ANTI-CORRUPTION AND INTERNATIONAL TRADE

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Abstract

Using a set of econometric models, we estimate that there are positive effects of a country's control of corruption on the value of the country's imports and exports of goods and services. The analysis utilizes a measure of control of corruption from the World Bank's World Governance Indicators, with robustness checks using other commonly used measures of corruption. Finally, we use the econometric models to simulate the effects of hypothetical changes in control of corruption in a group of ten developing countries.

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1 Introduction

Recent international trade policy negotiations, including some bilateral trade agreements and the Indo-Pacific Economic Framework for Prosperity (IPEF) talks, have aimed to improve the control of corruption in member countries, among other objectives. For example, in the Ministerial Text for the Fairness Pillar of the IPEF, the anti-corruption goal as aiming to pursue provisions and initiatives to prevent, combat, and sanction domestic and foreign bribery and other related corruption offenses, strengthen measures to identify, trace, and recover proceeds of crime, strengthen anti money laundering and countering the financing of terrorism frameworks and their enforcement, promote transparency and integrity in government procurement practices, encourage the private sector to implement internal controls, ethics, and anti-corruption compliance programs, establish and maintain systems for confidential and protected domestic reporting on corruption offenses, promote integrity of public officials, prevent corruption that undermines labor rights based on the ILO Declaration on Fundamental Principles and Rights at Work, which the Partners have adopted, strengthen transparency and implementation of existing anti-corruption review mechanisms, and promote the participation of all stakeholders, including individuals and groups.[1]

In theory, improving controls on corruption can improve a country's productivity and openness to trade. It can lower barriers and encourage investment. Lambsdorff (2003) and De Rosa et al. (2010) demonstrate the impact of corruption on productivity. Measuring productivity as the ratio of GDP to the capital stock, Lambsdorff (2003) shows for a cross section of 69 countries that capital productivity is decreasing in corruption and increasing in trade openness. The authors also show for context that bringing Tanzania's level of corruption to that of the United Kingdom would increase Tanzania's productivity by 10 percent and lead to a 20 percent increase in GDP, a thought experiment similar to our

[1] Available online at `ustr.gov/ipef.`

analysis for the United States. De Rosa et al. (2010) use firm-level data to test for the impact of bribes and red tape on firm productivity, showing that a "bribe tax" has a negative impact on firm-level productivity, but the effect of the "time tax" (red tape) is insignificant.

When it comes to anti-corruption enforcement specifically, Goldman and Zeume (2020), Beck et al. (1991), and Christensen et al. (2022) examined the impact of enforcement of the U.S. Foreign Corrupt Practices Act (FCPA). Goldman and Zeume (2020) show that FCPA enforcement levels the playing field for firms that are unwilling to use bribery to secure contracts. They find that FCPA enforcement actions can be tied an increase in revenue and productivity of firms operating in the same industry as a prosecuted violator. Beck et al. (1991) show that the enactment of the FCPA led to a decrease in market share of U.S. firms in bribery-prone non-Latin-American countries. More recently, Christensen et al. (2022) show that an early 2000s increase in enforcement of the FCPA led to a significant decrease in FDI in high-corruption countries, both from U.S. and non-U.S. investors.

The relationship between corruption and trade has also been widely studied, with evidence of causal impact moving in both directions. On one side, Bonaglia et al. (2001) examine how globalization affects corruption, including variables like the degree of trade liberalization and the general state of government "intervention" in the economy (as measured by government consumption as a share of GDP). The authors find there is a positive relationship between the extent of government intervention and corruption. They do not, however, find a statistically significant relationship between trade liberalization and corruption. They attribute this finding to the fact that tariff rates for countries in their sample are generally very low.

Wei (2000) demonstrates how a country's "natural openness" reduces corruption, using a gravity framework to decompose a country's openness (the sum of imports and exports divided by GDP) into "natural openness" (as determined by geographic factors, size, and language) and "residual openness" (capturing factors like trade policy). Wei shows that countries with greater natural openness exhibit less corruption, and that residual openness is not a significant determinant of corruption once natural openness is taken into account.

Gokcekus and Suzuki (2016) demonstrate a differential impact of openness on corruption depending on the trading partner using a panel of 34 African nations' trade between 1990 and 2009. The authors show that a 1 percent increase in those countries' openness to trade with advanced economies (China) led to a 1 percent decrease (0.2 percent increase) in corruption. The authors tie this finding to a steady worsening of corruption indicators for the countries in the sample as trade skewed away from Europe and toward China, a phenomenon that they attribute to lack of "conditionalities" China places on trading partners, such as conditions relating to human rights, freedom of speech, and governance, among other things.

Operating in the opposite causal direction, Bandyopadhyay and Roy (2007) examine the impact of corruption on trade protection. The authors argue that corruption leads to increases in trade protection, because corrupt lawmakers are more susceptible to lobbying. Using a panel of 88 countries between 1982 and 1997, the authors find that trade protection (as measured by import taxes) is increasing in corruption, and trade openness is decreasing in corruption.

Dutt and Traca (2010) examine the impact of corruption on trade flows, looking specifically at how extortion by customs officials and evasion of tariff barriers impact trade. The authors find that for most of the sample corruption reduces trade, but in high-tariff environments corruption enhances trade.

de Jong and Bogmans (2011) and Horsewood and Voicu (2012) also examine the impact of corruption on trade, showing that corruption limits both imports and exports. First, de Jong and Bogmans (2011) do cross-sectional gravity analysis of average trade between 1999 and 2002, showing longer border wait times and poorer quality customs institutions decrease trade, and the frequency of payments to customs officials (which they describe as bribery "greasing the wheels") increase trade. Horsewood and Voicu (2012) use a bilateral, dynamic trade model to show that distance between trading partners' corruption levels decreases trade.

Investigating the effects of anti-corruption measures on trade requires a measure of a country's controls of corruption. Kaufmann et al. (2010) defines control of corruption as: "perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as 'capture' of the state by elites and private interests" (Kaufmann et al.; 2010, 4). Based on this definition, the World Bank's Worldwide Governance Indicators rate the control of corruption of individual countries throughout the world every year.

Using this measure, we estimate a set of econometric models of imports and exports of goods and services. The models include the World Bank's rating of control of corruption in the partner country as an explanatory variable. We estimate that a country's control of corruption has a positive and statistically significant effect on the value of the country's trade.

We use the models to simulate the trade effects of hypothetical changes in control of corruption and regulatory quality. Specifically, we simulate the effects of a 10 percent reduction in the gap between control of corruption measure in a benchmark country (the United States) and the measure in a developing country. The point estimates of the increase in exports of goods range from 2.2 percent to 3.8 percent, while the point estimates of the increase in their imports of goods range from 3.2 percent to 5.6 percent. For services, the point estimates range from an increase of 0.8 percent to 1.4 percent for exports, and the point estimates for imports range from an increase of 2.1 percent to 3.7 percent.

The rest of the paper is organized into six sections. Section 2 defines the measures of control of corruption and regulatory quality used in the econometric models. Section 3 describes the methodology for the econometric analysis. Section 4 reports estimates of the parameters of the models, with robustness checks. In section 5, we address concerns about potential endogeneity between corruption and trade. Section 6 uses the estimated models to simulate the effects of hypothetical changes in countries' control of corruption. Section 7 concludes. An appendix provides additional variations on the econometric analysis.

2 Governance Indicators

Because the focus of our analysis is on how anti-corruption measures impact trade in goods and services, we use the World Bank's Control of Corruption (COC) index from the Worldwide Governance Indicators. In the literature, there are two additional corruption measures frequently used for analysis: the International Country Risk Guide (ICRG) from the Political Risk Services (PRS) Group and the Corruption Perceptions Index (CPI) from Transparency International. Additionally, many studies make use of more than one measure to check robustness of results given the inherent difficulties of measuring corruption. Bonaglia et al. (2001) and Zhang et al. (2023), for example, use both the CPI and the ICRG in their analysis. In our analysis, we begin by using the COC Index for analysis and use the ICRG and CPI for robustness checks.

The Control of Corruption (COC) Index in the World Bank's Worldwide Governance Indicators rates over 200 individual countries every year.[2] The COC Index is described at length in Kaufmann et al. (2010). The index is meant to capture "perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as 'capture' of the state by elites and private interests" (Kaufmann et al.; 2010, 4). The World Governance Indicators are derived from 30 underlying data sources, which include surveys of households and firms, commercial business information providers, non-government organizations, and public sector organization.[3] COC Index values range

[2]The data are publicly available at https://info.worldbank.org/governance/wgi/.

[3]Sources for the COC Index include the ICRG. The list of sources used to construct the COC Index is available here: https://info.worldbank.org/governance/wgi/Home/downLoadFile?fileName=cc.pdf.

approximately from -2.5 to 2.5. The variables are constructed to follow a standard normal random distribution, with a mean of zero and a unit standard deviation.

The analysis also uses the Regulatory Quality index from the Worldwide Governance Indicators. This index captures "perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development" (Kaufmann et al.; 2010, 4). This index is examined in further detail in Riker (2022) and is used as an additional control in the analysis here.

The International Country Risk Guide is a measure published by the Political Risk Services (PRS) Group each year, covering 141 countries as of 2022. ICRG staff collect information on political risk, such as government stability, socioeconomic conditions, investments, conflict, and corruption. The ICRG is constructed by experts researching the topics instead of through surveys.[4] The ICRG rating is scaled from 0 to 100.

The Corruption Perceptions Index released by Transparency International aggregates corruption data from different sources, available annually from 2012 covering around 180 countries, scaled 0 to 100, with 100 representing the least corrupt.[5] Based on the underlying data, the CPI contains several aspects of corruption, including bribery, diversion of public funds, prevalence of officials using public office for private gain without repercussion, the ability of the government to control corruption, red tape and excessive bureaucratic burden, among other things.[6] Another feature of the CPI is the inclusion of a standard error and confidence interval based on variation in the scores different data sources assigned to a given country. Table 1 reports the COC index, RQ index, ICRG index, and CPI for a sample of 20 countries for the year 2020.

[4]More information on ICRG methodology is available here: https://www.prsgroup.com/wp-content/uploads/2022/04/ICRG-Method.pdf.

[5]The Corruption Perceptions Index has been around longer than 2012, but was re-scaled in 2012 making the index not comparable across time periods. Before 2012, the index was scored from 0 to 10.

[6]Source information for the index is available here: https://images.transparencycdn.org/images/CPI2022_SourceDescription.pdf

Table 1: Indexes Used in Analysis

Countries	**Control of Corruption**	**Regulatory Quality**	**International Country Risk Guide**	**Corruption Perceptions Index**
United States	1.07	1.25	72	67
Argentina	-0.14	-0.48	41	42
Australia	1.66	1.82	76	77
Brazil	-0.41	-0.1	32	38
China	-0.05	-0.19	32	42
Germany	1.86	-0.56	85	80
Egypt	-0.79	1.2	32	33
France	1.15	1.59	67	69
United Kingdom	1.69	1.49	85	77
Indonesia	-0.43	0.23	50	37
India	-0.27	-0.11	41	40
Japan	1.49	1.36	67	74
Korea, Rep.	0.72	1.04	62	61
Malaysia	0.25	0.68	41	51
New Zealand	2.15	1.88	93	88
Peru	-0.5	0.49	49	38
Philippines	-0.49	0.13	41	34
Singapore	2.15	2.21	85	85
Thailand	-0.46	0.08	32	36
Turkey	-0.34	-0.01	41	40
Vietnam	-0.35	-0.22	41	36

3 Methodology for the Econometric Analysis

We estimate the effects of control of corruption on a country's exports and imports of goods and services using econometric models and a large panel of countries over the period 2002–2021. The governance indicators were described in the last section. The data on each country's exports and imports of goods and services are from the World Bank's World Development Indicators.[7]

First, we model the effects of a country's control of corruption on its exports of goods. Equation (1) relates exports of goods from country c in year t (V_{ct}) to its control of corruption (COC_{ct}) and a number of factors controlled for with country fixed effects (α_c) and year fixed effects (θ_t), and an error term (ϵ_{ct}). The country fixed effects control for factors that do not change over time, like international distance, common borders and language, and some institutions and infrastructure. The year fixed effects control for global demand conditions in year t.

$$ln\ V_{ct} = \alpha_c \ + \ \beta\ COC_{ct} \ + \ \theta_t \ + \ \epsilon_{ct} \tag{1}$$

Equation (2) is a slight extension of the model in equation (1). It adds a control for regulatory quality, RQ_{ct}.

$$ln\ V_{ct} = \alpha_c \ + \ \beta\ COC_{ct} \ + \ \gamma\ RQ_{ct} + \ \theta_t \ + \ \epsilon_{ct} \tag{2}$$

We use the same econometric specifications in equations (1) and (2) to also estimate parameters for imports of goods, exports of services, imports of services, and trade openness (defined as the total of imports and exports of goods and services divided by GDP).

[7] The World Development Indicators are available at https://databank.worldbank.org/source/world-development-indicators.

4 Estimates of the Model Parameters

We estimated the export and import models using a Poisson Pseudo Maximum Likelihood estimator (PPML). Santos Silva and Tenreyro (2006) show that the ordinary least squares (OLS) estimation of a log-linearized model leads to inconsistent estimates if heteroskedasticity is present in the trade data. They propose a PPML estimator, which, being a special case of the Generalized Linear Model framework, assumes that the variance is proportional to the mean. The only condition required for the PPML to be consistent is the correct specification of the conditional mean. The PPML also gives the same weight to each observation in the estimation and, therefore, is desirable when little information is available on the nature of heteroskedasticity in the trade data. Santos Silva and Tenreyro provide simulation evidence that the PPML is well behaved in a wide range of situations and can deal with certain types of measurement error in the dependent variable. PPML is also able to handle zero trade flows in the estimation, which is a common feature of trade data. Given these attractive properties, the main results of this paper are PPML.

Table 2 reports the estimates of the parameter values for the model in equation (1), with control of corruption as the only governance measure and year and country fixed effects. The table reports robust standard errors in parentheses and p values in square brackets. For all of the trade accounts (columns 1 through 4), the coefficients have a p value of 0.01 or less, indicating statistical significant at the 1 percent level. The coefficient for the regression on trade openness is significant at the 10 percent level. The impact of each individual trade account on COC is positive, suggesting that less corruption is associated with more trade.

Table 3 reports the estimates of the parameter values in the model in equation (2), with regulatory quality as an additional governance measure. In each of the columns, the additional explanatory variable is statistically significant and the lower values of the Akaike Information Criterion (AIC) indicates that the overall fit of the model is better than the

Table 2: PPML Estimates Using Equation (1)

Explanatory Variables	**Exports of Goods**	**Imports of Goods**	**Exports of Services**	**Imports of Services**	**Trade Openness**
COC_{ct}	0.225	0.355	0.164	0.247	-0.035
standard error	(0.065)	(0.053)	(0.039)	(0.055)	(0.019)
p value	[0.001]	[0.000]	[0.000]	[0.000]	[0.067]
Country FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Number of Obs.	3,396	3,396	3,396	3,396	3,386
Pseudo R^2	0.9906	0.9930	0.9910	0.9885	0.119
AIC	8.18 e+12	6.09 e+12	2.14 e+12	2.67 e+12	6636.15

Table 3: PPML Estimates Using Equation (2)

Explanatory Variables	**Exports of Goods**	**Imports of Goods**	**Exports of Services**	**Imports of Services**	**Trade Openness**
COC_{ct}	0.213	0.315	0.083	0.211	0.006
standard error	(0.071)	(0.059)	(0.047)	(0.058)	(0.023)
p value	[0.003]	[0.000]	[0.079]	[0.000]	[0.789]
RQ_{ct}	0.036	0.119	0.230	0.108	-0.091
standard error	(0.050)	(0.045)	(0.050)	(0.058)	(0.024)
p value	[0.463]	[0.008]	[0.000]	[0.063]	[0.000]
Country FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Number of Obs.	3,392	3,392	3,392	3,392	3,382
Pseudo R^2	0.991	0.993	0.992	0.989	0.119
AIC	8.18 e+12	6.03 e+12	2.07 e+12	2.66 e+12	6630.36

comparable estimates in Table 2. For this reason, the specifications in Table 3 are preferred to the specifications in Table 2. The estimated coefficient on COC_{ct} is lower, since it corrects the omitted variable bias in the Table 2 estimates. Controlling for regulatory quality makes control of corruption statistically insignificant for exports of services and trade openness.

For completeness, additional regressions are included in appendix A. First in section A.1, we report the results using OLS estimations. In section A.2, we report the results using the ICRG index and the CPI. And in section 5, we test for endogeneity of corruption and trade. Despite finding no evidence of endogeneity, we still report the results for two-stage least squares estimation of the model in the appendix.

5 Endogeneity of Corruption and Trade

There is some disagreement as to the causal direction between corruption and trade. As a result, using some form of instrumental variables (IV) regressions to control for the potential endogeneity of corruption and trade is relatively standard practice in the literature. For example, Bonaglia et al. (2001) instrument for openness following what they refer to as the "standard" in the literature despite limited evidence of endogeneity in their dataset. Zhang et al. (2023) instrument for the position of a country in an RTA network while examining how the position of a country in an RTA network influences anti-corruption enforcement. Bandyopadhyay and Roy (2007) instrument for corruption in their analysis of the impact of corruption on trade protection (as measured by import taxes) using British rule as the instrument for corruption, citing other studies in the literature which took the same approach. de Jong and Bogmans (2011) also instrument for corruption in their analysis of the impact of corruption on trade, considering a number of instruments but ultimately opting to use the non-traditional IV method from Egger (2005), which is specifically designed for cross-sectional gravity analysis. Horsewood and Voicu (2012) instrument for corruption using a

Table 4: Correlation of Key Variables and Voter Turnout

	COC_{ct}	vt_{Pres}	vt_{Parl}	$\ln X_{ct,g}$	$\ln M_{ct,g}$	$\ln X_{ct,s}$	$\ln M_{ct,s}$
COC_{ct}	1						
vt_{Pres}	0.0827	1					
vt_{Parl}	0.1871	0.7016	1				
$\ln X_{ct,g}$	0.3201	0.0182	-0.0523	1			
$\ln M_{ct,g}$	0.3622	-0.0179	-0.0747	0.9694	1		
$\ln X_{ct,s}$	0.5060	-0.0049	-0.0376	0.8727	0.9282	1	
$\ln M_{ct,s}$	0.3970	0.0092	-0.0564	0.9498	0.9602	0.9187	1

common religion index and a measure of remoteness as instruments along with lagged values to address the issue of endogeneity between corruption and trade.

Selecting an instrument for corruption is difficult, because common instruments for corruption are highly correlated with trade and are frequently used as variables in gravity models of trade (such as British colonial history, religion, and remoteness). For the purposes of this paper, we use voter turnout as an instrument for corruption. This is based on evidence presented in the political science literature, such as Stockemer et al. (2013), which shows a significant and negative relationship between voter turnout and corruption levels.

The International IDEA Voter Turnout Database includes information on both presidential and parliamentary (congressional) elections.[8] The correlation between voter turnout—both presidential and parliamentary, vt_{Pres} and vt_{Parl}, respectively—and different key variables is reported in table 4, with vt being the voter turnout and the g and s subscripts denoting goods and services, respectively. Due to the stronger correlation of parliamentary elections and their greater frequency in the dataset, we opt to use parliamentary voter turnout as our instrument, annualizing the data by adopting voter turnout from year x as the voter turnout for years $x + 1$, $x + 2$, etc. until the next parliamentary election takes place.

Doing instrumental variables regressions with an OLS first-stage and PPML second-stage

[8]Available at: https://www.idea.int/data-tools/data/voter-turnout-database.

produces biased results, so instead we return to the OLS specification of the model for both stages, using the log trade values as our left-hand-side variables. The results for the model using two-stage least-squares (2SLS) are reported in tables 5 and 6 using the Control of Corruption index as the key explanatory variable, with COC instrumented by parliamentary voter turnout.

The first point in the results worth noting is the results of the endogeneity tests.[9] For all trade values except for the log imports of services, there is no evidence of endogeneity between control of corruption and trade. This can be attributed to the inclusion of country fixed effects in the regressions: without the inclusion of the country fixed effects, there is strong evidence of endogeneity between the corruption measure and trade, implying that there is something country-specific driving the endogeneity between corruption and trade that is well controlled for by country fixed effects. The second point worth noting is that the first-stage regressions found that the impact of voter turnout on COC was positive (implying that corruption is decreasing in voter turnout) and significant at the 0.1 percent level.

Using the instrumented COC variable, tables 5 and 6 show that trade increases as corruption decreases, though the coefficients are not statistically significant for the majority of the regressions. The one coefficient that is statistically significant is in the regressions for the imports of services, which was also the only regression with evidence of endogeneity between corruption and trade. Generally, compared to the OLS results, these results are similar in magnitude for all the regressions except for imports of services, with the coefficient from 2SLS being much larger than the coefficient with OLS.

[9] The endogeneity test performed is using the "`endog`" option of the `ivreg2` command in Stata. The χ^2-statistic is numerically equivalent to the F-statistic from the Durbin-Wu-Hausman test.

Table 5: Two-Stage Least-Squares Estimates Using Equation (1)

Explanatory Variables	**Exports of Goods**	**Imports of Goods**	**Exports of Services**	**Imports of Services**
COC_{ct}	0.289	0.275	0.632	1.790
standard error	(0.459)	(0.293)	(0.498)	(0.597)
p value	[0.529]	[0.347]	[0.204]	[0.003]
Country FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
F-statistic of Excl. Instrument	11.66	11.66	11.66	11.66
Endogeneity Test χ^2-statistic	0.043	0.074	1.101	22.768
p value	[0.8348]	[0.7852]	[0.2941]	[0.0000]
Number of Observations	3,232	3,232	3,232	3,232
R^2	0.984	0.990	0.979	0.964

Table 6: Two-Stage Least-Squares Estimates Using Equation (2)

Explanatory Variables	**Exports of Goods**	**Imports of Goods**	**Exports of Services**	**Imports of Services**
COC_{ct}	0.157	0.164	0.643	2.097
standard error	(0.548)	(0.349)	(0.609)	(0.777)
p value	[0.775]	[0.638]	[0.291]	[0.007]
RQ_{ct}	0.210	0.197	-0.087	-0.757
standard error	(0.241)	(0.157)	(0.272)	(0.346)
p value	[0.383]	[0.211]	[0.748]	[0.029]
Country FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
F-statistic of Excl. Instrument	9.51	9.51	9.51	9.51
Endogeneity Test χ^2-statistic	0.018	0.047	1.052	23.161
p value	[0.8919]	[0.8285]	[0.3051]	[0.0000]
Number of Observations	3,228	3,228	3,228	3,228
R^2	0.984	0.990	0.979	0.960

6 Simulations of Policy Changes

Finally, we use the econometric estimates from table 3 in a series of simulations. We estimate the trade effects of hypothetically increasing the control of corruption in ten developing countries from current levels, specifically closing 10 percent of the gap between the COC value in the United States and the COC value in one of the developing countries.

Equation (3) translates the estimated parameter values and hypothetical increases in the control of corruption into percent changes in country c's exports or imports of goods or services.

$$\frac{V'_{ct} - V_{ct}}{V_{ct}} = \frac{e^{\beta\ COC'_{ct}} - e^{\beta\ COC_{ct}}}{e^{\beta\ COC_{ct}}} \tag{3}$$

COC'_{ct} is equal to $COC_{ct} + 0.10 \max[0, COC^*_t - COC_{ct}]$. For the simulations, we set COC^*_t equal to the values for the United States in 2021. The calculations use the point estimates of β in table 3 and the confidence intervals on these estimates.[10]

Table 7 reports the point estimates of the simulated percent change in the countries' exports and imports of goods, with 95 percent confidence intervals in parentheses, based on the confidence intervals of the econometric estimates of β. Table 8 reports the simulated percent change in the countries' exports and imports of services.

7 Conclusions

The econometric models provide estimates of the positive impact of a country's control of corruption on the value of the country's trade in goods and services. The simulated increases in exports of goods range from 2.2 percent to 3.8 percent, and the simulated increases in imports of goods range from 3.2 percent to 5.6 percent. The simulated increases in exports

[10] For exports of goods, the point estimate is 0.213 and the confidence intervals is 0.074 to 0.352. For imports of goods, the point estimate is 0.315 and the confidence interval is 0.199 to 0.432. For exports of services, the point estimate is 0.083 and the confidence intervals is -0.010 to 0.175. For imports of services, the point estimate is 0.211 and the confidence interval is 0.095 to 0.328.

Table 7: Simulations of Impact on Trade in Goods

Country Reducing COC Gap By 10%	**2021 COC Index**	**% Change in Exports of Goods**	**% Change in Imports of Goods**
Argentina	-0.40	3.1 (1.1 to 5.2)	4.7 (2.9 to 6.5)
Brazil	-0.48	3.3 (1.1 to 5.5)	4.9 (3.1 to 6.8)
China	0.05	2.2 (0.7 to 2.2)	3.2 (2.0 to 4.4)
Egypt	-0.68	3.8 (1.3 to 6.3)	5.6 (3.5 to 7.8)
India	-0.29	2.9 (1.0 to 4.8)	4.3 (2.7 to 6.0)
Indonesia	-0.43	3.2 (1.1 to 5.3)	4.8 (3.0 to 6.6)
Philippines	-0.51	3.4 (1.2 to 5.6)	5.0 (3.2 to 7.0)
Thailand	-0.46	3.3 (1.1 to 5.5)	4.9 (3.1 to 6.7)
Turkey	-0.39	3.1 (1.1 to 5.2)	4.6 (2.9 to 6.4)
Vietnam	-0.29	2.9 (1.0 to 4.8)	4.3 (2.7 to 6.0)

Table 8: Simulations of Impact on Trade in Services

Country Reducing COC Gap By 10%	**2021 COC Index**	**% Change in Exports of Services**	**% Change in Imports of Services**
Argentina	-0.40	1.2 (-0.1 to 2.6)	3.1 (1.4 to 4.9)
Brazil	-0.48	1.3 (-0.2 to 2.7)	3.3 (1.5 to 5.1)
China	0.05	0.8 (-0.1 to 1.8)	2.1 (1.0 to 3.3)
Egypt	-0.68	1.4 (-0.2 to 3.1)	3.7 (1.7 to 5.8)
India	-0.29	1.1 (-0.1 to 2.4)	2.9 (1.3 to 4.5)
Indonesia	-0.43	1.2 (-0.1 to 2.6)	3.2 (1.4 to 5.1)
Philippines	-0.51	1.3 (-0.2 to 2.8)	3.3 (1.5 to 5.2)
Thailand	-0.46	1.3 (-0.2 to 2.7)	3.2 (1.4 to 5.1)
Turkey	-0.39	1.2 (-0.1 to 2.6)	3.1 (1.4 to 4.8)
Vietnam	-0.29	1.1 (-0.1 to 2.4)	2.9 (1.3 to 4.5)

of services range from 1.1 percent to 1.4 percent, and the simulated increases in imports of services range from 2.1 percent to 3.7 percent.

There are several potential extensions for future research. First, this paper estimates aggregate, economy-wide effects, but it would also be informative to estimate more disaggregate effects on specific industries. Second, while the fixed effects are effective for controlling for difficult-to-measure country-specific and year-specific factors that would otherwise be omitted variables and might raise endogeneity concerns, it would be useful to add additional controls that vary by country and year. Third, it would be interesting to consider a dynamic specification that estimates the speed of adjustment to changes in a country's control of corruption. Finally, to use the model for policy analysis, it will be important to examine the details of the specific policy provisions to determine the appropriate magnitude of the change in COC_{ct} in the simulations. We analyze the effects of closing 10 percent of the gap, but it is not clear whether that is the right magnitude: it will depend on the particular provisions under consideration.

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A Additional Results

A.1 OLS estimates

We re-estimate the parameters in equations (1) and (2) using OLS rather than PPML. These results are reported in tables 9 and 10. The estimates are qualitatively similar, however they are smaller, and probably biased toward zero.

Table 9: OLS Estimates Using Equation (1)

Explanatory Variables	**Exports of Goods**	**Imports of Goods**	**Exports of Services**	**Imports of Services**	**Trade Openness**
COC_{ct}	0.199	0.211	0.123	0.088	-0.041
standard error	(0.039)	(0.023)	(0.040)	(0.029)	(0.017)
p value	[0.000]	[0.000]	[0.002]	[0.002]	[0.014]
Country FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Number of Obs.	3,396	3,396	3,396	3,396	3,386
R^2	0.9843	0.9903	0.9788	0.9841	0.896
AIC	2,990	-105	2,878	1,331	-2,059

Table 10: OLS Estimates Using Equation (2)

Explanatory Variables	**Exports of Goods**	**Imports of Goods**	**Exports of Services**	**Imports of Services**	**Trade Openness**
COC_{ct}	0.085	0.107	0.036	0.020	-0.021
standard error	(0.042)	(0.024)	(0.041)	(0.031)	(0.018)
p value	[0.044]	[0.000]	[0.383]	[0.512]	[0.263]
RQ_{ct}	0.250	0.224	0.189	0.144	-0.041
standard error	(0.049)	(0.027)	(0.046)	(0.032)	(0.018)
p value	[0.000]	[0.000]	[0.000]	[0.000]	[0.027]
Country FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Number of Obs.	3,396	3,396	3,396	3,396	3,382
R^2	0.9845	0.9906	0.9790	0.9841	0.896
AIC	2,928	-212	2,847	1,308	-2,063

A.2 Alternative Measures of Corruption

The International Country Risk Guide (ICRG) index and Corruption Perceptions Index (CPI) are two of the standard measures of corruption used in the literature. As a robustness check, we re-estimate the regressions from tables 2 and 3 here using the ICRG and CPI instead of the COC.

The results using the ICRG corruption estimate are reported in tables 11 and 12. The ICRG coefficients are positive and statistically significant at at least the 10 percent level for all trade measures except for goods exports, which is not statistically significant. The small size of the coefficients relative to the coefficient sizes from the COC index (and for the RQ index in the ICRG regressions) reflects the very different scale the two indexes use: the ICRG is scaled from 0 to 100, with 100 representing the least corruption risk, whereas the COC is distributed normally around zero, with a range of approximately -2.5 to 2.5.

The results using the CPI are reported in tables 13 and 14. The CPI results have much stronger statistical significance than the ICRG estimates and are also much larger despite

Table 11: PPML Estimates Using ICRG Index

Explanatory Variables	**Exports of Goods**	**Imports of Goods**	**Exports of Services**	**Imports of Services**
$ICRG_{ct}$	-0.001	0.001	0.004	0.003
standard error	(0.001)	(0.001)	(0.001)	(0.002)
p value	[0.375]	[0.073]	[0.006]	[0.048]
Country Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
Number of Observations	1,267	1,267	1,267	1,267
Pseudo R^2	0.996	0.997	0.994	0.993
Akaike Information Criterion	1.76e+12	1.04e+12	7.42e+11	8.09e+11

Table 12: PPML Estimates Using ICRG Index

Explanatory Variables	**Exports of Goods**	**Imports of Goods**	**Exports of Services**	**Imports of Services**
$ICRG_{ct}$	-0.001	0.001	0.004	0.003
standard error	(0.001)	(0.001)	(0.001)	(0.002)
p value	[0.349]	[0.097]	[0.007]	[0.053]
RQ_{ct}	0.062	0.070	0.089	0.076
standard error	(0.044)	(0.038)	(0.055)	(0.061)
p value	[0.155]	[0.063]	[0.103]	[0.217]
Country Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
Number of Observations	1,267	1,267	1,267	1,267
Pseudo R^2	0.996	0.997	0.994	0.993
Akaike Information Criterion	1.753e+12	1.028e+12	7.369e+11	8.060e+11

the fact that both indexes are scaled between 0 and 100. The addition of regulatory quality to the regressions in table 14 results in the CPI no longer being statistically significant for goods trade, but it remains significant for services.

Table 13: PPML Estimates Using Corruption Perceptions Index

Explanatory Variables	**Exports of Goods**	**Imports of Goods**	**Exports of Services**	**Imports of Services**
CPI_{ct}	0.026	0.028	0.040	0.034
standard error	(0.003)	(0.003)	(0.003)	(0.003)
p value	[0.000]	[0.000]	[0.000]	[0.000]
Region Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
Number of Observations	1,568	1,568	1,568	1,568
Pseudo R^2	0.336	0.346	0.464	0.411
Akaike Information Criterion	3.250e+14	3.159e+14	8.043e+13	7.806e+13

Table 14: PPML Estimates Using Corruption Perceptions Index

Explanatory Variables	**Exports of Goods**	**Imports of Goods**	**Exports of Services**	**Imports of Services**
CPI_{ct}	0.005	0.003	0.008	0.013
standard error	(0.005)	(0.005)	(0.005)	(0.004)
p value	[0.279]	[0.484]	[0.082]	[0.001]
RQ_{ct}	0.525	0.641	0.858	0.550
standard error	(0.141)	(0.150)	(0.156)	(0.132)
p value	[0.000]	[0.000]	[0.000]	[0.000]
Region Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
Number of Observations	1,568	1,568	1,568	1,568
Pseudo R^2	0.350	0.367	0.494	0.426
Akaike Information Criterion	3.180e+14	3.057e+14	7.599e+13	7.605e+13