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Corruption and Assortative Matching of Partners in International Trade

Abstract

Although the effects of corruption on bilateral trade are well-documented, its impact on the composition of trading partners remains unexplored. In this paper, we argue that corruption in a country imposes asymmetric costs on its trading partners depending on their characteristics. Consequently, as the level of corruption in a country changes, its trade flows from some of its trading partners change more than others, depending on their characteristics, changing the composition of its trading partners. We focus on two characteristics of trading partners: (1) the level of corruption and (2) membership in the Organization for Economic Cooperation and Development Convention on Combating Bribery of Foreign Public Officials in International Business Transactions (OECD Convention). Using the gravity model, we find evidence of a negative assortative matching in international trade with respect to corruption. We find that corruption in a country is negatively associated with trade flows from high-corrupt countries and is positively associated with trade volume from signatories of the OECD convention. Our results suggest that future studies on this topic should consider controlling for institutional dissimilarities between the trading partners as it has implications for bilateral trade costs.

Keywords: Corruption; International Trade; International Bribery; OECD Convention

JEL Classification Codes: D73; F14; K20

1. Introduction

The negative effects of corruption on several outcomes, such as investment and economic growth (Aidt et al., 2008; Gründler and Potrafke, 2019; Mauro, 1995), sustainable development (Aidt, 2009), foreign direct investment (FDI) (Cuervo-Cazurra, 2006; Habib and Zurawicki, 2002; Wei, 2000), and financial development (Cooray and Schneider, 2018), are well-documented. While several studies have investigated the effect of corruption on international trade (Anderson and Marcouiller, 2002; De Jong and Bogmans, 2011; Dutt and Traca, 2010; Lambsdorff, 1998; Musila and Sigue, 2010), the impact of corruption on the composition of a country's trading partners has not been studied. We investigate whether the level of corruption in a country, influences the composition of its trading partners. This is plausible because corruption in a country is likely to impose asymmetric costs on its trading partners, depending on their characteristics. Accordingly, we focus on two such characteristics: (1) the level of corruption in the trading partner, and (2) the trading partner's membership status in the Organization for Economic Cooperation and Development (OECD) Convention on Combating Bribery of Foreign Public Officials in International Business Transactions (henceforth, the OECD Convention). The focus on the OECD Convention is due to the fact that it requires member countries to declare international bribery illegal and take action to combat the prevalence of international bribery (discussed in detail later in the text).

The focus on the level of corruption in the trading partner, is motivated by the literature on assortative matching. In a seminal paper, Becker (1973) introduces the theory of assortative mating – positive and negative – in a theory of marriage. In a positive assortative matching, two individuals or groups with similar characteristics form an alliance. If on the other hand, an alliance is formed by two individuals or groups with opposite characteristics, it is known as negative assortative matching. This theory has since then been applied to several contexts including international trade.[1] To the best of our knowledge, no study has been undertaken on assortative matching in international trade with respect to corruption. The present paper fills this gap in the literature by investigating whether there exists a positive or negative assortative matching in international trade with regard to corruption. We argue that a country's level of corruption does not only impact its volume of bilateral trade, but also the composition of its

[1] Group lending (Guttman, 2008), labor markets and firm hiring (Hagedorn et al., 2017; Eeckhout and Kircher, 2018), international acquisitions (Rapport et al., 2017), and international trade (Sugita et al., 2017).

trading partners because it imposes heterogeneous costs on different trading partners depending on their aforementioned two characteristics.[2] Consequently, a change in the level of corruption in a country is likely to impact bilateral trade flows from some trading partners more than others, depending on their level of corruption, resulting in a change in the composition of its trading partners. Therefore, we investigate whether the level of corruption in a country determines its volume of trade with different trading partners based on the level of corruption that exists in the latter. In other words, we seek to answer the following question: Do high-corrupt countries trade more or less with one another?

A second issue that we investigate is whether the level of corruption in a country impacts its trade flows with members of the OECD convention differently to that of non-members and thereby the composition of trading partners. This is plausible because by requiring members to take action against bribery overseas, the OECD convention affects member countries' ability to deal with corruption in trading partner countries. As a result, changes in the level of corruption in a country can impose different costs on members of the OECD convention compared to non-members, causing an asymmetric effect on the volume of bilateral trade from different countries, depending on whether or not they are signatory to the OECD convention. Therefore, as the level of corruption in a country change, the composition of its trading partners (member versus non-members of the OECD convention) could change. To explore whether this is the case, we examine if corruption in a country plays a role in determining the volume of trade flows from different trading partners, depending on their membership in the OECD Convention.

The most important contribution of our study is that this is the first to shed light on how corruption in the importing country affects the composition of its trading partners. While some earlier studies have controlled for the level of corruption in the importing country (*e.g.*, Lambsdorff, 1998), and others have argued that corruption levels in both importing and exporting countries affect the cost of trade (*e.g.*, Musila and Sigue, 2010), existing studies have not looked at the interaction effect in which the level of corruption in a country plays a role in determining whether it attracts more trade flows from high-corrupt or low-corrupt countries. The second important contribution of our study is to provide further insights into the effects of

[2] Cuervo-Cazurra (2006) makes such arguments in the case of FDI. There could, of course, be other characteristics of the trading partner that might matter for the volume of international trade between the two countries. For instance, countries with similar institutions may engage in greater trade with each other (De Groot et al., 2004; Lavellee, 2005). This study focuses on corruption.

anti-bribery laws in international transactions on the volume of trade by providing evidence that the effects of such laws depend on the trading partner's level of corruption. The current literature reports that by making international bribery illegal and subject to legal sanctions, such laws (for instance, the Foreign Corrupt Practices Act (FCPA), 1977 and the OECD Convention, 1997) make engaging in international bribery more costly, affecting various outcomes related to businesses overseas (see, for instance, Geo-Jala and Mangum, 2000; Cuervo-Cazurra, 2006, 2008; Dass et al., 2020).

We investigate these two hypotheses using a large dataset from the Centre d'Etude Prospectives et d'Informations Internationales (CEPII) on bilateral trade flows covering 193 UN member countries over 1996-2014. We perform a number of robustness checks to ensure the validity of our results and the reliability of our estimates. First, we utilize different estimation techniques including the pooled OLS and the Poisson Pseudo-Maximum Likelihood method (PPML). Second, we control for a number of factors to minimize the possibility of an omitted variable bias. Third, we check the robustness of our results using alternative specification to capture institutional dissimilarities, using alternative corruption indices and high-dimensional fixed effects. Finally, we check the sensitivity of our results by using an alternative trade data source – the World Integrated Trade Solution (WITS), which allows us to exclude fuel-related trade to ensure that our results are not driven by, and are not contingent on, trade involving fuel.

We find evidence in support of a negative assortative matching in international trade. We find that as corruption levels in a country increase, the volume of trade from high-corrupt countries decreases. Further, we find that as a country becomes more corrupt, it receives more trade flows from the members of the OECD convention relative to the non-members. Our results also indicate that countries that are signatory to the OECD Convention generate more trade flows than non-signatory countries. Further, consistent with the findings of previous studies (for instance, Musila and Sigue (2010)), we find that the levels of corruption in both importing and exporting countries have negative impacts on trade. Our study thus provides important insights into the effect of corruption on the composition of a country's trading partners that have been absent from the literature until now. Another important implication of our study is that it could shed light on why there is a lack of unanimous evidence on the effect of corruption on trade flows (see, for instance, Lambsdorff (1998) versus Musila and Sigue (2010)). The findings of our study clearly demonstrate that not only corruption in the exporting and importing countries matter for bilateral trade (Musila and Sigue, 2010) but the levels of corruption in the two countries also jointly influence the volume of trade. Our results suggest that institutional dissimilarities between two trading partners have implications for bilateral trade costs and their omission could be one of the sources of specification bias. Therefore, future empirical studies on bilateral trade flows, especially those focusing on the role of governance and institutions, should control for the interaction effect of corruption or their distance to proxy for trade costs arising out of institutional dissimilarities.

The rest of this paper is structured as follows. In the next section, we discuss the related literature and present the theoretical foundations for the hypothesis by placing it within the larger literature on corruption and trade. Next, we present the empirical methodology and discuss the control variables and data sources in section 3. We go on to present the results in section 4, and the final section concludes with implications highlighting the significance of our findings.

2. Literature Review and Hypothesis Development

2.1 Corruption and Trade

There are two popular arguments regarding the effects of corruption on economic activity. According to the first one – the sand the wheels hypothesis – a high level of corruption makes a country less attractive to trade with, by increasing risk thereby raising the vulnerability of trading partners to hidden transaction costs (Anderson and Marcouiller, 2002; Dutt and Traca, 2010; Musila and Segue, 2010; De Jong and Bogmans, 2011). The reasons include the absence of a proper legal system and lack of transparency (Anderson and Marcouiller, 2002), absence of suitable economic policies (Anderson and Marcouiller, 2002), corruption in customs (Gatti 1999, De Jong and Bogmans, 2011), tax evasion through under-reporting of imports (Fisman and Wei, 2004), the lack of strong institutions and unpredictability (De Jong and Bogmans, 2011). According to this view, higher levels of corruption in a country reduce the incentive for other countries to trade with it.

The alternative argument – the grease the wheels hypothesis – is that corruption could 'grease the wheels' of economic activity in a second-best scenario. According to these studies, corruption can promote economic activity by acting as a hedge against bad policies (Leff 1964, Nye 1967, Wedeman, 1997). In case of international trade, corruption maybe trade enhancing in the presence of high tariffs if corruption allows exporters to evade tariffs (Dutt and Traca, 2010). De Jong and Bogmans (2011) find that while corruption (measured at the country level) discourages international trade, bribe payments to customs are associated with greater imports. Therefore, countries with weak institutions may attract more trade if bribery can be used to speed up the process of obtaining licenses and permits and to avoid tariffs and other regulatory costs (Shleifer and Vishney, 1993; Dutt and Traca, 2010).

2.2 Corruption and the Composition of Trading Partners

While some previous studies (for instance, Musila and Sigue (2010)) have controlled for both trading partners' levels of corruption, none of the studies has looked at the interaction effect between the levels of corruption in the trading partners that could have implications for the level of trade flows between two countries, which in turn, can affect the composition of trading partners. Importantly, such possibilities have been hypothesized, explored, and found to be significant in the context of FDI. Cuervo-Cazurra (2006), for instance, argues that host country corruption not only reduces FDI, but also influences the composition of the country of origin of FDI because not all foreign investors share the same concerns about corruption in the host country. Accordingly, he finds that more corrupt countries attract greater volumes of FDI from countries that have higher levels of corruption. Since there are important differences in FDI and international trade, the effects of corruption on the two might be very different. Unlike bilateral trade, FDI is a long-term commitment, involves large sunk costs, and cannot be easily withdrawn if the situation demands so (Helpman et al., 2004). Moreover, with FDI, investors are exposed to corruption in the destination country all the time (because the business operates in the host country), while the exposure to destination country corruption is much more limited in the case of international trade.

We argue that the cost imposed by corruption in a country on its trading partners will depend on whether the latter is a low-corrupt or high-corrupt country. A high-corrupt country will trade more with other high-corrupt countries if the cost of trade with such countries as a consequence of corruption in the trading partner is lower than that with low-corrupt countries and vice-versa. Alternatively, a high-corrupt country will trade more with other low-corrupt countries if the gains from trade (as a result of corruption) with such countries are higher than that from trading with high-corrupt countries and vice-versa. It is plausible to imagine scenarios in favor of both these possibilities: A positive assortative matching in which corrupt countries trade more with one another and a negative assortative matching whereupon high-corrupt countries tend to trade more with low-corrupt countries. Therefore, an empirical analysis is warranted to ascertain which of these two exists in international trade.

A high-corrupt country will engage in greater trade with more corrupt countries if firms in high-corrupt countries have a comparative advantage in dealing with corrupt government officials in partner countries due to expertise and experience in dealing with corruption and because the psychic distance between the two countries is low (Cuervo-Cazurra, 2006). As managers of firms and government officials of high-corrupt countries are exposed to corruption, they may find it easier to deal with corrupt trading partners and reach an agreement compared to the case in which two parties have very different levels of corruption. This will result in a positive assortative matching of trading partners with regard to corruption. Further, firms in high-corrupt countries may find bribery a normal part of doing business and hence will be more inclined to trade with other corrupt countries compared to low-corrupt countries (Godinez and Garita, 2015).[3] Based on this discussion, our first hypothesis can be stated as follows:

H1(a): There exists a positive assortative matching in international trade with regard to corruption. That is, high-corrupt countries trade more with one another.

On the other hand, a negative assortative matching would occur when high-corrupt countries trade more with less corrupt countries. There could be various reasons that might give rise to a negative assortative matching in international trade. One, firms in high-corrupt countries might be able to extract greater rents when trading with low-corrupt countries compared to high-corrupt countries. This possibility arises because officials and firms of high-corrupt countries have the experience of dealing with corruption in their own countries (Cuervo-Cazurra, 2006), which gives them an edge in bargaining for rents when dealing with their counterparts from low-corrupt countries. Consider a simple bargaining game for the distribution of rent that arises due to trade between the two countries. In this simple set-up, a high-corrupt country can either trade with a more corrupt country or a less corrupt country. The representatives of both trading partners wish to maximize their payoffs from trade.

Suppose the total rent generated from trade is x and can be shared by all the involved parties. Now consider a case where the two trading partners are equally corrupt. *Ceteris paribus*, the trading partners will share the rent equally, *i.e.*, each of them seizing $x/2$. In the scenario where one of the trading partners is a high-corrupt country while the other is a low-corrupt country, a payoff of greater than $x/2$ goes to the high-corrupt country due to its expertise in dealing with

[3] This argument is found to hold in other contexts. For instance, De Groot et al. (2004) and Lavellee (2005) find that countries with similar institutions tend to trade more with one another.

corruption. In an extreme case where one of the countries is corruption-free, the total rent, *x,* is kept by the corrupt partner country. In this extreme case, the entire rent might be generated within the high-corrupt country. Current literature supports such an argument by reporting that a common strategy adopted by corrupt officials to generate rents is to falsify their books to under-report the value of imports and exports to evade import tariffs and excise duties (Lambsdorff, 1998; Rijkers, Baghdadi, and Raballand, 2017). Therefore, representatives of the non-corrupt country would simply not participate in corrupt practices but still engage in trade. In general, the low-corrupt country might be indifferent to the level of corruption in the trading partner as long as it is not an accomplice to corrupt practices and will trade with the partner that results in the best outcome for them (without engaging in corrupt practices).

Two, the bargaining process for the distribution of rent will take longer when both trading partners are either high-corrupt countries or low-corrupt countries compared to the case when a high-corrupt country trades with a low-corrupt country, discounting the gains from trade (Rubinstein, 1982). It is easier to see this in the case of two high-corrupt countries: Corrupt officials and representatives of high corrupt countries wish to extract the greatest rents for themselves and hence the bargaining process will take longer and therefore the net present value of the benefits from trade is lower. What about a pair of low-corrupt countries? As long as there is a bargaining process for rents from trade, however, small the rent, since both low corrupt partners lack the experience of dealing with corruption, the bargaining process is likely to take longer compared to the case where one of the trading partners is a high-corrupt country while the other is a low-corrupt country. On the other hand, when one of the countries is high-corrupt while the other is less corrupt, the bargaining process takes less time because it is easier to agree on the distribution of rents. Consequently, the trade flows from a high-corrupt country to a less corrupt country will be higher than that to a more corrupt country and trade flows between two low-corrupt countries. Figure 1 exhibits the gains from trade in the case of a lengthy bargaining process.

Figure 1: Bargaining for Rents and the Gains from Trade with Discounting

		Destination country	
		High corrupt	Low corrupt
Origin country	High corrupt	Low	High

	Low corrupt	High	Low

The third possibility that might result in a negative assortative matching in international trade relates to the transaction cost argument. Musila and Sigue (2010), for instance, hold that corruption of both exporting and importing countries will determine the cost of doing business between two trading partners. Clearly, when two high-corrupt countries trade with each other, transaction costs will be very high because rents will be extracted by representatives (employees of the firms and the government officials) of *both* these countries. On the other hand, processes could take longer if both trading partners are low-corrupt countries than when only one of the countries is low-corrupt, allowing bribes to be used in the high-corrupt country to grease the wheels to speed up the process and even avoid a part of regulatory costs in the latter scenario. Finally, when both trading partners are low corrupt countries, compliance costs could be higher as "everything has to be done by the books" and bribes cannot be used to grease the wheels of trade to evade regulations and transaction costs.[4] Therefore, as shown in Figure 2, transaction costs could be lower when one of the trading partners is a low-corrupt country compared to the case in which both trading partners are either high-corrupt or low-corrupt countries, causing the trade volume to be higher in the first case compared to the latter two.

Figure 2: Transaction Costs of Trade

		Destination country	
		High corrupt	Low corrupt
Origin country	High corrupt	High	Low
	Low corrupt	Low	High

H1(b): There exists a negative assortative matching in international trade with regard to corruption. That is, high-corrupt countries trade less with one another.

[4] We would like to thank an anonymous referee for suggesting this line of argument.

In sum, since *a priori,* the effect of a country's corruption on bilateral trade might move in either direction with the level of corruption of its trading partner, this issue needs to be resolved empirically.

2.3 OECD Bribery Convention and the Composition of Trading Partners

Some countries may face different costs in trading with corrupt countries compared to others due to certain (anticorruption) regulations or policies that might be specific to those countries. In this case, a change in the level of corruption in a country will have a differential impact on bilateral trade from countries that are subject to such laws or policies than those that are not, leading to a change in the composition of its trading partners. Based on this idea, we investigate if a country's trade flows with members of the OECD Convention change differently as corruption levels change compared to its trade flows with the non-members. The OECD Convention was signed by 29 OECD countries and 5 non-OECD countries on December 17, 1997. It came into effect on February 15, 1999 (OECD, 2017)

According to the OECD Convention, member countries should deem the bribing of international officials as illegal and provide mutual legal assistance in investigations and facilitate extraditions. The convention also sets stricter accounting standards and requires that signatories adopt national laws to meet standards. Thus, the Convention increases both the probability of detection of bribing by mutual monitoring mechanisms and the cost of bribing by imposing penalties. Consequently, countries that have signed these laws, may trade less with countries that are highly corrupt because of higher costs (in terms of bribe amount, penalty, and the loss of image) associated with corrupt behavior (OECD, 2011; Cuervo-Cazurra, 2006). It is, however, possible that these countries may trade more with high-corrupt countries because OECD Convention member countries may be able to credibly argue that their hands are tied due to this law, evading bribery requests (Cuervo-Cazurra, 2006). As a result, members of the OECD Convention will bear a lower cost due to high corruption in their trading partners compared to non-member countries that cannot credibly argue the same. Hence, as a country's corruption level rises, its trade flows from the members of the OECD Convention will be affected less than that from non-members. Moreover, firms of more corrupt countries will have a greater incentive to trade with the members of the OECD Convention because they can then seize the entire rent generated by fudging their books. Therefore, as a country's corruption level rises, whether its trade flows with the members of the OECD Convention increases or decreases relative to those with the non-members is theoretically ambiguous. Hence, we empirically check which of the following two hypotheses is supported by the data.

H2(a): Countries that are members of the OECD Convention will trade less with high-corrupt countries.

H2(b): Countries that are members of the OECD Convention will trade more with high-corrupt countries.

Evidence supporting hypothesis H2(a) will suggest the existence of a positive assortative matching in which countries that are part of the anti-bribery law in international transactions (*i.e.,* the OECD Convention), trade more with less corrupt countries. On the other hand, if hypothesis H2(b) holds, a negative assortative matching exists because countries that are part of the anti-international-bribery law, trade more with more corrupt countries.

To the best of our knowledge, this is the first paper to examine how corruption influences the composition of a country's trading partners depending on: (1) whether the partner country is a high-corrupt or low-corrupt country, and (2) whether the partner country is a signatory to the OECD Convention.

3. **Research Design and Data**

3.1 Empirical Model

We employ two gravity models to examine our hypotheses. The origin of the gravity model dates back to Tinbergen (1962), who explained bilateral trade flows in terms of country size (GDP) and distance between two countries. The theoretical foundations of the gravity model were developed much later, following its empirical success and include seminal works by Anderson (1979), Bergstrand (1985, 1989), Eaton and Kortum (2002), and Anderson and Van Wincoop (2003). The gravity model specifications used in this paper are similar to those used in Dutt and Traca (2010) and Cuervo-Cazurra (2006) and are augmented by corruption variables.

$$\ln(F_{ijt}) = \alpha + \beta_1 HC_{it} + \beta_2 C_{jt} + \beta_3 C_{jt} \times HC_{it} + X_{ijt}\Theta + \mu_i + \pi_j + \vartheta_t + \varepsilon_{ijt} \quad (1)$$

$$\ln(F_{ijt}) = \delta + \gamma_1 BL_{it} + \gamma_2 C_{jt} + \gamma_3 C_{jt} \times BL_{it} + X_{ijt}\Theta + \mu_i + \pi_j + \vartheta_t + \varepsilon_{ijt} \quad (2)$$

where i , j and t represent the origin (exporting) and destination (importing) countries, and year respectively. F_{ijt} denotes real trade flows in U.S. dollars from i to j in year t. C_{jt} reflects the corruption level at the destination. High corruption (HC_{it}) is a dummy variable that takes a value 1 if corruption in the origin (exporting) country i is greater than the median value of the corruption index in year t, and 0 otherwise. Bribery Law (BL_{it}) is a dummy variable that takes a value 1 if the origin country is a signatory to the OECD Convention and has enacted legislation to enforce the convention in year t or earlier and *0* otherwise. X_{ijt} is a vector of control variables. $\mu_i, \pi_j, \vartheta_t$ and represent origin, destination, and year fixed effects that may be correlated with trade flows and control variables. ε_{ijt} is the uncorrelated error term.

Our primary variables of interest are the interaction terms between (1) corruption in the destination country and high corruption dummy in the origin country (β_3), and (2) corruption in the destination country and a dummy indicating whether the origin country is signatory to the OECD convention (γ_3). Instead of making *a priori* assumption about the direction of the effects, we analyze the data to learn whether our coefficients of interest, β_3 and γ_3, are positive or negative. A positive β_3 implies a positive assortative matching while a negative β_3 provides evidence in favor of a negative assortative matching. Similarly, a positive γ_3 indicates that OECD Convention signatories trade more with more corrupt countries and a negative γ_3 implies that these countries trade less with more corrupt countries, indicating a negative and positive assortative matching respectively.

The gravity model is conventionally estimated in log-linear form where the dependent variable (trade flows) and some of the control variables (such as GDP and distance between trading partners) enter the model in log form (see equations 1 and 2). This leads to two problems: (1) a log-linear model is subject to sample-selection bias (Dutt and Traca, 2010) given that a large proportion of bilateral trade values are zero which drop out in the log form; and (2) Silva and Tenreyro (2006) demonstrate that the log-linear gravity model yields severely biased and inconsistent estimates in the presence of heteroscedastic errors. The authors propose a Poisson Pseudo Maximum Likelihood (PPML) estimation method where estimates are consistent in the presence of heteroscedastic errors. Further, PPML estimates the gravity model in a multiplicative form where trade flows variable enters the model in its original form and not in logs. Hence, the PPML method overcomes the sample selection bias by including zero trade values. Given its superiority, our primary estimation procedure is the PPML method, and the dependent variable, F_{ijt}, enters the model in its original form. However, as a robustness check, we also estimate our models in a log-linear form using pooled OLS. Each of our estimated models controls for origin, destination, and year fixed-effects. The reported standard errors are robust to heteroscedasticity and adjusted for clustering by country-pair.

3.2 Data

Bilateral Trade Flows

The bilateral trade flow (F_{ijt}) data come from the TRADHIST CEPII database compiled by Fouquin and Hugot (2016).[5] Each observation in this dataset represents the bilateral trade flow from an origin country to a destination at a given time. The trade flow data refers to merchandise trade and excludes trade in services, bullion, and species (Fouquin and Hugot, 2016). This dataset is an unbalanced panel with the number of origin and destination countries increasing over time. The trade flow data is reported in British pound sterling. So that it is consistent with other studies in this literature, we convert the trade flow data into dollar equivalents using the historical exchange rates provided by Fouquin and Hugot (2016). We limit our sample to 193 UN member countries. Given that our primary measure of corruption, the World Bank's Control of Corruption Index (CCI), is only available from 1996, we also limit our analysis to the 1996-2014 period. Missing trade flow observations are treated as zeros. The bilateral trade flow observations are deflated to real terms using the US import price deflator for all commodities with the base year being 2010. The import price deflator data comes from the Bureau of Labor Statistics (retrieved on August 31, 2018).

Corruption Variables

Our primary measure of corruption is the World Bank's Control of Corruption Index (CCI) that ranges from –2.5 (most corrupt) to 2.5 (least corrupt). The perception of firms, households, business analysts, non-governmental organizations (NGOs), and public sector agencies regarding corruption in the country is utilized to compute the CCI. The survey questions capture respondents' perceptions about the existence of corruption in different sectors which include officials in various branches of the government such as the judiciary, customs, taxes, as well as political corruption. Interested readers may refer to Kaufmann et al. (2011) for further details on how the CCI is computed. We choose the CCI as our primary measure of corruption because it has the highest coverage of countries compared to other corruption measures used

[5] http://www.cepii.fr/cepii/en/bdd_modele/presentation.asp?id=32

in the empirical literature. To make the interpretation easier and straightforward, we adjust all the corruption indices such that higher values imply higher levels of corruption. The High corruption (HC_{it}) dummy variable takes a value 1 if the CCI for the origin country is greater than the median value of the CCI in the worldwide sample in year t, and 0 otherwise.

In addition, we use two widely used measures of corruption for robustness checks. The first measure, the International Country Risk Guide (ICRG) corruption index, ranges from 0 (highly corrupt) to 6 (least corrupt).[6] The second corruption measure is the Corruption Perception Index (CPI) published by Transparency International (TI).[7] The CPI takes values in the range of 0 (highly corrupt) to 100 (least corrupt). We adjust all the corruption indices in the regression specifications such that higher values imply higher levels of corruption.

Bribery Law Measure

The bribery law variable comes from the OECD Ant-bribery Convention website.[8] The Convention first came into effect in 1999 and was signed by 29 OECD members and 5 other countries. As of today, there are 44 (36 OECD and 8 non-OECD) countries that are signatory to the convention. The Convention requires that member countries to: (1) make bribing to international officials illegal, and (2) provide mutual legal assistance in investigations of international bribery and to facilitate extraditions. Bribery Law (BL_{it}) for the origin takes a value 1 if the origin country is a signatory to the OECD convention and has legislation in place to enforce the convention in year t and 0 otherwise. For example, Canada signed the Convention on December 17, 1997 but passed the legislation to ratify the convention only in February 1999. Therefore, the bribery law variable for Canada takes a value of 1 only from 1999 onwards. Only four countries, Austria, Greece, Iceland, and the United States, enforced the legislation in 1998 and none in 1997. Hence, the bribery law data cover period from 1998-2014.

Baseline Controls

The standard gravity literature explains bilateral trade flows in terms of country size and proximity among trading partners. Hence, our baseline control variables include Gross

[6] Visit http://www.prsgroup.com/wp-content/uploads/2012/11/icrgmethodology.pdf for details on the ICRG corruption index.
[7] The details on CPI can found at https://www.transparency.org/research/cpi/overview.
[8] http://www.oecd.org/daf/anti-bribery/countryreportsontheimplementationoftheoecdanti-briberyconvention.htm

Domestic Product (GDP), as a measure of economic size, measured in millions of constant U.S. 2010 dollars for both partners. Following the convention, the GDP variable enters the regression model in logarithmic form (De Jong and Bogmans, 2011; Dutt and Traca, 2010; De Groot et al, 2004). We include population (in millions) of each bilateral trading partner as an additional measure of country size (Bandyopadhyay and Roy, 2007). The data on GDP and population come from the World Development Indicators (WDI).[9] Our model includes geographical distance (in kilometers) between trading partners as a measure of proximity. This variable comes from the CEPII GeoDist database[10] and is calculated using the great circle formula that uses latitudes and longitudes of the most populated cities.

Studies also show that countries that are contiguous, have colonial ties, and share a common language, tend to trade more with each other (Dutt and Traca, 2010, Anderson and Marcouiller, 2002; Thede and Gustafson, 2012). Hence, our set of baseline control variables includes dummy variables to capture whether trading partners are contiguous, have the same official language, and if they were ever in a colonial relationship. Data on these standard gravity variables come from the CEPII GeoDist database. It is also established in the literature that landlocked countries tend to trade less (Dutt and Traca, 2010; Paudel and Cooray, 2018). Hence, we include a dummy variable in the model that takes a value 1 if either of the trading partners is landlocked. Some trading partners have trading agreements that allow for preferential treatment (Anderson and Marcouiller, 2002). Hence, we take into account the existence of any regional bilateral and multilateral trading arrangements between two trading partners. The data on Regional Trade Agreements (RTA) come from the Mario Larch RTA Database (Egger and Larch, 2008) and cover bilateral and multilateral trading agreements over 1950-2015. This variable is coded as one if the two trading partners have any bilateral or multilateral trading arrangements between them, and zero otherwise.

Additional Controls

We use a number of other control variables for robustness checks. Since protectionism is detrimental to trade flows (see, for example, Anderson and Marcouiller, 2002; Bandyopadhyay and Roy, 2007; De Jong and Bogmans, 2011; Thede and Gustafson, 2012), we, control for the aggregate tariff rates of origin and destination countries as measures of trade protectionism. The rate is a weighted mean of tariff rates applied to all products and is expressed as a

[9] Accessed on July 31, 2018.
[10] http://www.cepii.fr/cepii/en/bdd_modele/presentation.asp?id=6 (retrieved on September 21, 2018)

percentage using the data from the WDI.[11] The quality of institutions is an important determinant of bilateral trade between countries (Dutt and Traca, 2010; De Groot et al., 2004; Lavellee, 2005). Aidt and Gassebner (2010) report that autocratic countries trade less than democratic countries. To account for the heterogeneity of institutions across countries, we include the Polity IV index of origin and destination countries. The polity index is a broader measure of institutional quality and takes values between 10 (strongly democratic) to –10 (strongly autocratic). We also control for relative factor endowments (RFE), calculated as the difference between the per-capita incomes of the two trading partners. The positive (negative) coefficient on RFE implies that countries with different endowments will trade more (less) with each other supporting the Heckscher-Ohlin (Linder) hypothesis (see Paudel and Cooray (2018) for a discussion). Finally, we also control for per-capita income growth rates of both trading partners to see if increased trade is driven by higher growth rates. Table 1 reports summary statistics for the variables used in the study.

4. Results

4.1 Main Results

Table 2 reports PPML estimation results with the dependent variable being trade flows in millions of real dollars. All the specifications include origin, destination, and year dummies to ensure that the results are not biased due to the omission of origin-, destination-, and year-specific factors that might be correlated with the error term. The baseline estimates presented in column 1 point to a statistically significant negative association between corruption at destination and real trade flows. A statistically significant negative coefficient on the high-corruption dummy for origin countries indicates that high-corrupt countries experience lower trade than low-corrupt countries. In the next column, we add the interaction term between the high-corruption dummy for origin countries and corruption in destination countries to investigate whether trade flows from high-corrupt countries to corrupt destinations are systematically different from that of low-corrupt countries. In column 2, the coefficient on the interaction term is negative and statistically significant at conventional levels indicating that high-corrupt countries' trade volume decreases with increases in the trading partner's level of corruption. This finding points to the existence of a negative assortative matching in bilateral trade supporting hypothesis 1(b).

[11] The data was extracted on July 31, 2018.

In the next columns, we control for a number of additional variables to minimize the possibility of an omitted variable bias: tariff rates in the origin and destination countries (column 3), polity indices of the origin and destination countries (column 4), and relative factor endowment (RFE) and growth rates of the origin and destination countries (column 5). In all these columns, both corruption variables remain negative and statistically significant at conventional levels, indicating that corruption discourages trade. More importantly, the coefficient on the interaction term between corruption in the destination country and high-corruption dummy variable in the origin country remains negative and statistically significant in each of these columns. These results provide evidence in support of our hypothesis that corruption not only impacts the volume of trade but also alters the composition of a country's trading partners. We find strong evidence of a negative assortative matching: As the level of corruption in a country goes down, its trade volume with high-corrupt countries rises.

Taking a look at the control variables, GDP in both destination and origin countries have a positive significant effect on trade, suggesting that larger economies engage in greater trade (Bandyopadhyay and Roy, 2007; Dutt and Traca, 2010). Similarly, contiguity and trade agreements have a positive and statistically significant effect on real trade flows, which is consistent with the findings of previous studies (Dutt and Traca, 2010; Anderson and Marcouiller, 2002; Thede and Gustafson, 2012). Consistent with the findings of Paudel and Cooray (2018) and Dutt and Traca (2010), the coefficients on the distance between trading partners are negative and statistically significant, suggesting a greater distance between countries leads to a fall in the trade volume. While being landlocked discourages trade as shown by a negative coefficient, it is not statistically significant. The mean tariff rates in origin countries affect trade adversely (see Anderson and Marcouiller, 2002; Bandyopadhyay and Roy, 2007; De Jong and Bogmans, 2011; Thede and Gustafson, 2012). Moreover, while the population in the origin country is negatively associated with the trade volume, the population in the destination country is not significantly associated with trade flows. Finally, the growth rate of neither the origin nor the destination country is significantly associated with trade flows.

Table 3 present the results of the same specifications as in Table 2 except that the high-corruption origin dummy variable is replaced with the bribery-law origin dummy variable, and the interaction term between corruption at the destination and high-corruption dummy for the origin country is replaced with that between corruption in the destination country and dummy variable for origin countries that have signed the OECD Convention, to investigate whether the

Convention matters for trade with corrupt countries. Consistent with the results reported in Table 2, a negative relationship between corruption in the destination country and trade is observed in Table 3. Further, we find that countries that are signatories to the OECD Convention engage in higher levels of trade than those that are not.

Next, we find that the coefficient on the interaction term between the bribery-law origin dummy variable and corruption in the destination country is positive in all columns of Table 3 indicating a greater volume of trade from countries that have signed the OECD Convention to more corrupt countries. This finding is consistent with hypothesis H2(b), suggesting that firms of OECD convention member countries may be able to credibly argue to corrupt countries that their hands are tied and cannot pay bribes because international bribery is prevented and punishable in their countries, effectively shielding themselves from corruption in highly corrupt countries. Non-signatories of the OECD Convention cannot credibly argue the same and hence are subject to greater costs due to corruption in their trading partners than signatory countries. This finding is also in the spirit of a negative assortative matching in which countries that are members of the anti-international-bribery convention, trade more with more corrupt countries than those that are non-members.

To identify the existence of assortative matching of trading partners in international trade with respect to corruption, we utilize multiplicative interaction models as proposed in equations (1) and (2). In equation (1), we interact the high corruption dummy in the origin with corruption at the destination. Similarly in equation (2), the bribery law dummy for the origin is interacted with corruption at the destination. Hainmueller et. al. (2019) highlight two problems in such models. First, such models assume that the effect of the treatment variable (high corruption dummy/bribery law dummy) on the dependent (trade flows) variable changes linearly with the moderator variable (corruption at the destination). However, if this assumption of the linear interaction effect (LIE) is incorrect, the estimated conditional marginal effects are biased and inconsistent. Second, Hainmueller et. al. (2019) argue that these interactive models often overlook the issue of the lack of common support. For example, to estimate marginal effects of the treatment variable at a given value of the moderator variable, there should be sufficient observations of the moderator variable and variation in the treatment variable at that given value of the moderator. Multiplicative interaction models fail to meet these conditions in many instances resulting in estimates being model-dependent (Hainmueller et. al., 2019).

Hainmueller et. al. (2019) propose two alternative estimation strategies to overcome these problems.[12] The first one is a binning estimator and the second one estimates conditional marginal effects using a kernel smoothing estimator. Both these estimation strategies can be implemented using the author-written STATA command "Interflex". For demonstration, we use the binning estimator for its user friendliness. The binning estimator first divides the moderator (corruption at destination) variable into three bins corresponding to three terciles where each bin is represented by a dummy variable.[13] Second, this estimator generates evaluation points in each bin to estimate the conditional marginal effect of the treatment (high corruption at origin) variable on the dependent variable (trade flows). Finally, the model is estimated after incorporating the interactions of the bin dummies with the treatment variable and other modifications.

Figures 3 (a) and (b) represent the conditional marginal effects of high corruption and bribery law at the origin, respectively, from the binning estimates for the low, medium and high levels of corruption at the destination. These binning estimates (represented by the red dots) are superimposed on linear marginal effects obtained from the multiplicative interaction models (represented by the blue line) following equations 1 and 2. Both model estimations use trade flows (in logs) as the outcome variable and the set of baseline controls with origin, destination and time fixed effects as control variables. The resulting Wald test from both the models reject the null hypothesis that both models are statistically equivalent ($p=0.000$). Marginal effects from the multiplicative interaction models reiterate our conclusions from the PPML estimates discussed earlier. In figure 3 (a), we find a weak negative interactive effect in the case of high corruption dummy at the origin reflecting a negative assortative matching. In figure 3 (b), in the case of bribery law dummy at the origin, we find a strong positive interactive effect, again reflecting a negative assortative matching. In the case of the binning estimator, we find evidence of non-linear effects in both cases. In figure 3 (a), while the marginal effect of high corruption dummy (o) on trade flows is statistically insignificant at the lowest tercile, the marginal effects are negative and significant at the upper two terciles of corruption level at the destination. This gives credence to our results presented in the earlier section that the interactive effect is negative at higher values of corruption at the destination. However, it must be emphasized that the marginal effect slightly improves (though still negative and significant)

[12] Hainmueller et. al. (2019) have also developed a set of diagnostic tests that allow users to identify these problems. For the sake of brevity, we do not report the plots from the diagnostic tests.
[13] The number of bins can be changed. The default is 3 bins in STATA.

once we move from the mid to high tercile corruption level at the destination. Overall, the results provide evidence that the effect of high corruption (o) on trade flows is not linear with the level of corruption at the destination.

In figure 3 (b), the marginal effect of bribery law (o) on trade flows is positive and significant in each tercile of corruption level at the destination. The marginal effect improves as we move from the lowest towards the higher terciles of corruption level at the destination. This lends further credence to our results from the PPML estimates presented earlier reflecting negative assortative matching. However, analogous to figure 3 (a), we find evidence of non-linearity, the marginal effect increases as we move from the lowest to mid tercile and declines though still positive and significant as we from mid to high tercile of corruption level at the destination.

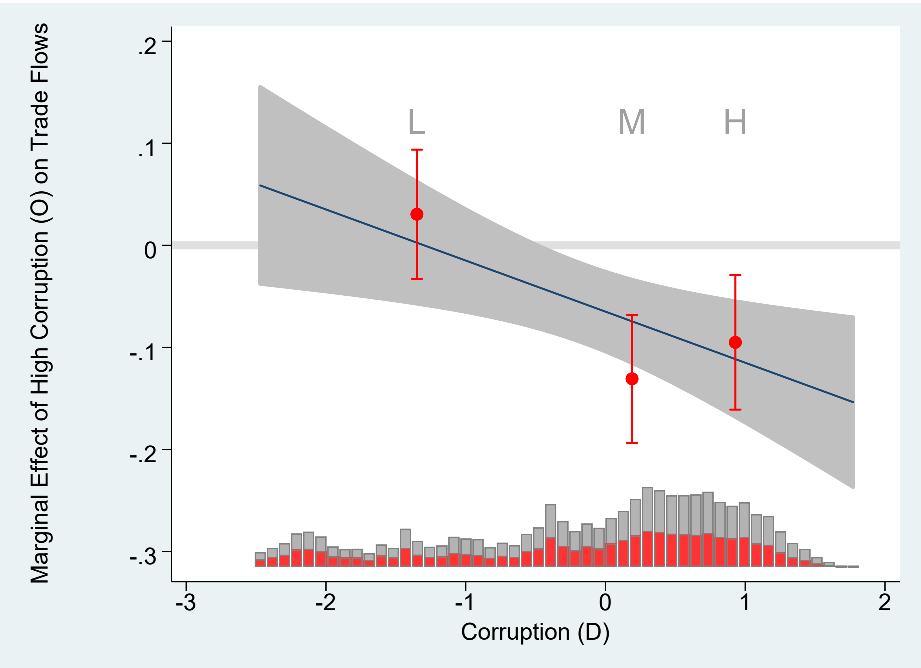

Figure 3 (a)

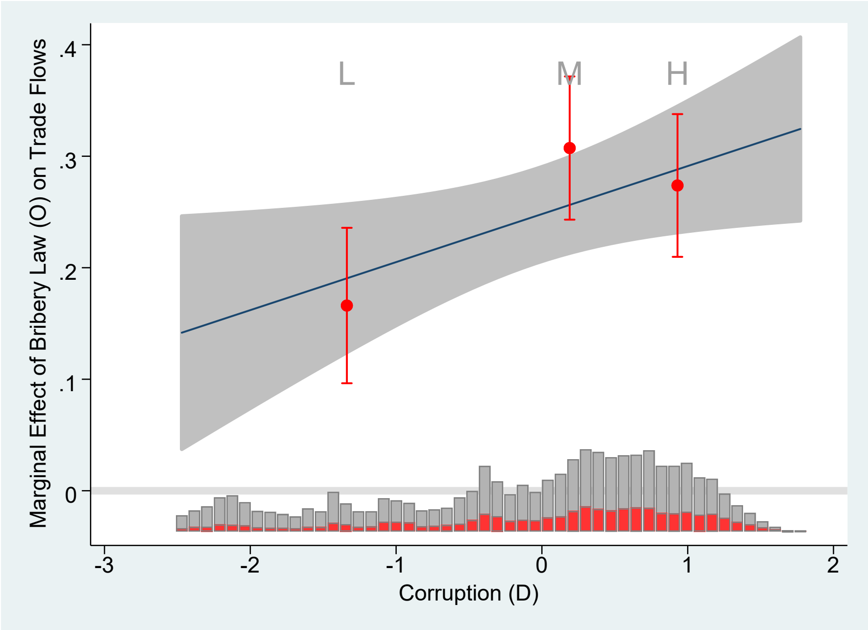

Figure 3 (b)

4.2 Alternative Estimation Strategy

In this section, we adopt an alternative empirical strategy to ascertain whether there exists a positive or negative assortative matching in international trade with respect to corruption. The estimated empirical specification is

$$\ln(F_{ijt}) = \alpha + \beta_1 C_{jt} + \beta_2 |C_{it} - C_{jt}| + X_{ijt}\Theta + \mu_i + \pi_j + \vartheta_t + \varepsilon_{ijt} \qquad (1)$$

where i , j and t represent the origin (exporting) and destination (importing) countries, and year respectively. Here $|C_{it} - C_{jt}|$ measures the absolute corruption distance between two trading partners. This variable captures the institutional dissimilarities between two trading partners and is an alternative method to capture the interaction effect. A positive coefficient on this variable indicates a negative assortative matching as countries with greater corruption distance trade more with one another. A negative coefficient, on the other hand, will indicate a positive assortative matching of trading partners indicating trade volume between two countries falls as the corruption distance increases.

We report the results of the alternative empirical strategy in Table 4. We include the same control variables as in the previous section. We find that the coefficient on the absolute corruption gap variable is positive and statistically significant at the 5% level in each column, suggesting a negative assortative matching. The results of the alternative empirical specification thus also confirm hypothesis 1(B) wherein pairs of high- and low-corrupt countries trade more with one another. This result suggests that institutional dissimilarities, as captured by the corruption distance between two trading partners, have implications for bilateral trade flows.

4.3 High Dimensional Fixed Effects

So far, we have included origin-, destination-, and year-fixed effects in all our specifications in exploring the existence of assortative matching. In Table 5, we introduce high dimensional fixed effects by including origin-year and destination-year dummies in our empirical specifications. This allows us to control for unobserved time-variant origin and destination level effects on trade flows. Once we control for these fixed effects, the time-variant origin and destination specific controls (such as real GDP, population, tariff rates, the level of corruption etc.) drop out from the model. Since time-variant country specific variables drop out from the model, we only report the results for the baseline specification in Table 5. The results presented in Table 5 are consistent with those previously reported. In column 1, we find that the interaction term between high-corruption origin dummy and corruption at the destination is negative and statistically significant at the 1% level. In column 2, the coefficient on the absolute corruption distance between trading partners is positive and statistically significant at the 5% level. Both these confirm the existence of a negative assortative matching implying high-corrupt countries trade less with other high corrupt countries. Finally, the coefficient on the bribery law dummy and corruption at the destination is positive and statistically significant in the last column confirming that countries that are signatory to the OECD convention trade more with more corrupt countries.

5. Robustness Checks

5.1 Robustness with Alternative Estimation Method

Next, we check the robustness of our estimates using Pooled OLS estimation. The results are reported in Table 6. In the odd-numbered columns, we control for origin, destination, and year fixed effects and include origin-year and destination-year fixed effects in even-numbered columns. Our main results remain unchanged with all the key variables being statistically significant at conventional levels, with signs that are consistent with those reported in Tables 2—5.

5.2 Sensitivity to Alternative Corruption Indices

In Table 7, we examine the sensitivity of our results using two alternative corruption measures – the ICRG corruption index (columns 1, 2, 4 and 5) and the CPI (columns 3 and 6). Recall that we rescale both the indices such that a greater value of the index implies a higher corruption level. Each of these models controls for baseline variables with high-dimensional fixed effects and is estimated using PPML. With the exception of column 3, results presented in the first four columns are consistent with those reported in the previous sections indicating a negative assortative matching and suggesting that high-corrupt countries trade less with more corrupt countries – consistent with hypothesis H1(b). Similarly, the interaction between corruption in the destination country and the dummy for origin countries that are signatory to the OECD, is positive and significant, implying that OECD Convention signatory countries trade more with corrupt countries than non-signatory countries. Note that the results using the CPI as a measure of corruption must be treated with caution because according to the publisher of the CPI, Transparency International, the index is not comparable across time before 2012.[14] This point has been highlighted by many existing studies such as Gründler and Potrafke (2019) and Jha and Sarangi (2017). Hence, the use of the CPI may not be appropriate for pooled data analysis, and could be the underlying reason why the interaction term between the high-corruption origin dummy and corruption in the destination is insignificant in column 3. Overall, these results support hypotheses 1(b) and 2(b).

5.3 Corruption in Trading Partners and Fuel vs Non-Fuel Trade Flows

Next, we investigate whether our results are driven by trade involving mineral fuels, oils, and products of their distilleries (fuels), as a few countries, e.g., Saudi Arabia, Russia, Iraq, UAE, Canada, USA, and Nigeria dominate the world market in exporting such products. An importer with a low (high) level of corruption may not have a choice but to trade with these oil-exporting countries regardless of their levels of corruption. We utilize the World Integrated Trade Solutions (WITS) data provided by the World Bank in collaboration with the United Nations Conference on Trade and Development (UNCTAD). One of the primary advantages of the WITS data is the availability of trade flow data by industry and product. As before, we limit our sample to UN member countries and the period 1996-2014 and treat missing trade flow observations as zeros.[15]

[14] Footnote 1 of the document available at https://www.transparency.org/files/content/pressrelease/2012_CPIUpdatedMethodology_EMBARGO_EN.pdf

[15] The bilateral data on aggregate trade flows, fuel trade flows, and non-fuel trade flows are deflated to their real values using the US import price deflators for all commodities, for fuels, and for non-petroleum products from

Table 8 reports PPML results using WITS data. In the first three columns, our variable of interest is the interaction term between the high-corruption dummy for origin countries and destination country corruption. In columns 4-6, our variable of interest is absolute corruption distance between trading partners. Our conjecture seems to be correct here as we find evidence of negative assortative matching in trade flows with respect to the level of corruption only for non-fuel trades. For fuel trade, there is no assortative matching with respect to corruption. These results echo our findings using the TRADHIST CEPII data that high-corrupt countries trade more with less corrupt countries. In columns 7—9, our variable of interest is the interaction variable between the OECD Convention signatory dummy for origin countries and corruption in the destination country. As previously, we find that the interaction term is significant only for non-fuel trade flows but not for trade flows related to fuel. In sum, the results reported in Table 8 corroborate our findings in the previous section by providing evidence of a negative assortative matching of trading partners. Moreover, it is shown that our results are not driven by and are not contingent on fuel trade.

6. Discussion and Conclusion

The primary objective of this study is to investigate how corruption levels at the destination affect the composition of the country's trading partners. We find evidence of a negative assortative matching in international trade, wherein a high-corrupt origin country trades more with a less corrupt destination country. The main explanation for the existence of negative assortative matching is that when only one of the trading partners is corrupt, corruption acts as "grease on the wheel" in the corrupt country and thereby, increases the trade flows. In contrast, when both trading partners are highly corrupt, a significant proportion of the benefits from trade will be lost due to rents extracted by firms and officials of both these countries. Finally, when both partners are low-corrupt, "everything has to be done by the books" causing the cost of trade to be higher and hence profitability to be lower. One might still ask: Why would a low-corrupt country trade with a high-corrupt country? One possibility is that a low-corrupt country might be indifferent to the partner country's level of corruption as long as they are not directly involved in corruption. A reason for high-corrupt countries to trade more with low-corrupt countries is reputation (David-Barrett and Okamura, 2013).[16] High-corrupt countries might

the BLS, respectively. Ideally, non-fuel trade should be deflated by the deflator for non-fuel products, but the data for the latter is available beginning only from 2001, which would cause a substantial loss of observations. The base year for each price index is 2010.

[16] David-Barrett and Okamura (2013) suggest that corrupt countries might care about their reputation because the amount of aid from international donors might depend on a country's reputation concerning corruption. They

want to trade with low-corrupt countries to create a better reputation domestically and internationally. Our findings, therefore, suggest that claims by policymakers of high-corrupt countries that they are fighting corruption by trading with low-corrupt countries cannot be taken at the face value. Moreover, much in the same vein, as countries that are part of the OECD convention can credibly argue that their hands are tied and avoid paying bribes in foreign countries (Cuervo-Cazurra, 2006), it is also possible that low-corrupt countries could be much less affected by corruption in their trading partners as the general level of corruption in different countries is public information.[17]

The findings of our study have important policy implications. First, we show that corruption not only discourages the total volume of international trade but also influences the composition of trading partners. It is therefore important to combat corruption.[18] Second, our findings show that being part of an international anti-bribery convention can reduce a country's exposure to corruption in partner countries. Implementing anti-bribery laws, may, therefore, prove to be an effective tool in shielding a country from corruption.

Third, our findings suggest the need for active global partnership, consistent with the Sustainable Development Goal (SDG) #17: Rather than the corrupt practices only within their geographical boundaries, low-corrupt countries should actively take *all* corruption associated with their trade into account, including those that take place in partner countries without their direct involvement. When low corrupt countries (OECD signatories) trade with high corrupt countries, these countries could lobby for greater transparency and increase awareness of the dangers of corruption. For example, in the 2008 Siemens case, Germany and the United States exerted their OECD Convention enforcement efforts to indict Siemens AG and three of its subsidiaries for corruption for an amount of more than $1.4 billion in bribes paid to government bureaucrats in Asia, Africa, Europe, the Middle East and the Americas. Thus, countries with low levels of corruption (including those are signatories to the OECD convention) can promote awareness of the crime of corruption in trading partners (Brewster and Dryden 2018), thereby,

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show that a country's volume of aid raises with its progress through Extractive Industries Transparency Initiative (EITI) implementation process that is aimed at curbing corruption in oil, gas, and mining.

[17] In addition, in the context of the FDI, studies have shown that multinational companies (MNCs) may see higher returns in countries with high levels of corruption where the "rules of the game" are known (Petrou et al. 2014, Wei 1997, Campos et al. 1999). Wei (1997) and Campos et al. (1999) cite East Asia and China in this regard which have been able to attract a large volume of private capital from many developed countries despite rising levels of corruption.

[18] Studies have identified several cultural, democratic, economic, and institutional determinants of corruption across countries (see for instance, Jha and Panda, 2017; Treisman, 2000) that can be used as a guide by the policy makers to combat corruption.

contributing to SDG #17. The final implication stems from the difference in the findings from the existing literature. While Cuervo-Cazurra (2006) finds that a corrupt country attracts less FDI from less corrupt countries, we find the exact opposite in international trade, where a high-corrupt country trades more with less corrupt countries. Similarly, while Cuervo-Cazurra (2006) finds that members that are signatory to the OECD convention invest less in more corrupt countries, we find that members of the OECD convention trade more with more corrupt countries. And, while previous studies have found evidence of a positive assortative matching concerning institutions (De Groot et al., 2004; Lavellee, 2005), our findings indicate a negative assortative matching with respect to corruption. Our results, therefore, suggest that policymakers and researchers need to be careful in extrapolating (1) the effects of corruption on one outcome to another in international context (FDI vs. foreign trade flows) and (2) the effects of one dimension of institutions to others.

Our findings have important implications for future research on this topic. We show that not only the levels of corruption in the origin and destination countries matter for the volume of trade between two countries, but their interaction effect or the distance between them also plays an important role. This suggests that a correct specification must account for the effect of institutional dissimilarities by including an interaction effect or a distance variable whose omission could be one of the underlying reasons for the current mixed evidence on the relationship between corruption and international trade. Further, our results suggests that corruption distance (as a measure of institutional dissimilarities) has ramifications for bilateral trade costs. Therefore, gravity models on international trade, especially those focusing on institutional characteristics, should consider including corruption (institutional) distance between two trading partners to proxy for this implication for bilateral trade cost.[19]

[19] We thank an anonymous referee for pointing this out.

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Table 1: Summary Statistics

	N	Mean	SD	Min	Max
Real Trade Flows (in Millions $)	632073	330.818	4068.799	0.000	428973.813
High Corruption (Origin)	523832	0.531	0.499	0.000	1.000
Bribery Law (Origin)	565969	0.182	0.386	0.000	1.000
Corruption (Destination)	529509	0.081	1.004	-2.470	1.869
Absolute Corruption Distance (|Org.-Dest.|)	521382	1.120	0.871	0.000	4.262
Real GDP (in Millions $) (Origin), in logs	607730	10.127	2.426	3.154	16.601
Real GDP (in Millions $) (Destination), in logs	612773	10.248	2.334	3.154	16.601
Population (in Millions, Origin)	631552	35.090	131.652	0.009	1364.270
Population (in Millions, Destination)	631827	36.237	133.011	0.009	1364.270
Distance, in logs	626651	8.744	0.778	2.349	9.899
Contiguity (=1)	626651	0.017	0.130	0.000	1.000
Common Official Language (=1)	626651	0.152	0.359	0.000	1.000
Colony (If ever in a colonial relationship=1)	626651	0.011	0.106	0.000	1.000
Regional Trading Agreement (=1)	632073	0.161	0.367	0.000	1.000
Landlocked (=1)	632073	0.349	0.477	0.000	1.000
Mean Tariff Rate (in %, Origin)	441956	7.289	10.840	0.000	421.500
Mean Tariff Rate (in %, Destination)	457111	7.341	11.022	0.000	421.500
Polity (Origin)	532476	3.341	6.500	-10.000	10.000
Polity (Destination)	550205	3.343	6.485	-10.000	10.000
Relative Factor Endowment	589150	-231.617	24426.693	-111742.047	111742.047
Per Capita GDP Growth Rate, Origin (in %)	605984	2.677	6.374	-62.225	140.501
Per Capita GDP Growth Rate, Destination (in %)	611235	2.709	6.355	-62.225	140.501

Table 2: Corruption and Assortative Matching in Trade: PPML Estimation

Dependent Variable: Real Trade Flows (in Mil. $)					
	(1)	(2)	(3)	(4)	(5)
High Corruption (Origin)	-0.051**	-0.146***	-0.164***	-0.180***	-0.182***
	(0.024)	(0.043)	(0.050)	(0.051)	(0.051)
Corruption (Destination)	-0.143***	-0.110**	-0.130***	-0.130***	-0.129***
	(0.046)	(0.051)	(0.048)	(0.049)	(0.049)
High Corruption (O) × Corruption (D)		-0.109**	-0.134***	-0.136***	-0.136***
		(0.044)	(0.045)	(0.045)	(0.045)
Log (Distance)	-0.638***	-0.634***	-0.617***	-0.613***	-0.613***
	(0.033)	(0.033)	(0.032)	(0.032)	(0.032)
Contiguous	0.428***	0.453***	0.482***	0.486***	0.486***
	(0.086)	(0.083)	(0.081)	(0.081)	(0.081)
Common Language	0.067	0.063	0.074	0.072	0.072
	(0.081)	(0.080)	(0.082)	(0.082)	(0.082)
Colony	0.292***	0.308***	0.232**	0.231**	0.231**
	(0.100)	(0.098)	(0.093)	(0.093)	(0.093)
RTA	0.385***	0.410***	0.443***	0.444***	0.444***
	(0.057)	(0.058)	(0.058)	(0.059)	(0.059)
Landlocked	-0.242	-0.229	-0.208	-0.210	-0.210
	(0.190)	(0.190)	(0.196)	(0.196)	(0.196)
Log (Real GDP) (O)	1.038***	1.052***	0.912***	0.917***	0.928***
	(0.091)	(0.089)	(0.091)	(0.091)	(0.093)
Log (Real GDP) (D)	1.076***	1.091***	1.056***	1.062***	1.047***
	(0.097)	(0.100)	(0.112)	(0.112)	(0.114)
Population (O)	-0.002**	-0.002**	-0.001*	-0.001*	-0.002*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Population (D)	0.001	0.001	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Mean Tariff Rate (O)			-0.016***	-0.016***	-0.015***
			(0.005)	(0.005)	(0.005)
Mean Tariff Rate (D)			-0.008	-0.008	-0.008
			(0.006)	(0.006)	(0.006)
Polity (O)				-0.010**	-0.011**
				(0.005)	(0.004)
Polity (D)				-0.008*	-0.007*
				(0.004)	(0.004)
RFE					0.000
					(0.000)
Per Capita GDP Growth Rate (O)					0.001
					(0.001)
Per Capita GDP Growth Rate (D)					-0.000
					(0.002)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Origin Fixed Effects	Yes	Yes	Yes	Yes	Yes
Destination Fixed Effects	Yes	Yes	Yes	Yes	Yes
N	486072	486072	287745	232239	232239
Pseudo R-Squared	0.932	0.932	0.935	0.932	0.932

Note: Robust standard errors clustered by country-pair in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Constant is not reported.

Table 3: OECD Convention, Corruption, and Trade: PPML Estimation

Dependent Variable: Real Trade Flows (in Mil. $)					
	(1)	(2)	(3)	(4)	(5)
Bribery Law (Origin)	0.091***	0.178***	0.279***	0.277***	0.279***
	(0.028)	(0.050)	(0.052)	(0.052)	(0.053)
Corruption (Destination)	-0.145***	-0.194***	-0.236***	-0.238***	-0.239***
	(0.044)	(0.051)	(0.051)	(0.051)	(0.052)
Bribery Law (O) × Corruption (D)		0.082**	0.103***	0.105***	0.106***
		(0.037)	(0.038)	(0.038)	(0.038)
Log (Distance)	-0.642***	-0.641***	-0.624***	-0.619***	-0.619***
	(0.033)	(0.033)	(0.032)	(0.032)	(0.032)
Contiguous	0.424***	0.436***	0.468***	0.472***	0.472***
	(0.086)	(0.085)	(0.083)	(0.083)	(0.083)
Common Language	0.066	0.065	0.075	0.073	0.073
	(0.082)	(0.082)	(0.083)	(0.083)	(0.083)
Colony	0.293***	0.304***	0.230**	0.229**	0.229**
	(0.100)	(0.098)	(0.093)	(0.093)	(0.093)
RTA	0.379***	0.399***	0.436***	0.437***	0.438***
	(0.058)	(0.060)	(0.059)	(0.059)	(0.059)
Landlocked	-0.235	-0.225	-0.203	-0.206	-0.205
	(0.191)	(0.190)	(0.196)	(0.197)	(0.197)
Log (Real GDP) (O)	1.006***	1.022***	0.871***	0.875***	0.891***
	(0.089)	(0.088)	(0.087)	(0.087)	(0.091)
Log (Real GDP) (D)	1.117***	1.104***	1.076***	1.080***	1.062***
	(0.097)	(0.098)	(0.108)	(0.108)	(0.112)
Population (O)	-0.002**	-0.002**	-0.001	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Population (D)	0.001	0.001	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Mean Tariff Rate (O)			-0.011**	-0.011**	-0.010**
			(0.005)	(0.005)	(0.005)
Mean Tariff Rate (D)			-0.007	-0.007	-0.007
			(0.006)	(0.006)	(0.006)
Polity (O)				-0.009*	-0.009*
				(0.005)	(0.005)
Polity (D)				-0.006	-0.005
				(0.004)	(0.004)
RFE					0.000
					(0.000)
Per Capita GDP Growth Rate (O)					0.001
					(0.001)
Per Capita GDP Growth Rate (D)					-0.001
					(0.002)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Origin Fixed Effects	Yes	Yes	Yes	Yes	Yes
Destination Fixed Effects	Yes	Yes	Yes	Yes	Yes
N	460175	460175	281098	226717	226717
Pseudo R-Squared	0.932	0.932	0.935	0.932	0.932

Note: Robust standard errors clustered by country-pair in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1. Constant is not reported.

Table 4: Corruption and Assortative Matching in Trade: PPML Estimation

Dependent Variable: Real Trade Flows (in Mil. $)					
	(1)	(2)	(3)	(4)	(5)
Corruption (Destination)	-0.144***	-0.140***	-0.163***	-0.163***	-0.163***
	(0.046)	(0.047)	(0.046)	(0.046)	(0.047)
|Corruption Distance|		0.050**	0.059**	0.060**	0.060**
		(0.025)	(0.025)	(0.025)	(0.025)
Log (Distance)	-0.638***	-0.638***	-0.622***	-0.618***	-0.618***
	(0.033)	(0.033)	(0.032)	(0.032)	(0.032)
Contiguous	0.429***	0.443***	0.472***	0.477***	0.477***
	(0.085)	(0.083)	(0.081)	(0.081)	(0.081)
Common Language	0.067	0.070	0.081	0.079	0.079
	(0.081)	(0.081)	(0.082)	(0.082)	(0.082)
Colony	0.292***	0.304***	0.228**	0.227**	0.227**
	(0.100)	(0.098)	(0.094)	(0.094)	(0.094)
RTA	0.385***	0.402***	0.433***	0.434***	0.434***
	(0.057)	(0.058)	(0.058)	(0.059)	(0.059)
Landlocked	-0.242	-0.224	-0.201	-0.203	-0.203
	(0.190)	(0.194)	(0.201)	(0.201)	(0.201)
Log (Real GDP) (O)	1.038***	1.053***	0.913***	0.917***	0.929***
	(0.091)	(0.089)	(0.090)	(0.091)	(0.093)
Log (Real GDP) (D)	1.076***	1.089***	1.056***	1.061***	1.046***
	(0.097)	(0.100)	(0.112)	(0.112)	(0.114)
Population (O)	-0.002**	-0.002**	-0.002*	-0.002*	-0.002*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Population (D)	0.001	0.001	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Mean Tariff Rate (O)			-0.015***	-0.015***	-0.015***
			(0.005)	(0.005)	(0.005)
Mean Tariff Rate (D)			-0.007	-0.008	-0.008
			(0.006)	(0.006)	(0.006)
Polity (O)				-0.008*	-0.009*
				(0.005)	(0.005)
Polity (D)				-0.007*	-0.007
				(0.004)	(0.004)
RFE					0.000
					(0.000)
Per Capita GDP Growth Rate (O)					0.001
					(0.001)
Per Capita GDP Growth Rate (D)					-0.000
					(0.002)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Origin Fixed Effects	Yes	Yes	Yes	Yes	Yes
Destination Fixed Effects	Yes	Yes	Yes	Yes	Yes
N	488397	486072	287745	232239	232239
Pseudo R-Squared	0.932	0.932	0.935	0.932	0.932

Note: Robust standard errors clustered by country-pair in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1. Constant is not reported.

Table 5: Robustness Check with High Dimensional Fixed Effects: PPML Estimation

Dependent Variable: Real Trade Flows (in Mil. $)			
	(1)	(2)	(3)
High Corruption (O) × Corruption (D)	-0.128***		
	(0.044)		
|Corruption Distance|		0.058**	
		(0.025)	
Bribery Law (O) × Corruption (D)			0.094**
			(0.039)
High Corruption (Origin)	Y (Drop)		
Corruption (Destination)	Y (Drop)	Y (Drop)	Y (Drop)
Bribery Law (Origin)			Y (Drop)
Log (Distance)	-0.631***	-0.636***	-0.639***
	(0.033)	(0.033)	(0.034)
Contiguous	0.438***	0.427***	0.423***
	(0.083)	(0.083)	(0.086)
Common Language	0.065	0.072	0.067
	(0.080)	(0.081)	(0.082)
Colony	0.306***	0.302***	0.302***
	(0.097)	(0.098)	(0.097)
RTA	0.444***	0.434***	0.429***
	(0.060)	(0.060)	(0.062)
Landlocked	-0.236	-0.230	-0.231
	(0.188)	(0.192)	(0.189)
Log (Real GDP) (O)	Y (Drop)	Y (Drop)	Y (Drop)
Log (Real GDP) (D)	Y (Drop)	Y (Drop)	Y (Drop)
Population (O)	Y (Drop)	Y (Drop)	Y (Drop)
Population (D)	Y (Drop)	Y (Drop)	Y (Drop)
Origin FE × Year FE	Yes	Yes	Yes
Destination FE × Year FE	Yes	Yes	Yes
N	486072	486072	460175
Pseudo R-Squared	0.936	0.936	0.935

Note: Robust standard errors clustered by country-pair in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1. Constant is not reported. The regression specifications include the baseline variables. Y(Drop) indicates that the variable was introduced but was dropped by PPML estimation procedure due to collinearity with fixed effects. It can be seen that the dropped variables are country specific-time varying variables which are correlated with high dimensional fixed effects.

Table 6: Corruption and Assortative Matching in Trade: Pooled OLS Estimation (Robustness Check)

Dependent Variable: Real Trade Flows (in Mil. $) (in Logs)						
	(1)	(2)	(3)	(4)	(5)	(6)
High Corruption (O) × Corruption (D)	-0.050**	-0.048**				
	(0.019)	(0.020)				
|Corruption Distance|			0.044***	0.047***		
			(0.014)	(0.015)		
Bribery Law (O) × Corruption (D)					0.043**	0.040*
					(0.020)	(0.021)
High Corruption (Origin)	-0.065***	Y(Drop)				
	(0.020)					
Corruption (Destination)	-0.138***	Y(Drop)	-0.163***	Y(Drop)	-0.177***	Y(Drop)
	(0.026)		(0.024)		(0.026)	
Bribery Law (Origin)					0.248***	Y(Drop)
					(0.022)	
Log (Distance)	Yes	Yes	Yes	Yes	Yes	Yes
Contiguous	Yes	Yes	Yes	Yes	Yes	Yes
Common Language	Yes	Yes	Yes	Yes	Yes	Yes
Colony	Yes	Yes	Yes	Yes	Yes	Yes
RTA	Yes	Yes	Yes	Yes	Yes	Yes
Landlocked	Yes	Yes	Yes	Yes	Yes	Yes
Log (Real GDP) (O)	Yes	Y(Drop)	Yes	Y(Drop)	Yes	Y(Drop)
Log (Real GDP) (D)	Yes	Y(Drop)	Yes	Y(Drop)	Yes	Y(Drop)
Population (O)	Yes	Y(Drop)	Yes	Y(Drop)	Yes	Y(Drop)
Population (D)	Yes	Y(Drop)	Yes	Y(Drop)	Yes	Y(Drop)
Year Fixed Effects	Yes	No	Yes	No	Yes	No
Origin Fixed Effects	Yes	No	Yes	No	Yes	No
Destination Fixed Effects	Yes	No	Yes	No	Yes	No
Origin FE × Year FE	No	Yes	No	Yes	No	Yes
Destination FE × Year FE	No	Yes	No	Yes	No	Yes
N	323565	323565	323565	323565	306709	306709
R-Squared	0.721	0.732	0.721	0.732	0.723	0.733

Note: Robust standard errors clustered by country-pair in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Constant is not reported. Each column reports the results with baseline specification. Y(Drop) indicates that the variable was introduced but was dropped during estimation due to collinearity with fixed effects. It can be seen that the dropped variables are country specific-time varying variables which are correlated with high dimensional fixed effects.

Table 7: Corruption and Assortative Matching in Trade: (Robustness Check-Alternative Corruption Indices)

Dependent Variable: Real Trade Flows (in Mil. $)						
	(1)	(2)	(3)	(4)	(5)	(6)
	ICRG	ICRG	TI	ICRG	ICRG	TI
High Corr (O) × Corr (D)	-0.064**		-0.002			
	(0.027)		(0.002)			
|Corruption Distance|		0.046**		0.002**		
		(0.019)		(0.001)		
Bribery Law (O) × Corr (D)					0.091***	0.004**
					(0.030)	(0.002)
High Corruption (Origin)	Y(Drop)		Y(Drop)			
Corruption (Destination)	Y(Drop)	Y(Drop)	Y(Drop)	Y(Drop)	Y(Drop)	Y(Drop)
Bribery Law (Origin)					Y(Drop)	Y(Drop)
Log (Distance)	Yes	Yes	Yes	Yes	Yes	Yes
Contiguous	Yes	Yes	Yes	Yes	Yes	Yes
Common Language	Yes	Yes	Yes	Yes	Yes	Yes
Colony	Yes	Yes	Yes	Yes	Yes	Yes
RTA	Yes	Yes	Yes	Yes	Yes	Yes
Landlocked	Yes	Yes	Yes	Yes	Yes	Yes
Log (Real GDP) (O)	Y(Drop)	Y(Drop)	Y(Drop)	Y(Drop)	Y(Drop)	Y(Drop)
Log (Real GDP) (D)	Y(Drop)	Y(Drop)	Y(Drop)	Y(Drop)	Y(Drop)	Y(Drop)
Population (O)	Y(Drop)	Y(Drop)	Y(Drop)	Y(Drop)	Y(Drop)	Y(Drop)
Population (D)	Y(Drop)	Y(Drop)	Y(Drop)	Y(Drop)	Y(Drop)	Y(Drop)
Origin FE × Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Destination FE × Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	326893	326893	348433	348433	397567	414527
Pseudo R-Squared	0.931	0.931	0.934	0.934	0.934	0.935

Note: Robust standard errors clustered by country-pair in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Constant is not reported. Each column reports the results with the baseline specification. Columns (1), (2), (4) and (5) report the results with ICRG Index and columns (3) and (6) reports the results with Transparency International Index. Y(Drop) indicates that the variable was introduced but was dropped by PPML estimation procedure due to collinearity with fixed effects. It can be seen that the dropped variables are country specific-time varying variables which are correlated with high dimensional fixed effects.

Table 8: Corruption and Assortative Matching in Trade: Fuel vs. Non-Fuel Trade

	Dependent Variable: Real Trade Flows (in Mil. $)								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Aggregate	Fuel	Non-Fuel	Aggregate	Fuel	Non-Fuel	Aggregate	Fuel	Non-Fuel
High Corr (O) × Corr (D)	-0.122***	-0.004	-0.165***						
	(0.042)	(0.078)	(0.044)						
|Corr Distance|				0.056**	-0.055	0.084***			
				(0.025)	(0.057)	(0.025)			
Bribery Law (O) × Corr (D)							0.090**	-0.036	0.142***
							(0.038)	(0.078)	(0.041)
Corr (D)	Y(Drop)	Y(Drop)	Y(Drop)	Y(Drop)	Y(Drop)	Y(Drop)	Y(Drop)	Y(Drop)	Y(Drop)
High Corr (O)	Y(Drop)	Y(Drop)	Y(Drop)						
Bribery Law (O)							Y(Drop)	Y(Drop)	Y(Drop)
Log (Distance)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Contiguous	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Common Language	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Colony	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
RTA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Landlocked	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Log (Real GDP) (O)	Y(Drop)	Y(Drop)	Y(Drop)	Y(Drop)	Y(Drop)	Y(Drop)	Y(Drop)	Y(Drop)	Y(Drop)
Log (Real GDP) (D)	Y(Drop)	Y(Drop)	Y(Drop)	Y(Drop)	Y(Drop)	Y(Drop)	Y(Drop)	Y(Drop)	Y(Drop)
Population (O)	Y(Drop)	Y(Drop)	Y(Drop)	Y(Drop)	Y(Drop)	Y(Drop)	Y(Drop)	Y(Drop)	Y(Drop)
Population (D)	Y(Drop)	Y(Drop)	Y(Drop)	Y(Drop)	Y(Drop)	Y(Drop)	Y(Drop)	Y(Drop)	Y(Drop)
Origin FE × Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Destination FE × Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	424881	412035	424702	424881	412035	424702	410616	397528	410435
Pseudo R-Squared	0.938	0.866	0.954	0.934	0.866	0.954	0.934	0.866	0.954

Note: Robust standard errors clustered by country-pair in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Constant is not reported. Each column reports the results with the baseline specification. Y(Drop) indicates that the variable was introduced but was dropped by PPML estimation procedure due to collinearity with fixed effects. It can be seen that the dropped variables are country specific-time varying variables which are correlated with high dimensional fixed effects.