INTERNATIONAL TRADE AND INFORMALITY

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BOĞAZİÇİ UNIVERSITY

2016

INTERNATIONAL TRADE AND INFORMALITY

Thesis submitted to the
Institute for Graduate Studies in the Social Sciences
in partial fulfillment of the requirements for the degree of

Master of Arts
in
Economics

by
Özge Demirci

Boğaziçi University
2016

International Trade and Informality

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June 2016

DECLARATION OF ORIGINALITY

I, Özge Demirci, certify that

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ABSTRACT

International Trade and Informality

In this thesis, we empirically and theoretically investigate whether the presence of an informal sector contributes positively to exports of an economy. Using annual bilateral trade data of 161 economies over the period from 1960 to 2009, we run several estimations and find that a relatively larger informal sector in the exporting economy is associated with a higher amount of exports to the importing country. In line with this empirical result, we also construct a Melitz-type model of trade incorporating informal sector to examine different channels through which informality might affect trade. The model also sheds light on several policy changes with respect to the informal sector as well as international trade.

ÖZET

Uluslararası Ticaret ve Kayıtdışılık

Bu tezde, kayıtdışı sektörün varlığının bir ekonominin ihracatına katkıda bulunup bulunmadığı ampirik ve teorik olarak incelenmiştir. 161 ülke için 1960-2009 yıllarını kapsayan veri seti ile yapılan ekonometrik çalışmaların sonunda, bir ekonominin göreceli olarak daha büyük bir kayıtdışı sektöre sahip olmasının daha yüksek miktarda ihracat yapması ile ilişkili olduğu sonucu elde edilmiştir. Bu ampirik sonuç doğrultusunda, kayıtdışılığın ihracatı hangi yollarla etkileyebileceğini inceleyen ve enformel sektör içeren bir Melitz tipi ticaret modeli de kurulmuştur. Bu model aynı zamanda, enformel sektör ve uluslararası ticarete ilişkin politika önerilerine de yer vermektedir.

ACKNOWLEDGMENTS

I would like to express my gratitude to my advisor, Prof. Ceyhun Elgin for his guidance for this study. I am also grateful to Prof. Tolga Umut Kuzubaş for inspiring me with his valuable comments and to Prof. Murat Taşdemir for his participation in my thesis committee.

I would also like to acknowledge the Scientific and Technological Research Council of Turkey (TÜBİTAK) for generously granting me a graduate scholarship.

Last but not least, I am indebted and grateful to my parents, my brother and my boyfriend for continuously supporting and encouraging me to pursue this degree. I also would like to thank to Serkant Adıgüzel and Mustafa Kaba for their friendship and collaboration on various aspects of this thesis.

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CHAPTER 1

INTRODUCTION

As the world markets move closer towards interdependence, the question of what contributes to the trade flow between countries has gained further importance. The modeling of trade flows paves the way for a widely used methodology for estimating trade. The gravity model of trade predicts that bilateral trade between two countries is proportional to the size of their economies and is inversely related to the distance between them. Although the traditional version of the gravity model introduced by Tinbergen (1963) only incorporates GDP as a measure of country size and bilateral distances, recent studies also control for whether such factors like common language, common border, common currency, having past or current colonial ties, being involved in any trade agreement have an impact on trade. In this study, our objective is to contribute to the literature by investigating whether the presence of informal sector promotes exports for an economy.

The gravity model is one of the most used empirical methods in international trade due to its success in providing robust estimation results. McCallum (1995) uses gravity equation and controls for economic size and distance by using interprovincial trade data. This study indicates the usefulness of gravity equation and also proposes a "border effect" framework implying that trade within same country is far more than bilateral trade between countries even if these countries have very similar legal and political environments, similar institutional quality and a common language. However, Anderson and van Wincoop (2003) refer to that effect as the b̈order puzzle" and propose a resolution by claiming that bilateral trade between countries is not only dependent on bilateral characteristics but is also a multilateral resistance term. This

term not only represents bilateral trade barriers but at the same time includes country-pair trade with every possible trade partner of these two countries.

In addition to the achievement of gravity modeling in empirical research, its theoretical foundation lacked a proper justification for decades. Since Anderson (1979), the theoretical framework has been elaborated through various approaches. He justifies a theoretical foundation for the gravity equation in relation to the Armington trade models in which goods are differentiated by country of origin and consumers with CES preferences. Later, Deardorff (1995) presents derivations for gravity equation based on the Heckscher-Ohlin model. All these models assume that firms are identical, and thus depict how a representative firm can alter its export decision according to trade costs and the demand structure.

Eaton and Kortum (2002) proposed an alternative model based on Ricardian comparative advantage with many countries, which was in line with the study by Dornbush, Fischer and Samuelson (1977). In the model, comparative advantages stemming from productivity differences result in international trade flows. In that sense, micro-level firm productivity differences have an impact on trade between countries.

The seminal work of Krugman (1980) proposes a model in which monopolistic competition and product differentiation account for the presence of intra-industry trade. Moreover, Melitz (2003) elaborates the idea of heterogeneous firms in international trade within the framework of the general equilibrium model. That model expands the trade model of monopolistic competition developed by Krugman (1980) and allows accounting for firm heterogeneity. He also introduces the idea of reallocation of resources between exporter and non-exporter firms within a sector.

Chaney (2008) extends Melitz's model by including the decisions of firms related to export destinations, allowing for the structure of bilateral trade flows to be estimated in a more detailed way. Owing to the work of Chaney (2008), Melitz and Ottaviano (2008), Helpman, Melitz and Rubinstein (2007), this framework investigating microfoundations of international trade can be used in quantitative analysis.

The rest of the paper is organized as follows. First, we present the empirical analysis methodology, where we will introduce our data, explain the econometric methodology and provide estimation of results. Then, we demonstrate the construction of a Melitz model of international trade with heterogeneous firms including informal sector and we conduct a numerical analysis of the model. Finally, in the last section we provide some concluding remarks.

CHAPTER 2

EMPIRICAL ANALYSIS

2.1 Data

Throughout our empirical analysis, we use the Correlates of War Project Dyadic Trade data set, version 3.0 (Barbieri and Omar, 2012). The data set contains information on bilateral trade flows as well as total national imports and exports over the period of 1870 and 2009. The dyadic trade data set yields import and export data in current U.S. dollars for pairs of countries.

The data for GDP per capita of countries between 1960 and 2011 is obtained through PWT 8.1. In order to incorporate other control variables of gravity equation, we make use of CEPII Gravity Dataset for pairs of countries between 1948 and 2006. It includes geographical distances between countries as well as dummy variables for contiguity, common language, having colonial ties, common currency, common legal origin and being involved in a trade agreement.

Following the main focus of our study of investigating a possible contribution of informal sector to country exports, we use the data set provided by Elgin and Oztunali (2012). The data set consists of model-based estimates of informal sector size for 161 economies over the period from 1950 to 2012. By using a two-sector (formal and informal) dynamic equilibrium model, they calibrate the parameters of their model. It gives the observables in the data which they calculate the size of the informal economy as percentage of formal economy. Table 1 summarizes the dataset used in this paper (Please refer to the Appendix B).

2.2 Methodology

The gravity models have been traditionally used to estimate trade flows between countries. According to Anderson (1979), the gravity equation has been notably successful empirical method in economics as its estimations have mostly produced robust and clear empirical results.

Although the gravity equation is represented in multiplicative form, it is characteristically estimated in log-linear form mainly due to the computational difficulty of exponential functions. The log-linearized version of gravity is estimated using OLS techniques together with the assumption of constant variance for error terms (homoscedasticity) or using panel regressions assuming that variance of error terms is constant over country-pairs (Gomez-Herrera, 2013). However, these estimation techniques may pose some problems such as loss of information due to existence of zero trade flow or inconsistent results under heteroscedasticity.

In order to deal with zero trade flows problems, various censoring methods such as the Tobit regression, the substitution of small values in zero trade values or truncated OLS have been used in the literature. Nonetheless, it has to be remembered that through the elimination of zero trade flows that are mostly not randomly distributed these estimation methods may have biased estimates and reduce efficiency (Martin and Pham, 2008).

In addition to truncation and censoring, many scholars such as Matyas (1998) and Melitz (2007) have used panel techniques that allow capturing heterogeneity across countries. Within the scope of panel regression two main techniques have been implemented: fixed and random effects estimators. The panel fixed effect estimation assumes that unobserved heterogeneous components affect each pair of countries

differently and are constant over time. On the other hand, the random effect model receives the unobserved heterogeneous components as strictly exogenous (Gomez, 2011).

According to Silva and Tenreyro (2006), taking logarithm of gravity equation alters the characteristics of the error term. To illustrate, if data has homoscedastic error terms, then the variance of error terms are constant over time. However, if the error terms are heteroscedastic, then they are dependent on explanatory variables. Log-linearization changes the distribution of endogenous variables resulting in the altered distribution of error terms, which in turn causes inefficient estimations. In that sense, they argue that under the presence of heteroscedasticity, gravity equation can be estimated in multiplicative form by using a simple pseudo-maximum likelihood estimation technique. This method provides consistent estimations and handles the zero trade flows problem.

2.3 Estimation results

The basic form of gravity equation augmented with a wide range of dummy variables that affect trade costs is used in this study. Specifically, we estimated the following log-linear equation:

$$log(X_{ij}) = \beta_0 \ + \ \beta_1 \log Y_j \ + \ \beta_2 \log(relinf) + \beta_3 \log(distance) + \beta_4(dummies) + \gamma_i + \theta_t + \epsilon_{i,t}$$

In this specification γ_i and θ_t refer to country and year fixed effects for country i and year t, respectively.

The estimation results of the various econometric techniques are presented in Tables 2-7 (please refer to the Appendix C). In order to deal with zero trade flows

problem, we have used simple OLS, panel regressions with fixed effect and random effects, censored regression (Tobit) and Pseudo Poisson Maximum Likelihood methodologies. The dependent variable is used as the logarithm of trade share of exporter in importer's total import in OLS and panel regressions whereas in Tobit and Pseudo Poisson Maximum Likelihood (PPML) estimations the gravity equation is estimated in levels.

Regarding overall estimation techniques used in this study —even though the magnitudes of parameters indicate changes depending on different methods—their signs remain same. In line with the literature, importer's real GDP per capita increases exports, when distance between trading countries decreases. As this study expects, the relative informality contributes positively to exports in an economy, and has positive and statistically significant coefficients for all specifications. We have obtained significant coefficients for other gravity variables as well. Having a common border, common language, common legal origin, GATT or WTO membership of any trade partners as well as belonging to a regional trade agreement have positive and significant effect on exports. The substantial difference among estimators reveals itself in the coefficient magnitudes.

Specification 1 (in Table 7) reports the results of a simple OLS regression. As discussed before, it uses the logarithm of export share as a dependent variable, thus it does not include zero trade flows between country pairs, i.e. 36% of the sample. Furthermore, it does not recognize how the variables change through time by specifying time or country effects.

Specification 2 (in Table 7) present the results for panel regression including country and year fixed effects. The results of this regressions is in accordance with the literature, indicating not only positive and statistically significant coefficients for

all gravity variables (except distance) but also positive coefficients for relative informality. In addition to using a fixed effect model in a panel setting, we also estimate a random effect panel regression which gives a statistically significant and positive coefficient for relative informality. In order to measure the adequacy of a random effect model, we conduct a Hausman Specification Test and reject the null hypothesis. Thus, the random effect model is not consistent.

Specification 3 in Table 7 shows the results for Tobit estimation that modifies the dependent variable artificially so as to overcome the zero trade flows problem. It gives positive and significant coefficients for GDP per capita of an importer country, relative informality as well as other dummy variables and a negative coefficient for distance.

Specification 4 in Table 7 indicates the Poisson estimation results for the sample. First point to notice is that using a PPML estimator enables to include zero trade flows into the estimation procedure without making any artificial modification in the data like in Tobit estimation methodology. In PPML, the dependent variable is introduced in levels rather than logarithms. Despite the fact that signs are quite similar to other estimations using OLS, in PPML, the magnitude of the coefficients decreased substantially. As Silva and Tenreyro (2006) state, heteroscedasticity is the reason for the difference between PPML and other estimations using only positive export values. PPML estimates indicate that the coefficient for GDP per capita of importer country is not close to 1, as it is generally stated in the literature.

CHAPTER 3

THEORETICAL ANALYSIS

3.1 Model

In this section, we develop a theoretical model of international trade with heterogeneous firms. The model is adapted from Arkolakis, Costinot and Rodriguez-Clare (2009) and Arkolakis (2012), then it is developed with the extension of informal sector.

Throughout this paper, we assume that there are N countries producing multiple goods using labor as sole factor of production. Each country is endowed with a continuum of workers with same CES preferences. Workers are the only consumers. It is also assumed that labor is immobile across countries. L_j and w_j represent the total labor endowment and the wage in country j, respectively. P_j refers to aggregate price index in country j.

3.1.1 Representative consumer's problem

The potentially differentiated variety of goods is indexed by $\omega \epsilon \Omega$ where Ω represents set of all varieties. The representative consumer in each country has symmetric CES preferences over all goods $\omega \epsilon \Omega$.

The maximization problem of the representative consumer in country j is

$$\max \quad (\sum_{i=1}^{N} \int_{\Omega_i} x_{ij}(\omega)^{\frac{\sigma-1}{\sigma}} d_\omega)^{\frac{\sigma}{\sigma-1}}$$

$$\text{subject to} \quad \sum_{i=1}^{N} \int_{\Omega_i} P_{ij}(\omega) x_{ij}(\omega) d_\omega = w_j + \int_{\omega \epsilon \Omega_{F_j}} \pi_F(z) dz \quad + \int_{\omega \epsilon \Omega_{I_j}} \pi_I(z) dz$$

where $x_j(\omega)$ represents the quantity of a variety ω available to consumers in country j and $P_j(\omega)$ is the price of the good in country j. These goods are substitutes implying an elasticity of substitution $\sigma>1$ according to Dixit-Stiglitz preferences framework. Workers inelastically supply their labor endowment.

3.1.2 Bilateral trade

We specify the bilateral sales from country i to country j by X_{ij}. The total expenditure of country j for its imports from all countries is denoted by X_j. Also, the share of country i's export in country j's expenditure is expressed as λ_{ij}. The sales from country i to country j can be denoted as follows:

$$X_{ij} = \int_{\omega \epsilon \Omega_i} P_{ij}(\omega) q_{ij}(\omega) d_\omega$$

3.1.3 Trade barriers

Bilateral trade between countries is subject to a variable cost in the form of standard iceberg trade costs. This means that in order to export one unit of differentiated good ω from country i to country j, the exporter country pays $\tau_{ij} \geq 1$. Both formal and informal firms need to pay those transportation costs.

3.1.4 The static problem of firms

We assume there is a continuum of firms not only in the formal sector but also in the informal sector. Firms are heterogeneous in their productivity level z. In line with the literature, the distribution of productivity is assumed to be Pareto distribution (Chaney, 2008; Helpman, Melitz & Rubinstein, 2007).

We denote $\pi_j(z)$ as the profit of a firm with productivity level z in the formal (F) or informal sectors (I) where $j = F, I$. Firms choose to employ in formal or informal sectors according to their profit maximization:

$$\max_{F,I} \quad [\pi_{F(z)}, \pi_{I(z)}]$$

where $\omega \epsilon \Omega_F$ and $\omega \epsilon \Omega_I$ denotes the set of goods produced in formal and informal sectors. The aggregation of production in formal and informal sectors gives the amount of goods in the economy, i.e. $\Omega_F \cup \Omega_I = \Omega$

Firms decide to enter a new market by solving the following profit maximization problem:

$$\pi_{ij}(z) = \max_{P_{ij}(z)}(1 - T_i\phi_{F_i})\frac{P_{ij}(z)^{(1-\sigma)}}{P_j(z)^{(1-\sigma)}}X_j - (1 - \kappa_i\phi_{I_i})\frac{\tau_{ij}\omega_i}{z_i}\frac{P_{ij}(z)^{-\sigma}}{P_j(z)^{(1-\sigma)}}X_j - \omega_j f_{ij} - B\phi_{I_i}$$

$$\text{subject to} \qquad B = (1 + r_i)\kappa_i\frac{\tau_{ij}}{z_i}\omega_i\frac{P_{ij}(z)^{-\sigma}}{P_j(z)^{(1-\sigma)}}X_j$$

where Dixit-Stiglitz price index is $P_j = [\sum_{k=1}^{N} P_{kj}^{(1-\sigma)}]^{\frac{1}{(1-\sigma)}}$.

κ_i represents the fraction of production costs which an informal firm in country i cannot finance internally and B is the sum of the amount that has to be borrowed at an exogenous interest rate by informal firms. ϕ_{j_i} is an indicator function that takes value of 1 if the firm in country i is in the sector $j = F, I$ and zero otherwise. Note that the fixed marketing cost f_{ij} is paid in terms of labor in country j. T represents a proportional tax rate on the firm's total output.

By solving the maximization problem of a representative consumer, we obtain the CES demand for the consumers in country j. Given the individual demand function, profit maximization of firm implies optimal pricing as:

$$P_{ij}^{*}(z) = \frac{\sigma}{\sigma - 1} \frac{\tau_{ij}\omega_i}{z_i} \frac{(1 + r_i\kappa_i\phi_{I_i})}{(1 - T\phi_{F_i})}$$

According to this pricing, we can write the relation between the prices in formal and informal sector as

$$P_{ij}^{F*}(z) = \frac{P_{ij}^{I*}(z)(1 + r_i\kappa_i)}{(1 - T_i)}$$

3.1.5 The profit and threshold

In monopolistic competition environment, only firms that have productivity level z $\geq$ z_{ij}^* will survive in the market. By using the optimal price of the representative firm, we have obtained the threshold z_{ij}^* for firms in country i in order to survive the market.

$$(z_{ij}^*)^{\sigma-1} = \frac{\sigma\omega_j f_{ij} P_j^{1-\sigma}(z)(1+r_i\kappa_i\phi_{I_i})^{\sigma-1}}{(\frac{\sigma}{\sigma-1}\tau_{ij}\omega_i)^{1-\sigma} X_j(1-T_i\phi_{F_i})^{\sigma}}$$

By replacing this definition, aggregate sales in country j from country i can be obtained,

$$X_{ij}(z) = \sigma\omega_j f_{ij}(1-T_i\phi_{F_i})(\frac{z_i}{z_{ij}^*})^{\sigma-1}$$

3.1.6 Gravity aggregation

The Pareto distribution in terms of productivities is identified as Pr (Z $\leq$ z) = 1 - $\frac{A_i}{z^\theta}$. Given the Pareto distribution of firm productivities, the trade flow from country i to country j can be derived as

$$X_{ij} = N_i Pr(Z \geq z_{ij}^*) \int_{z_{ij}^*}^{\infty} \sigma\omega_j f_{ij}(1-T_i\phi_{F_i})(\frac{z}{z_{ij}^*})^{\sigma-1} \frac{\theta\frac{A_i^\theta}{z^{\theta+1}}}{Pr(Z \geq z_{ij}^*)} d_z$$

and

$$X_{ij} = N_i(\frac{A_i}{z_{ij}^*})^\theta \frac{\theta\sigma}{\theta - \sigma + 1}\omega_j f_{ij}(1 - T_i\phi_{F_i})$$

where $\theta \geq \sigma - 1$.

Now, we can aggregate the gravity equation and compute the share of total expenditure in country j spent on goods from country i

$$\lambda_{ij} = \frac{N_i A_i^\theta (\tau_{ij}\omega_i)^{-\theta} f_{ij}^{1-\frac{\theta}{\sigma-1}}(1 - T_i\phi_{F_i})^{1+\frac{\theta\sigma}{\sigma-1}}(1 + r_i\kappa_i\phi_{I_i})^{-\theta}}{\sum_k^N N_k A_k^\theta (\tau_{kj}\omega_k)^{-\theta} f_{kj}^{1-\frac{\theta}{\sigma-1}}(1 - T_k\phi_{F_k})^{1+\frac{\theta\sigma}{\sigma-1}}(1 + r_k\kappa_k\phi_{I_k})^{-\theta}}$$

Since we use a theoretical model with heterogeneous firms including both formal and informal sectors, in the structural form of gravity equation, we obtain additional components $(1 - T\phi_{Fk})^{1+\frac{\theta\sigma}{\sigma-1}}$ and $(1 + r\kappa\phi_{Ii})^{-\theta}$.

The conditions $\theta \geq \sigma - 1$ and $0 \leq T \leq 1$ ensure that when ϕ_{Fi} takes value of one, λ_{ij}, trade share of exporter country i in importer country j's total import will decrease, when everything else is controlled. In other words, when formal firms exist in the market, tax liabilities on these firms decrease the export share of the country i in imports of country j. Hence, being an informal firm brings along a cost advantage in the sense that it does not have to pay taxes. The existence of informal sector facilitates export for country i through decreasing production costs. On the other hand, informal firms face liquidity constraints in financing their production costs and they have to finance themselves through external borrowing. These borrowings are paid with an exogenous interest rate r, creating a financial cost for informal firms. Thus, this limited access to finance constitutes an additional cost and trade barrier for

the informal firms. Therefore, for an informal firm, there is a trade-off between avoiding paying taxes and having constraints for access to finance. In the next section, we will focus on the question that for which parameter values cost advantage of avoiding paying taxes can overcome disadvantage of having financial constraints for informal firms in an economy.

3.2 Numerical analysis

Anderson and Wincoop (2003) propose a framework which examines the structure of bilateral trade between countries. This benchmark model is also used to identify different parameters with regard to bilateral trade costs. As it is discussed in the previous section, we make use of a heterogeneous firm model and investigate the micro behaviour of the firms in this study. Our model also provides a number of predictions at the micro level and these predictions can be analysed to acquire key parameters of the model. The main parameters of interest are the Pareto parameter, θ and the elasticity of sales, σ. These parameters determine the ways in which informality may affect international trade by directly affecting the magnitudes of $(1 - T\phi_{Fk})^{1+\frac{\theta\sigma}{\sigma-1}}$ and $(1 + r\kappa\phi_{Ii})^{-\theta}$ components of the gravity equation.

In order to calibrate the structural form of gravity equation, we target the average of the bilateral trade dataset and use Germany and Turkey bilateral trade to find the parameter values that match informality and international trade. Although there are no standard values usually used in the gravity literature, estimates of Pareto parameter θ and the elasticity of sales σ range within a certain interval.

We use the following parameter values of $f_{ii} = 0.043$, $f_{ij} = 0.0588$ and $T = 0.3$. These benchmark parameter values rely on Balistreri, Hillberry and

Rutherford (2011), Eaton and Kortum (2002), Broda and Weinstein (2004) as well as Segerstrom and Sugita (2014). For the remaining parameters, we use actual data for number of firms, firm productivity, real wages, lending interest rate, need for external borrowing, trade costs and model based estimates for informal sector shares (Elgin and Oztunali (2012), ESCAP World Bank International Trade Database, World Bank Enterprises Survey Database, World Development Indicators Database). As a result of our calibration, we find the following intervals matching the Melitz model with the actual data, $3.82 \leq \sigma \leq 6.57$ and $4.58 \leq \theta \leq 8.49$.

CHAPTER 4

CONCLUSION

In this study, we attempted to answer whether the presence of informal economy positively contributes to countries' exports. In order to estimate bilateral trade flows between countries, we make use of the estimation of gravity model for 161 countries over the period from 1960 to 2009. The range of estimation methods we use covers different econometric methodologies from simple OLS to panel regressions with fixed effects, tobit estimations and pseudo poisson maximum likelihood estimations. The empirical analysis we conducted indicates that a higher relative informality has a positive and significant impact on trade share of an exporter in importer's total import.

Our theoretical analysis elaborated the Melitz-type model of international trade incorporating firm heterogeneity in their productivity levels and the continuum of heterogeneous products. We developed the model with extensions of informal sector including tax barriers to formal firms and access to finance constraints for informal firms and derived a structural form of gravity equation.

According to the gravity equation, the tax liabilities on formal firms bring an additional cost of production in formal sector and it has negative impact on a country's export. In that sense, producing in the informal sector brings a cost advantage as they avoid paying taxes. Therefore, higher informal sector positively contributes to the export of the country. On the other side, firms in the informal sector cannot finance their all production costs internally and they have to make external borrowing. These borrowings have to be paid with an exogenous interest rate. The liquidity constraints for informal sector constitute a trade barrier for informal firms in the market. The calibration of the gravity delivers certain values for parameters in the

model. These parameter values determine the different channels in which informality may affect international trade and informality.

This study not only makes an extension of Melitz model by emphasizing the existence of informal sector in an economy and but also conducts an empirical analysis on international trade and informality. In that sense, it contributes to international trade literature by investigating how relative informality may have impact on international trade through different channels.

APPENDIX A

THE COUNTRIES USED IN EMPIRICAL ANALYSIS

Albania, Algeria, Angola, Argentina, Armenia, Australia, Austria, Azerbaijan, Bahamas, Bahrain, Bangladesh, Belarus, Belgium, Bolivia, Bosnia, Botswana, Brazil, Brunei, Bulgaria, Burkina Faso, Cambodia, Cameroon, Canada, Chile, China, Colombia, Democratic Republic of Congo, Republic of Congo, Costa Rica, Cote Divore, Croatia, Cyprus, Czech Republic, Denmark, Dominican Republic, Ecuador, Egypt, El Salvador, Equatorial Guinea, Estonia, Ethiopia, Fiji, Finland, France, Gabon, Gambia, Georgia, Germany, Ghana, Greece, Guatemala, Guinea, Guinea-Bissau, Guyana, Haiti, Honduras, Hong Kong, Hungary, Iceland, India, Indonesia, Iran, Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Korea Republic, Kuwait, Kyrgyzstan, Latvia, Lebanon, Liberia, Libya, Lithuania, Luxembourg, Madagascar, Malawi, Malaysia, Mali, Malta, Mexico, Moldova, Mongolia, Morocco, Mozambique, Namibia, Nepal, Netherlands, New Zealand, Nicaragua, Niger, Nigeria, Norway, Oman, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Portugal, Qatar, Romania, Russia, Saudi Arabia, Senegal, Sierra Leone, Singapore, Slovakia, Slovenia, South Africa, Spain, Sri Lanka, Sudan, Suriname, Sweden, Switzerland, Syria, Taiwan, Tanzania, Thailand, Togo, Trinidad and Tobago, Tunisia, Turkey, Uganda, Ukraine, United Arab Emirates, United Kingdom, United States, Uruguay, Venezuela, Vietnam, Yemen, Zambia, Zimbabwe

APPENDIX B

SUMMARY OF STATISTICS

Table 1. Summary Statistics of Data Set

	Observations	Mean	Std. Dev.	Min	Max
Export Volume (million USD)	3449748	155.6	2270.5	0	363989.6
Trade Share of Exporter Country in Importer's Total Import	1074217	0.008	0.03	0	1
Relative Informality (% of GDP)	912296	1.23	0.88	0.08	13.10
GDP per capita of Importer (thousand USD)	1116490	8858.9	11571.1	160.9	118770.5
Distance	1003612	7538.04	4333.26	0	19918
Contiguity	2960384	0.012	0.110	0	1
Common Language	2960384	0.174	0.379	0	1
Current Colonial Ties	2960384	0.003	0.057	0	1
GATT or WTO membership for Exporter	2960384	0.373	0.484	0	1
GATT or WTO membership for Importer	2960384	0.373	0.484	0	1
Regional Trade Agreement in Force	2947168	0.012	0.110	0	1
Common Legal Origin	2934365	0.277	0.448	0	1
Common Currency	2960384	0.020	0.140	0	1

APPENDIX C

ESTIMATION RESULTS

Table 2. Benchmark Estimation Results for OLS Regressions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
GDP Per Capita of Importer Country	0.019*			0.02*	0.027*		0.027*
	(0.000)			(0.000)	(0.000)		(0.000)
Relative informality		0.012*			0.017*	0.016*	0.016*
		(0.003)			(0.003)	(0.003)	(0.003)
Distance			-0.023*	-0.023*		-0.025*	-0.022*
			(0.000)	(0.000)		(0.000)	(0.000)
R-Squared	0.008	0.001	0.001	0.011	0.012	0.002	0.013
Observations	913937	782295	847976	807558	776040	782249	775997

* The dependent variable is the export share of exporter country in importer's total import for all specifications. Robust standard errors are reported in parentheses. * denote 5% confidence level. In all regressions, a constant is also included but not reported.

Table 3. Estimation Results for OLS Regressions

	(1)	(2)	(3)	(4)	(5)
Log of GDP Per Capita of Importer Country	0.451*	0.576*	0.537*	0.543*	0.537*
	(0.001)	(0.001)	(0.001)	(0.001)	(0 .001)
Log of Distance		-0.508*	-0.435*	-0.508*	1.688*
		(0.003)	(0.004)	(0.003)	(0.004)
Log of Relative informality				1.814*	-0.432*
				(0.004)	(0.004)
Contiguity			0.314*		0.295*
			(0.020)		(0.020)
Common Language			0.297*		0.240*
			(0.008)		(0.009)
Colonial Ties			0.787*		0.771*
			(0.024)		(0.024)
WTO or GATT membership of exporter			-0.617*		-0.615*
			(0.008)		(0.008)
WTO or GATT membership of importer			0.403*		0.406*
			(0.008)		(0.008)
Regional Trade Agreement			0.051*		0.047*
			(0.015)		(0.015)
Common Legal Origin			0.124*		0.108*
			(0.008)		(0.007)
Common Currency			0.284*		0.106*
			(0.003)		(0.001)
R-Squared	0.235	0.469	0.502	0.492	0.503
Observations	525554	467264	341740	467177	341740

* The dependent variable is the logarithm of export share of exporter country in importer's total import for all specifications. Robust standard errors are reported in parentheses. * denote 5% confidence level. In all regressions, a constant is also included but not reported.

Tabel 4. Estimation Results for Panel Regressions

	(1)	(2)	(3)	(4)	(5)
Log of GDP Per Capita of Importer Country	0.845*	0.872*	0.825*	0.526*	0.503*
	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
Log of Distance		-1.056*	-0.763*	-1.102*	-0.830*
		(0.004)	(0.005)	(0.004)	(0.005)
Log of Relative informality				1.404*	1.321*
				(0.008)	(0.010)
Contiguity			0.985*		0.980*
			(0.023)		(0.023)
Common Language			-0.013		-0.097*
			(0.011)		(0.011)
Colonial Ties			1.755*		1.801*
			(0.027)		(0.027)
WTO or GATT membership of exporter			-0.252*		-0.204*
			(0.014)		(0.014)
WTO or GATT membership of importer			0.655*		0.552*
			(0.009)		(0.009)
Regional Trade Agreement			1.016*		0.881*
			(0.017)		(0.017)
Common Legal Origin			0.248*		0.391*
			(0.008)		(0.008)
Common Currency			0.018		-0.001
			(0.031)		(0.031)
R-Squared	0.2510	0.3387	0.3793	0.3697	0.4073
Observations	565338	513991	374886	500227	366579

* The dependent variable is the logarithm of export share of exporter country in importer's total import for all specifications. Robust standard errors are reported in parentheses. * denote 5% confidence level. In all regressions, a constant is also included but not reported. All panel regressions include country and year fixed effects.

Table 5. Estimation Results for Tobit Regressions

	(1)	(2)	(3)	(4)	(5)
GDP Per Capita of Importer Country	0.00003*	0.00003*	0.00003*	0.00006*	0.00006*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Distance		-0.00001*	-0.00001*	-0.00002*	-0.00001*
		(0.000)	(0.000)	(0.000)	(0.000)
Relative informality				0.0008*	0.0006*
				(0.000)	(0.000)
Contiguity			0.036*		0.037*
			(0.000)		(0.000)
Common Language			0.002*		0.002*
			(0.000)		(0.000)
Colonial Ties			0.076*		0.077*
			(0.000)		(0.000)
WTO or GATT membership of exporter			0.017*		0.014*
					(0.000)
WTO or GATT membership of importer			0.002*		0.003*
			(0.000)		(0.000)
Regional Trade Agreement			0.012*		0.009*
			(0.000)		(0.000)
Common Legal Origin			-0.001*		-0.001*
			(0.000)		(0.000)
Common Currency			0.001		0.002*
			(0.000)		(0.000)
Observations	909677	805573	595567	774195	366579

* The dependent variable is the export share of exporter country in importer's total import for all specifications. Robust standard errors are reported in parentheses. * denote 5% confidence level. In all regressions, a constant is also included but not reported.

Tabel 6. Estimation Results for PPML Regressions

	(1)	(2)	(3)	(4)	(5)
GDP Per Capita of Importer Country	0.0003*	0.0003*	0.0004*	0.0001*	0.0002*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Distance		-0.0001*	-0.0001*	-0.0001*	-0.0001*
		(0.000)	(0.000)	(0.000)	(0.000)
Relative informality				0.696*	0.698*
				(0.011)	(0.015)
Contiguity			1.235*		1.357*
			(0.056)		(0.058)
Common Language			0.229*		0.101*
			(0.041)		(0.043)
Colonial Ties			2.076*		2.396*
			(0.259)		(0.262)
WTO or GATT membership of exporter			-0.804*		-0.423*
			(0.051)		(0.053)
WTO or GATT membership of importer			1.313*		1.121*
			(0.057)		(0.059)
Regional Trade Agreement			0.248*		0.391*
			(0.056)		(0.058)
Common Legal Origin			0.119*		0.361*
			(0.034)		(0.036)
Common Currency			-0.049*		0.123*
			(0.082)		(0.083)
Observations	910660	804934	594789	775207	575737

* The dependent variable is the export share of exporter country in importer's total import for all specifications. Robust standard errors are reported in parentheses. * denote 5% confidence level. In all regressions, a constant is also included but not reported.

Table 7. Summary of Different Estimation Results

	(1) OLS	(2) Panel	(3) Tobit	(4) PPML
Log of GDP per capita of Importer	0.537*	0.503*	0.00006*	0.0002*
	(0 .001)	(0.003)	(0.000)	(0.000)
Log of Relative Informality	1.688*	1.321*	0.0006*	0.698*
	(0.004)	(0.010)	(0.000)	(0.015)
Log of Distance	-0.432*	-0.830*	-0.00001*	-0.0001*
	(0.004)	(0.005)	(0.000)	(0.000)
Contiguity	0.295*	0.980*	0.037*	1.357*
	(0.020)	(0.023)	(0.000)	(0.058)
Common Language	0.240*	-0.097*	0.002*	0.101*
	(0.009)	(0.011)	(0.000)	(0.043)
Current Colonial Ties	0.771*	1.801*	0.077*	2.396*
	(0.024)	(0.027)	(0.000)	(0.262)
GATT or WTO membership for Exporter	-0.615*	-0.204*	0.014*	-0.423*
	(0.008)	(0.014)	(0.000)	(0.053)
GATT or WTO membership for Importer	0.406*	0.552*	0.003*	1.121*
	(0.008)	(0.009)	(0.000)	(0.059)
Regional Trade Agreement in Force	0.047*	0.881*	0.009*	0.391*
	(0.015)	(0.017)	(0.000)	(0.058)
Common Legal Origin	0.108*	0.391*	-0.001*	0.361*
	(0.007)	(0.008)	(0.000)	(0.036)
Common Currency	0.106*	-0.001	0.002*	0.123*
	(0.001)	(0.031)	(0.000)	(0.083)
R-squared	0.503	0.4073	-	-
Observations	341740	366579	571488	575737

* The dependent variable is export share of exporter country in importer's total import for specification (1) and (2). In (3) and (4), estimation is introduced in levels. Robust standard errors are reported in parentheses. * denote 5% confidence level. In all regressions, a constant is also included but not reported. All panel regressions include year fixed effects.

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