Senior Project

Department of Economics

The Effect of Corruption on International Trade in Developed and Developing Countries

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Abstract

Trefler (1995) established that the observed trade volume was less than what was predicted by economic theory. Since then, a large amount of literature has viewed corruption as an additional transaction cost to trade. Marjit and Mandal (2013) lay out a theoretical model using the Heckscher-Ohlin theory of trade. Corruption is modeled as a labor abundant activity, and the model predicts that corruption should harm trade of developing countries but benefit trade of developed countries. This project uses a Pooled OLS and a Random Effects Gravity Model to empirically test if developing countries' trade is harmed by corruption and if developed countries' trade is benefited by corruption. While the Pooled OLS showed the opposite expected results, the Random Effect model showed that developed countries benefited from corruption when looking at their export activity and developing countries were harmed by corruption when looking at their importing activities.

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Introduction

The impact of corruption is an important aspect to consider when analyzing the transaction costs of international trade. Previous research has looked at what specific factors increase and diminish corruption's effects, as well as how specific facets of corruption impact international trade differently. Corruption's effects on trade have even examined in specific cases, such as for new members of the European Union, showing that international organizations consider corruption when conducting trade (Horsewood and Voicu, 2012). International organizations seeking to develop policy to counteract corruption need to have an understanding of how it influences international trade, what countries are at risk, and what additional factors play a role in shaping trade flow. Most economists have found that corruption has a negative impact on international trade overall, but its effects can change depending on the factor endowment of the host country. In fact, previous research has found that corruption lowers trade flow for countries with large labor endowments and increases the trade flow for countries with large capital endowments.

The purpose of this paper is to further examine the impact of corruption by looking at developed countries and developing countries separately. This approach has not been done in previous econometric studies. The availability of resources, factor endowment, and trade regulation and policy can vary greatly between countries, particularly between developing and developed countries. As such, we conjecture that corruption may have a different impact in developing countries than in developed countries. By examining how corruption affects developing countries differently than developed countries, organizations can create more informed policy when addressing specific cases of corruption. In addition, our understanding of how corruption impacts international trade will grow as we find examples of how corruption can

be both beneficial and detrimental to trade depending upon the situation. These differing effects that corruption has on developing countries and developed countries have yet to be specifically addressed in previous economic research.

This paper will test the hypothesis that corruption has a negative impact on trade for a developing country and a positive impact on trade of a developed country. This paper will use a Gravity Model to test this relationship by looking at exports from the US and the Country Policy and Institutional Assessment (CPIA) of the exporting country's trade facilities. A review of previous literature looking at the topic of international trade and corruption, an explanation of the theoretical model, and an analysis of the results will make up the rest of the paper.

Literature Review

Trefler (1995) acknowledges that the observed volume of trade is less than what is predicted in the Heckscher-Ohlin-Vanek theorem. Trefler looks at several other ways to model international trade by testing models focusing on technology differences and consumption. The paper also looked at factor endowment as a part of the problem. The abundance of most factors in poor countries and the scarcity of most factors in rich countries are stated in the paper to be another issue with the HOV model. The paper calls for further research to be conducted on factor endowment and trade. The conclusions in this paper lead to further research regarding the under prediction of trade in the HOV model by looking at corruption as an additional barrier to trade. Anderson and Marcoullier (2002) analyze the factors that affect trade by looking at corruption as an additional transaction cost to trade. Using a gravity model, Anderson and Marcoullier find that corruption creates a significant barrier to trade and that increasing transparency by 10 percent leads to an increase in volume of trade by 5 percent.

Knack and Azfar (2003) look at potential sample selection bias when examining the relationship between corruption and trade. The purpose of their paper is to show that previous studies on the relationship between country size, trade, and corruption were subjected to bias in the data. To test this, the paper uses the Transparency International corruption index, the Graft index, and the Country Policy and Institutional Assessment index. The latter two indexes use a wider variety of small countries excluded from Transparency International's index. By including data on a larger selection of countries and comparing it with data that excludes certain small countries, the results show that the size of a country has a weak relationship with a country's corruption, if any. The paper then looks at the relationship between trade and corruption using the Graft and CPIA indexes for corruption. The results show that the relationship between corruption and trade openness is not significant with the newer data set.

Jansen and Nordas (2004) examine the relationship between the quality of institutions and trade flows. Corruption in the paper lowers the quality of customs and trade institutions, which creates additional transaction costs. These additional transaction costs lead to lower trade flow. The control of corruption is one of the variables used to determine the quality of institutions. The paper uses a simple gravity model in order to estimate the effect that quality of institutions has on a country's trade flows. The results of the regressions show that there is a positive relationship between the two, and that increasing quality will increase trade flow. Therefore, lowering corruption has positive benefits to a country's trade based on the results.

Thede and Gustafson (2012) examine the effects of corruption on trade by looking at different characteristics of corruption, including level, prevalence, customs location, function (either common, which is corruption that affects all businesses equally, or restrictive, which is corruption that favors certain businesses while hindering others), and predictability. Data is taken

from the World Business Environment Survey provided by the World Bank, and the gravity model serves as the econometric model for the paper. The results show that each individual facet of corruption has its own impact on international trade. For example, corruption within customs officials was shown to have a large negative impact on trade. By removing the insignificant corruption variables and observing the effects on the unpredictability of corruption and the tariff variable, they conclude that the unpredictability of corruption creates difficulty when implementing trade regulation. The unpredictability of corruption was measured by looking at the WBES survey results where respondents indicated how frequently they knew the amount of bribes they needed to conduct business. Overall the level of corruption is always found to have a negative effect on trade except for restrictive corruption, or corruption that favored certain firms but harmed other firms, which had a large positive impact on trade.

De Jong and Bogmans (2011) examine how corruption affects countries with different trade activities. They look at corruption of an exporting country separately from that of an importing country using World Business Environment Survey data. Similar to previous research, the paper uses Heckscher-Ohlin model as the basis for the theory, and uses a gravity model as the econometric model. The relations in the model are estimated with an Ordinary Least Squares and the Hausman-Taylor Method. The Hausman-Taylor Method was used in order to eliminate possible correlation between explanatory variables and unobserved country specific effects. However, the OLS was found to have a better goodness of fit. Similarly to Thede and Gustafson (2012), this paper uses several regressions to test several measures of corruption: the general level of corruption, quality of trading institutions, and the predictability of corruption. The results showed that measurement of corruption in general has a negative effect on international trade. When looking at different elements of corruption and how they affect imports and exports, the

results differed. They found that low quality trading institutions hurt imports more than exports, corruption in the form of bribes to customs increase imports but have little effect on exports, and that unpredictability in corruption has a positive relationship with trade, which the authors state is an unexpected and unusual result. Unpredictability was tested further on imports and exports, and the results showed that imports were not affected by unpredictability whereas exports were stimulated by unpredictability. The authors believe that this unexpected result is due to correlation between trade volume respondents of the WBES indicating unexpected extra payments and knowledge of how much an additional payment is.

Not all research on corruption and trade relies on the gravity model. Bandyopadhyay and Roy (2007) depart from the gravity model approach by using a fixed effects model and a two staged least squares model to correct for endogeneity of corruption and trade policy. They find that corruption leads to an increase in trade protection through tariffs and a decrease in trade openness. Bandyopadhyay and Roy also look at how contract enforcement, which is used as an indicator of corruption in government and trade facilities, affects trade protection. Similar methods were also mentioned in Anderson and Marcoullier (2002). In the presence of corruption, contract enforcement was found to have a significant effect of trade protection. Bandyopadhyay and Roy conclude that as government repudiation of contracts increases trade protection as lobbying increases to counter the lower enforcement of contracts.

When looking at corruption and trade, previous literature has shown that the effects are not always consistent given varying factors. While certain papers find that corruption and trade always have a negative relationship, others find that this is not only the case. Certain factors, such as a country's natural endowment and whether the trade activity in question is exporting or importing, have been shown to affect how corruption influences international trade. No research

has been conducted on the topic that separates the data based on whether or not a country is classified as developing or developed. The approach of this paper is to separate developed and developing countries in the data and regress them separately in order to test whether or not corruption affects the trade of developing and developed countries differently.

Theoretical Model

Marjit and Mandal (2013) take a unique approach to modeling how corruption affects trade. Using the Heckscher-Ohlin-Samuelson-Vanek model of international trade, the paper seeks to find the relationship between corruption and labor abundance by looking at corruption as a labor intensive activity. Heckscher-Ohlin theory explains trade by looking at the factor endowments of the countries involved in trade. According to the theory, a country that is labor abundant will be able to more easily produce goods that are more labor-intensive to produce, and a capital abundant country will be able to more easily produce goods that are more capital-intensive to produce. The labor abundant country will then export the labor intensive goods it produces and import the capital intensive good that is more difficult to produce, and vice versa. They propose that in a labor abundant country, the volume of trade is negatively affected by the level of corruption, while in a capital abundant country the volume of trade is positively affected by the level of corruption. They model the relationship between corruption and trade by modifying a general equilibrium model for trade to include corruption of a labor and capital abundant country, and propose that labor abundant countries are harmed by corruption. Since the model views corruption as a labor intensive activity, corruption will harm the production of the labor intensive good. Since a labor abundant country trades the labor-intensive goods it produces, this will harm the trade of a labor abundant country. They also propose that capital abundant countries might benefit from corruption, leading to a greater volume of trade. This,

according to the paper, is due to corruption artificially increasing capital through additional payments and bribes. Labor abundant countries cannot benefit from corruption this way. According to the paper, this is because corruption detracts from the labor force by causing laborers to participate in illegal activity.

The same theoretical background used in Marjit and Mandal (2013) is applied in this paper. The predicted differences in the effect corruption has on developing countries and developed countries are based on whether the country is more capital or labor abundant. Because developed countries have more capital than developing countries, these countries should benefit more from corruption than developed countries. Developed countries, on the other hand, should be hindered by corruption. The Heckscher-Ohlin Model of international trade is based on factor endowments influencing trade. Trefler (1995) looks at factor endowments as one of the problems with the Heckscher-Ohlin Model. Marjit and Mandal (2013) use Hechscher-Ohlin theory to relate capital and labor endowments to corruption, a potential barrier to trade for developing countries.

The testable hypothesis of this paper is that the trade of developing countries will have a negative relationship with corruption, whereas developed countries will have a positive relationship with corruption. This paper assumes that a developed country is more capital abundant than a developing country and that a developing country is more labor abundant. Corrupt activities should detract from the labor force of a labor abundant economy, lowering volume of trade. A capital abundant country with corruption would not have this problem, leading to increased trade in capital-based goods. This theory, as explained in Marjit and Mandal's general equilibrium model, will be empirically tested in this paper.

Econometric Model and Data

In order to estimate this relationship, trade will be looked at with the United States serving as a base country. Data from the years 2005 through 2010 was used in the model. Data sources and definitions of the variables used are listed in the appendix in Table 2. The dependent variable in the model is trade between the United States and a partner country. Trade with each country is measured in the form of US exports and US imports to the partner country in current US dollars.

The corruption of the trade partner is measured using the World Bank Country Policy and Institutional Assessment (CPIA) for trade and general corruption in different regressions. The CPIA for trade ranks the quality and level of corruption in customs and other trade facilities between 1 and 6, with 1 indicating low quality and high corruption and 6 indicating high quality and low corruption. The CPIA for general corruption rates the quality and corruption of a country's public sector in the same way as the CPIA rating for trade.

Geographical distance between the United States and the partner country is included in the model. The GDP of the partner country is included as a means of measuring the economic size of each country. The partner country's cost of importing and cost of exporting in current US dollars is included in the model as an additional barrier to trade.

This paper, similar to previous literature looking at the relationship between corruption and trade, uses a gravity model to estimate the relationship. Both a Pooled OLS and a Random Effect model were used in this paper. Since the data is collected for multiple years, the Random Effect model is needed to control for unobserved heterogeneity. Because De Jong and Bogmans (2011) noted that there were differences between countries primarily importing and countries

primarily exporting, regressions are performed with US imports from a partner country and US exports to a partner country as dependent variables separately. Furthermore, separate regressions are performed with the CPIA trade rating and the general CPIA rating as variables of interest.

$$\mathbf{log(usimports)}_{it} = \alpha_0 + \beta_1 \mathbf{log(GDP)}_{it} + \beta_2 \mathbf{log(export\ cost)}_{it} + \beta_3 \mathbf{CPIA}_{it} + \beta_4 \mathbf{log(distance)}_{it} + \varepsilon$$

$$\mathbf{log(usexports)}_{it} = \alpha_0 + \beta_1 \mathbf{log(GDP)}_{it} + \beta_2 \mathbf{log(import\ cost)}_{it} + \beta_3 \mathbf{CPIA}_{it} + \beta_4 \mathbf{log(distance)}_{it} + \varepsilon$$

In order to examine how corruption affects developing and developed countries differently, this paper separates the countries in the data set into two groups. After an initial regression including every country in the dataset, countries classified by the World Bank as low income countries are regressed separately from the other countries in the data set.

Results

Table 4 in the appendix shows the results of the Pooled OLS regression with CPIA rating for trade as the variable of interest. Table 5 shows the results of the Pooled OLS regression with general CPIA rating as the variable of interest. Tables 6 and 7 show the results with trade CPIA and general CPIA respectively for the Random Effect models.

First, when looking at the Pooled OLS models, the GDP and Distance variables are the expected signs. The positive parameter estimates for GDP indicate that there is a positive relationship between trade and GDP. The negative parameter estimates for Distance indicates a negative relationship between trade and distance. There are a few instances where the parameter for distance is actually positive. However, this is usually the case when distances was not statistically significant and occurred when the data set was split between developing and developed countries.

It should be noted that a higher CPIA rating indicates lower corruption. Therefore, when interpreting the CPIA parameter estimates, a negative parameter estimates indicates that increasing corruption will increase trade since, and a positive parameter estimate indicates that increasing corruption will decrease trade. The Pooled OLS with CPIA trade as the variable of interest shows a positive .25 parameter estimate for developed countries when the partner country is an importer. This means that an increase on the CPIA scale by 1 will increase US exports to that country by .25 percent. The CPIA trade rating with the developing partner country was not significant. When the developing partner country was an exporting country, the parameter estimate of -.39 indicates that an increase on the CPIA scale by 1 will decrease US imports from that country by .39 percent. These results are the opposite of what was expected, as this shows that the developing country will have increased trade when corruption increases. These results also show that developed countries will have decreased trade when corruption increases. The Pooled OLS regressions with the general CPIA as the variable of interest were negative for both developing and developed countries when the partner country was an importer and an exporter.

The Random Effects models, similar to the Pooled OLS, have GDP's parameter estimates displaying the correct signs as well. Distance mostly displays the expected sign, but occasionally becomes positive when it is not statistically significant. When looking at the partner country as an exporter and viewing CPIA trade as the variable of interest, developed countries have a parameter estimate of -.23, meaning that increasing the CPIA trade rating of a country by 1 decreases exports to the US by .23 percent. When looking at the imports of a developing country, CPIA trade has a parameter estimate of .29, indicating that increasing the CPIA trade rating by 1 increases imports from the US by .29 percent. This follows what was predicted by the theory, as

developed countries now see a benefit from corruption and developing countries are harmed by corruption.

The import and export costs variables are rarely significant in the models. This is most likely due to the cost of trade already being represented by the distance variable.

Conclusion

Both the Pooled OLS models and the Random Effects model showed that there were differences in how corruption affects the trade of developing and developed countries. However, it is important to take into account whether the exporting activity or importing activity of the country in question is being examined. The pooled OLS Gravity Model results are opposite of what was expected. However, the Random Effects Gravity Model with the CPIA rating for trade as the variable of interest support the testable hypothesis when the imports of a developing country and the exports of a developed country are compared.

There are several limitations with this project that must be addressed. First, this study would benefit from the inclusion of more countries. Performing an analysis with a complete Gravity Model instead of a US focused model would allow for more observations and more accurate results. Removing the export and import cost variables would improve the accuracy of these models since the cost of trade is already represented in the distance variable. Furthermore, including other variables associated with a Gravity Model, such as common language and common border variables, would allow for more explanatory power, especially if the US centric approach is abandoned in favor of a complete gravity model.

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Appendix

Table 1: Countries Used in the Regression Analysis

Afghanistan	Georgia	Nicaragua
Albania	Ghana	Niger
Angola	Grenada	Nigeria
Armenia	Guinea	Pakistan
Azerbaijan	Guinea-Bissau	Papua New Guinea
Bangladesh	Guyana	Rwanda
Benin	Haiti	Samoa
Bhutan	Honduras	Sao Tome and Principe
Bolivia	India	Senegal
Bosnia and Herzegovina	Indonesia	Sierra Leone
Burkina Faso	Kenya	Solomon Islands
Burundi	Kiribati	Sri Lanka
Cambodia	Kyrgyz Republic	St. Lucia
Cameroon	Lao PDR	St. Vincent and the Grenadines
Canada	Lesotho	Tajikistan
Central African Republic	Liberia	Tanzania
Chad	Madagascar	Togo
Comoros	Malawi	Tonga
Congo, Dem. Rep.	Maldives	Uganda
Congo, Rep.	Mali	Uzbekistan
Cote d'Ivoire	Mauritania	Vanuatu
Djibouti	Moldova	Vietnam
Dominica	Mongolia	Zambia
Eritrea	Mozambique	Zimbabwe
Gambia, The	Nepal	

Table 2: Data Sources

Variable	Definition	Source
Distance	The distance between the US and trade partner	CEPII
Cost of exporting	The cost of exporting for the partner country in US Dollars	World Bank WITS
Cost of importing	The cost of importing for the partner country in US Dollars	World Bank WITS

General CPIA	Country Policy and Institutional Assessment for the public sector on a scale of 1 (high corruption) to 6 (low corruption)	World Bank WDI
CPIA trade	Country Policy and Institutional Assessment of trade institutions on a scale of 1 (high corruption) to 6 (low corruption)	World Bank WDI
GDP	Gross Domestic Product of partner country	World Bank WDI
US Exports	Amount of US exports to partner country in US Dollars	World Bank WITS
US Imports	Amount of US imports from partner country in US Dollars	World Bank WITS

Table 3: Descriptive Statistics

Variable	N	Mean	Std Dev	Minimum	Maximum
US imports	430	5024591	32329865	41.462	339074076
US exports	430	3215928	24932895	108.899	260890167
Import Cost	430	1976.47	1265.66	317	8525
Export Costs	430	1607.75	1008.94	400	5902
CPIA general	430	2.884884	0.669954	1	4.5
CPIA trade	430	3.812791	0.649869	1.5	6
Distance	430	9575.24	3396.99	548.3946	16180.32
GDP	430	4.06E+10	1.78E+11	104668675	1.71E+12

Table 4: Pooled OLS with CPIA Trade

Partner Country as Importer

	All countries	Developing	Developed
Intercept	9.85 [1.21712]***	4.38 [2.02672]**	11.86 [1.85499]***
log(gdp)	0.92 [0.02618]***	1.03 [0.04465]***	0.85 [0.03461]***
log(import cost)	-0.57 [0.07854]***	-0.52 [0.10118]***	-0.55 [0.14578]***
CPIA trade	0.19 [0.073]***	0.13 [0.09374]	0.25 [0.11668]**
Log (distance)	-1.71 [0.08885]***	-1.43 [0.18183]***	-1.79 [0.10994]***
R-Squared	0.79	0.73	0.83
No of Observations	430	234	184

Partner Country as Exporter

	All countries	Developing	Developed
Intercept	-7.16 [2.35483]***	-17.84 [4.38675]***	-7.95 [2.88815]***
Log(gdp)	1.41 [0.0525]***	1.44 [0.09658]***	1.34 [0.06194]***
Log(export cost)	-0.57 [0.16842]***	-0.49 [0.23298]**	-0.099 [0.26652]
CPIA Trade	-0.21 [0.14623]	-0.39 [0.20221]**	-0.12 [0.20509]
Log(distance)	-0.95 [0.17878]***	0.09 [0.39169]	-1.05 [0.18916]***
R-Squared	0.64	0.52	0.75
No of Observations	430	234	184

Standard Errors are in brackets. * denotes significance at the 10 percent level, ** denotes significance at the 5 percent level, and *** denotes significance at the 1 percent level

Table 5: Pooled OLS with General CPIA

Partner Country as Importer

	All countries	Developing	Developed
Intercept	10.85 [1.25037]***	5.27 [1.93723]***	15.12 [1.97112]***
log(gdp)	0.92 [0.02653]***	1.04 [0.04523]***	0.83 [0.03796]***
log(import cost)	-0.59 [0.08080]***	-0.54 [0.10506]***	-0.59 [0.14462]***
CPIA general	0.04 [0.07282]	-0.02 [0.09888]	-0.25 [0.13185]*
Log (distance)	-1.75 [0.08852]***	-1.47 [0.18018]***	-1.88 [0.11103]***
R-Squared	0.79	0.73	0.83
No of Observations	430	234	184

Partner Country as Exporter

	All countries	Developing	Developed
Intercept	-7.5 [2.4785]***	-20.25 [4.19157]***	-1.53 [3.30406]
log(gdp)	1.39 [0.05294]***	1.44 [0.09774]***	1.25 [0.06491]***
log(export cost)	-0.58 [0.17978]***	-0.51 [0.24615]**	-0.28729 [0.26384]
CPIA general	-.13 [0.15134]	-0.2 [0.21702]	-.80429 [0.23127]***
Log (distance)	-0.92 [0.177]***	.29 [0.39079]	-1.17 [0.18545]***
R-Squared	0.64	0.51	0.76
No of Observations	430	234	184

Standard Errors are in brackets. * denotes significance at the 10 percent level, ** denotes significance at the 5 percent level, and *** denotes significance at the 1 percent level

Table 6: Random Effects with CPIA Trade

Partner Country as Importer

	All countries	Developing	Developed
Intercept	18.85	5.37	23.18
	[4.1703]***	[7.7369]	[5.4905]***
log(gdp)	0.27	0.59	0.18
	[0.0610]***	[0.0981]***	[0.0670]***
log(import cost)	.07	.15	-0.08
	[0.1344]	[0.2092]	[0.1644]
CPIA trade	0.17	0.29	0.05
	[0.0759]**	[0.1295]**	[0.0922]
Log (distance)	-1.6	-1.05	-1.66
	[0.4201]***	[0.8181]	[0.5618]***
R-Squared	0.09	0.18	0.09
No of Observations	430	234	184

Partner Country as Exporter

	All countries	Developing	Developed
Intercept	11.26	-6.8	12.91
	[6.3092]*	[11.7842]	[7.4595]*
log(gdp)	0.42	0.77	0.27
	[0.0953]***	[0.1842]***	[0.0846]***
log(export cost)	-0.08	-0.33	.38
	[0.2199]	[0.3407]	[0.252]
CPIA trade	-.33827	-0.58	-0.22904
	[0.1283]***	[0.2418]***	[0.1256]*
Log (distance)	-.9855	0.5	-1.02521
	[0.6433]	[1.2303]	[0.7768]
R-Squared	0.06	0.10	0.09
No of Observations	430	234	184

Standard Errors are in brackets. * denotes significance at the 10 percent level, ** denotes significance at the 5 percent level, and *** denotes significance at the 1 percent level

Table 7: Random Effects with General CPIA

Partner Country as Importer

	All countries	Developing	Developed
Intercept	20.04	6.62	24.19
	[4.1906]***	[7.8643]	[5.4816]***
log(gdp)	0.27	0.61	0.18
	[0.0615]***	[0.0982]***	[0.0669]***
log(import cost)	.05	0.2098	-0.098
	[0.135]	[0.2098]	[0.1632]
CPIA general	-0.04	-0.08	-0.13
	[0.0852]	[0.1097]	[0.136]
Log (distance)	-1.66	-1.14	-1.69
	[0.4234]***	[0.835]	[0.5596]***
R-Squared	0.08	0.17	0.09
No of Observations	430	234	184

Partner Country as Exporter

	All countries	Developing	Developed
Intercept	9.79	-9.81	13.63
	[6.2618]	[11.7767]	[7.3510]*
log(gdp)	.42	0.75	0.26
	[0.0965]***	[0.1861]***	[0.0838]***
log(export cost)	.10	-0.38	.42
	[0.2217]	[0.3435]	[0.248]*
CPIA general	-0.14	0.07	-.41
	[0.1447]	[0.2069]	[0.1907]**
Log (distance)	-0.94	0.69	-1.06
	[0.6368]	[1.2349]	[0.7606]***
R-Squared	0.05	0.07	0.10
No of Observations	430	234	184

Standard Errors are in brackets. * denotes significance at the 10 percent level, ** denotes significance at the 5 percent level, and *** denotes significance at the 1 percent level

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  'ABW' = 'Aruba'
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  'AUT' = 'Austria'
  'AZE' = 'Azerbaijan'
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'BWA' = 'Botswana'

'BRA' = 'Brazil'

'BRN' = 'Brunei'

'BGR' = 'Bulgaria'

'BFA' = 'Burkina Faso'

'BDI' = 'Burundi'

'KHM' = 'Cambodia'

'CMR' = 'Cameroon'

'CAN' = 'Canada'

'CPV' = 'Cape Verde'

'CYM' = 'Cayman Islands'

'CAF' = 'Central African Republic'

'TCD' = 'Chad'

'CHL' = 'Chile'

'CHN' = 'China'

'CNI' = 'China and India'

'COL' = 'Colombia'

'COM' = 'Comoros'

'COG' = 'Congo'

'ZAR' = 'Congo, Dem. Rep.'

'CRI' = 'Costa Rica'

'CIV' = 'Côte d"Ivoire'

'HRV' = 'Croatia'

'CUB' = 'Cuba'

'CUW' = 'Curacao'

'CYP' = 'Cyprus'

'CZE' = 'Czech Republic'

'CSK' = 'Czechoslovakia'

'DNK' = 'Denmark'

'DJI' = 'Djibouti'

'DMA' = 'Dominica'

'DOM' = 'Dominican Republic'

'ECU' = 'Ecuador'

'EGY' = 'Egypt'

'SLV' = 'El Salvador'

'GNQ' = 'Equatorial Guinea'

'ERI' = 'Eritrea'

'EST' = 'Estonia'

'ETH' = 'Ethiopia'

'FRO' = 'Faroe Islands'

'FJI' = 'Fiji'

'FIN' = 'Finland'

'FRA' = 'France'

'GUF' = 'French Guiana'

'PYF' = 'French Polynesia'

'GAB' = 'Gabon'

'GMB' = 'Gambia, The'

'GEO' = 'Georgia'

'DEU' = 'Germany'

'GHA' = 'Ghana'

'GIB' = 'Gibraltar'

'GRC' = 'Greece'

'GRL' = 'Greenland'

'GRD' = 'Grenada'

'GLP' = 'Guadeloupe'

'GUM' = 'Guam'

'GTM' = 'Guatemala'

'GIN' = 'Guinea'

'GNB' = 'Guinea-Bissau'

'GUY' = 'Guyana'

'HTI' = 'Haiti'

'HND' = 'Honduras'

'HKG' = 'Hong Kong SAR, China'

'HUN' = 'Hungary'

'ISL' = 'Iceland'

'IND' = 'India'

'IDN' = 'Indonesia'

'IRN' = 'Iran'

'IRQ' = 'Iraq'

'IRL' = 'Ireland'

'IMY' = 'Isle of Man'

'ISR' = 'Israel'

'ITA' = 'Italy'

'JAM' = 'Jamaica'

'JPN' = 'Japan'

'JOR' = 'Jordan'

'KAZ' = 'Kazakhstan'

'KEN' = 'Kenya'

'KIR' = 'Kiribati'

'KOR' = 'Korea'

'KSV' = 'Kosovo'

'KWT' = 'Kuwait'

'KGZ' = 'Kyrgyz Republic'

'LAO' = 'Lao PDR'

'LVA' = 'Latvia'

'LBN' = 'Lebanon'

'LSO' = 'Lesotho'

'LBR' = 'Liberia'

'LBY' = 'Libya'

'LIE' = 'Liechtenstein'

'LTU' = 'Lithuania'

'LUX' = 'Luxemourg'

'MAC' = 'Macao SAR, China'

'MKD' = 'Macedonia'

'MDG' = 'Madagascar'

'MWI' = 'Malawi'

'MYS' = 'Malaysia'

'MDV' = 'Maldives'

'MLI' = 'Mali'

'MLT' = 'Malta'

'MHL' = 'Marshall Islands'

'MTQ' = 'Martinique'

'MRT' = 'Mauritania'

'MUS' = 'Mauritius'

'MYT' = 'Mayotte'

'MEX' = 'Mexico'

'FSM' = 'Micronesia'

'MDA' = 'Moldova, Republic of'

'MCO' = 'Monaco'

'MNG' = 'Mongolia'

'MNE' = 'Montenegro'

'MAR' = 'Morocco'

'MOZ' = 'Mozambique'

'MMR' = 'Myanmar'

'NAM' = 'Namibia'

'NPL' = 'Nepal'

'NLD' = 'Netherlands'

'NCL' = 'New Caledonia'

'NZL' = 'New Zealand'

'NIC' = 'Nicaragua'

'NER' = 'Niger'

'NGA' = 'Nigeria'

'MNP' = 'Northern Mariana Islands'

'NOR' = 'Norway'

'OMN' = 'Oman'

'PAK' = 'Pakistan'

'PLW' = 'Palau'

'PAN' = 'Panama'

'PNG' = 'Papua New Guinea'

'PRY' = 'Paraguay'

'PER' = 'Peru'

'PHL' = 'Philippines'

'POL' = 'Poland'

'PRT' = 'Portugal'

'PRI' = 'Puerto Rico'

'QAT' = 'Qatar'

'REU' = 'Reunion'

'ROM' = 'Romania'

'RUS' = 'Russian'

'RWA' = 'Rwanda'

'WSM' = 'Samoa'

'SMR' = 'San Marino'

'STP' = 'Sao Tome and Principe'

'SAU' = 'Saudi Arabia'

'SEN' = 'Senegal'

'SRB' = 'Serbia'

'SYC' = 'Seychelles'

'SLE' = 'Sierra Leone'

'SGP' = 'Singapore'

'SXM' = 'Sint Maarten (Dutch part)'

'SVK' = 'Slovak Republic'

'SVN' = 'Slovenia'

'SLB' = 'Solomon Islands'

'SOM' = 'Somalia'

'ZAF' = 'South Africa'

'SSD' = 'South Sudan'

'ESP' = 'Spain'

'LKA' = 'Sri Lanka'

'SDN' = 'Sudan'

'SUR' = 'Suriname'

'SWZ' = 'Swaziland'

'SWE' = 'Sweden'

'CHE' = 'Switzerland'

'SYR' = 'Syryan Arab Republic'

'TWN' = 'Taiwan, China'

'TJK' = 'Tajikistan'

'TZA' = 'Tanzania, United Republic of'

'THA' = 'Thailand'

'TLP' = 'Timor-Leste'

'TGO' = 'Togo'

'TON' = 'Tonga'

'TTO' = 'Trinidad and Tobago'

'TUN' = 'Tunisia'

'TUR' = 'Turkey'

'TKM' = 'Turkmenistan'

'TCA' = 'Turks and Caicos Islands'

'TUV' = 'Tuvalu'

'UGA' = 'Uganda'

'UKR' = 'Ukraine'

'ARE' = 'United Arab Emirates'

'GBR' = 'United Kingdom'

'USA' = 'United States'

'URY' = 'Uruguay'

'UZB' = 'Uzbekistan'

'VUT' = 'Vanuatu'

'VEN' = 'Venezuela'

'VNM' = 'Vietnam'

```
 'VIR' = 'Virgin Islands'
 'WLD' = 'World'
 'YEM' = 'Yemen'
 'YMD' = 'Yemen, PDR'
 'ZMB' = 'Zambia'
 'ZWE' = 'Zimbabwe'
;
quit;

proc import
datafile='C:\Users\jhe8\Desktop\data2\data_rework222.xlsx'
out=work.rework
dbms=xlsx;
run;



proc import
datafile='C:\Users\jhe8\Desktop\data2\usexprev2.xlsx'
out=work.exp
dbms=xlsx;
sheet='partner';
run;

proc import
datafile='C:\Users\jhe8\Desktop\data2\usimprev2.xlsx'
out=work.imp
```

```
dbms=xlsx;
sheet='partner';
run;

proc import
datafile='C:\Users\jhe8\Desktop\data2\OGHIST2.xlsx'
out=work.devel
dbms=xlsx;
sheet='sheet1';
run;

data work.devel2; set work.devel;
year0 = year+0;
run;

data work.exp2; set work.exp;
year0 = year+0;
run;

data work.imp2; set work.imp;
year0 = year+0;
run;

data work.rework2; set work.rework;
year0 = year+0;
run;
```

```
proc sort data=work.devel2 out=work.devel3;
by iso_d year0;
run;

proc sort data=work.imp2 out=work.imp3;
by iso_d year0;
run;

proc sort data=work.exp2 out=work.exp3;
by iso_d year0;
run;

proc sort data=work.rework2 out=work.rework3;
by iso_d year0;
run;

data work.new;
merge work.rework3(drop=year) work.exp3(drop=year) work.imp3(drop=year)
work.devel3(drop=year);
by iso_d year0;
run;

data work.newlog;
set work.new;
lnusimp = log(usimp);
```

```
lnusexp = log(usexp);
lngdp = log(gdp);
lnexpcost = log(expcost);
lnimpcost = log(impcost);
cpitrade0 = cpitrade+0;
lndist = log(distance);
cpigen0 = cpigen+0;
expcost0 = expcost+0;
impcost0 = impcost+0;
gdp0 = gdp+0;
run;

data work.newlog2;
set work.newlog;
if nmiss(of _numeric_) > 0 then delete;
run;

data work.newlog2low;
set work.newlog2;
where class = 'L';
run;

proc sort data=work.newlog2low;
by iso_d year0;
run;

data work.newlog2high;
```

```
set work.newlog2;
where class = 'LM' OR class = 'UM' OR class = 'H';
run;

proc sort data=work.newlog2high;
by iso_d year0;
run;

proc means data=work.newlog2;
var usimp usexp impcost0 expcost0 cpitrade0 distance gdp0;
run;



ods pdf file='C:\Users\jhe8\Desktop\data2\output.pdf';

*import partner with trade corruption;
proc reg data=work.newlog;
title 'import trade full';
model lnusexp = lngdp lnimpcost cpitrade0 lndist;
run;
proc reg data=work.newlog;
title 'import trade low';
model lnusexp = lngdp lnimpcost cpitrade0 lndist;
where class = 'L';
run;
proc reg data=work.newlog;
title 'import trade high';
```

```
model lnusexp = lngdp lnimpcost cpitrade0 lndist;
where class = 'LM' OR class = 'UM' OR class = 'H';
run;

*export partner with trade corruption;
proc reg data=work.newlog;
title 'export trade full';
model lnusimp = lngdp lnexpcost cpitrade0 lndist;
run;
proc reg data=work.newlog;
title 'export trade low';
model lnusimp = lngdp lnexpcost cpitrade0 lndist;
where class = 'L';
run;
proc reg data=work.newlog;
title 'export trade high';
model lnusimp = lngdp lnexpcost cpitrade0 lndist;
where class = 'LM' OR class = 'UM' OR class = 'H';
run;

*import partner with general corruption;
proc reg data=work.newlog;
title 'import gen full';
model lnusexp = lngdp lnimpcost cpigen0 lndist;
run;
proc reg data=work.newlog;
title 'import gen low';
```

```
model lnusexp = lngdp lnimpcost cpigen0 lndist;
where class = 'L';
run;
proc reg data=work.newlog;
title 'import gen high';
model lnusexp = lngdp lnimpcost cpigen0 lndist;
where class = 'LM' OR class = 'UM' OR class = 'H';
run;

*export partner with general corruption;
proc reg data=work.newlog;
title 'export gen full';
model lnusimp = lngdp lnexpcost cpigen0 lndist;
run;
proc reg data=work.newlog;
title 'export gen low';
model lnusimp = lngdp lnexpcost cpigen0 lndist;
where class = 'L';
run;
proc reg data=work.newlog;
title 'export gen high';
model lnusimp = lngdp lnexpcost cpigen0 lndist;
where class = 'LM' OR class = 'UM' OR class = 'H';
run;

*random import partner trade corruption;
proc panel data=work.newlog2;
```

```
title 'import trade full';
id iso_d year0;
model lnusexp = lngdp lnimpcost cpitrade0 lndist / rantwo;
run;

proc panel data=work.newlog2low;
title 'import trade low';
id iso_d year0;
model lnusexp = lngdp lnimpcost cpitrade0 lndist / rantwo;
run;

proc panel data=work.newlog2high;
title 'import trade high';
id iso_d year0;
model lnusexp = lngdp lnimpcost cpitrade0 lndist / rantwo;
run;

*random export partner trade corruption;
proc panel data=work.newlog2;
title 'export trade full';
id iso_d year0;
model lnusimp = lngdp lnexpcost cpitrade0 lndist / rantwo;
run;

proc panel data=work.newlog2low;
title 'export trade low';
id iso_d year0;
```

```
model lnusimp = lngdp lnexpcost cpitrade0 lndist / rantwo;
run;

proc panel data=work.newlog2high;
title 'export trade high';
id iso_d year0;
model lnusimp = lngdp lnexpcost cpitrade0 lndist / rantwo;
run;

*random import partner general corruption;
proc panel data=work.newlog2;
title 'import gen full';
id iso_d year0;
model lnusexp = lngdp lnimpcost cpigen0 lndist / rantwo;
run;

proc panel data=work.newlog2low;
title 'import gen low';
id iso_d year0;
model lnusexp = lngdp lnimpcost cpigen0 lndist / rantwo;
run;

proc panel data=work.newlog2high;
title 'import gen high';
id iso_d year0;
model lnusexp = lngdp lnimpcost cpigen0 lndist / rantwo;
run;
```

```
*random export partner general corruption;
proc panel data=work.newlog2;
title 'export gen full';
id iso_d year0;
model lnusimp = lngdp lnexpcost cpigen0 lndist / rantwo;
run;

proc panel data=work.newlog2low;
title 'export gen low';
id iso_d year0;
model lnusimp = lngdp lnexpcost cpigen0 lndist / rantwo;
run;

proc panel data=work.newlog2high;
title 'export gen high';
id iso_d year0;
model lnusimp = lngdp lnexpcost cpigen0 lndist / rantwo;
run;

ods pdf close;
```