than those that engage in no wholesale or retail trade. These firms trade less value but more products per country. Firms that engage in a mixture of wholesale/retail and direct trade have substantially higher employment than firms that only trade directly.

There has also been much research exploring why exporters use trade intermediaries. Ahn et al. (2011) and Akerman (2011) provide similar theoretical frameworks that find firms sort according to their productivity, and in general the least productive firms serve only the domestic market (or exit), the most productive export directly to the foreign market and all others use trade intermediaries. The intermediary provides lower fixed costs to access the foreign market than doing so directly, but has higher variable costs since the intermediary is providing a service. Thus firms that aren't productive enough to incur the larger fixed costs and trade directly use an intermediary to export. Ahn et al. (2011) uses Chinese census data at the firm level to empirically support the productivity sorting hypothesis. Intermediary unit values are also found to be higher than direct export values, consistent with model predictions that intermediaries have higher marginal costs.

With respect to country characteristics, Bernard et al. (2010b) and Ahn et al. (2011) both suggest that intermediaries are focused geographically. This is consistent with intermediaries possessing country specific knowledge that allows them to forego some costs of trade. Consistent with standard gravity model results, Bernard et al. (2010b) finds that exports are negatively related to distance and positively related to GDP. Ahn et al. (2011) finds that intermediary export share is positively related to

distance and negatively related to GDP[2]. Intuitively, since exports in general decrease with distance, this makes intermediaries even more valuable for trade as distance increases. They also find that when compared to direct exports, intermediaries are less sensitive to country characteristics.

There has also been recent research examining the role related party, or intra-firm, trade plays. Felbermayr and Jung (2009) get similar results as Ahn et al. (2011) and Akerman (2011) when firms sort according to their comparative advantage, which is a measure of firm level productivity that is a function of the firms brand reputation, labor input requirement to produce one unit, and variable distribution costs. In their model, firms can trade via a foreign intermediary or a wholesale affiliate of the firm. They find firms with higher quality products, lower costs, and stronger marketability tends to use intra-firm trade. This is for two reasons; first intra-firm trade eliminates hold-up problems that can arise when trading with other firms, and second contracts between trading firms can raise costs for the exporter. Helpman et al. (2004) get similar results with respect to sorting by productivity, and their model predicts the most productive firms will invest in horizontal FDI to serve the foreign market.

Bernard et al. (2010c) uses product and country characteristics to analyze firm decisions to import from related parties versus directly, or arm's length trade. Their motivation for using these characteristics is the large amount of observed heterogeneity amongst importers and contracting issues that can arise between importers and exporters. Of particular interest to this paper, they find that industries whose products require greater capital and skill intensity are more positively associated with intra-firm trade.

[2] Bernard et al. (2010b) also finds this negative relationship with GDP, but doesn't find a statistically significant relationship with distance.

Rauch (1999) finds evidence using a gravity model that product differentiation has an effect on international trade. He groups commodities into one of three categories based on how the commodity is priced. Commodities that are priced on *organized exchanges*, for example the Chicago Mercantile Exchange, are considered to be homogenous commodities because they can be priced without knowledge of the specific producer. Commodities that are priced in trade journals are considered *referenced priced* and also homogenous for the same reason as commodities priced on organized exchanges. All other commodities are considered *differentiated* for their lack of any widely accepted price. This research will use these commodity classifications to better understand how product differentiation influences firm's decisions to use intermediaries in international trade. While previous research has focused on firm and country characteristics of intermediary and direct exporters, this paper will focus on the products produced by the firm. In particular, we look for evidence that firms select their mode of export in part due to the products they trade.

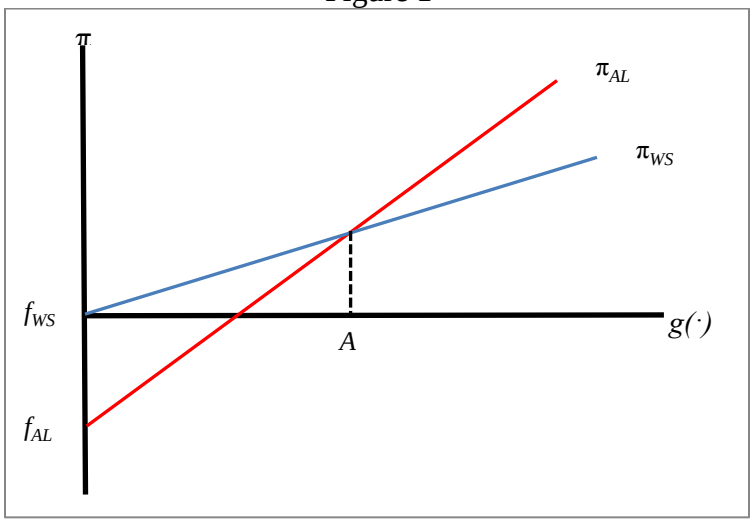
2 Theoretical Framework

The previous research has focused on the relationships between arm's-length, wholesale, and related party trade while considering only two of these methods of trade in one model. This model wishes to combine all three of these methods of trade into one theoretical framework. To do so we will draw heavily upon the works of Ahn et al. (2011), Akerman (2011), Felbermayr and Jung (2009), and Helpman et al. (2004) essentially by simply synthesizing their frameworks.

Ahn et al. (2011) and Akerman (2011) both provide similar theories that firms that trade via arm's-length have greater fixed costs, f_{AL}, than those that trade via a

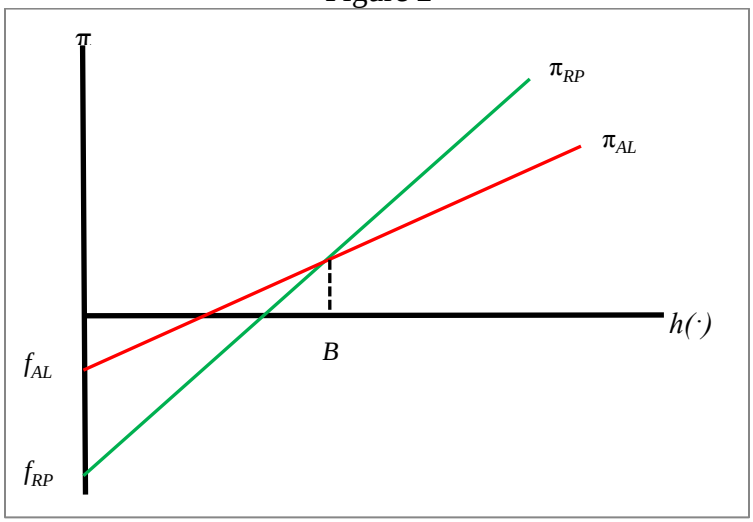
wholesaler where fixed costs are f_{WS}. The fixed costs for wholesale trade is lower because the firm forgoes the costs of setting up its own network in the foreign market. Revenue is greater for firms that trade via arm's length since wholesale trade requires paying the wholesaler for their service, which increases marginal cost. Thus profits, π, increase more quickly when trading via arm's-length. The point *A* represents the position where it becomes more profitable to engage in arm's-length trade rather than wholesale trade. Their models are summarized in figure 1. The function $g(\cdot)$ represents the firm's productivity.

Figure 1



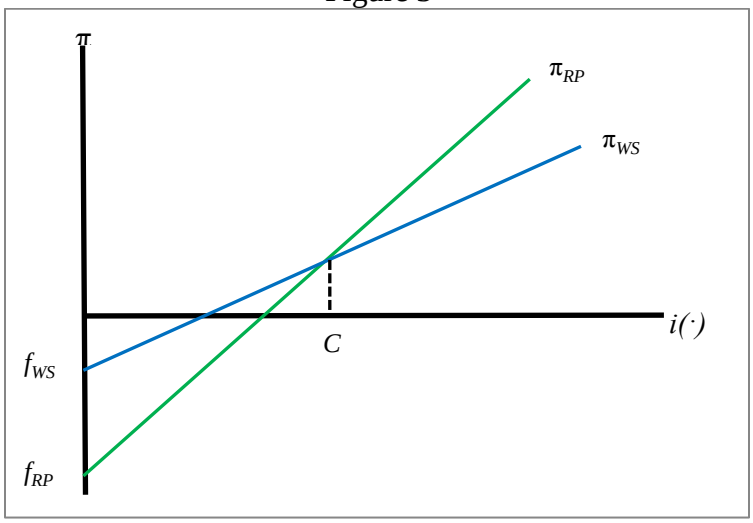
The model by Helpman et al. (2004) contains trade via arm's length which has lower sunk costs than trade via related party, $f_{AL} < f_{RP}$, but higher per-unit costs that results in a flatter profit function. The switch from arm's length to related party trade at point *B* is based on the productivity of the firm, i.e., the most productive invest in a subsidiary with FDI. Labor per unit output is represented by the function $h(\cdot)$. This is shown graphically in figure 2.

Figure 2



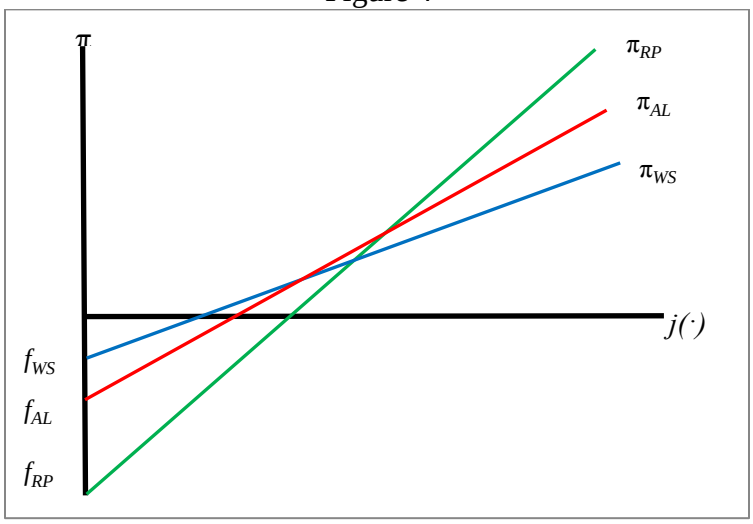
In Felbermayr and Jung (2009) wholesale trade has lower fixed costs than related party trade. The switch from wholesale to related party trade at point *C* is related to the firm's competitive advantage which is a function in part of production costs and the marketability of its goods, $i(\cdot)$. This is summarized in figure 3.

Figure 3



Figures 1 and 2 make it easy to see the relationship between costs, $f_{WS} < f_{AL} < f_{RP}$. This relationship is also captured in figure 3. Figures 1-3 also provide simple visual evidence that $\pi'_{WS} < \pi'_{AL}$, $\pi'_{AL} < \pi'_{RP}$, $\pi'_{WS} < \pi'_{RP}$ respectively. Combining these we have $\pi'_{WS} < \pi'_{AL} < \pi'_{RP}$. These relationships are summarized in figure 4.

Figure 4

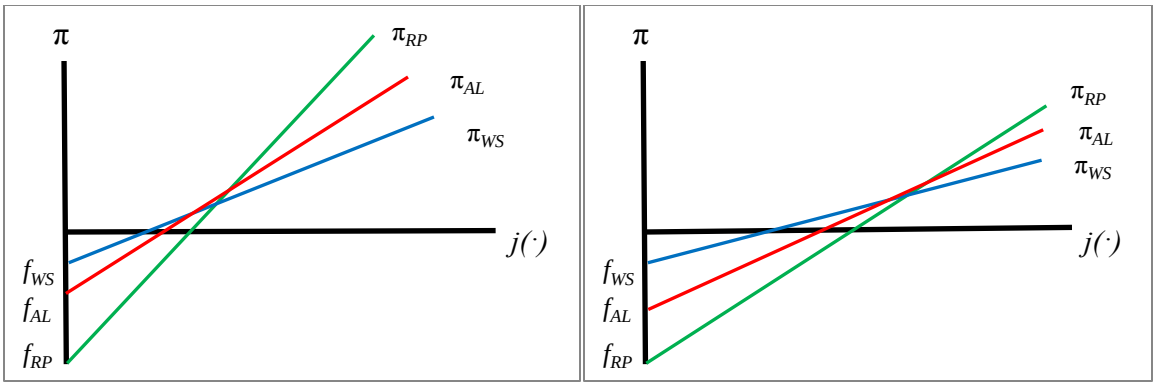


We now see the richness available by including all three trading methods in a single theoretical framework. We are no longer binding firms to progress solely from one method to another, but rather a firm may begin with a wholesaler, than proceed to arm's-length, and finally related party trade. Intuitively this makes sense. A firm that is testing the waters of international trade for the first time is less likely to risk a large investment for an endeavor it is uncertain of. Wholesalers provide the cheapest way to this since they already have facilities abroad. They are also the easiest way, since they overcome country characteristics such as language, cultural, and legal barriers that can hinder trade. Once the firm has successfully traded and found a market receptive to their products moving to arm's length trade is now easier. The firm knows there is a market for their product making the added expenses of arm's length trade worthwhile to save the marginal cost

paid to wholesalers that flattens the profit curve. The argument for a move to related party from arm's length trade is similar.

Let us now turn out attention to $j(\cdot)$, the function that will determine the slope and intercept of the profit curves, and hence the level of wholesale, arm's-length, and related party trade. In line with previous research, $j(\cdot)$ should be a function capturing firm productivity, the firm's ability to write contracts for traded goods, and the quality or uniqueness of the firm's goods. Since the goods a firm produces has not often been the center of attention for previous research, let's discuss this in greater detail. Goods characteristics are important because they are how the firm earns profits. A unique good, a *heterogeneous good*, is likely to be more profitable than common goods, or *homogenous goods*. Apple Inc. makes very unique products and is indeed very profitable. Compare this with the producers of oranges, which are quite homogenous, and less profitable. There are exceptions to this argument, for instance petroleum is quite homogenous yet very profitable. But, in general we hypothesize that heterogeneous goods are more likely to be trade related party, as a means of earning profits by taking advantage of cost savings by doing so and protecting firm level secrets about their goods. Homogenous goods on the other hand are more likely to be traded via wholesalers, because there are no secrets to protect about their goods, and the marginal cost savings are likely not large enough to warrant the fixed costs or related party or arm's length trade.

Heterogenous goods lead to increased related party trade	Homogenous goods lead to increased wholesale trade



3 Data and descriptive statistics

For 2007, we observe 85 U.S. industries at the four digit NAICS code level. Data from the U.S. Census Bureau identifies the amount of each industries export value that is attributable to wholesale or related party trade. For each industry we calculate the *wholesale intensity*, the percentage of exports that are wholesale exports. Similarly, we calculate the *related party intensity*, the percentage of exports that are related party, or intra firm trade. Exports classified as neither are represented by *arms-length intensity*; intuitively this intensity represents trade in the traditional sense between countries. For example, a U.S. firm exports its goods directly to a French firm. Herfindahl-Hirschman index data is collected for manufacturing industries from the U.S. Census Bureau's 2007 economic census. U.S. Census data from 2006 is used to determine annual pay and employment for each industry. These data do not include four digit NAICS level data for many agriculture industries, so two digit level data is used so that the agriculture industries will be included in our analysis[3]. Worldwide R&D expenses and sales are

[3] We don't have wholesale export data for many agriculture industries; 1121, 1122, 1124, 1125, 1129, 1132, and 1133. Thus, without including these two level data agriculture would be left out of the analysis.

collected from the National Science Foundation. Much of these data is at the three digit NAICS level, thus many of our four digit observations will have identical values for these data. Previous research has found positive and significant results between intra-firm trade and the ratio of R&D to sales, thus we include this variable in our analysis[4]. This variable also provides a proxy for contract complexity that may arise in trade. Variables defining goods as organized, referenced, or differentiated are obtained from Rauch (1999)[5].

Inspecting the summary statistics in table 1 we see on average approximately 17% of an industries total trade value is attributable to wholesale trade, 26% is related party trade, and 57% is arms-length trade between countries.

Table 1: Summary Statistics

	mean	sd	min	max
WS Intensity	0.169	0.118	0.036	0.598
RP Intensity	0.258	0.130	0.024	0.657
Arms-length Inten.	0.573	0.151	0.002	0.869
Mean Employ.	80.365	97.400	2.806	708.597
HHI	401.216	400.572	5.800	2030.700
Pay/Worker	44406.700	14217.980	24429.578	111211.766
R&D/Sales	0.024	0.029	0.004	0.150
Differ. Good	0.753	0.434	0.000	1.000
Refer. Good	0.200	0.402	0.000	1.000
Organized Good	0.047	0.213	0.000	1.000
N	85			

Table 2: Correlation Matrix

	WS	RP	Arms	Mean Emp.	HHI	Pay/ Worker	R&D/ Sales	Differ. Good	Refer. Good	Org. Good
WS	1									
RP	-0.08	1								
Arms	-0.59	-0.76	1							

The two level data is used for NAICS codes Oilseed and Grain Farming (1111), Vegetable and Melon Farming (1112), Fruit and Tree Nut Farming (1113), Greenhouse, Nursery, and Floriculture Production (1114), Other Crop Farming (1119), and Poultry and Egg Production (1123).

[4] For example, see Bernard et al. (2010c), Antras (2003), and Yeaple (2006).

[5] Rauch (1999) uses two approaches for creating this variable. A 'conservative' approach that minimizes the number of commodities classified as organized/exchange and a 'liberal' approach that maximizes. This research uses the variables from the conservative approach. However, regression coefficients and significance levels are very similar when using the variables from the liberal approach.

Mean Emp.	-0.13	0.24	-0.11	1						
HHI	0.11	0.16	-0.20	0.61	1					
Pay/Worker	0.01	0.31	-0.25	0.43	0.34	1				
R&D/Sales	0.17	0.41	-0.45	0.12	0.14	0.64	1			
Differ. Good	-0.32	0.15	0.09	-0.09	-0.08	-0.25	-0.10	1		
Refer. Good	0.37	-0.08	-0.17	0.09	0.05	0.23	0.16	-0.90	1	
Organized Good	-0.06	-0.17	0.17	0.02	0.07	0.09	-0.11	-0.36	-0.07	1

To inspect the data set, two subsets are created. Table 3, column (1) represents industries where wholesale intensity is greater than related party intensity, and column (2) represents the opposite. We also conduct a difference of means test between these two columns to determine statistical significance. We observe that wholesale intense industries have mean employment significantly less than that of related party intense industries. There is not a statistically significant difference between the competiveness of wholesale or related party intense industries. Mean pay per worker is approximately 28% higher in related party intense industries when compared to wholesale intense industries. Pay per worker is likely to be closely related to employment size for an industry, and in these data we calculate a correlation coefficient of .43 between these two variables, which indicates a mild correlation. Related party intense industries also have significantly higher R&D to sales ratio. Industries that have more related party trade than wholesale trade also have a significantly larger portion of their products that are priced differentially. On average, approximately 82% of industries where related party trade is greater than wholesale trade have goods that are priced differentially, compared to 50% for wholesale intense industries. A similar observation is made when considering referenced price goods. Approximately 39% of wholesale intense industries goods are referenced priced compared to 15% for related party intense industries. Thus, one inference to make from these summary statistics is that the more homogenous the good,

the more likely it is to be traded by wholesalers. Equivalently, the more heterogeneous the good the more likely it is to be traded by related party exchange.

Given the above observation, why may firms choose between wholesale or related party trade based on the good they're producing? Let's first consider how the production process may differ between the two types of goods. The production of a differentiated good may require more intermediate steps that are unique (and possibly secretive) to the firm. Thus by trading within the firm, they can take advantage of costs savings in the production process across countries to complete the final good.

A good example may be the automotive industry, which is considered to produce a differentiated good and thus heterogeneous. For instance, U.S. high skilled labor and technology may be used to produce component parts that are then shipped to affiliate plants in Mexico which has a lower labor cost to assemble the final product. Trading intra-firm or wholesale is beneficial because of the labor cost savings. However, intra-firm may be preferred because a firm possesses a unique assembly process for a differentiated product, and trading via a wholesaler would not be efficient (since the wholesaler is unlikely to know this process) or expose the firm's process to its competitors, thus losing its advantage. Indeed, in 2000 more than 70% of U.S. auto and related equipment imports are intra-firm trade (Bernard et al, 2010c).

Compare this example with dairy product manufacturing, which is a referenced price good and thus homogenous. The production of dairy products is relatively well documented and similar amongst the various producers. Thus, if cost savings are available by trading during the production process, intra-firm and wholesale will both be beneficial. But wholesale may be preferred, because the production process is better

known amongst firms and there are less production secrets that could be exposed. The lower fixed costs of trade offered by the wholesaler likely benefit the producers of homogenous goods, whereas the producers of differentiated goods are benefited by keeping the production process within the firm. Not surprisingly, our data reveals dairy product manufacturing is the industry with the largest percentage of its trade attributed to wholesale trade, approximately 60%. Agriculture in general should be expected to be dominated by wholesale trade, and consistent with findings from Bernard et al. (2010c) we find that out of the six most wholesale intense industries, five are agriculture related.

Shifting focus from the production of the good, let's now consider the level of control a firm may wish to have over their final good, how this level of control can influence their revenues, and the decision to trade via an intermediary, intra-firm, or directly. Let's first consider another heterogeneous good, for example a semiconductor, which is also a leading U.S. export. The firm, by either trading directly or intra-firm, retains control of the good throughout the entire trade process, and thus collects all the revenue from the final sale of the good. This is important because international trade by its nature segments consumers into different geographical locations. If the firm is able to apply third degree price discrimination, which is more likely for heterogeneous than homogenous goods, it can extract larger revenues. For instance, if Japanese consumers are willing to pay twice as much for a semiconductor than Mexican consumers, the firm can take advantage of this by intra-firm or direct trade. However, if the firm trades via an intermediary it loses this pricing control, reducing its revenue and possibly exposing its product to arbitrage. With intermediaries now controlling the final good, Mexican wholesalers could trade semiconductors with Japanese purchasers taking advantage of the

price differences. This effect is likely less important for homogenous goods since arbitrage and price discrimination are more difficult. For semiconductors in our data we observe approximately 78% of total trade value is intra-firm or direct, whereas only 22% is traded via intermediaries.

Table 3: Comparing Intensities Based on Magnitude

	(1) WS > RP	(2) WS < RP
	Mean	Mean
WS Intensity	0.337***	0.124
RP Intensity	0.128	0.293***
Arms-length Intensity	0.535	0.584
Mean Employment	43.126	90.369**
HHI	456.700	391.826
Pay/Worker	36165.350	46620.794***
R&D/Sales	0.014	0.027*
Differ. Good	0.500	0.821*
Refer. Good	0.389	0.149
Organized Good	0.111	0.030
N	18	67

Difference of means test is conducted for columns (1) and (2). * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

We also divide the data set into two groups using a cutoff chosen for wholesale intensity such that the two groups are more similar in size. The results are shown in table 4 and a difference of means test is conducted as before.

Table 4: Comparing Intensities Based on Cutoff Value

	(1) WS > .125	(2) WS < .125
WS Intensity	0.253***	0.087
RP Intensity	0.252	0.263
Arms-length Intensity	0.495	0.649***
Mean Employment	68.264	92.184
HHI	411.036	392.378
Pay/Worker	44325.867	44485.654
R&D/Sales	0.027	0.021
Differ. Good	0.619	0.884**
Refer. Good	0.333**	0.070
Organized Good	0.048	0.047
N	42	43

Difference of means test is conducted for columns (1) and (2). * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

4 Estimation Methods

To determine the relationship between trading intensities (wholesale, related party, and arms-length), industry characteristics such as employment level, market concentration, pay per worker, and goods characteristics the following three equations will be estimated using different methods[6]:

$$WS_i = \beta_0 + \beta_1 \ln(mean\ employment_i) + \beta_2 HHI_i + \beta_3 \ln(pay\ per\ worker_i) + \beta_4 \ln(R\&D/Sales) + \beta_5 DifferCon_i + \beta_6 ReferCon_i + \epsilon_i$$

$$RP_i = \beta_7 + \beta_8 \ln(mean\ employment_i) + \beta_9 HHI_i + \beta_{10} \ln(pay\ per\ worker_i) + \beta_{11} \ln(R\&D/Sales) + \beta_{12} DifferCon_i + \beta_{13} ReferCon_i + \epsilon_i$$

$$Arms - Length_i = \beta_{14} + \beta_{15} \ln(mean\ employment_i) + \beta_{16} HHI_i + \beta_{17} \ln(pay\ per\ worker_i) + \beta_8 \ln(R\&D/Sales) + \beta_{19} DifferCon_i + \beta_{20} ReferCon_i + \epsilon_i$$

where WS_i is the wholesale intensity for industry *i*, RP_i is the related party intensity, $Arms - Length_i$ is the arms-length intensity, $DifferCon_i$ is the conservative Rauch variable for differentiated prices, $ReferCon_i$ is the conservative Rauch variable for referenced prices, and ϵ_i is an error term. We estimate the model using different methods and find that our results are robust with respect to model specification. Aside from ordinary least squares estimation, we also estimate the model using logit, generalized linear model, and seemingly unrelated regressions.

Since our dependent variables are proportion data, and thus between zero and one, OLS may be too simple for our estimation purposes. Thus, we'll apply a logit

[6] Organized goods comprise less than 5% of the goods traded on average. Thus this variable is omitted to avoid the dummy variable trap.

transformation to the independent variables mapping their interval of zero to one to the real line. First we assume a model of the following form:

$$y = \frac{e^{X'\beta}}{1 + e^{X'\beta}}$$

and applying simple algebra we have:

$$\ln\left(\frac{y}{1-y}\right) = X'\beta$$

The logit model above has particular limitations, and thus a generalized linear model as suggested by Papke and Wooldridge (1996) will also be estimated[7]. We estimate a model of the form:

$$\begin{aligned} y_i = G(\beta_0 + \beta_1 \ln(mean\ employment_i) + \beta_2 HHI_i \\ + \beta_3 \ln(pay\ per\ worker_i) + \beta_3 \ln(R\&D/Sales_i) + \beta_4 DiffCon_i \\ + \beta_5 RefCon_i) \end{aligned}$$

where $G(*)$ is the *link* function, and chosen such that $0 < G(a) < 1\ \forall\ a \in \mathbb{R}$. A natural choice for the link function is the logistic function, and is commonly used. Doing so will guarantee that the predicted values are in the interval zero to one (Papke and Wooldridge, 1996).

We also estimate our model using seeming unrelated regressions (SUR). Under SUR, each regression can be estimated individually using OLS as was done earlier. But, unlike OLS, SUR assumes that the error terms are correlated, and this is likely true given the nature of our data. Indeed, upon inspection of the residuals from the earlier OLS equations we find the residuals between related party and arms-length trade regressions is

[7] See page 620 of Papke and Wooldridge (1996) for a detailed explanation of these limitations.

highly correlated (-.76), and between wholesale and arms-length trade (-.59)[8]. SUR is equivalent to OLS under two circumstances: when the error terms are uncorrelated and when each regression equation contains the same set of explanatory variables. Thus, product variables will be omitted when they are not hypothesized to have a significant effect.

5 **Regression Results**

All of the estimation methods produce similar results with respect to coefficient signs, magnitudes and significance levels. We find evidence that industries that are wholesale intense have lower employment on average. The coefficient for the natural log of mean employment is negative for wholesale and related party intensity, but larger in magnitude for wholesale intensity. The coefficient is positive for arms-length intensity. This is consistent with previous research that wholesalers tend to have lower employment than other firms. The coefficients on Herfindahl-Hirschman Index are positive for wholesale and related party intensity, and negative for arms-length intensity. The coefficients are very small in magnitude and any inference may be an exaggeration of the true effect. The natural log of pay per worker is negative for wholesale and arms-length intensity, and positive for related party intensity[9]. This suggests that industries with a higher proportion of related party trade also have higher pay per worker. However, none of the coefficients are statistically significant at the 5% level. We find evidence that the ratio of R&D to sales is positively related with wholesale and related party intensity, and negatively related with arms-length intensity. This relationship is statistically significant for related party and arms-length intensity. This suggests that related party trade is

[8] The correlation coefficient between wholesale and related party trade is minimal, -.08.

associated with higher R&D per sales, and the opposite for arms-length trade.

We find wholesale and arms-length trading intensities to be negatively related to differentiated goods, and related-party trade to be positively related. The relationship is statistically significant only with related party trade. This is evidence of one of the key hypotheses; goods that are heterogeneous are more likely to be traded within the firm rather than through a wholesaler.

The coefficient for referenced price goods is positive for wholesale and related party intensity, and negative for arms-length intensity. The coefficient is larger in magnitude for wholesale intensity than related party intensity and statistically significant for wholesale intensity in two of the four estimation methods. This is further evidence that goods influence the method of trade; in this case homogenous goods are associated with wholesale trade.

6 Conclusions

This research had the goal to identify how the homogeneity of goods influences how they are traded. We considered three methods for trading a good; via an intermediary in the form of a wholesaler, intra firm trade, or trading directly with another firm in a foreign country. Controlling for factors such as employment size, market concentration, payroll size, and research and development expenditures we find evidence that good characteristics influence their method of trade. Differentiated goods, which are heterogeneous in nature, are associated with intra firm trade. The heterogeneity of these goods can make writing contracts for trade difficult, thus trading within the firm avoids this problem. There may also be a large amount of intellectual property invested in these

[9] With one exception, the logit regression estimates a positive coefficient for arms-length intensity.

goods, thus intra firm trade is a safer way to protect this property. Heterogeneous goods may also be more profitable, and these profits may allow the firm to invest abroad to make intra firm trade possible and thus lower costs. Referenced goods, which are homogenous in nature, are associated with wholesale trade. The benefits of passing a homogenous good through a wholesaler, whom has country specific knowledge and provides market access, likely out way the costs using the wholesaler. 57% of the average industry in our sample is comprised of arms-length trade, trade that is not within the firm or using a wholesaler. Arms-length trade is negatively associated with differentiated and referenced goods, although this relationship is only statistically significant for referenced goods.

OLS			
	(1) WS Intentisy	(2) RP intensity	(3) Arms-Length Intensity
ln(Mean Emp.)	-0.043509 (0.024588)	-0.0025095 (0.0263939)	0.0460185 (0.0322521)
HHI	0.0000671 (0.0000431)	0.0000248 (0.0000371)	-0.0000919* (0.0000429)
ln(Pay/Worker)	-0.0471731 (0.0600443)	0.0600368 (0.0715532)	-0.0128637 (0.0784963)
Ln(R&D/Sales)	0.0153882 (0.0141189)	0.0484584* (0.0192951)	-0.0638466* (0.0250491)
Differentiated	-0.013308 (0.0297959)	0.0973726* (0.0420918)	-0.0840718 (0.0594667)
Referenced	0.1079086 (0.0547795)	0.0497311 (0.0379969)	-0.1576397* (0.063245)
_cons	0.864535 (0.6365276)	-0.251248 (0.8175723)	0.3867129 (0.9201437)
N R^2	72 0.2333	72 0.2446	72 0.2425

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

	Logit			GLM		
	(1) WS Intentisy	(2) RP intensity	(3) Arms-Length Intensity	(4) WS Intentisy	(5) RP intensity	(6) Arms-Length Intensity
ln(Mean Emp.)	-0.4769924** (0.1731943)	-0.0726368 (0.1384705)	0.3299807 (0.217897)	-0.3358901 (0.1730162)	-0.0123597 (0.1278756)	0.19023 (0.1282105)
HHI	0.0004925 (0.0002689)	0.0001225 (0.0001943)	-0.0005311 (0.0002756)	0.0005091 (0.0002879)	0.0001135 (0.0001681)	-0.0003804* (0.0001713)

ln(Pay/Worker)	-0.1448325	0.5053933	0.0143922	-0.4001858	0.2980525	-0.0439815
	(0.4379692)	(0.4182137)	(0.4080861)	(0.4247424)	(0.3696957)	(0.3147988)
Ln(R&D/Sales)	0.1031086	0.2336981*	-0.4018493	0.125454	0.2379211**	-0.2641172**
	(0.1037257)	(0.1018446)	(0.2154806)	(0.1090484)	(0.0928965)	(0.1008254)
Differentiated	-0.1641306	0.612985*	-0.3195437	-0.1029367	0.6053774*	-0.4001852
	(0.3248734)	(0.3054958)	(0.3208142)	(0.2832315)	(0.2715793)	(0.2893368)
Referenced	0.7789185	0.3152883	-0.628396	0.7504662*	0.3528955	-0.7026973*
	(0.3980517)	(0.2977974)	(0.3567661)	(0.3796377)	(0.2662145)	(0.2991067)
_cons	1.860911	-5.781255	-2.346433	4.167951	-3.726029	-0.5177276
	(4.713526)	(4.72666)	(5.375466)	(4.600204)	(4.204243)	(3.702477)
N	72	72	72	72	72	72
R^2	0.2866	0.2468	0.1753			

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

	SUR		
	(1)	(2)	(3)
	WS Intentisy	RP intensity	Arms-Length Intensity
ln(Mean Emp.)	-0.0435859*	-0.0014565	0.0450461
	(0.0197637)	(0.0245532)	(0.0302418)
HHI	0.0000673*	0.0000234	-0.0000907*
	(0.0000302)	(0.0000376)	(0.0000463)
ln(Pay/Worker)	-0.04391	0.0508675	-0.0069919
	(0.0566746)	(0.0719768)	(0.0879395)
Ln(R&D/Sales)	0.0142792	0.0518984**	-0.0661648**
	(0.0152457)	(0.0193538)	(0.0236539)
Differentiated		0.0538693	-0.0540306
		(0.034911)	(0.0350507)
Referenced	0.1210041***		-0.1211865***
	(0.0291493)		(0.0295102)
_cons	0.8125052	-0.0998471	0.2879084
	(0.6156511)	(0.7946628)	(0.9654721)
N	72	72	72
R^2	0.2329	0.2411	0.2412

Standard errors in parentheses
$p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 6: Industry Descriptions

NAICS Code	Description	NAICS Code	Description
1111	Oilseed and Grain Farming	3272	Glass and glass product manufacturing
1112	Vegetable and Melon Farming	3273	Cement and concrete product manufacturing
1113	Fruit and Tree Nut Farming	3274	Lime and gypsum product manufacturing
1114	Greenhouse, Nursery, and Floriculture Production	3279	Other nonmetallic mineral product manufacturing
1119	Other Crop Farming	3311	Iron and steel mills and ferroalloy manufacturing
1123	Poultry and Egg Farming	3312	Steel product manufacturing from purchased steel
1141	Fishing	3313	Alumina and aluminum production and processing
2123	Nonmetallic Mineral Mining and Quarrying	3314	Nonferrous metal (except aluminum) production and processing

3111	Animal food manufacturing	3315	Foundries
3112	Grain and oilseed milling	3321	Forging and stamping
3113	Sugar and confectionery product manufacturing	3322	Cutlery and handtool manufacturing
3114	Fruit and vegetable preserving and specialty food mfg	3323	Architectural and structural metals manufacturing
3115	Dairy product manufacturing	3324	Boiler, tank, and shipping container manufacturing
3116	Animal slaughtering and processing	3325	Hardware manufacturing
3117	Seafood product preparation and packaging	3326	Spring and wire product manufacturing
3118	Bakeries and tortilla manufacturing	3327	Machine shops and threaded product mfg.
3119	Other food manufacturing	3329	Other fabricated metal product manufacturing
3131	Fiber, yarn, and thread mills	3331	Agriculture, construction, and mining machinery manufacturing
3132	Fabric mills	3333	Commercial and service industry machinery manufacturing
3133	Textile and fabric finishing and fabric coating mills	3334	HVAC and commercial refrigeration equipment
3141	Textile furnishings mills	3336	Engine, turbine, and power transmission equipment manufacturing
3149	Other textile product mills	3339	Other general purpose machinery manufacturing
3151	Apparel knitting mills	3341	Computer and peripheral equipment manufacturing
3152	Cut and sew apparel manufacturing	3342	Communications equipment manufacturing
3159	Apparel accessories and other apparel mfg	3343	Audio and video equipment manufacturing
3161	Leather and hide tanning and finishing	3344	Semiconductor and other electronic component manufacturing
3162	Footwear manufacturing	3345	Electronic instrument manufacturing
3169	Other leather and allied product manufacturing	3346	Manufacturing and reproducing magnetic and optical media
3211	Sawmills and wood preservation	3351	Electric lighting equipment manufacturing
3212	Veneer, plywood, and engineered wood product mfg	3352	Household appliance manufacturing
3219	Other wood product manufacturing	3353	Electrical equipment manufacturing
3221	Pulp, paper, and paperboard mills	3359	Other electrical equipment and component manufacturing
3222	Converted paper product manufacturing	3361	Motor vehicle manufacturing
3251	Basic chemical manufacturing	3362	Motor vehicle body and trailer manufacturing
3252	Resin, rubber, and artificial fibers mfg.	3363	Motor vehicle parts manufacturing
3253	Agricultural chemical mfg.	3364	Aerospace product and parts manufacturing
3254	Pharmaceutical and medicine manufacturing	3365	Railroad rolling stock manufacturing
3255	Paint, coating, and adhesive manufacturing	3371	Household and institutional furniture mfg.
3256	Soap, cleaning compound, and toilet prep. mfg	3372	Office furniture (including fixtures) manufacturing
3259	Other chemical product & prep. mfg	3391	Medical equipment and supplies manufacturing
3261	Plastics product manufacturing	3399	Other miscellaneous manufacturing
3262	Rubber product manufacturing	5112	Software Publishers
3271	Clay product and refractory manufacturing		

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