

# Trade, Democracy, and the Gravity Equation\*

Miaojie Yu<sup>†</sup>

China Center for Economic Research (CCER)  
Peking University, China

March 2007

## Abstract

Trading countries' democracy has various effects on their bilateral trade. An importer's democratization could change various trade barriers and hence affect trade flow. Simultaneously, a democratic country would become a favorable exporter due to its more reliable quality of products developed by its better institution. In this paper, I present a theoretical gravity model with democracy. Using a rich panel data set while clearly controlling for the endogeneity of democracy, a variety of empirical evidence suggests that democracy significantly fosters trade. Overall, democratization contributes 6-8% to bilateral trade growth (3% from the exporter's side and 3-5% from the importer's side), *ceteris paribus*.

**JEL:** F13, F14

**Keywords:** Trade, Democracy, Gravity Equation, Transportation Costs, Product Quality

---

\*I thank Robert Feenstra, Joaquim Silvestre, Gordon Hanson, Justin Lin, Jimmy Chan, Qiao Liu, Zhigang Li, Steven Chiu, Wen Sun, Chong-en Bai, Teh-Ming Huo, Yang Yao, Yaohui Zhao, and Zhixiong Zeng for their very helpful comments. This paper is also benefited from seminar participants at the University of Hong Kong, Peking University, Tsinghua University, Academic Sinica in Taiwan, Shanghai University of Finance and Economics, Southwestern University of Finance and Economics, China. However, all errors are mine.

<sup>†</sup>Assistant Professor, China Center for Economic Research, Peking University, Beijing 100871, China. Phone: 86-10-6275-3109, Fax: 86-10-6275-1474, Email: mjyu@ccer.pku.edu.cn.

# 1 Introduction

Relatively little research has concentrated on the effects of democratization on trade globalization—one of the most intriguing topics on international political economy. As Dani Rodrik (1995, pp.1485) noted, “Theoretical and empirical work relating institutional contexts to trade policy outcomes is in its infancy but should be a promising area of research”. Over the last four decades trade has grown dramatically. As shown in Figure 1, the average bilateral logarithm export had a 16% increase from 14.37 in 1962 to 16.66 in 1998. Put in another way, the global bilateral trade volume soared 877% during the past 40 years.

Simultaneously, global political liberalization emerged during this period as well. There were about 36 countries that had democratic regimes in this era (Elias Papaioannou and Gregorios Siourounis, 2005), and this number has increased dramatically. Since the late 1980s, 70% of developing countries made substantial improvements in terms of political liberalization (Rudra, 2005). As viewed in Figure 1, the *Polity IV* indicator, which measures each regime’s democracy with an incremental institutionalized 22-point scale, clearly demonstrated that the average democracy index increased significantly from 4.53 in 1962 to 5.93 in 1998. Thus, such a phenomenon raises the following question: does global democratization foster trade? More specifically, can an importer’s democratization promote trade? And can an exporter’s democratization encourage trade?

Theoretically, the effects of an importer’s democratization on bilateral trade differ across countries by their incomes per capita. Developing countries’ democratization fosters

trade flow whereas developed countries's democracy improvement hampers trade volume. The economic logics are the following. According to the Heckscher-Ohlin theorem, most developing countries are labor abundant and therefore import relatively capital-intensive products. A decrease in the import tariff of a capital-intensive good decreases the real return on capital, hence harming capital owners but benefiting labor owners, according to the Stolper-Samuelson theorem. Essentially, a country's democratization implies that political power is switched from non-elected elites to the labor group, which in turn would push the government to choose a pro-trade policy (Helen V. Milner and Keiko Kubota, 2005, Kevin O' Rourke and Allen M. Taylor, 2006). In short, democracy in developing countries encourages trade flow. A similar argument applies to developed countries: the democratization of developed countries hampers trade globalization.

In addition, an exporter's democracy also affects bilateral trade. A high democratic regime is associated with a better maintenance of the rule of law (Robert J. Barro, 1996), which in turn incorporates a better protection and enforcement of intellectual property rights and a more rigorous regulation of product safety (Rodrik, 2000). Accordingly, the qualities of commodities produced in a high democratic regime are relatively higher. People would prefer to import products from high democratic regimes since their products are more reliable, *ceteris paribus*.

Without a doubt, within the last decade, some researchers have made significant contributions on how democracy affects trade globalization. For instance, Barry Eichengreen and David Leblang (2006) provide a helpful survey for the related literature. As they pointed out, the current literatures include the works, among others already mentioned,

of Bernard Grofman and Mark Gray (2000), Dennis Quinn(2000), Jan Fidrumc (2001), Francesco Giavazzi and Guido Tabellini (2005), and Miaojie Yu (2005). In particular, Grofman and Gray (2000) suggest a negative effect of authoritarianism on trade by examining the impact on trade of the number of years a country was ruled by an authoritarian regime. Based on a larger country sample, Giavazzi and Tabellini (2005) obtain a similar result by using the widely accepted *Polity IV* data set maintained by Monty G. Marshall and Keith Jagers (2004). Meanwhile, Fidrumc (2001) finds a strongly positive effect of democracy on economic growth in 25 transition countries. Quinn (2000) investigates the impact of democracy on international financial liberalization and concludes that democratization is more likely to remove various capital controls.

However, all of these studies ignore the important fact that democracy is *not* exogenously given. Instead, trade globalization could have a reverse causality on democratization. Trade does not only change the consumption possibility set for trading countries but also creates a channel for people to communicate ideas. Thus, ignorance of the reverse causality of trade on democracy could lead to an estimation bias, which could be severe if researchers cannot find a valid instrument variable to control for the reverse causality. Fortunately, a few exceptions occurs. For instance, Giavazzi and Tabellini (2005) provide ample evidence that countries that liberalize the democratization followed by economy perform much worse than those countries that pursue the opposite sequence. Eichengreen and Leblang (2006) offer a variety of estimations to argue the existence of a two-way positive causality between trade openness and democracy, using long historical data from the years 1870-2000. Yu (2005) takes a step forward to present fruitful evidence that

democracy fosters trade, whereas trade hinders democracy during the last four decades, using simultaneous equation methods to control for the estimation bias caused by the single-equation estimates.

However, most of these studies are reduced-form estimations. The lack of a theoretical model could make estimation results volatile and biased. It is also very difficult for such researchers to provide economic interpretation of the magnitude for their estimated coefficients. For this reason, in this paper I perform estimations based on a theoretical gravity model, as inspired by Paul R. Krugman (1979), Elhanan Helpman (1987), Scott L. Baier and Jeffery H. Bergstrand (2001), and Robert C. Feenstra (2002). The significant advantage of having a theoretical framework for the estimations is that it could help us understand the quantitative contributions of democracy on trade.

Aside from this advantage, I choose the infant mortality rate to serve as an instrument variable to control for the endogeneity of democracy. This is because a country's infant mortality rate is a key exogenous determinant of democracy (Barro, 1999) but is not necessarily related to trade. An extensive exploration shows that it is indeed an ideal instrument to control for the endogeneity of democracy. Because of this, I am able to accurately estimate the effects of democratization on trade, based on a rich panel data set of 134 IMF member countries over the years 1962-1998. I obtain robust empirical evidence that democracy significantly fosters trade, controlling for the endogeneity of democracy. Overall, democratization led to about 70% trade growth over these years, which explains around 8% of the 877% increase in the global bilateral trade volume.

The rest of the paper is organized as follows. Section 2 presents a theoretical gravity

framework. The key innovation here is that I neatly incorporate both trading partners' democracy into the gravity equation. Section 3 introduces the methodology of estimating the theoretical gravity model. The main estimation results and sensitivity analysis are discussed in Section 4. Finally, Section 5 concludes the paper.

## 2 Theoretical Gravity Model

Jan Tinbergen (1962) was the first to use a gravity equation to describe the trade pattern. In its simplest form, the gravity equation suggests that bilateral trade is directly proportional to the trading entities' GDP. Based on this motivation, James Anderson (1979) provided a theoretical micro-foundation for the gravity equation based on the constant elasticity of substitution (CES) utility function, which has become a standard setup in subsequent work. An innovation of the present paper is the modification of the CES utility function by embedding a democracy index into the model. This modification is crucial in deriving a simple gravity equation which is operational for estimation.

Suppose that each country produces unique product varieties; the export of good  $k$  from country  $i$  to country  $j$  is identical to the consumption of good  $k$  in country  $j$ . Democratization in country  $j$  affects its imports, and thus consumption via the change of tariffs and various non-tariff-barriers. For example, if country  $j$  increases the tariff of good  $k$  due to pressure from labor unions, then the import of good  $k$  from country  $i$  to country  $j$  decreases.

Assume that country  $i = 1, \dots, I$  produces  $N_i$  commodities, and consider the CES

utility function:

$$U_j = \sum_{i=1}^I \sum_{k=1}^{N_i} [\exp(z_i) C_{ijk}]^{\frac{\sigma-1}{\sigma}}, (\sigma > 1) \quad (1)$$

where  $C_{ijk}$  denotes the consumption in country  $j$  of good  $k$  produced by country  $i$ . The elasticity of substitution  $\sigma$  is assumed to be higher than one. The bilateral trade volume and hence consumption  $C_{ijk}$ , will be affected by tariffs and non-tariff barriers.

More importantly, an importer  $j$ 's aggregate welfare (utility)  $U_j$  also depends on the quality of products that it imports from country  $i$ . As introduced by Michael A. Spence (1975) and developed by James Anderson, Andre de Palma, and Jacques-Francois Thisse (1989), the quality of products is an import indicator for consumers choice as well as the quantities of consumption. An exponential function of exporter's democracy index  $z_i$  is adopted here to denote the effect of quality raised by exporter  $i$ 's democracy on the importer  $j$ 's aggregate utility. The advantages for such a specification are three-fold. First, the higher the democracy level the country has, the better also the institutional quality it has, which in turn implies a higher quality of its products. In this sense, its products are more favorable for other countries, *ceteris paribus*. Thus, I model the aggregate utility function of country  $j$  as a strictly increasing function of the democracy index  $z$  of exporter  $i$  ( $i = 1, \dots, I$ )<sup>1</sup>. Second, the exponential functional form also allows me to control for the potential nonlinearity relationship between product quality and the representative consumer's utility. Finally, such a specification is also convenient for the estimation<sup>2</sup>.

For brevity, and in line with previous studies (e.g., James Anderson and Eric van

---

<sup>1</sup>Note if  $i = j$ , country  $j$  produces but does not import varieties from country  $i$ .

<sup>2</sup>Since data on democracy index is scaled from -10 to 10, it is inappropriate to use a simple linear increasing function.

Wincoop, 2003), I assume that, given  $i$  and  $j$ ,  $p_{ijk} = p_{ijk'}$  for all  $k$  and  $k'$  in  $\{1, \dots, N^i\}$ , i.e., all the varieties imported by country  $j$  from country  $i$  have the same price  $p_{ij}$ . Then consumption in country  $j$  is also identical over the entire line of products sold by country  $i$ , i.e.,  $C_{ijk} = C_{ij}$ ,  $\forall k \in \{1, \dots, N^i\}$ . Utility function (1) can then be expressed as:

$$U_j = \sum_{i=1}^I N_i \cdot [\exp(z_i) C_{ijk}]^{\frac{\sigma-1}{\sigma}}. \quad (2)$$

The representative consumer in the importing country maximizes his/her utility (2) subject to his/her budget constraint:

$$Y_j = \sum_{i=1}^I p_{ij} C_{ij}, \quad (3)$$

where  $Y_j$  is importer  $j$ 's GDP level. Observe that democracy is not included in the budget constraint (3) since democracy is not a commodity. Solving this maximization problem, I obtain the derived demand function for each product  $C_{ij}$ :

$$C_{ij} = (p_{ij}/P_j)^{-\sigma} (Y_j/P_j) \cdot (\exp(z_i))^{\sigma-1}, \quad (4)$$

where the aggregate price index  $P_j$  is defined as:

$$P_j = \left[ \sum_{i=1}^I N_i (p_{ij}/\exp(z_i))^{1-\sigma} \right]^{\frac{1}{1-\sigma}}. \quad (5)$$

Finally, the total export from country  $i$  to country  $j$  is:

$$X_{ij} = \sum_{k=1}^{N_i} p_{ijk} C_{ijk} = N_i p_{ij} C_{ij}, \quad (6)$$

where the first equality follows the definition of export value, whereas the second is due to equal price assumption across varieties. Combining (4), (5) and (6), I obtain the export

value from country  $i$  to country  $j$ :

$$X_{ij} = N_i Y_j (p_{ij}/P_j)^{1-\sigma} [\exp(z_i)]^{\sigma-1}. \quad (7)$$

Paul Samuelson (1952) suggests that there exists an "iceberg" transport cost  $T_{ij}$  across borders. In order to have one unit of the product reach the destination country  $j$ , one needs  $T_{ij} \geq 1$  units of the product shipped from the departure country  $i$ . Hence, the price on a c.i.f. (cost, insurance, freight) base  $p_{ij}$  equals the product of the "iceberg" transport cost and the price on a f.o.b. (free on board) base  $p_i$ . The iceberg transport cost is also a function of an importer's democracy index due to the reasons I argued before, i.e.,  $p_{ij} = T_{ij}(z_j)p_i$ . Thus, (7) can be written as:

$$X_{ij} = N_i Y_j [T_{ij}(z_j)/P_j]^{1-\sigma} p_i^{1-\sigma} [\exp(z_i)]^{\sigma-1}. \quad (8)$$

Clearly, in the gravity equation (8), the bilateral trade depends on the importing country's GDP, the aggregate price index, the trading countries' democracy levels, and the f.o.b. price.

However, bilateral trade is also affected by the number of varieties in the exporting country,  $N_i$ , which is unfortunately unobservable. For estimation, I consider the monopolistic competition model presented originally by Krugman (1979), which helps us eliminate the number of exporting varieties in my gravity equation (8).

As in Krugman (1979), Baier-Bergstrand (2001), and Feenstra (2003), the representative firm in country maximizes profits. Specifically, the production of goods ( $y_i$ ) incurs a fixed cost ( $\kappa$ ) and constant marginal cost ( $\phi$ ) given that labor ( $l$ ) is the firm's unique

input:

$$l_i = \kappa + \phi \cdot y_i. \quad (9)$$

The monopolistically competitive equilibrium implies two conditions for the representative firm. First, the firm's maximization behavior requires that marginal revenue should be equal to marginal cost. Since the elasticity of demand equals the elasticity of substitution  $\sigma$  when country's number of varieties  $N_i$  is large, I obtain the first equilibrium condition:

$$p_i = \left(\frac{\sigma}{\sigma - 1}\right)\phi \cdot w, \quad (10)$$

where wage is denoted as  $w$ .

Second, the representative firm obtains zero profits due to free entry. Given that the firm's profit function in country  $i$  is  $\pi_i = p_i y_i - w(\kappa + \phi \cdot y_i)$ , I obtain the equilibrium production level  $\bar{y}$  for such a representative firm in country  $i$ :

$$\bar{y}_i = (\sigma - 1)\kappa/\phi,$$

where  $\bar{y}_i$  is a constant number given that  $\sigma, \kappa$  and  $\phi$  are all constant parameters. It is also noted that the GDP in country  $i$  is  $Y_i = N_i p_i \bar{y}_i$ , and substituting this into (8), I have:

$$X_{ij} = \frac{Y_i Y_j}{(p_i)^\sigma y_i} [T_{ij}(z_j)/P_j]^{1-\sigma} p_i^{1-\sigma} [\exp(z_i)]^{\sigma-1}. \quad (11)$$

Therefore, bilateral trade depends on the trading countries' GDP, the iceberg cost, the trading countries' democracy levels, the exporting representative firms' fixed production, and various price indexes. For the readers' convenience, I include the notation of the model in Table 1.

### 3 Empirical Methodology

To estimate the gravity equation (11), I specify the estimating equation by taking logs on both sides:

$$\ln X_{ij} = \ln(Y_i Y_j) - \sigma \ln p_i + (1 - \sigma) \ln T_{ij} + (\sigma - 1) \ln P_j + (\sigma - 1) z_i - \ln \bar{y}_i. \quad (12)$$

Following Anderson and van Wincoop (2003), the bilateral iceberg cost  $T_{ij}$  includes two categories: artificial and natural transportation costs. Aside from the importer's democracy level  $z_j$ , the artificial category also includes various regional trade agreements  $R_{ij}$ <sup>3</sup>, General System of Preference (GSP)  $S_{ij}$ , and a dummy of currency unions  $D_{ij}$ . Similarly, the natural transportation costs include the following: (a) the bilateral distance cost  $g_{ij}$ ; (b) the indicator of a common land border  $B_{ij}$ : whether or not the trading countries share a common land border is important in reducing transportation cost; (c) the number of countries landlocked  $L_{ij}$ ; and (d) the number of island countries  $I_{ij}$ . Intuitively, countries far from the sea trade less, and countries which are farther apart trade less, while countries with many islands benefit from the convenient transportation and thus trade more. Therefore, I have the following:

$$\begin{aligned} \ln T_{ij} = & \alpha_{ij} + \rho_0 z_j + \rho_1 \ln g_{ij} + \rho_2 B_{ij} + \rho_3 L_{ij} \\ & + \rho_4 I_{ij} + \rho_5 R_{ij} + \rho_6 S_{ij} + \rho_7 D_{ij} + \mu_{ij}, \end{aligned} \quad (13)$$

where  $B_{ij}$  is a dummy variable which is unity if country  $i$  and country  $j$  share a common border and zero otherwise. A similar explanation applies to another currency unions

---

<sup>3</sup>Such preferential trade agreements include the following: EEC/EC/EU, US-Israel Trade Agreement, CUTA/NAFTA, CARICOM, PATCRA, CACM, MERCOSUR, ASEAN, and SPARTECA.

dummy variable  $D_{ij}$ . The constant term  $\alpha_{ij}$  captures any other border effects which are not specified in (13). Note that tariffs are not included here since global tariffs data are still currently unavailable. Thus, the effect of tariffs on transportation cost is partially absorbed by the importer's democracy index  $z_j$ , as I discussed above.

Now I can obtain the estimating equation for each period, moving the logarithm products of the GDP to the left side and substituting (13) into (12):

$$\begin{aligned} \ln X_{ijt} = & \ln(Y_{it}Y_{jt}) + (\sigma - 1)z_{it} + (1 - \sigma)\rho_0 z_{jt} - \sigma \ln p_{it} \\ & + (1 - \sigma)[\rho_1 \ln g_{ij} + \rho_2 B_{ij} + \rho_3 L_{ij} + \rho_4 I_{ij} + \rho_5 R_{ij} + \rho_6 S_{ij} + \rho_7 D_{ij}] \\ & + [(1 - \sigma)\alpha_{ijt} - \ln \bar{y}_{it} + (\sigma - 1) \ln P_{jt} (1 - \sigma)\mu_{ijt}]. \end{aligned} \quad (14)$$

In this specification, the log bilateral export, an indicator of trade openness, mainly depends on trading countries' GDP product, the exporter's democracy level ( $z_i$ ), the importer's democracy level ( $z_j$ ), the exporter's f.o.b. price index ( $\ln p_i$ ), and the importer's log aggregate price index ( $\ln P_j$ ). In addition, bilateral openness is also affected by various indicators of transportation costs ( $\ln g_{ij}$ ,  $B_{ij}$ ,  $L_{ij}$ ,  $I_{ij}$ ,  $D_{ij}$ ,  $R_{ij}$ , and  $S_{ij}$ ) and the exporter's representative firm's production  $\bar{y}_i$ .

However, in addition to the unspecified border effects ( $\mu_{ij}$ ) and the exporter's representative firm's production ( $\bar{y}_i$ ), the importer's aggregate price index  $P_j$  in Specification (14) is also *unobservable* since it depends on the unobservable exporter's varieties number  $N_i$  according to (5). Hence, these terms are absorbed into the error term  $e_{ijt}$ , which is as follows:

$$e_{ijt} = (1 - \sigma)\alpha_{ijt} - \ln \bar{y}_{it} + (\sigma - 1) \ln P_{jt} + (1 - \sigma)\mu_{ijt}.$$

Accordingly, I have the following specification for estimations:

$$\begin{aligned} \ln X_{ijt} = & \beta_0 + \ln(Y_{it}Y_{jt}) + \beta_1 z_{it} + \beta_2 z_{jt} + \beta_3 \ln p_{it} + \beta_4 \ln g_{ijt} \\ & + \beta_5 B_{ijt} + \beta_6 L_{ijt} + \beta_7 I_{ijt} + \beta_8 R_{ijt} + \beta_9 S_{ijt} + \beta_{10} D_{ijt} + e_{ijt}, \end{aligned} \quad (15)$$

where  $\beta_1 = \sigma - 1$ ,  $\beta_2 = (1 - \sigma)\rho_0$ ,  $\beta_3 = -\sigma$ ,  $\beta_4 = (1 - \sigma)\rho_1$ ,  $\beta_5 = (1 - \sigma)\rho_2$ ,  $\beta_6 = (1 - \sigma)\rho_3$ ,  $\beta_7 = (1 - \sigma)\rho_4$ ,  $\beta_8 = (1 - \sigma)\rho_5$ ,  $\beta_9 = (1 - \sigma)\rho_6$ , and  $\beta_{10} = (1 - \sigma)\rho_7$  according to Specification (14). Following the theoretical model, and in agreement with previous studies like Baier and Bergstrand (2001), I restrict the coefficient of trading countries's GDP as a constant unit. Note that my main interests are the signs of the coefficients of trading countries' democracy  $\beta_1$  and  $\beta_2$ .

## 4 Data, Econometrics, and Results

In this section, I first describe the data sets used in the paper, followed by a discussion of econometric methods. I then address the possible endogeneity problem. Finally, I close the section with various robustness checks and additional specifications.

### 4.1 Data

The regressand of (15) is the logarithm of bilateral aggregate export from country  $i$  to country  $j$ . As compared to other trade openness measurement (e.g., the sum of imports and exports relative to a country's GDP), bilateral export has a significant advantage: it can clearly describe the direction of trade that specifies the source and destination countries. Accordingly, trade data are more disaggregated and the samples are much

larger, which in turn can reduce the possible multicollinearity problem among regressors and avoid aggregated bias (Jeffery M. Wooldridge, 2002).

The trading countries' democracy levels, the key variables in Specification (15), are taken from the *Polity IV* data set by Marshall and Jaggers (2004), which is a widely accepted data set to measure world democratization. Many previous studies (e.g., Milner and Kubota, 2005, and Eichengreen and Leblang, 2006) used this data set to construct the democracy index. Specifically, *Polity IV* includes annual composite indicators measuring the “institutionalized autocracy” and “institutionalized democracy” for just about every independent entity with a population over 500,000. The political liberalization index is defined as the difference between the democracy indicator and the authoritarian indicator. Each indicator is an additive 11-point scale (0-10) based on the scale weights of four factors: (1) competitiveness of political participation, (2) competitiveness of executive recruitment, (3) openness of executive recruitment, and (4) constraints on the chief executive. Accordingly, the political liberalization index is scaled between -10 and 10, with -10 representing the lowest level of political liberalization. Table A in the Appendix offers the formation of the polity index in the *Polity IV* data set<sup>4</sup>.

All data used in the present paper are publicly available. The nominal export data comes from the NBER-UN Trade data maintained by Feenstra *et. al.*(2005). Information related to the log product of real GDP data (in constant US dollars) and various geographic factors between trading countries are directly adopted from Andrew K. Rose (2004). Since

---

<sup>4</sup>Readers who are interested in the components of political liberalization can refer to the dataset user's manual of *Polity IV* project maintained by Marshall and Jaggers (2003).

his data set ends in the year 1998, I obtain 67,359 observations for 134 countries during the years 1962-1998 (Table B in the Appendix lists all countries used in the estimations). I use the exporter's consumer price index (CPI) to measure the exporter  $i$ 's price level  $p_i$ . Such data can be accessed from the World Development Indicator (WDI, 2002) of the World Bank, which specifies the base year of the CPI as 1995. Finally, my instrument variable, infant mortality rate<sup>5</sup>, is also available from the WDI (2002).

Panel A of Table 2 presents a descriptive statistics for each variable, while Panel B describes several key variables' partial correlations. As one can observe, the exporter's democracy has almost no correlation with the importer's democracy ( $corr. = -0.01$ ). In addition, the trading countries' democracy variables are not highly correlated with all other gravity variables<sup>6</sup>. These imply that the multicollinearity is not a problem for the coefficient of interest.

## 4.2 Endogeneity Issues

Democracy is not exogenously given but is indeed affected by international trade. As Lipset (1960) points out, international trade could create a channel for trading countries' people to communicate ideas. Accordingly, the dogma and ideology that are dominant in rich clubs would easily spillover to poor countries. Aside from this, other possible channels exist. For example, trade globalization affects the democracy level of developing countries because the security and cohesiveness of the governing strata are challenged by globalization. In order to avoid such potential threat, the elites will more likely push up

---

<sup>5</sup>According to the definition of WDI, infant mortality rate is the number of infants dying before reaching one year of age, per 1,000 live births in a given year.

<sup>6</sup>I do not report such correlations to save space. Interested readers can contact me directly.

democracy (Rudra, 2005).

Turning to my gravity equation (12), the endogeneity issue exists for the democracy indexes  $z_i$  and  $z_j$  in the sense of econometrics. Such democracy indexes are correlated with the error term ( $cov(z_{it}, e_{ijt}) \neq 0$ ,  $cov(z_{jt}, e_{ijt}) \neq 0$ ) for two reasons. First, a source of endogeneity is the problem of omitted variables (Wooldridge, 2002). Note that the error term  $e_{ijt}$  includes the importer  $j$ 's aggregate price index  $P_j$  which, in turn, includes the *unobservable* number of varieties  $N_i$  according to (5). In addition to this, the *unobservable* exporter's fixed production  $\bar{y}_i$  is absorbed into the error term  $e_{ijt}$  as well. These two omitted variables thus lead to the endogeneity of the democracy index. Second, the democracy indexes  $z_i$  and  $z_j$  of the trading countries are also obviously correlated with the error term since both variables are included into importer  $j$ 's aggregate price index  $P_j$ .

One needs to control for the endogeneity of democracy in order to obtain the accurate estimated effects of democracy on trade. Otherwise, the related estimates would be suspect. The two-step instrument variable (IV) estimation is a powerful econometric method to address this problem (Wooldridge, 2002). However, to my limited knowledge, few previous works perform such estimation since researchers immediately face the challenge of choosing a good instrument for democracy—it is very difficult to find a variable that affects only democracy but not trade.

I therefore address this potential challenge by adopting a country's infant mortality rate as the instrument variable. Clearly, a country's infant mortality rate is an important *exogenous* determinant of its democracy level (Barro, 1999). The infant mortality rate is

highly correlated with the democracy for a country (this is confirmed in my estimation samples: their partial correlations are  $-0.52$  for exporters and  $-0.55$  for importers, respectively, as shown in Panel B of Table 2), and more importantly, it is exogenous to the democracy index. As viewed in Table A in the Appendix, the construction of the democracy index in *Polity IV* does *not* include the infant mortality rate. Finally, one more intriguing matter is that the infant mortality rate is not necessarily related to a country's trade activities. A country with a high level of trade openness may well maintain a high proportion of infant mortality. For example, India is one of the leading trading countries in the world, yet its average infant mortality rate in the years 1962-1998 is around 0.10, which is about twice the sample mean (around 0.05).

Without a doubt, to fully justify its validity as an instrument variable, more specification tests should be reported as well. I thus fulfill such a request when I turn to report the estimation results obtained from the two-step GMM shortly.

### 4.3 Estimates

Table 3 presents the estimated effects of democracy on trade. In all estimations, the regressand is the log bilateral trade, while the coefficients of the log product of GDP are restricted to be a unit, following the guidance of the previous theoretical model. The first column is the benchmark pooled OLS results. The most interesting finding is that trading partners' democracy level,  $z_i$  for exporters and  $z_j$  for importers, are positively associated with their bilateral export at a conventional statistical level. An importer's democratization, overall speaking, reduces various trade barriers such as tariffs and hence

increases trade flow. Similarly, an increase in exporters' democracy leads to an increase in bilateral trade flow due to the quality upgrading of trading goods from the high democratic regimes.

However, we cannot rely much on the estimated coefficients obtained from the OLS since they could have some endogenous bias, as we discussed before. To obtain the more accurate estimates, therefore, I choose a country's infant mortality rate as the instrument variable to perform the two-step General Method of Moments (GMM) estimation. The main reason for adopting the GMM is because it requires less assumptions on the error term and has the ability to generate heteroscedasticity-robust standard errors as compared to the general least squares method (Alastair Hall, 2005). I then report both stages of the GMM in the rest of Table 3.

In the first stage of GMM, the instrument variables—trading countries' infant mortality rates—serve as regressors for importer and exporter's democracy, respectively. The estimates show that the two instruments are highly statistically significant. The F-statistics are also definitely high enough to pass the F-test. I also include Shea's (1997) partial R-square to take into account the inter-correlation among instruments. All of these serve as the first evidence that the infant mortality rate is an ideal instrument.

Furthermore, estimates in the second stage offer a more fruitful and supportive evidence for the instrument's validity. An instrument (i.e., infant mortality rate) is considered truthful if it affects the regressand (i.e., bilateral log export) through and only through the instrumented variable (i.e., democracy). To justify this, I perform several useful tests as follows. First, I perform Anderson's (1984) canonical correlation likelihood-ratio test to

check whether or not the excluded instruments (i.e., infant mortality rate) are correlated with the endogenous regressors. The null hypothesis that the model is under identified is rejected at the 1% level. Second, I also go a step further to see whether or not countries' infant mortality rates are weakly correlated with their democracy. If so, then the estimates will perform poorly in this two-step GMM. Luckily enough, the Cragg and Donald (1993) F-statistics provide strong evidence to reject the null hypothesis that the first stage is weakly identified at a highly significant level. Third, the Anderson and Rubin (1949)  $\chi^2$  statistic rejects the null hypothesis that the coefficients of the endogenous regressors jointly equal zero. Note that I do not report the Hansen statistic here, though it is included, since the equation is exactly identified. In a nutshell, such various statistical tests give me sufficient confidence that the instruments are well performed, and therefore, the specification is indicated well.

Overall, the regressors covered in the two-step GMM explain 99% of the growth of bilateral trade ( $R^2 = 0.99$ ). Turning to the economic meaning of the estimated coefficients of this GMM, we observe that the coefficients of trading countries' democracy are still significantly positive. In particular, my estimates show that a one scale increase in the exporter's democracy leads to around a 15 percentage point increase of bilateral openness. The estimated constant elasticity of substitution is  $\sigma = 1.15$ , since  $\hat{\beta}_1 = \sigma - 1$ , which is also consistent with my theoretical assumption  $\sigma > 1$ . Analogously, the importer's democracy, another key variable, has an estimate of  $\hat{\beta}_2 = 0.11$ . This suggests that the semi-elasticity of the importer's democracy on trade is about 11 units.

Equally importantly, after controlling the endogeneity of democracy, the effects of

democracy on trade are amplified five times as compared to their counterparts obtained from the OLS. This finding is consistent with the findings of Yu (2005): democracy fosters trade whereas trade dampens democracy. In the OLS, the positive effects of democracy on trade are under-estimated since they are undercut by the reverse negative effects of trade on democracy. In the present paper, the accurate magnitudes are hence explicit after I control for the endogeneity using a truthful instrument.

Aside from this, all geographic factors are economically and statistically significant. Countries with long distance trade less ( $\hat{\beta}_4 = -1.28$ ). Meanwhile, countries with common land borders trade more ( $\hat{\beta}_5 = 0.23$ ), and countries with island also trade more ( $\hat{\beta}_6 = 0.11$ ). In contrast, countries which are land-locked trade less ( $\hat{\beta}_7 = -0.17$ ). Regional trade agreements are also helpful to increase trade flow ( $\hat{\beta}_8 = 0.35$ ). The General System of Preferences (GSP) also has a positive effect on trade promotion ( $\hat{\beta}_9 = 0.32$ ). Countries that belong to a common currency union trade more ( $\hat{\beta}_{10} = 2.09$ ). All of these results are consistent with previous related studies like Rose (2004) and Arvind Subramanian and Shang-Jin Wei (2003).

Let us turn to the price index. The random estimate turns out to be  $\hat{\beta}_1 = 0.15$  and  $\hat{\beta}_3 = 0.00$ , which are inconsistent with the theoretical requirement  $\hat{\beta}_3 \neq -(\hat{\beta}_1 + 1)$ . However, the coefficient of  $\hat{\beta}_3$  cannot be taken too seriously since it is statistically insignificant, controlling for the endogeneity. This economically and statistically insignificant estimate comes from the measurement error of the exporter's price index ( $\ln p_i$ ), which is a common shortcoming from using a published price index data. As pointed out by Feenstra (2003), most of the published price index data are measured relative to an arbitrary base period

(I choose 1995 in my estimation), which usually undermines the accuracy of the estimates.

I then identify the coefficients in Specification (13) based on my estimation results. For example, in the two-step GMM estimate, the coefficient of distance is  $\hat{\rho}_1 = \hat{\beta}_4 / (1 - \hat{\sigma}) = -1.28 / (-0.15) = 8.53$ . I now obtain the coefficients for other geographic variables using the same method, which are presented in Table 4. All numbers have the anticipated economic meanings. Geographical distance significantly increases the iceberg transportation cost. Moreover, countries which are farther from the sea suffer from the high iceberg cost as well. Particularly, countries with common land borders have an iceberg cost which is 1.53 times lower than those without common land borders, controlling for the endogeneity of democracy. In contrast, I also calculated the coefficients obtained from the pooled OLS. As one can observe, due to the endogeneity issue, all geographical effects are exaggerated in the pooled OLS. This serves as an additional evidence for the endogenous bias in the OLS estimates caused by the endogeneity issue of democracy.

#### 4.4 Robustness Checks

If the trading country pair ( $\varphi_{ij}$ ) is assumed to be equal across all countries, then the pooled OLS estimates are consistent and efficient. However, since different trading country pairs could have unobserved specific country characteristics, omitting them could cause biased estimates. The GMM method is one of the good methods to handle this problem. Another powerful way is to use the fixed effect specification to avoid such possible biases (Feenstra, 2002). That is, the classical measurement error term is decomposed into a country-pair random variable  $\varphi_{ij}$ , a year specific effect  $\omega_t$  and an idiosyncratic effect  $\epsilon_{ijt}$  with normal

distribution:  $\epsilon_{ijt} \sim N(0, \sigma_{ij}^2)$ . This is represented in the following:

$$e_{ijt} = \varphi_{ij} + \omega_t + \epsilon_{ijt}.$$

Column (1) of Table 5 presents the fixed-effect estimation results. Observations in the sample are clustered across different periods by the trading countries' pairs. Accordingly, time-invariant variables like various geographical factors ( $\ln g_{ij}$ ,  $B_{ij}$ ,  $L_{ij}$ , and  $I_{ij}$ ) are automatically dropped out. I also include time-specific fixed effects to control time-variant unobserved specific characteristics. The Hausman (1978) test strongly rejects the null hypothesis that the random effect specification is appropriate (p-value= 0.00). Put in another way, the country-pair random variable,  $\varphi_{ij}$ , is correlated with other regressors. Thus, the fixed-effect estimation is proper for my specification.

It turns out from the fixed-effect estimates that trading countries' democracy are positively associated with their bilateral export. However, the coefficient of the importer's democracy is statistically insignificant. I suspect that the bias is caused by the endogeneity issue. I then perform the two-stage IV fixed-effect estimates, which are reported in the rest of Table 5. The important finding is that both trading countries' democracy leads to an increase in bilateral trade, respectively. Their magnitude are close to those obtained in the two-step GMM as well:  $\hat{\beta}_1 = 0.18$ ;  $\hat{\beta}_2 = 0.15$ .

My final step is to offer a more economic explanation for these two key variables. Comparing the data in 1962 with those in 1998, the world average exporter's democracy index increased by 1.41 points, which predicts around 25.4% of the bilateral trade growth since  $1.41 * 0.18 = 25.4\%$ . This contributes 2.9% to the 877% increase of the bilateral trade

during this period. Similarly, given that the average importer's democracy increases by about 3.00 points, it then explains the 45% of the growth in bilateral trade, *ceteris paribus*, since  $3.00 * 0.15 = 45\%$ . It contributes 5.1% to bilateral trade as well. Adding these two numbers together, overall, democracy contributes about 8% to the bilateral trade growth. The magnitude of contributions decreases a little (i.e., to 6.2%) when one uses estimated coefficients obtained from the two-step GMM to calculate, following the similar approach.

In a nutshell, all my results are robust using various econometric methods. Since the impacts of democracy levels on trade are economically and statistically significant, I can safely conclude that global democratization fosters world trade.

#### **4.5 More Specifications**

Given that a country's income varies, is the effect of democratization on trade sensitive to income? Previous studies suggest an affirmative answer. Milner and Kubota (2005) find evidence that democratization in developing countries leads to a higher trade flow since politicians in democratic countries cannot use strategic trade policies to win political support from special interest groups like labor unions. In contrast, O'Rourke and Taylor (2006) suggest that democratization could discourage trade in capital-abundant countries because workers, who get more political power from the democratization, may prefer protectionism along the lines of the Heckscher-Ohlin-Stolper-Samuelson theorem.

I thus perform my estimations by dividing the sample by country groups according to their income *per capita*. I do not restrict myself to two groups (developing and developed countries); instead, I split all countries into five categories according to the 2004 Gross

National Income (GNI) per capita level reported by the World Bank: (a) low income countries (\$825 or less); (b) lower middle income countries (\$826 - \$3,255); (c) upper middle income countries(\$3,256 - \$10,065); (d) high income non-OECD countries (\$10,066 or more); and (e) high-income OECD countries (\$10,066 or more). The list of countries included in the estimation is reported in Table C in the Appendix. Note that here I do not use the dummy variables to capture the income difference. This is mainly because each variable in my estimations has a theoretical implication which is supported by the model, and hence I cannot add extra variables arbitrarily.

Table 6 presents the results, separating exporters and importers into each income group. To save space, I only report the exporter's and importer's democracy variables. As viewed in Column (1), the exporter's democratization fosters trade for all of the income groups. The increase in products' quality in a better institution, which is proxied by the countries' democracy level, makes it a favorable exporter in international trade. Similarly, the poor importer's democratization fosters trade, which is in line with the findings of Milner and Kubota (2005). For the rich club, the estimates are slightly different between those from the GMM and from the IV fixed-effect estimations. In particular, the high income OECD importers' democracy is negatively associated with their bilateral trade from Column (3), which is then broadly consistent with previous findings of O'Rourke and Taylor (2006).

Furthermore, I run the GMM estimations disaggregating by geographical regions. My sample is separated into seven groups: (a) East Asian countries; (b) South Asian countries; (c) Mid-eastern and North African countries; (d) Sub-Saharan countries; (e) European

countries; (f) North American countries; and (g) Latin American and Caribbean countries. As shown in Table 7, most of the impacts of the exporter's democratization on trade are significantly positive in the OLS estimates. One exception remains for South Asian countries ( $-0.20$ ). However, this is not a problem since it is statistically insignificant.

I also consider the effects of democratization for 20 transition countries<sup>7</sup>. Overall, the transitional exporter's democracy promotes trade as in other countries. In contrast, the effects of the transitional importer's democracy on trade are insignificant.

One might also worry about the interaction effect of trading partners' democracy levels. The correlation reported in Table 2B suggests that they might be mutually exclusive. This is confirmed again by the exercise of including the interaction term of both countries' democracy levels into the estimations. I find that the coefficients of such an interaction term are highly close to nil for all estimations<sup>8</sup>.

The last concern is about the missing data problem in my estimates. Usually, small countries have trade data, but not CPI data. As a consequence, most of the missing data comes from the regressors' side and therefore should not be a severe problem for my estimations (Rose, 2004).

## 5 Concluding Remarks

Democratization could affect trade in various matters. In this paper I estimate a gravity equation with democracy based on a gravity theoretical model. I find robust evidence

---

<sup>7</sup>Such transition countries include Albania, Armenia, Azerbaijan, Belarus, Bulgaria, Croatia, Czech Republic, Estonia, Georgia, Hungary, Kazakhstan, Kyrgyz Republic, Latvia, Lithuania, Poland, Russia, Slovenia, Tajikistan, Turkmenistan, and Uzbekistan.

<sup>8</sup>I did not report the coefficients for such a term in the text. Interested readers can refer to me directly.

that democratization significantly fosters trade. After controlling for the endogeneity of democracy, the importer's democratization accounts for 3-5% of bilateral trade growth; and the exporter's democratization explains around 3% also. Overall, democratization contributes 6-8% to bilateral trade growth.

The present paper offers three main contributions. The first one is about the methodology. It is the first one, to my limited knowledge, to involve democracy into a *theoretical* gravity model. The importer's democracy promotes trade via various channels such as the removal of various trade barriers and the reduction of trade uncertainty. Furthermore, a country with a high democracy level will be a favorable exporter in international trade due to the products' quality upgrading in the high democratic regime. Because of these, I am able to perform estimations for structural variables to investigate the impact of democratization on trade.

Second, the present findings are consistent with previous works, and more importantly, take an important step forward for the understanding of the endogenous nexus between trade globalization and democratization. It also enriches the trade literatures which analyze trade growth. By examining the bilateral trade flows among 16 OECD countries, Baier and Bergstrand (2001, pp.23) point out the following: "*We found that approximately 67-69% of this (trade) growth could be explained by real GDP growth, 23-26% by tariff-rate reductions and preferential trade agreements, 8-9% by transport-cost declines, and virtually none by real GDP converge.*" Here I go further to identify that trading countries' democracy accounts for a total of 6-8% of trade flows within the 23-26% of trade liberalization and preferential trade agreements.

Turning to the contribution on international political economy, previous works recognize that democracy fosters trade whereas trade has no impact on (or even dampens) democracy (Eichengreen and Leblang, 2006, Yu, 2005). However, due to the potential shortcoming of their reduced-form estimates, previous works suffer from the lack of offering economic magnitude for such findings. Thanks to the guidance of the theoretical framework, I am able to fix this problem by showing that democracy fosters trade not only statistically but also *economically* significantly, by controlling for the endogeneity of democracy.

## References

- [1] Anderson, Simon P., Andre de Palma, and Jacques-Francois Thisse, "Demand for Differentiated Products, Discrete Choice Models, and the Characteristics Approach," *Review of Economic Studies*, 1989, 56, pp.21-35.
- [2] Anderson, James, "A Theoretical Foundation for the Gravity Equation," *American Economic Review*, 1979, 75 (1), pp. 178-190.
- [3] Anderson, James and van Wincoop, Eric, "Gravity with Gravitas: A Solution to the Border Puzzle," *American Economic Review*, 2003, 93(1), pp. 170-192.
- [4] Anderson, T.W., *Introduction to Multivariate Statistical Analysis*, 2nd ed. New York: John Wiley & Sons, 1984.
- [5] Anderson, T. W., and H. Rubin., "Estimation of the Parameters of a Single Equation in a Complete System of Stochastic Equations," *Annals of Mathematical Statistics*, 1949, 20, pp. 46-63.
- [6] Baier, Scott L. and Bergstrand, Jeffery H., "The Growth of World Trade: Tariffs, Transport Costs, and Income Similarity," *Journal of International Economics*, 2001, 53, pp. 1-27.
- [7] Barro, Robert J., "Democracy and Growth," *Journal of Economic Growth*, 1996, 1(1), pp. 1-27.
- [8] —, Determinants of Democracy, *Journal of Political Economy*, 1999, 107(S6), pp. S158-183.
- [9] Cragg, J.G. and S.G. Donald, "Testing Identifiability and Specification in Instrumental Variables Models," *Econometric Theory* 1993, 9, pp. 222-240.

- [10] Eichengreen, Barry and Leblang, David, "Democracy and Globalization," Unpublished Paper, University of California, Berkeley, 2006.
- [11] Feenstra, Robert C., "Border Effects and the Gravity Equation: Consistent Methods for Estimation," *Scottish Journal of Political Economics*, 2002, 49, pp. 491-506.
- [12] —, *Advanced International Trade: Theory and Evidence*. Princeton University Press, 2003.
- [13] Feenstra, Robert C., Robert E. Lipsey, Haiyan Deng, Alyson Ma and Hengyong Mo, "World Trade Flow: 1962-2000," National Bureau of Economic Research, Inc., NBER Working Papers, No.11040, 2005.
- [14] Fidrumc, Jan, "Economic Reform, Democracy and Growth during Post-Communist Transition," Unpublished Paper, Center for European Integration Studies, University of Bonn, 2001.
- [15] Giavazzi, Francesco and Tabellini, Guido, "Economic and Political Liberalizations," *Journal of Monetary Economics*, 2005, 52, pp. 1297-1340.
- [16] Grofman, Bernard and Gray, Mark, "Geopolitical Influences on Trade Openness in Thirty-One Long-Term Democracies, 1960-1995," Unpublished Paper, University of California, Irvine, 2000.
- [17] Hall, R. Alastair, *Generalized Method of Moments*, Oxford University Press, 2004.
- [18] Hausman, Jerry A., "Specification Tests in Econometrics," *Econometrica*, 1978, 46, pp.1251-1271.
- [19] Helpman, Elhanan, "Imperfect Competition and International Trade: Evidence from Fourteen Industrial Countries," *Journal of the Japanese and International Economics*, 1987, 1, pp.62-81.

- [20] Lipset, Seymour Martin, *Political Man—the Social Bases of Politics*, Garden City: Doubleday & Company, 1960.
- [21] Krugman, Paul R., “Increasing Returns, Monopolistic Competition, and International Trade,” *Journal of International Economics*, 1979, 9, pp. 469-479.
- [22] Marshall, Monty G. and Jaggers, Keith, “Polity IV Project,” data set available at <http://www.cidcm.umd.edu/inscr/polity/> , 2002.
- [23] Milner, Helen and Kubota, Keiko., “Why the Move to Free Trade? Democracy and Trade Policy in the Developing Countries,” *International Organization*, 2005, 59 (1), pp.157-93.
- [24] O’ Rourke, Kevin and Taylor, Alan M., “Democracy and Protectionism in the Nineteen Century,” National Bureau of Economic Research, Inc., NBER Working Papers, No.12250, 2006.
- [25] Papaioannou, Elias and Gregorios Siourounis., "Economic and Social Factors Driving the Third Wave of Democratization," unpublished manuscript, London Business School, 2005.
- [26] Quinn, Dennis, “Democracy and International Financial Liberalization,” Unpublished Paper, Georgetown University, 2001.
- [27] Rodrik, Dani, “Institutions for High-Quality Growth: What They Are and How to Acquire Them,” Center for Economic Policy Research Inc., CEPR Discussion Paper, No. 2370, London, 2000.
- [28] —, “The Political Economy of Trade Policy,” In *Handbook of International Economics*, ed. Gene M. Grossman and Kenneth Rogoff. Amsterdam: Elsevier Science BV. Vol. III, 1995, pp. 61-88.

- [29] Rose, Andrew K., "Do We Really Know That the WTO Increases Trade?" *American Economic Review*, March 2004, 94(1), pp. 98-114.
- [30] Rudra, Nita, "Globalization and the Strengthening of Democracy in the Developing World," *American Journal of Political Science*, 2005, 49, pp. 704-730.
- [31] Samuelson, Paul, "The Transfer Problem and Transport Costs: The Terms of Trade When Impediments are Absent," *Economic Journals*, 1952, 62, pp. 278-304.
- [32] Shea, John (1997), "Instrument Relevance in Multivariate Linear Models: A Simple Measure," *Review of Economics and Statistics* 49(2), pp. 348-352.
- [33] Spence, A. Michael, "Monopoly, Quality, and Regulation," *Bell Journal of Economics*, 1975, 6:417-29.
- [34] Subramanian Arvind and Wei, Shang-Jin, "The WTO Promotes Trade, Strongly but Unevenly," National Bureau of Economic Research, Inc., NBER Working Papers, No. 10024, 2003.
- [35] Tinbergen, Jan, *Shaping the World Economy*, New York: Twentieth Century Fund, 1962.
- [36] Wooldridge, Jeffery M., *Econometric Analysis of Cross Section and Panel Data*, MIT Press, 2002.
- [37] Yu, Miaojie, "Trade Globalization and Political Liberalization: A Gravity Approach," SSRN working paper, available at <http://ssrn.com/abstract=906280>, 2005.

Table 1: Main Notation for the Models

Symbol	Definition
<i>Panel A: Theoretical Model</i>	
$C_{ijk}$	Amount of good $k$ produced in country $i$ and consumed in country $j$
$N_i$	Number of varieties produced in country $i$
$z_i$	Exporter $i$ 's democracy level
$z_j$	Importer $j$ 's democracy level
$\sigma$	Elasticity of substitution, $\sigma > 1$
$Y_i, Y_j$	Country $i$ and country $j$ 's GDP level, respectively
$p_{ij}$	Price on a c.i.f. (cost, insurance, freight) base
$p_i$	Price on a f.o.b. (free on board) base
$T_{ij}$	Bilateral iceberg transportation cost
$X_{ij}$	Value of exports from country $i$ to country $j$
$P_j$	Aggregate price index in importing country $j$
$w$	Wages
$l_i$	Labor input for the representative firm in country $i$
$y_i$	Output of country $i$ 's representative firm, which is fixed in equilibrium: $y_i = \bar{y}_i$
$\kappa$	Fixed cost for the representative firm in country $i$
$\phi$	Constant marginal cost for the representative firm in country $i$
<i>Panel B: Empirical Model</i>	
$\alpha_{ij}$	Unspecified bilateral border effect
$g_{ij}$	Bilateral distance cost
$B_{ij}$	Dummy variable which is unity if country $i$ and country $j$ share common border
$L_{ij}$	Number of countries landlocked
$I_{ij}$	Number of island countries
$R_{ij}$	Dummy of various regional trade agreements
$S_{ij}$	Dummy of the General System of Preferences
$D_{ij}$	Dummy of currency unions
$\mu_{ijt}$	Error term in transport cost specification (13)
$\varphi_{ij}$	Country-pair random variable
$\omega_t$	Year-specific random variable
$\epsilon_{ijt}$	Idiosyncratic random variable

Table 2: Descriptive Statistics of Variables

*Panel A: Basic Statistics*

Variable	Mean	Std. Dev.	Minimum	Maximum
Log Bilateral Exports	15.42	3.06	6.91	25.87
Log Product GDP	49.16	2.22	41.68	58.02
Democracy Index of Exporter	3.26	7.54	-10	10
Log Consumer Price Index (1995:100)	2.34	4.10	-23.02	9.51
Log Distance	8.22	0.78	4.02	9.42
Land Border	0.03	0.17	0	1
Number Landlocked	0.23	0.45	0	2
Exporter's infant mortality rate	0.05	0.04	0.00	0.22
Importer's infant mortality rate	0.06	0.05	0.00	0.22

*Panel B: Key Partial Correlations*

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Log Bilateral Exports	1.00						
(2) Log Product GDP	0.69	1.00					
(3) Democracy Index of Exporter	0.18	0.14	1.00				
(4) Democracy Index of Importer	0.21	0.20	-0.01	1.00			
(5) Log Consumer Price Index	0.18	0.09	0.20	0.06	1.00		
(6) Exporter's infant mortality rate	-0.35	-0.22	-0.52	0.03	0.30	1.00	
(7) Importer's infant mortality rate	-0.37	-0.31	0.04	-0.55	-0.09	-0.00	1.00

Notes: I obtain 67,359 observations for 134 IMF member countries the year 1962 to 1998. I choose 1995 as the base year to calculate CPI following WDI (2002).

Table 3: Estimated Effects of Democracy on Trade

Regressand: Log Bilateral Export	OLS	2-Step GMM		
		2nd Stage	1st Stage( $Z_i$ )	1st Stage( $Z_j$ )
Log Product of GDP	1.00	1.00		
Exporter's Democracy ( $Z_i$ )	0.03** (23.62)	0.15** (54.97)		
Importer's Democracy ( $Z_j$ )	0.02** (20.65)	0.11** (49.21)		
Exporter's Infant Mortality Rate			-84.49** (-135.44)	8.89** (14.54)
Importer's Infant Mortality Rate			9.02** (16.98)	-87.03** (-174.38)
Log CPI	0.05** (24.07)	0.00 (1.51)	0.10** (14.72)	0.02** (3.37)
Log Distance	-1.20** (-108.53)	-1.28** (-98.16)	0.41** (10.71)	0.55** (14.05)
Land Border	0.23** (4.58)	0.23** (3.75)	0.15 (0.85)	0.55** (3.17)
Number Landlocked	-0.18** (-11.43)	-0.17** (-9.50)	0.36** (6.72)	0.72** (13.43)
Number Islands	0.42** (23.72)	0.11** (5.28)	0.55** (10.59)	0.96** (18.12)
Regional Trade Agreements	1.44** (33.52)	0.35** (5.53)	2.87** (16.67)	3.70** (20.86)
GSP	0.68** (44.90)	0.32** (17.36)	0.51** (9.77)	0.57** (10.59)
Currency Unions	1.01** (8.49)	2.09** (14.75)	-0.77** (-2.71)	0.26 (1.04)
F-statistics	2,402	1,996	2,715	3,985
Anderson Likelihood-ratio statistic		14,016 <sup>‡</sup>		
Cragg-Donald F statistic		7,784 <sup>‡</sup>		
Anderson-Rubin $\chi^2$ Statistic		5,597 <sup>‡</sup>		
Shea Partial $R^2$			0.21	0.26
RMSE	1.95	2.24	6.38	6.50
$R^2$	0.23	0.99	0.40	0.35
Prob.>F or Prob.> $\chi^2$	0.00	0.00	0.00	0.00

Notes: numbers in parenthesis are t-value. \*(\*\*) indicates significance at 1 (5) percent level. ‡ indicates p-value of the statistic is less than 0.01. There are 67,359 observations in the sample. The Hansen statistics for the over-identification test is exactly identified.

Table 4: Calculated Coefficients for the Iceberg Cost Specification

Iceberg Costs	$\rho_0$	$\rho_1$	$\rho_2$	$\rho_3$	$\rho_4$	$\rho_5$	$\rho_6$	$\rho_7$
Pooled OLS	-0.67	40.0	-7.67	6.00	-14.29	-48.0	-22.67	-33.67
2-Step GMM	-0.73	8.53	-1.53	1.13	-0.73	-2.33	-2.13	-13.93

Notes: numbers reported in this table are calculated from Table 3 using a method discussed in the text. Here  $\rho_0, \rho_1, \rho_2, \rho_3, \rho_4, \rho_5, \rho_6,$  and  $\rho_7$  denotes calculated coefficients for importer's democracy  $z_j$ , distance, border, landlocked, island, RTA, GSP, and currency unions, respectively.

Table 5: Further Estimated Effects of Democracy on Trade

Regressand: Log Bilateral Export	Fixed Effects	Fixed Effects+IV		
		2nd Stage	1st Stage( $Z_i$ )	1st Stage( $Z_j$ )
Log Product of GDP	1.00	1.00		
Exporter's Democracy ( $Z_i$ )	0.02** (12.14)	0.18** (13.92)		
Importer's Democracy ( $Z_j$ )	0.00 (0.38)	0.15** (11.62)		
Exporter's Infant Mortality Rate			-67.29** (-44.51)	33.19** (22.15)
Importer's Infant Mortality Rate			24.94** (16.79)	-62.70** (-42.57)
Log CPI	-0.00* (-1.93)	-0.03** (-9.82)	0.13** (18.50)	-0.03** (-4.42)
Regional Trade Agreements	0.40** (5.56)	0.24** (2.84)	1.21** (4.53)	0.49** (1.86)
GSP	-0.14** (-5.69)	0.12** (3.40)	-0.63** (-6.83)	-0.62** (-6.82)
Currency Unions	0.54** (2.61)	0.16 (0.67)	1.67** (2.19)	1.27** (1.68)
Year-specific Fixed Effect	Yes	Yes	Yes	Yes
F-statistics	302	235	9,315	10,324
Anderson Likelihood-ratio statistic		611 <sup>‡</sup>		
Cragg-Donald F statistic		307 <sup>‡</sup>		
Anderson-Rubin $\chi^2$ Statistic		435 <sup>‡</sup>		
Number of Groups	4,881	4,460	4,460	4,460
Hausman Test (Prob.> $\chi^2$ )	0.00	0.00		
Prob.>F	0.00	0.00	0.00	0.00

Notes: numbers in parenthesis are t-value. \*(\*\*) indicates significance at 1 (5) percent level. ‡ indicates p-value of the statistic is less than 0.01. There are 67,359 observations in the sample. The Hansen statistics for the over-identification test is exactly identified.

Table 6: Two-Step GMM Estimates Varied by Income Groups

Log Bilateral Export	Exporter's Democracy ( $Z_i$ )	Importer's Democracy ( $Z_j$ )	
		2-Step GMM	2-Step Fixed Effects
Low Income	0.34** (5.60)	0.16** (20.96)	0.26** (10.17)
Lowmiddle Income	0.13** (11.82)	0.07** (15.18)	0.13** (6.60)
Upper-middle Income	0.46** (14.07)	0.11** (20.49)	-2.85 (-0.63)
High Income OECD	0.12** (39.05)	0.08** (11.56)	-0.02** (-3.65)
High Income Non-OECD	0.22** (8.81)	0.10** (6.24)	0.08** (1.98)

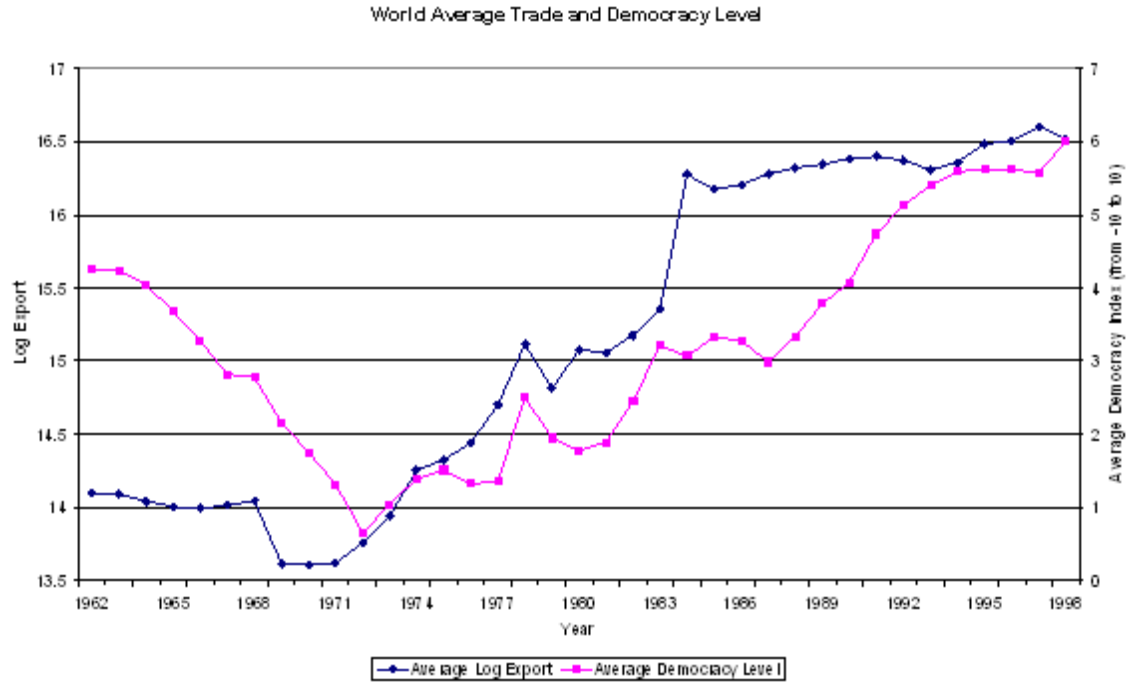
Notes: countries are separated by importer's income level into five categories according to the World Bank's classification standard. Numbers in parenthesis are t-value. \*(\*\*) indicates significance at 1 (5) percent level for a two-tailed test. In Column (3), the Hausman tests are favorable to the fixed effects. Year-specific fixed effects are included but not reported to save space. The z-statistics are in parenthesis and clustered by the trading countries' pair-id for fixed effects.

Table 7: Two-Step GMM Estimates Varied by Regions and Transition Countries

Log Bilateral Export	<i>Categories of Exporters</i>		<i>Categories of Importers</i>	
	Exporter's Democracy ( $Z_i$ )	Importer's Democracy ( $Z_j$ )	Exporter's Democracy ( $Z_i$ )	Importer's Democracy ( $Z_j$ )
East Asia	0.15** (17.44)	0.09** (12.15)	0.29** (21.46)	0.26** (18.78)
South Asia	-0.20 (-1.08)	0.07** (2.55)	0.16** (6.43)	0.13** (8.24)
Mideast & North Africa	0.40** (5.16)	-0.36** (-2.34)	0.14** (21.85)	0.10** (13.89)
Sub-Sahara	0.20** (7.82)	0.07** (3.37)	0.18** (26.12)	0.16** (24.47)
Europe	0.15** (42.88)	0.12** (44.15)	0.15** (14.57)	0.10** (14.74)
North America	0.13** (15.26)	0.10** (14.13)	0.10** (2.17)	-0.09 (-0.75)
Latin America & Caribbean	0.30** (21.31)	0.18** (15.40)	0.20** (28.05)	0.12** (23.81)
Transition	0.19** (3.49)	0.35** (2.10)	0.14** (3.10)	0.06 (1.28)

Notes: numbers in parenthesis are t-value. \*(\*\*) indicates significance at 1 (5) percent level for a two-tailed test. The z-statistics are in parenthesis and clustered by the trading countries' pair-id for fixed effects.

Figure 1: World Trade Flow and Democracy Level



Sources: export data from Feenstra, et. al. (2005). Democracy index from *Polity IV* by Marshall-Jagers (2004).

## 6 Appendix

Appendix Table A: Formation of Polity Index in the Polity IV Project

Categories	Scale Weight	
	Democracy Coding	Authority Coding
Competitiveness of Executive Recruitment		
(1) Selection		+2
(2) Transitional	+1	
(3) Election	+2	
Openness of Executive Recruitment		
(1) Closed		+1
(2) Dual/Designation		+1
(3) Dual/Election	+1	
(4) Election	+1	
Constraint on Chief Executive		
(1) Unlimited authority		+3
(2) Intermediate category		+2
(3) Slight to moderate limitations		+1
(4) Intermediate category	+1	
(5) Substantial limitations	+2	
(6) Intermediate category	+3	
(7) Executive parity or subordination	+4	
Competitiveness of Political Participation		
(1) Repressed		+2
(2) Suppressed		+1
(3) Fractional	+1	
(4) Transitional	+2	
(5) Competitive	+3	

Note: according to the Polity IV project, the polity indicator is defined as difference between the institutionalized democracy and the institutionalized autocracy. Both of them are derived from coding of competitiveness of political participation, the regulation of participation, the openness and competitiveness of executive recruitment, and constraints on the chief executive using the weights shown above. Readers can refer to the Polity IV Project Dataset Users' Manual by Marshall-Jagers (2004) for details.

Appendix Table B: List of Countries for Estimations

<b>East Asia &amp; Pacific</b>	<b>Europe</b>	<b>Latin America</b>	<b>Sub-Sahara</b>
Australia	Albania	Argentina	Angola
Cambodia	Armenia	Bolivia	Benin
China	Austria	Brazil	Burkina Faso
Fiji	Azerbaijan	Chile	Burundi
Indonesia	Belarus	Columbia	Cameroon
Japan	Belgium	Costa Rica	Chad
Korea	Bulgaria	Dominican Republic	Equatorial Guinea
Malaysia	Croatia	Ecuador	Ethiopia
Micronesia, Fed. sts.	Cyprus	El Salvador	Gambia
New Zealand	Czech Republic	Guatemala	Ghana
Papua New Guinea	Denmark	Guyana	Guinea
Philippines	Estonia	Haiti	Kenya
Singapore	Finland	Honduras	Liberia
Thailand	France	Jamaica	Malawi
<b>South Asia</b>	Georgia	Mexico	Mali
Bangladesh	Germany	Nicaragua	Mauritania
India	Greece	Panama	Mauritius
Nepal	Hungary	Paraguay	Mozambique
Pakistan	Iceland	Peru	Niger
Sri Lanka	Ireland	Trinidad and Tobago	Nigeria
<b>Mid-East</b>	Italy	Uruguay	Rwanda
Algeria	Kazakhstan	Venezuela, RB	Senegal
Bahrain	Latvia		Sierra Leone
Djibouti	Lithuania	<b>North America</b>	South Africa
Egypt, Arab Rep.	Macedonia, FYR	Canada	Sudan
Iran, Islamic Rep.	Netherlands	United States	Tanzania
Iraq	Norway		Togo
Israel	Poland		Uganda
Jordan	Portugal		Zambia
Kuwait	Romania		Zimbabwe
Lebanon	Slovak Republic		
Libya	Slovenia		
Malta	Spain		
Morocco	Sweden		
Oman	Switzerland		
Qatar	Tajikistan		
Saudi Arabia	Turkey		
Syrian Arab Republic	Turmenistan	<b>Europe (continued)</b>	
Tunisia	Ukraine	Uzbekistan	
United Arab Emirates	United Kingdom	Yugoslavia, Fed. Rep.	

Source: World Development Indicator CD-Rom (2002), the World Bank

Appendix Table C: List of Countries Varied by Income

<b>High Income OECD</b>	<b>Upper Middle Income</b>	<b>Lower Middle Income</b>	<b>Low Income</b>
Australia	Argentina	Algeria	Bangladesh
Austria	Bahrain	Bolivia	Benin
Belgium	Brazil	Bulgaria	Burundi
Canada	Chile	China	Cameroon
Denmark	Costa Rica	Columbia	Chad
Finland	Croatia	Dominican Republic	Ghana
France	Czech Republic	Ecuador	Guinea-Bissau
Germany	Gabon	Egypt, Arab Rep.	Haiti
Greece	Hungary	El Salvador	India
Iceland	Malaysia	Equatorial Guinea	Indonesia
Ireland	Mauritius	Fiji	Kenya
Italy	Mexico	Guatemala	Madagascar
Japan	Oman	Guyana	Malawi
Netherlands	Panama	Honduras	Mali
New Zealand	Poland	Iran, Islamic Rep.	Nepal
Norway	South Africa	Jamaica	Nicaragua
Portugal	Trinidad and Tobago	Jordan	Niger
Spain	Turkey	Latvia	Nigeria
Sweden	Uruguay	Lithuania	Pakistan
Switzerland	Venezuela, RB	Morocco	Rwanda
United Kingdom		Namibia	Sierra Leone
United States		Papua New Guinea	Tanzania
		Paraguay	Togo
<b>High Income Non-OECD</b>		Peru	Uganda
Cyprus		Romania	Ukraine
Israel		Sri Lanka	Zambia
Korea		Syrian Arab Republic	Zimbabwe
Kuwait		Thailand	
Malta		Tunisia	
Singapore			
Slovenia			
United Arab Emirates			

Sources: World Development Indicator CD-Rom (2002), the World Bank.