EFFECTS OF TRADE ON CORRUPTION  
IN ECONOMIES WITH HETEROGENEOUS FIRMS  
Chapter 1  
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This paper studies the effect of trade liberalization on corruption using Melitz’s model. We find that corruption increases because of an increase in benefits from bribery for firms in the economy as a whole. In fact, this increase in bribery incentive is proportional to the increase in total production as a result of trade openness. Moreover, when home country trades with a less corrupt foreign country, fewer domestic firms will stay active than in the symmetric case but many of them will become exporters. When foreign firms have to pay higher exporting cost, home country will have more firms operating domestically but only a smaller number of them will export. The effect on corruption level is determined by the magnitudes of these changes in home country’s market environment.

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1 Introduction

Corruption and its effect on economic growth have been a popular topic of debates among economists. The general consensus is that corruption affects growth negatively. Mauro (1995) is one of the first papers using systematic cross-country empirical analysis to study corruption, measured by indicators of bureaucratic honesty, and efficiency to economic growth. He found that corruption lowers private investment and reduces economic growth. A popular explanation for this negative effect is that corruption allows inefficient usage of resources and distorts economic activities.

Some have found that other variables play an important role in determining the relationship between corruption and economic growth. Ehrlich and Lui (1999) study the investments in accumulating human capital and accumulating political capital and their consequences on long-term growth under two political regimes. Neeman, Paserman, and Simhon (2008) have found evidence that the relationship between corruption and output per capita is strongly related to a country's degree of openness. Corruption and GNP per capita in open economies are negatively correlated but show no relationship in closed economies. Other empirical studies, including Ades and Di Tella (1999), Fisman and Gatti (2002), Goldsmith (1999), Treisman (2000), and Wei (2000), have found that higher trade intensity and/or small populations are associated with lower corruption levels. On the other hand, Dutt and Traca (2010) show that in high tariff environments, corruption can actually enhance trade flows between countries by allowing firms to evade these tariff barriers.

This paper contributes to the literature on corruption by studying the effect of trade liberalization on corruption caused by a reallocation of market shares within firms and not by an improvement in technology of individual firms. The theoretical model is based on Melitz (2003) which models how international trade reallocates resources among heterogeneous firms in a monopolistically competitive industry. Trade openness does not affect distribution of individual firms' productivity but it reallocates market shares to more productive firms.
In this paper, corruption is defined as firms' willingness to bribe government officials to reduce their variable costs in production. An example of this type of bribery is providing monetary benefit to public officials to increase per unit input value added tax (VAT) claim to reduce overall variable cost. Bribery can also be used to lower the costs of complying to environmental or labor regulations. Firms that bribe government regulators may be able to pollute more carbon dioxide into the air without buying more CO₂ permits in countries that have emissions trading programs. They may be able to get away with having working conditions below national standards. These activities help cut variable costs because the costs of maintaining enough CO₂ permits for their production or providing workers with acceptable working conditions increase because firms pollute more or hire more workers when they increase outputs. Firms can also pay bribes to other public officials, such as health inspectors, safety inspectors, and fire inspectors, to avoid complying to various regulations. The expenses on these bribes are considered an increase in fixed costs that may help reduce variable costs in production for businesses involved in bribery. Moreover, firms can bribe government officials to evade tariffs. Sequeira and Djankov (2010) call this type of corruption "collusive corruption" since public officials and private agents collude to share rents generated by involving in illegal transactions. They study a situation between two competing ports in Southern Africa. If a South African firm chooses to ship through the port of Maputo, it will only have to pay tariffs when the cargo enters South Africa and not at the port of Maputo. However, while the shipment is in transit in Mozambique, South African firms have to pay a refundable transit bond equal to the tariff amount the cargo would have to pay to Mozambican customs, were it to stay in Mozambique. While transit bond procedures are in principle straightforward, customs in Maputo would often seek to re-classify shipments or change shipment values, threatening to increase the amount of transit bond to negotiate a bribe with firms.

The approach used in this paper is similar to the innovation literature which includes several studies showing how firms choose to spend more on fixed costs to reduce variable costs.
in Melitz’s international trade model, such as Bustos (2011) and Yeaple (2005). Bustos shows that more productive firms will choose higher technology and trade openness encourages more firms to upgrade their technology. Falvey et al (2007) studying the case where home country has a superior technology compared to foreign country concludes that the home survival cutoff is lower and the home export cutoff is higher than the foreign ones.

The main research question here is whether a country will experience more or less corruption with trade openness. We find that trade liberalization increases firms’ willingness to bribe government officials in the overall economy proportionally to the increase in total production. However, the effect is different for firms producing only in domestic market and exporting firms. Departing from the symmetric case, this paper also studies the situation where foreign country is less corrupt than home country and shows that home country will have fewer firms but many of them will be exporters. When foreign firms have to pay higher exporting cost, home country has more firms but only a small number of them will export. The effect on corruption level depends on the magnitudes of these changes in the home country.

The paper is organized as follows. Section 2 provides the basic setup of Melitz’ model with CES preferences demand and Cobb-Douglas production function. Section 3 introduces an option for firms to produce and export goods to foreign markets. Section 4 analyzes firms’ decisions on whether to produce, to export, and how much to bribe government officials. Section 5 analyzes the case where countries are asymmetric. Finally, section 6 summarizes key results from the model.

2 The Setup

2.1 Demand

We have an economy with homogeneous consumers and heterogeneous firms. A representative consumer has income $I$ and $CES$ preferences over a set of differentiated goods $x \in X$, 
where $X$ is a set of all potentially available goods. Income consists of wages normalized to 1 paid for inelastically supplied amount of labor $L$ and firm profits $\pi$ which are equally distributed among all consumers.

Consumer maximizes his utility as follows:

$$\max_{q(x)} U = \left( \int_{x \in X} q(x)^\rho dx \right)^{\frac{1}{\rho}}, \quad 0 < \rho < 1$$

s.t. $\int_{x \in X} p(x)q(x)dx = I = L + \pi$

where $\tilde{q}(x)$ is the demand for good $x$, $p(x)$ is the price of good $x$, $\sigma$ is the elasticity of substitution between any two goods with $\sigma > 1$ and $\rho \equiv \frac{\sigma - 1}{\sigma}$. We define the aggregate price index $P$ as:

$$P = \left[ \int_{x \in X} p(x)^{1-\sigma} dx \right]^{\frac{1}{1-\sigma}}.$$

The demand for good $x$ is derived from the consumer maximization problem:

$$q(x) = \left( \frac{I}{P} \right) \left[ \frac{p(x)}{P} \right]^{-\sigma},$$

and the price elasticity of demand is:

$$\varepsilon_p = -\frac{dq}{dp} \frac{p}{q} = \sigma.$$

### 2.2 Production

We consider a monopolistically competitive market with $N$ firms where each firm produces a differentiated good $x$. They can choose to bribe government officials to reduce their variable costs or not, which is the main departure from Melitz’s model. The increasing returns
technologies for bribing and non-bribing firms are defined as follows

\[ TC^{mb}(\varphi) = f + \frac{1}{\varphi} q, \]
\[ TC^{b}(\varphi) = f + \frac{1}{\varphi r} q + B. \]

where \( f > 0 \) is the fixed cost of production which is the same for all firms, \( \varphi \geq 1 \) is a firm's productivity level, and \( r > 1 \) is the amount of variable cost that can be reduced by bribing government officials. Firms choosing to bribe will incur extra fixed costs \( B \), which we will discuss later.

Each firm draws its productivity from a Pareto distribution with the cumulative distribution function:

\[ F(\varphi) = 1 - \varphi^{-\gamma}, \gamma > Max\{1, \sigma - 1\}. \] (1)

The assumption \( \gamma > Max\{1, \sigma - 1\} \) assures that in equilibrium the size distribution of firms has a finite mean.

Firm maximizes its profits:

\[ \max_p \pi^{mb}(\varphi) = pq - \frac{1}{\varphi} q - f, \]
\[ \text{or } \max_p \pi^{b}(\varphi) = pq - \frac{1}{\varphi r} q - f - B, \]
\[ \text{s.t. } \pi^{mb} \geq 0, \pi^{b} \geq 0. \]

Solving the firm's problem, we have:

\[ p^{mb}(\varphi) = \frac{1}{\rho \varphi}, \quad p^{b}(\varphi) = \frac{1}{\rho \varphi r} \]
\[ q^{mb}(\varphi) = IP^{\sigma-1}(\rho \varphi)^\sigma, \quad q^{b}(\varphi) = IP^{\sigma-1}(\rho \varphi r)^\sigma, \text{ and} \]
\[ \pi^{mb}(\varphi) = \frac{I(P \rho \varphi)^{\sigma-1}}{\sigma} - f, \quad \pi^{b}(\varphi) = \frac{I(P \rho \varphi r)^{\sigma-1}}{\sigma} - f - B. \]
3 Model with International Trade

Let two identical economies of the type described above trade with each other. That means the foreign country has the same parameters as the domestic economy.

3.1 Production in the Domestic Market

The equilibrium price $p_d$, quantity $q_d$, and profits $\pi_d$ in the domestic market given the aggregate price index in the open economy $P_T$ and consumer income $I_T$ are as follows:

\[ p_d^{nb}(\varphi) = \frac{1}{\rho + \sigma}, \quad p_d^b(\varphi) = \frac{1}{\rho + \rho r} \]
\[ q_d^{nb}(\varphi) = I_T P_T^{\sigma - 1}(\rho + \sigma)^{\sigma}, \quad q_d^b(\varphi) = I_T P_T^{\sigma - 1}(\rho + \rho r)^{\sigma}, \text{ and} \]
\[ \pi_d^{nb}(\varphi) = \frac{I_T(P_T^{\rho + \rho r})^{\sigma - 1}}{\sigma} - f, \quad \pi_d^b(\varphi) = \frac{I_T(P_T^{\rho + \rho r})^{\sigma - 1}}{\sigma} - f - B, \]

3.2 Exports

Following Melitz (2003), we model international trade with two new cost parameters. Let $\tau > 1$ be a per-unit cost for exporting, including transportation costs and tariffs. Also, let $f_x$ be the fixed cost of exporting and $f_x > f$. Then, the total cost of an exporting firm in the foreign market is:

\[ TC_x^{nb}(\varphi) = f_x + \left( \frac{\tau}{\varphi} \right) q_x, \]
\[ \text{or } TC_x^b(\varphi) = f_x + \left( \frac{\tau}{\varphi r} \right) q_x + B. \]

An exporting firm maximizes its profits in the foreign market as follows:

\[ \max_{p_x} \pi_x^{nb}(\varphi) = p_x q_x - \frac{\tau}{\varphi} q_x - f_x, \]
\[ \text{or } \max_{p_x} \pi_x^b(\varphi) = p_x q_x - \frac{\tau}{\varphi r} q_x - f_x - B. \]
\[ \text{s.t. } \pi_x \geq 0. \]
Then, the equilibrium price, quantity, and profits for an exporting firm in the foreign market are:

\[
\begin{align*}
p^b_x(\varphi) &= \frac{\tau}{\rho \varphi}, \quad p^b_x(\varphi) = \frac{\tau}{\rho \varphi r}, \\
q^b_x(\varphi) &= I_T P_T^{\varphi - 1} \left( \frac{\rho \varphi}{\tau} \right)^\sigma, \quad q^b_x(\varphi) = I_T P_T^{\varphi - 1} \left( \frac{\rho \varphi r}{\tau} \right)^\sigma, \quad \text{and} \\
\pi^b_x(\varphi) &= \frac{I_T}{\sigma} \left( \frac{P_T P_T}{\tau} \right)^{\sigma - 1} - f_x, \quad \pi^b_x(\varphi) = \frac{I_T}{\sigma} \left( \frac{P_T P_T}{\tau} \right)^{\sigma - 1} - f_x - B.
\end{align*}
\]

Since exporting firms operate both in the domestic market and the foreign market, their profits are \( \pi_X(\varphi) = \pi_d(\varphi) + \pi_x(\varphi) \). We also have that \( I_T = I = \frac{\varphi}{\gamma - \rho} L \). Here, all costs are paid to domestic labor so it does not make a difference whether firms pay to a public official in the form of bribes or to labor in the form of wages.

\[\textbf{4} \quad \textbf{Corruption in An Open Economy}\]

\[\textbf{4.1} \quad \textbf{Firms' Production, Exporting, and Bribery Decisions}\]

From the above sections, we can summarize the profit functions for firms depending on their choices of whether to export or not, whether to bribe or not, and if yes, how much to pay in bribes.

\[
\begin{align*}
\pi^b_d &= \frac{I_T}{\sigma} \left( \frac{\rho \varphi P_T}{\tau} \right)^{\sigma - 1} - f, \\
\pi^b_d &= \frac{I_T}{\sigma} \left( \frac{\rho \varphi P_T r}{\tau} \right)^{\sigma - 1} - f - B, \\
\pi^b_x &= \tau^{1 - \sigma} \frac{I_T}{\sigma} \left( \frac{\rho \varphi P_T}{\tau} \right)^{\sigma - 1} - f_x, \\
\pi^b_x &= \tau^{1 - \sigma} \frac{I_T}{\sigma} \left( \frac{\rho \varphi P_T r}{\tau} \right)^{\sigma - 1} - (f_x + B).
\end{align*}
\]

Producing firms face three 0:1 decisions: whether to produce, whether to export, and whether to bribe. Since they have to decide whether to stay in the market first and only
firms that earn non-negative profits will produce, the cut-off level of producing firms $\varphi_d$ satisfies $\pi^{nb}(\varphi_d) = 0$, so

$$\varphi_d = \frac{1}{P_T \rho} \left( \frac{f \sigma}{I_T} \right)^{\frac{1}{\sigma-1}}. \tag{2}$$

Secondly, firms decide whether to export and only firms that earn non-negative profits from exporting will export, the cut-off level of exporting firms $\varphi_x$ satisfies $\pi^{nb}(\varphi_x) = 0$, so

$$\varphi_x = \frac{\tau}{P_T \rho} \left( \frac{f_x \sigma}{I_T} \right)^{\frac{1}{\sigma-1}}$$

$$= \varphi_d \left[ \frac{f_x \tau^{\sigma-1}}{f} \right]^{\frac{1}{\sigma-1}}.$$

Lastly, firms choose between bribing and not bribing. The maximum willingness to bribe of firms is the amount that makes firms indifferent between the two options. For firms operating only in the domestic market:

$$\pi^{nb}_d = \pi^b_d(B_d)$$

$$\frac{I_T}{\sigma} (\rho \varphi P_T)^{\sigma-1} - f = \frac{I_T}{\sigma} (\rho \varphi P_T r)^{\sigma-1} - f - B_d$$

So, the maximum amount firms only operating in the domestic market are willing to pay in bribes is

$$B_d(\varphi) = \frac{I_T}{\sigma} (P_T \rho \varphi)^{\sigma-1}(r^{\sigma-1} - 1).$$

Similarly, exporting firms face the same decision for their production to foreign market:

$$\pi^{nb}_x = \pi^b_x(B_x)$$

$$\tau^{1-\sigma} \frac{I_T}{\sigma} (\rho \varphi P_T)^{\sigma-1} - f_x = \tau^{1-\sigma} \frac{I_T}{\sigma} (\rho \varphi P_T r)^{\sigma-1} - f - B_x$$

Here, $B_x(\varphi)$ denotes the maximum bribery amount exporting firms are willing to pay for
their exported production only.

\[ B_x(\varphi) = \frac{I_T}{\sigma} \left( \frac{P_T \rho \varphi}{\tau} \right)^{\sigma - 1} (r^{\sigma - 1} - 1). \]

We assume that \( r^{\sigma - 1} > 1 \) so firms have an incentive to bribe.

### 4.2 Effects of Lower Exporting Costs on The Aggregate Price Index

We can obtain the aggregate price index in the open economy:

\[
P_T = \left[ \int_{\varphi_d}^{\infty} p_d(\varphi)^{1-\sigma} dF(\varphi) + \int_{\varphi_x}^{\infty} p_x(\varphi)^{1-\sigma} dF(\varphi) \right]^\frac{1}{1-\sigma}
= \left[ \int_{\varphi_d}^{\infty} \left( \frac{1}{\rho \varphi r} \right)^{1-\sigma} \gamma \varphi^{-\gamma - 1} d\varphi + \int_{\varphi_x}^{\infty} \left( \frac{2}{\rho \varphi r} \right)^{1-\sigma} \gamma \varphi^{-\gamma - 1} d\varphi \right]^\frac{1}{1-\sigma}.
\]

We can rewrite the aggregate price index as follows:

\[
P_T = P_T(\varphi_d, \varphi_x)
= \left[ \frac{\gamma}{\gamma - \sigma + 1} (\rho r)^{\sigma - 1} ((\varphi_d)_{\sigma - 1}^{-\gamma} + \left( \frac{1}{\tau} \right)^{\sigma - 1} (\varphi_x)^{\sigma - 1 - \gamma}) \right]^\frac{1}{\sigma - 1}
= \left[ \frac{\gamma}{\gamma - \sigma + 1} (\rho r)^{\sigma - 1} \left[ \left( \frac{1}{P_T \rho \varphi (f_x^\beta)} \right)^{\frac{1}{\sigma - 1}} + \left( \frac{1}{\tau} \right)^{\sigma - 1} \left( \frac{\varphi_x}{P_T f_x^\beta} \right)^{\frac{1}{\sigma - 1}} \right] \right]^\frac{1}{\sigma - 1}.
\]

\[
= \left[ \frac{\gamma}{\gamma - \sigma + 1} (\rho r)^{\sigma - 1} \gamma \left( \frac{\sigma}{I_T} \right) \left[ f_x^{\beta} + \tau^{-\gamma} (f_x^\beta) \right] \right]^\frac{1}{\sigma - 1} \frac{1}{P_T^{1 - \frac{1}{\sigma - 1}}}
= \left[ \frac{\gamma}{\gamma - \sigma + 1} (\rho r)^{\sigma - 1} \left( \frac{\sigma}{I_T} \right)^{\beta} \left( f_x^{\beta} + \tau^{-\gamma} f_x^\beta \right) \right]^\frac{1}{\beta}, \text{ where } \beta = \frac{\sigma - 1 - \gamma}{\sigma - 1}.
\]

We see that the cut-off level of producing firms, \( \varphi_d \), increases as \( \tau \) decreases. On the other hand, the cut-off level of exporting firms, \( \varphi_x \), decreases as \( \tau \) decreases (Appendix 7.1).

These results are consistent with previous studies on Melitz's model.
Proposition 1 For an individual firm producing only in domestic market, when exporting costs are lower, their willingness to bribe decreases.

Proposition 2 For an individual exporting firm, when exporting costs are lower, their willingness to bribe for the exported production increases.

Substituting $P_f$ into $B_d$ and $B_x$, we find that $B_d$ increases in $\tau$ and $B_x$ decreases in $\tau$. For firms producing only in the domestic market, lower willingness to bribe is due to lower price level associated with lower exporting costs. Exporting firms, in contrast, have more incentive to bribe for exported production because of the higher benefits of bribery when $\tau$ decreases (Appendix 7.2).

Proposition 3 For an individual exporting firm, when exporting costs are lower, their willingness to bribe for the total production in both domestic and foreign markets increases if $\left(\frac{\lambda}{f}\right)^{\beta} < \frac{\tau^{\alpha-1}}{\tau^\beta-1}$ and decreases if $\left(\frac{\lambda}{f}\right)^{\beta} > \frac{\tau^{\alpha}}{\tau^\beta-1}$.

Since an exporting firm operates in both domestic and foreign markets, its total bribery costs are

$$B_X(\varphi) = B_d(\varphi) + B_x(\varphi)$$

$$= \frac{I_T}{\sigma} (P_T \rho \varphi)^{\alpha-1} (\tau^{\alpha-1} - 1) \left(1 + \frac{1}{\tau^{\alpha-1}}\right).$$

How the total bribery costs change as a result of a decrease in variable exporting costs $\tau$ depends on the difference between the fixed costs in domestic market $f$ and the fixed costs in foreign market $f_x$. When exporting does not associate with much higher fixed costs than operating domestically $\left(\frac{\lambda}{f} < \tau^{\frac{\sigma-1}{\beta}}\right)$, exporting firms are willing to bribe more if variable exporting costs are lower (Appendix 7.2). That is because there is more incentive to export and pay in bribes for the exported production. When the fixed costs associated with exporting $f_x$ is much higher than the fixed costs for operating domestically $\left(\frac{\lambda}{f} > \tau^{\frac{\sigma-1}{\beta}}\right)$, the benefit from exporting and paying bribes for exported production is not enough to
compensate for the lowered incentive to pay bribes for domestic production. In addition, holding everything else constant, to both firms producing only in domestic market and exporting firms, the incentive to bribe increases as productivity \( \varphi \) increases due to higher benefits of bribery.

4.3 Willingness to Bribe Aggregated Across the Market

The previous section shows an individual firm’s decision making process. It is similar for all firms in the market. Aggregating across the market gives us

\[
\overline{B} = \overline{B}_d + p_x \overline{B}_x,
\]

where \( \overline{B}_d \) is the expected amount of bribery firms are willing to spend in domestic market, \( p_x = \frac{1 - F(\gamma_d)}{1 - F(\gamma_d)} \) is the probability of exporting conditional on survival, and \( \overline{B}_x \) is the expected amount of bribery in foreign market. Using the cut-off productivity levels obtained in the previous section, we can derive \( \overline{B} \) (Appendix 7.3):

\[
\overline{B} = \frac{\gamma}{\gamma - \sigma + 1} (r^{\sigma - 1} - 1) \left[ f + \left( r^{\sigma - 1} \frac{f_x}{f} \right) \frac{\overline{B}_x}{f_x} \right].
\]  \( \text{(5)} \)

**Proposition 4** The bribery expense to firms across the economy increases when the exporting costs, \( \tau \), decrease.

When the variable exporting cost, \( \tau \), decreases, the willingness to bribe of firms in aggregate increases because the probability of exporting increases and exporting firms have an incentive to bribe due to their larger quantity of production. However, when considering bribery as a fraction of total revenues, we have

\[
\frac{\overline{B}}{TR^b} = \frac{r^{\sigma - 1} - 1}{r^{\sigma - 1}}.
\]
The ratio also holds for any individual firm in the economy.

5 Analysis on Asymmetric Countries

The discussion so far has assumed that the foreign country is identical to the home country. Therefore, the cut-off levels of surviving firms, exporting firms, and firms involved in bribery from the home country can be applied to the foreign country. Let \( \varphi_s \) and \( \varphi_{xs} \) be the cut-off level of survival and of exporting in the symmetric case:

\[
\varphi_s = \frac{1}{P_T \rho} \left( \frac{f_\sigma}{I_T} \right)^{\frac{1}{\alpha-1}},
\]

\[
\varphi_{xs} = \frac{\tau}{P_T \rho} \left( \frac{f_\sigma}{I_T} \right)^{\frac{1}{\alpha-1}},
\]

where \( P_T \) is derived in equation (3)

When we assume different characteristics for home and foreign countries, these results do not hold anymore.

5.1 Foreign Country Is Not Corrupt

First, we look at the case where home country is corrupt but foreign country is not. That means foreign firms receive the same benefit of bribery \( r \) as firms in the home country without having to pay its costs \( B \). The total cost for foreign firms is

\[
\overline{TC} = f + \frac{1}{\overline{\varphi}} \overline{q},
\]

Let \( M = \left( \frac{f}{P_T} \right)^{\frac{1}{\alpha-1}} \frac{1}{P_T \rho} \) denote the market environment in home country and \( \overline{M} \) denote
the market environment in foreign country. We can write the cut-off productivity levels as

\[ \varphi_d = M \bar{f}^{\frac{1}{\sigma-1}}, \varphi_x = \bar{M} \bar{r}(f_x)^{\frac{1}{\sigma-1}} \] for home country,

\[ \bar{\varphi}_d = \frac{\bar{M}}{\bar{r}} \bar{f}^{\frac{1}{\sigma-1}}, \bar{\varphi}_x = \frac{\bar{M}}{\bar{r}}(f_x)^{\frac{1}{\sigma-1}} \] for foreign country.

Then, \[ \frac{\varphi_d}{\varphi_x} = \left( \frac{\bar{f}}{\bar{r}} \right)^{\frac{1}{\sigma-1}} \varphi_x = \mu^{-1}. \]

\[ \bar{\varphi}_x = \mu \varphi_d, \]

\[ \varphi_x = \mu \bar{\varphi}_d. \]

Figure 2 shows the comparison between the symmetric and asymmetric cases. Compared to the symmetric case, when foreign firms do not have to pay bribes \( B \) to government officials but still receive the benefits of lower variable costs \( r \). The zero-profit curve for foreign firms shifts inward because firms with lower productivity cut-off levels, \( \bar{\varphi}_d \) and \( \varphi_d \), can earn zero profit (Appendix 7.4.1). From Figure 2, the ordering of these cut-off productivity levels is as follows

\( \bar{\varphi}_d < \varphi_x < \varphi_d < \varphi_x < \varphi_x \).

**Proposition 5** When home country is corrupt and foreign country is not, home country has fewer active firms than in the symmetric case but a larger number of them are exporters.

Since firms in foreign country do not have to pay for bribes to have the cost reduction \( r \), foreign market still has lower productivity firms operating but when these firms want to export to home country, they face competition with surviving firms in home country that have higher average productivity levels due to bribery costs. Hence, it requires very high productivity level of firms in foreign country to make a profit from exporting to home country. In contrast, firms in home country have to pay more bribes and face competition from foreign firms; therefore, the number of active firms is less than that in foreign country.
However, those surviving firms in home country can easily make a profit from exports due to less fierce competition with lower average productivity firms in foreign country.

In summary, when trading with a less corrupt country, home country has fewer active firms but these firms have a higher chance of being exporters. Similarly, when trading with a more corrupt country, home country will have more active firms but only the very productive firms can export.

5.2 Firms From Foreign Country Pay Higher Exporting Cost Than Firms From Home Country

In this section, both countries are corrupt, which means firms in both countries have to pay bribes to receive the benefit $r$ but firms in foreign country have to pay more exporting cost when they want to export to home country than when firms in home country export to
foreign country.

\[ \varphi_d = Mf \sigma^{-1}, \quad \varphi_x = \tilde{M} \tau (f_x)^{\sigma^{-1}} \]
\[ \tilde{\varphi}_d = \tilde{M}f \sigma^{-1}, \quad \tilde{\varphi}_x = M \tau' (f_x)^{\sigma^{-1}}, \]

where \( \tau' > \tau > 1 \).

We have \( \frac{\varphi_d}{\varphi_x} = \left( \frac{\tau}{\tau'} \right) \frac{\sigma}{\tau-1} \frac{f_x}{f} = \frac{\tilde{\varphi}_d}{\varphi_x} = \frac{\lambda}{\lambda'} = \lambda^{-1} \).

\[ \tilde{\varphi}_x = \lambda \varphi_d, \]
\[ \varphi_x = \left( \frac{\tau}{\tau'} \right) \lambda \tilde{\varphi}_d = \lambda' \tilde{\varphi}_d, \]

where \( \lambda' < \lambda \).

Figure 3 shows the comparison between the symmetric case and the case where foreign firms pay higher exporting costs. In the asymmetric case, there is a non-parallel outward shift of the zero-profit curve for foreign firms (Appendix 7.4.2). From Figure 3, the ordering of these cut-off productivity levels is:

\[ \varphi_d < \varphi_x < \tilde{\varphi}_d, \]
\[ \frac{\lambda'}{\lambda} \tilde{\varphi}_x < \varphi_{x'} < \varphi_x. \]

**Proposition 6** When foreign firms have to pay higher exporting cost, home country will have more active firms than in the symmetric case but a smaller number of them are exporters.

Market in home country is less competitive due to higher importing restrictions so the cut-off level of survival in home country is lower than in foreign country. Market in foreign country, on the other hand, is more competitive because home country's firms have to pay less exporting cost to have their products in foreign country. Thus, exporters in home country are those with very high productivity level. In contrast, exporters in foreign country face
less competition in home country but have to pay higher exporting cost so it is ambiguous whether $\Phi_x$ is lower or higher than in the symmetric case.

![Graph showing Foreign Firms Face Higher Exporting Cost](image)

6 Conclusion

Economists have established that corruption, in general, is detrimental to economic growth. It pushes economies even further away from efficiency than they normally are. We find that trade liberalization decreases willingness to bribe government officials for firms producing only in the domestic market but increases willingness to bribe for the exporting production. Lower exporting costs reduce the price index, which decrease benefits from bribery for firms operating only in domestic market but exporting firms have the increased revenues from foreign market that is enough to offset the effect of a lower price index. For an individual exporting firm, the willingness to bribe increases if the fixed cost associated with exporting is not much higher than the fixed cost associated with operating domestically. Aggregating
across the economy shows that in total, willingness to bribe increases as exporting costs are reduced. This increase in willingness to bribe is proportional to the increase in total revenues of firms.

Furthermore, the paper extends to the study of asymmetric countries. In particular, when foreign country is less corrupt than home country, home country has fewer firms but a larger number of them are exporters. In the case where foreign firms have to pay higher exporting cost, home country have more firms since it can protect its market but a smaller number of those firms are exporters. The effect on corruption level depends on the magnitudes of these changes.

7 Appendix

7.1 Price Index and Productivity Cut-Off Levels

\[
\frac{\partial P_T}{\partial \tau} = K \frac{\gamma}{\gamma - \sigma + 1} \rho^{\gamma \sigma - 1} \left( \frac{\sigma}{I_T} \right)^{\beta} f_x^\beta \gamma^{-\gamma - 1} > 0,
\]

where \( K = \frac{\gamma}{\gamma - \sigma + 1} \rho^{\gamma \sigma - 1} \left( \frac{\sigma}{I_T} \right)^{\beta} (f^\beta + \tau^{-\gamma} f_x^\beta). \)

Since \( \varphi_d = \frac{1}{P_T \rho} \left( \frac{f_x}{I_T} \right)^{\frac{1}{\sigma - 1}}, \frac{\partial \varphi_d}{\partial \tau} < 0. \) For \( \varphi_x, \) we have

\[
\varphi_x = \frac{\tau}{P_T \rho} \left( \frac{f_x}{I_T} \right)^{\frac{1}{\sigma - 1}}
\]

\[
\frac{\partial \varphi_x}{\partial \tau} = \frac{\partial P_T}{\partial \tau} \left( \frac{f_x}{I_T} \right)^{\frac{1}{\sigma - 1}} \left( \frac{f_x}{I_T} \right)^{\frac{1}{\sigma - 1}} + \frac{1}{P_T \rho} \left( \frac{f_x}{I_T} \right)^{\frac{1}{\sigma - 1}}
\]

\[
= \frac{1}{P_T \rho} \left( \frac{f_x}{I_T} \right)^{\frac{1}{\sigma - 1}} \left[ -K^{-1} K \frac{f_x^\beta}{f^\beta + \tau^{-\gamma} f_x^\beta} \gamma^{-\gamma} + 1 \right] > 0.
\]

7.2 Changes in Firms' Willingness to Bribe with Respect to Ex-
porting Costs

Substituting \( P_T \) into \( B_d \), we have

\[
B_d(\varphi) = \frac{I_T}{\sigma} \left[ \frac{\gamma}{\gamma - \sigma + 1} \rho^{\gamma \tau^{\sigma - 1}} \left( \frac{\sigma}{I_T} \right)^{\beta} (f^\beta + \tau^{-\gamma} f_x^\beta) \right]^{\frac{1-\sigma}{\gamma}} (\rho \varphi)^{\sigma - 1} (\tau^{\sigma - 1} - 1)
\]

\[
\frac{\partial B_d(\varphi)}{\partial \tau} = \frac{I_T}{\sigma} (\sigma - 1) K^{\frac{1-\sigma}{\gamma}} \frac{f_x^\beta}{f^\beta + \tau^{-\gamma} f_x^\beta} \tau^{-\gamma - 1} (\rho \varphi)^{\sigma - 1} (\tau^{\sigma - 1} - 1) > 0.
\]

Similarly for \( B_z \):

\[
B_z(\varphi) = \frac{I_T}{\sigma} \left[ \frac{\gamma}{\gamma - \sigma + 1} \rho^{\gamma \tau^{\sigma - 1}} \left( \frac{\sigma}{I_T} \right)^{\beta} (f^\beta + \tau^{-\gamma} f_x^\beta) \right]^{\frac{1-\sigma}{\gamma}} \left( \frac{\rho \varphi}{\tau} \right)^{\sigma - 1} (\tau^{\sigma - 1} - 1)
\]

\[
\frac{\partial B_z(\varphi)}{\partial \tau} = \frac{I_T}{\sigma} (\sigma - 1) K^{\frac{1-\sigma}{\gamma}} \frac{f_x^\beta}{f^\beta + \tau^{-\gamma} f_x^\beta} \tau^{-\gamma - 1} (\rho \varphi)^{\sigma - 1} (\tau^{\sigma - 1} - 1)
\]

\[
+ \frac{I_T}{\sigma} (1 - \sigma) K^{\frac{1-\sigma}{\gamma}} \tau^{-\sigma} (\rho \varphi)^{\sigma - 1} (\tau^{\sigma - 1} - 1)
\]

\[
= \frac{I_T}{\sigma} (\sigma - 1) K^{\frac{1-\sigma}{\gamma}} \tau^{-\sigma} (\rho \varphi)^{\sigma - 1} \left[ \frac{f_x^\beta (\tau^{-\gamma} + \tau^{-\gamma + 1 - \sigma})}{f^\beta + \tau^{-\gamma} f_x^\beta} - 1 \right].
\]

Since \( \frac{f_x^\beta (\tau^{-\gamma} + \tau^{-\gamma + 1 - \sigma})}{f^\beta + \tau^{-\gamma} f_x^\beta} < 1 \), \( \frac{\partial B_z(\varphi)}{\partial \tau} < 0 \).

The willingness to bribe for an exporting firm is \( B_X = B_d + B_z \). Therefore, we have

\[
\frac{\partial B_X(\varphi)}{\partial \tau} = \frac{\partial B_d(\varphi)}{\partial \tau} + \frac{\partial B_z(\varphi)}{\partial \tau}
\]

\[
= \frac{I_T}{\sigma} (\sigma - 1) K^{\frac{1-\sigma}{\gamma}} \tau^{-\sigma} (\rho \varphi)^{\sigma - 1} \left[ \frac{f_x^\beta (\tau^{-\gamma} + \tau^{-\gamma + 1 - \sigma})}{f^\beta + \tau^{-\gamma} f_x^\beta} - 1 \right].
\]

\[
\frac{\partial B_X(\varphi)}{\partial \tau} < 0 \text{ if and only if } \frac{I_T^\beta (\tau^{-\gamma} + \tau^{-\gamma + 1 - \sigma})}{f^\beta + \tau^{-\gamma} f_x^\beta} - 1 < 0. \text{ This is the same as } \left( \frac{I_T}{f_x} \right)^\beta < \frac{\tau^{-\gamma}}{\tau^{\sigma - 1}} < 1 \text{ since } \gamma > \sigma - 1.
\]

7.3 Bribery Aggregated Across The Economy

The expected amount of bribery is \( \overline{B} = \overline{B}_d + p_x \overline{B}_z \), where \( p_x = \frac{1 - F(\varphi_x)}{1 - F(\varphi_d)} = \left( \frac{\varphi_x}{\varphi_d} \right)^{-\gamma} \).
The expected amount of bribery in domestic market is calculated as follows

\[
\overline{B}_d = \frac{I_T}{\sigma} \left( r \bar{\varphi}_d \right)^{\sigma - 1} \left( r^{\sigma - 1} - 1 \right),
\]

where \((\bar{\varphi}_d)^{\sigma - 1} = \int_{\varphi_d}^{\infty} \varphi^{\sigma - 1} \left( \frac{\gamma \varphi^{-\gamma - 1}}{1 - F(\varphi_d)} \right) d\varphi\)

\[
= \frac{\gamma}{\gamma - \sigma + 1} \left( \varphi_d \right)^{\sigma - 1}
\]

\[
= \frac{\gamma}{\gamma - \sigma + 1} \left( \frac{f_T \sigma}{I_T} \right) \left( \frac{1}{P_T \rho} \right)^{\sigma - 1}.
\]

The expected amount of bribery from exporting is calculated as follows

\[
\overline{B}_x = \frac{I_T}{\sigma} \left( \frac{P_T \rho \bar{\varphi}_x}{\tau} \right)^{\sigma - 1} \left( r^{\sigma - 1} - 1 \right),
\]

where \((\bar{\varphi}_x)^{\sigma - 1} = \int_{\varphi_x}^{\infty} \varphi^{\sigma - 1} \left( \frac{\gamma \varphi^{-\gamma - 1}}{1 - F(\varphi_x)} \right) d\varphi\)

\[
= \frac{\gamma}{\gamma - \sigma + 1} \left( \varphi_x \right)^{\sigma - 1}
\]

\[
= \frac{\gamma}{\gamma - \sigma + 1} \left( \frac{f_x \sigma}{I_T} \right) \left( \frac{\tau}{P_T \rho} \right)^{\sigma - 1}.
\]

Hence, we can obtain \(\overline{B}\) as in equation (5).

7.4 Asymmetric Cases

7.4.1 Foreign Country Is Not Corrupt

Total profits for foreign firms are as followed

\[
\tilde{\pi} = (\tilde{M})^{-\sigma + 1} \left( r \bar{\varphi}_d \right)^{\sigma - 1} - f + \left( \frac{\bar{\varphi}_x}{\bar{\varphi}_d} \right)^{-\gamma} \left[ (\tilde{M})^{-\sigma + 1} \left( \frac{r \bar{\varphi}_x}{\tau} \right)^{\sigma - 1} - f_x \right]
\]

\[
= (\tilde{M})^{-\sigma + 1} \left( r \bar{\varphi}_d \right)^{\sigma - 1} - f + \left( \frac{\mu \bar{\varphi}_d}{\bar{\varphi}_d} \right)^{-\gamma} \left[ (\tilde{M})^{-\sigma + 1} \left( \frac{r \mu \bar{\varphi}_d}{\tau} \right)^{\sigma - 1} - f_x \right].
\]

In the symmetric case where foreign firms have to bribe to get benefits \(r\), total profits for foreign firms are \(\tilde{\pi} - B\). Thus, comparing to the symmetric case, we have an inward shift of
the zero-profit curve for foreign firms as in Figure 2.

The slope of the $\tilde{\pi} = 0$ is

$$\frac{\partial \varphi_d}{\partial \varphi_d} = \frac{(\varphi_d)^{-\gamma-1}[-f\gamma - (\sigma - 1 - \gamma)\overline{M}^{-\sigma+1}(r\varphi_d)^{\sigma-1}]}{\mu^{-\gamma}(\varphi_d)^{-\gamma-1}[\gamma f_x + (\sigma - 1 - \gamma)\overline{M}^{-\sigma+1}(\frac{r\varphi_d}{\mu})^{\sigma-1}]}$$

$$= \frac{-(\varphi_d)^{-\gamma-1}[(\sigma - 1)(\pi_d + f) - \gamma \pi_d]}{\mu^{-\gamma}(\varphi_d)^{-\gamma-1}[(\sigma - 1)(\pi_x + f_x) - \gamma \pi_x]}.$$

Since total profits include profits from home market and from exporting, which depend on $\pi_d$ and $\varphi_d$ respectively, we need $\frac{\partial \varphi_d}{\partial \varphi_d} < 0$. Hence, we need these following conditions

$$(\sigma - 1)(\pi_d + f) - \gamma \pi_d > 0,$$ \hspace{1cm} (6)

and $$(\sigma - 1)(\pi_x + f_x) - \gamma \pi_x > 0,$$

or

$$(\sigma - 1)(\pi_d + f) - \gamma \pi_d < 0,$$ \hspace{1cm} (7)

and $$(\sigma - 1)(\pi_x + f_x) - \gamma \pi_x < 0.$$

These two conditions are assumptions on the proportions of fixed costs in total profits in both domestic and exporting sectors. Condition 1 can be rewritten as $\frac{f_x}{\pi_d}$ and $\frac{f_x}{\pi_x}$ being greater than $\frac{\sigma-1}{\sigma-1}$. Similarly, condition 2 means that $\frac{f_x}{\pi_d}$ and $\frac{f_x}{\pi_x}$ are less than $\frac{\sigma+1}{\sigma-1}$.
To find the curvature of the zero-profit curve, we need second derivative $\frac{\partial^2 \varphi_d}{\partial (\varphi_d)^2} \equiv \frac{C}{D}$

$$C = (\sigma - 1 - \gamma)(\sigma - 2 - \gamma)\nu^{\sigma - 1} \left[ \tilde{M}^{-\sigma + 1}(\tilde{\varphi_d})^{\sigma - 3 - \gamma} + M^{-\sigma + 1}\mu^{-\gamma} \left( \frac{T}{\tau} \right)^{\sigma - 1} (\varphi_d)^{\sigma - 3 - \gamma} \left( \frac{\partial \varphi_d}{\partial \varphi_d} \right)^2 \right]$$

$$+ (-\gamma - 1) \gamma \left[ f(\tilde{\varphi}_d)^{-\gamma - 2} + f_x \mu^{-\gamma} \left( \frac{\tau}{\tau} \right)^{\sigma - 1} (\varphi_d)^{-\gamma - 2} \left( \frac{\partial \varphi_d}{\partial \varphi_d} \right)^2 \right]$$

$$= (\tilde{\varphi}_d)^{-\gamma - 2} [(\sigma - 1 - \gamma)(\sigma - 2 - \gamma)(\tilde{\pi}_d + f) - \gamma(\gamma + 1)f]$$

$$+ \mu^{-\gamma} (\varphi_d)^{-\gamma - 2} \left( \frac{\partial \varphi_d}{\partial \varphi_d} \right)^2 [(\sigma - 1 - \gamma)(\sigma - 2 - \gamma)(\tilde{\pi}_x + f_x) - \gamma(\gamma + 1)f_x],$$

$$D = -\mu^{-\gamma}(\varphi_d)^{-\gamma - 1}[(\sigma - 1 - \gamma)\tilde{M}^{-\sigma + 1} \left( \frac{\tau \mu \varphi_d}{\tau} \right)^{\sigma - 1} + \gamma f_x]$$

$$= -\mu^{-\gamma}(\varphi_d)^{-\gamma - 1}[(\sigma - 1)(\tilde{\pi}_x + f_x) - \gamma \tilde{\pi}_x].$$

Since $\sigma - 2 - \gamma < -(\gamma + 1)$, we have

$$(\tilde{\varphi}_d)^{-\gamma - 2} [(\sigma - 1 - \gamma)(\sigma - 2 - \gamma)(\tilde{\pi}_d + f) - \gamma(\gamma - 1)f]$$

$$< (\tilde{\varphi}_d)^{-\gamma - 2}(\sigma - 2 - \gamma)[(\sigma - 1 - \gamma)(\tilde{\pi}_d + f) + \gamma f]$$

$$= (\tilde{\varphi}_d)^{-\gamma - 2}(\sigma - 2 - \gamma)[(\sigma - 1)(\tilde{\pi}_d + f) - \gamma \tilde{\pi}_d].$$

If we have assumption (6), then $C < 0$ and $D < 0$. So, $\frac{\partial^2 \varphi_d}{\partial (\varphi_d)^2} > 0$. In contrast, if we have assumption (7), then $C > 0$, $D > 0$, and $\frac{\partial^2 \varphi_d}{\partial (\varphi_d)^2} > 0$.

Similarly, we can find the slope and curvature of the zero-profit curve for home country, $\tilde{\pi}$.

### 7.4.2 Foreign Firms Pay Higher Exporting Costs

Total profits for foreign firms are as followed

$$\tilde{\pi}' = (\tilde{M})^{-\sigma + 1}(r\tilde{\varphi}_d)^{\sigma - 1} - f + \left( \frac{\tilde{\varphi}_x}{\tilde{\varphi}_d} \right)^{-\gamma} \left[ \tilde{M}^{-\sigma + 1} \left( \frac{r\tilde{\varphi}_x}{\tau'} \right)^{\sigma - 1} - f_x \right]$$

$$= (\tilde{M})^{-\sigma + 1}(r\tilde{\varphi}_d)^{\sigma - 1} - f + \left( \frac{\lambda \tilde{\varphi}_d}{\tilde{\varphi}_d} \right)^{-\gamma} \left[ \tilde{M}^{-\sigma + 1} \left( \frac{r\lambda \tilde{\varphi}_d}{\tau'} \right)^{\sigma - 1} - f_x \right].$$
The slope of the zero-profit curve for foreign firms is

\[
\frac{\partial \phi_d}{\partial \tilde{\phi}_d} = \frac{(\tilde{\phi}_d)^{-\gamma-1}[-f\gamma - (\sigma - 1 - \gamma)\tilde{M}^{-\sigma+1}(r\tilde{\phi}_d)^{-1}]}{\lambda^{-\gamma}(\tilde{\phi}_d)^{-\gamma-1}[\gamma f_x + (\sigma - 1 - \gamma)\tilde{M}^{-\sigma+1}(\frac{r\lambda\phi_d}{\gamma})^{-1}]} > \frac{(\tilde{\phi}_d)^{-\gamma-1}[-f\gamma - (\sigma - 1 - \gamma)\tilde{M}^{-\sigma+1}]}{\lambda^{-\gamma}(\tilde{\phi}_d)^{-\gamma-1}[\gamma f_x + (\sigma - 1 - \gamma)\tilde{M}^{-\sigma+1}(\frac{r\lambda\phi_d}{\gamma})^{-1}]}.
\]

Since the zero-profit curves are downward sloping, the higher slope means the zero-profit curve for foreign firms when they have to pay higher exporting costs is flatter than that in the symmetric case. The analysis on the curvature of the curve is similar to the case where foreign country is not corrupt.
References


Effects of Trade on Perceived Level of General Corruption versus Collusive Corruption: Cross-Sectional and Panel Data Studies

Chapter 2

Vanessa Pham*

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This paper studies the empirical evidences of effect of trade liberalization on the perceived level of general corruption and collusive corruption using both cross-sectional and panel data samples. The cross-sectional results show that trade openness does improve general institutional quality, measured by the corruption index, in data for 1996 and 2010 after we control for latitude, colony history, legal origin, religion affiliation, and ethnolinguistic fractionalization. Furthermore, the panel data study using the System GMM estimator indicates that the positive impact of trade openness on institutional quality in the cross-sectional study still holds true over time. When considering only the collusive type of corruption where firms bribe government officials to “get things done”, we find that the impact of trade openness in reducing corruption is not significant as found before.

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1. Introduction

Corruption has been shown to have negative impacts on economic growth. Mauro (1995) using systematic cross-country empirical analysis to study the relationship between these two variables finds that corruption lowers private investment and reduces economic growth because it allows inefficient usage of resources and distorts economic activities. Rodrik et al (2004) estimates the contributions of institutions, geography, and trade in determining income levels around the world using a sample of 79 countries in 1995 and finds that the quality of institutions has the strongest influence on income per capita of a country. They use mortality rates of colonial settlers as an instrument for institutional quality and geographically-based trade shares followed Frankel and Romer (1999) as an instrument for actual trade/GDP ratios. Ehrlich and Lui (1999) study the investments in accumulating human capital, political capital, and their consequences on long-term growth under two political regimes. Neeman, Paserman, and Simhon (2008) show that corruption and GNP per capita are negatively correlated in open economies but exhibit no relationship in closed economies.

Many empirical studies, including Ades and Di Tella (1999), Fisman and Gatti (2002), Goldsmith (1999), Treisman (2000), and Wei (2000), explore the role of trade in lowering corruption. They find that higher trade intensity and/or small populations are associated with lower corruption levels. Soudis (2009) concludes that the relationship depends on the quality of existing domestic institutions. If a country has institutional quality below a certain threshold, trade openness ceases to help reduce corruption. The author argues that using the property right index to measure institutional quality focuses on the independence of the judiciary and the ability of individuals and businesses to enforce contracts. Therefore, it is different from what the
dependent variable, Transparency International Corruption Perception Index, measures, which is the abuse of public office for private gain. Treisman (2000) tests various explanations of why corruption is perceived to be more widespread in some countries than others. Countries with Protestant traditions, histories of British rule, more developed economies, and (probably) higher imports have a lower level of perceived corruption while federal states are perceived to be more corrupt. Treisman also shows that the current degree of democracy is not significant but long exposure to democracy is associated with lower corruption. On the other hand, Dutt and Traca (2010) show that in high tariff environments, corruption can actually enhance trade flows between countries by allowing firms to evade these tariff barriers. Alexeev and Song (2012) find that stronger product market competition is associated mostly with greater collusive corruption, the cost-reducing type of corruption.

The main research question in this paper is whether trade openness helps reduce the perceived level of general corruption and collusive type of corruption after we control for factors such as latitude, colonisation culture, ethnolinguistic fractionalization, legal origin, and religion. The paper tackles several problems frequently arising in studying the perceived level of general corruption. We begin with examining this question using a cross-sectional sample and pinpoint two appropriate instruments to address the exogeneity issue of trade openness as an independent variable in this study. Following Rodrik et al (2004), I use the geographically-constructed trade shares from FR to instrument the actual trade shares. I also compare the results obtained from using this instrument to those obtained from using an extension of this geographically-constructed trade shares in Levchenko (2008), called institutional intensity of exports.

This paper also contributes to the literature on the relationship between trade openness and corruption by exploring the usage of System GMM estimator (available in Stata through the
xtabond2 command) on the panel data. The problem of using a panel data estimator in this model is that the main independent variable of interest, trade share, is endogenous and may be correlated with past and possibly current realizations of the error. The proposed instrument for the trade share variable, the geographically-constructed trade share variable, is time-invariant and would be subtracted out in the fixed effect method. In addition, the dependent variable, corruption, may be dynamic and depends on its own past realizations. There may also be heteroskedasticity and autocorrelation within each country in the sample. The System GMM estimator is a good solution to these problems since it incorporates both the original regression and a transformed one, called Difference GMM, where all regressors are transformed by differencing or the orthogonal deviations method. Results from both cross-sectional and panel data regressions confirm that trade openness is significantly correlated with lower level of perceived corruption.

Pham (2013) shows that in the Melitz's framework with heterogeneous firms, firms' incentive to bribe government officials to reduce variable costs increases proportionally to the increase in total sales across the economy when a country lowers their variable exporting costs. This type of corruption is called collusive corruption or cost-reducing corruption. In contrast with the effects of trade openness on the perceived level of general corruption, the effect of trade on the level of collusive, or cost-reducing, corruption is not statistically significant, which is consistent with the theoretically results.

The paper is organized as follows. Section 2 describes the data set and all the variables used in perceived level of general corruption. Section 3 presents the results for cross-sectional regressions on data of two years, 1996 and 2000, and compares the two sets of results to see if there is any change in our conclusions over time. Section 4 shows the results for panel-data
regressions using xtabond2. Comparisons between results obtained from using corruption index from Worldwide Governance Indicator and those using collusive corruption data from Enterprise Surveys are in section 5. Finally, section 6 concludes our discussion and results.

2. Data Description

The data set used in this paper consists of 116 countries from 1996 to 2010. However, we only have data on corruption index once every two years in the period between 1996 and 2002. From 2002, data is available every year. The Worldwide Governance Indicators (WGI) project surveys a large number of enterprises, citizens, and experts to provide governance indicators for 215 economies since 1996. The one dimension of governance that we are interested in for this study is the control of corruption indicator. According to the WGI website, control of corruption indicator “reflects 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.” It ranges from approximately -2.5 (weak) to 2.5 (strong) scores for governance performance. The main independent variable of interest is the degree of openness, measured by the sum of exports and imports as a fraction of total GDP with data adjusted for purchasing power parity from Penn World Table.

The problem of regressing trade openness on corruption is that trade openness is an endogenous variable. It is problematic if it is correlated with the error term in the regression, which is the case when we omit a variable that is relevant to our study. However, it is almost impossible to guarantee that we have included all relevant variables in the regression. One solution to endogenous variable on the right hand side of the regression is instrumenting it with an exogenous variable that is correlated with the endogenous variable and uncorrelated with the
error term in the original regression. Frankel and Romer (1999) suggest instrumenting the sum of exports and imports/GDP (the openness data) with trade shares constructed from geographically based bilateral trade flows. Therefore, constructed trade shares are obtained from only exogenous variables, such as distances between countries, populations, areas, and dummies for landlocked or common-border countries, and thus, are exogenous.

Levchenko (2008) extends FR model by weighting predicted exports computed based on FR model for each sector in a country by the sector-level index of institutional intensity and summing across sectors. Institutional intensity of a sector is defined as the fraction of each industry’s inputs not sold on organized exchanges or reference priced. It measures how dependent the sector is on good contracting institutions. Levchenko argues that if countries have different levels of technology, a country that has much worse technology in institutionally-intensive sectors may have no incentive to improve its institution to attract business in those sectors. It cannot compete with countries that have comparative advantage; thus, the group in power sees no benefit in improving the country’s institutional quality. They only have an incentive to do so when it allows them to attract or retain the institutionally dependent sectors after trade opening. In this case, the geographically based expected trade volume for a country as a whole proposed by FR does not carry information on what industries the country has comparative advantage in and how that, in turns, affects incentive to improve institutional quality by the group in power. Summing the geographically-based predicted trade volume in each sector within a country, weighted by how dependent the sector is on institutions, across sectors can measure how institutionally intensive a country’s export pattern is expected to be. As a result, the variable obtained is a measure of countries’ export patterns, not their expected aggregate trade
volumes, that is based on exogenous geographical variables. It is called the predicted institutional intensity of exports (IIX) and data for this variable are from Levchenko (2008).

The next independent variables are included in the regressions for control. Firstly, there is a vast amount of literature on how geography determines economic growth. The common conclusion is that the further away from the equator a country is, the more likely it is to have higher level of income. Economists researching this topic argue that with cold winter, countries further from the equator have few disease burdens, and thus may have higher economic developments (see Diamond 1997; Gallup, Sachs, and Mellinger 1998; Sachs 2001; and Rodrik et al 2003). In the data set, absolute latitude is scaled to range from 0 to 1.

The next variable is a dummy for whether a country was a British colony. Studies have shown that former British colonies and Britain have significantly lower perceived corruption (Treisman 2000). In contrast, countries that have never been colonized and countries that have been colonized by other European empires do not show significantly different levels of perceived corruption. Treisman explores various reasons to explain this phenomenon. He rules out the hypothesis that countries with British heritage have lower perceived corruption due to greater openness to trade or democracy and whether they have Protestant or Anglican religious traditions. A viable explanation is that these countries have common law system and superior administration of justice that provide greater protection against official abuse.

We also consider the role of ethnolinguistic diversity in determining the corruption level of a country. La Porta et al (1999) argues that as ethnic diversity increases, the ethnic group controlling the government will try to oppress the minority groups. It tends to lead to inefficient and more corrupt government. The variable used to measure ethnolinguistic diversity is called ethnolinguistic fractionalization, defined as the probability that two randomly selected people
from a given country will not belong to the same ethnolinguistic group. More particularly, in this paper, the data for this variable is the average value of five different indices of ethnolinguistic fractionalization, with values ranging from 0 to 1.

Other variables in the study are dummy variables for various legal origins (English, Socialist, French, German, or Scandinavian), fractions of the population in various religions (Protestant, Catholic, Muslim, and others), and exports of natural resources (fuel and metals) as a fraction of total exports. La Porta et al (1999) shows that English common law, German origin, and Scandinavian origin countries have better government performance than socialist origin and French origin countries. Moreover, Catholic and Muslim affiliations of the population are associated with worse government performance than Protestant affiliation. This result is also consistent with Treisman (2000).

3. Cross-Sectional Results

Before using the whole panel data set, I run two-stage least square regressions on data for 2010 and 1996. Openness is instrumented by constructed trade shares, and then by IIXs. Figure 1 and 3 show that there is a positive relationship between log openness and corruption index in data for both 2010 and 1996. Furthermore, we can see in Figure 2 and 4 that both log constructed trade share and log IIX have a positive relationship with log openness in data for 2010 and 1996. The first-stage regression results also confirm this observation. Table 1 compares results from 2SLS regressions using log constructed trade shares and IIXs as instruments for data in 1996 and 2010.

In general, countries with higher level of openness have stronger governance performance and less corruption, regardless of which instrument and which data set used, although the
coefficient estimate using constructed trade shares for data in 2010 is not significant. Furthermore, countries that are further away from the Equator have lower level of perceived corruption at 1% confidence level. Results from 2010 data support the hypothesis that countries that are former British colonies or the United Kingdom have significantly lower level of perceived corruption at 1% confidence level. On the other hand, socialist legal origin countries consistently have more corruption than common law countries in both sets of data for 1996 and 2010 at around 1% confidence level. German and Scandinavian legal origin countries also have more corruption than common law countries in 1996 results but the coefficient estimates change sign and become more significant for 2010. It indicates that there is a progression in institutional quality in German and Scandinavian legal origin countries, relative to common law countries. Diversity in a country (high ethnolinguistic fractionalization index) has a negative relationship with the governance performance score at 5% level of confidence, except the estimate using constructed trade shares for 1996. Lastly, countries with a large fraction of population with Muslim affiliation tend to have higher corruption level than countries with Protestant affiliation.

4. Panel Data Regression

The fact that the level of perceived corruption may be dynamic, meaning that current realization depends on past ones, can be problematic if we are not careful in choosing instruments for our regression. Moreover, since all variables, except log openness and corruption index, are time invariant, regular panel data regression estimators, such as xtreg for a simple panel data regression or xtitreg to perform extended IV/GMM estimation of panel data models in Stata, would drop all the time-invariant variables. Therefore, we need a different estimator to explore the variations across countries and over time. Roodman (2006) proposes the System
GMM estimator xtabond2 in Stata that is appropriate to deal the data set in this study. To avoid the problem of having too many instruments, I choose to use only first and second lags of the levels as instruments for the transformed data and first lag of the differences for the levels data. I also collapse the instrument matrix, which helps with the overfitting problem.

**Figure 1.** Corruption Index vs. Log Openness for 2010

**Figure 2.** Log Openness vs. Constructed Trade Shares and IIXs for 2010
Figure 3. Corruption Index vs. Log Openness for 1996

Figure 4. Log Openness vs. Constructed Trade Shares and IIXs for 1996
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<td>-0.334</td>
<td>0.223</td>
<td>3.229</td>
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<td>(0.212)</td>
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<td>-1.293**</td>
<td>0.908**</td>
<td>3.866**</td>
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<td>(0.887)</td>
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<td>(0.813)</td>
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<td>2.570***</td>
<td>2.585***</td>
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<td>89.40</td>
<td>94.10</td>
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p-values in parentheses
* p<0.10, ** p<0.05, *** p<0.01

**Table 1.** Compare Results from Cross-Sectional Regressions

1996a and 2010a use constructed trade shares as instrument; 1996b and 2010b use IIXs as instrument.
Figure 5. Panel Data on Log Openness and Corruption Index

Note that constructed trade share or IIIX is an instrument for openness, and not for corruption. Therefore, either one appears in the list of ivstyle instruments but not in the list of all variables before the comma in the syntax. The options of two-step and robust estimate for a small data set (reporting t-stats instead of z-stats) are chosen. Instead of transforming the variables by differencing, I use orthogonal deviation transformation, which subtracts the average of all future available observations of a variable. Note that corruption level and trade openness may be correlated with the unobserved country fixed effects so the transformed instruments of these variables should not be used in the levels equation. Instead, we include the ivstyle instruments, including the time dummy variable and the instrumental variable for log openness, in the levels equation only.

We see from Table 4 that the results obtained with constructed trade share and IIIX as instrument for log openness are similar. The process is indeed dynamic where corruption index
and its first lag are significantly positively correlated at at least 5% confidence level. Furthermore, log openness, whether instrumented by constructed trade share or IIX, and corruption index have a positive relationship in the panel data sample with at least 10% confidence level. These results confirm the observation about the relationship between the two variables in Figure 5.

Furthermore, both Tables 2 and 3 show results of the Arellano-Bond test for AR(2) in first differences. They indicate that we cannot reject the null hypothesis of autocorrelation at 10% confidence level for both regressions. That means that we do not detect AR(1) in levels and first lag is an appropriate instrument. The Sargan and Hansen test of overidentification restrictions in both regressions show that we cannot reject the null hypothesis at 10% confidence level.
Dynamic panel-data estimation, two-step system GMM

| Group variable: id Number of obs = 1276 |
| Time variable: time Number of groups = 116 |
| Number of instruments = 16 Obs per group: min = 11 |
| F(13, 116) = 3.20 avg = 11.00 |
| Prob > F = 0.000 max = 11 |

| corrul | Corrected Coef. | Std. Err. | t | P>|t| | [95% Conf. Interval] |
|--------|-----------------|-----------|---|-----|--------------------------|
| corrul | .3415687        | .1590697  | 2.15 | 0.034 | .0264714 - .656666 |
| 11.00  |                 |           |     |      |                          |
| lgopen | .3587602        | .2021942  | 1.77 | 0.079 | -.041711 - .752312      |
| _Itime_2 | -1.432074 | .942336  | -1.70 | 0.092 | -3.101226 - .2354786    |
| _Itime_3 | -1.455333 | .8573604 | -1.70 | 0.093 | -3.356331 - .2439659    |
| _Itime_4 | -1.468018 | .6537995 | -1.71 | 0.090 | -3.351876 - .2302392    |
| _Itime_5 | -1.467885 | .6551394 | -1.72 | 0.089 | -3.351876 - .2302392    |
| _Itime_6 | -1.505596 | .8674611 | -1.74 | 0.085 | -3.224102 - .212303     |
| _Itime_7 | -1.549025 | .8732963 | -1.77 | 0.079 | -3.378698 - .180485     |
| _Itime_8 | -1.526428 | .8778443 | -1.74 | 0.085 | -3.265109 - .212535     |
| _Itime_9 | -1.5414     | .8792082 | -1.75 | 0.082 | -3.328278 - .199826     |
| _Itime_10 | -1.546523 | .8832755 | -1.75 | 0.083 | -3.295962 - .2029151    |
| _Itime_11 | -1.513886 | .8561076 | -1.77 | 0.080 | -3.209514 - .1817434    |
| _Itime_12 | -1.534665 | .8689973 | -1.77 | 0.080 | -3.255824 - .1864939    |

Instruments for orthogonal deviations equation
GMM-type (missing=0, separate instruments for each period unless collapsed)
BOR. L(1/2), (L.corrul lgopen) collapsed

Instruments for levels equation
Standard
lgtcr _Itime_2 _Itime_3 _Itime_4 _Itime_5 _Itime_6 _Itime_7 _Itime_8 _Itime_9 _Itime_10 _Itime_11 _Itime_12

Arellano-Bond test for AR(1) in first differences: z = -3.25 Pr > z = 0.001
Arellano-Bond test for AR(2) in first differences: z = 1.60 Pr > z = 0.110

Sargan test of overid. restrictions: chi2(3) = 2.34 Prob > chi2 = 0.505
(Note robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(3) = 1.95 Prob > chi2 = 0.582
(Robust, but weakened by many instruments.)

Table 2. Panel Data Regression Results Using Constructed Trade Share as Instrument for Openness

40
Dynamic panel-data estimation, two-step system GMM

| Group variable: id | Number of obs | 1276 |
| Time variable: time | Number of groups | 116 |
| Number of instruments | Obs per group: min | 11 |
| F(13, 116) | $= 16.89$ | avg $= 11.00$ |
| Prob > F | 0.000 | max $= 11$ |

| corr | Corrected Coef. | Std. Err. | t | P>|t| | [95% Conf. Interval] |
|------|----------------|-----------|---|-----|---------------------|
| corr | 0.5217759 | 0.138096 | 3.78 | 0.000 | 0.2482593 | 0.7952925 |
| L1 | . | . | . | . | . | . |
| lgopen | 0.8334589 | 0.2738629 | 3.04 | 0.003 | 0.291039 | 1.375879 |
| _ltime_2 | -3.6168944 | 1.126944 | -3.03 | 0.003 | -5.650921 | -1.586799 |
| _ltime_3 | -3.677819 | 1.145918 | -3.03 | 0.003 | -5.747455 | -1.208183 |
| _ltime_4 | -3.474527 | 1.138735 | -3.05 | 0.003 | -5.729935 | -1.219118 |
| _ltime_5 | -3.083344 | 1.143261 | -3.05 | 0.003 | -5.747717 | -1.218972 |
| _ltime_6 | -3.544255 | 1.159529 | -3.06 | 0.003 | -5.840849 | -1.247661 |
| _ltime_7 | -3.600327 | 1.172549 | -3.07 | 0.003 | -5.922708 | -1.279945 |
| _ltime_8 | -3.586941 | 1.181263 | -3.04 | 0.003 | -5.928581 | -1.247302 |
| _ltime_9 | -3.606078 | 1.181669 | -3.05 | 0.003 | -5.946522 | -1.265333 |
| _ltime_10 | -3.620188 | 1.187264 | -3.05 | 0.003 | -5.971714 | -1.268662 |
| _ltime_11 | -3.526031 | 1.148863 | -3.07 | 0.003 | -5.801499 | -1.250563 |
| _ltime_12 | -3.569552 | 1.167430 | -3.06 | 0.003 | -5.881762 | -1.257278 |

Instruments for orthogonal deviations equation
GMM-type (missing=0, separate instruments for each period unless collapsed)
BOD.L(1/2), (l.corru lgopen) collapsed

Instruments for levels equation
Standard
lginstr _ltime_2 _ltime_3 _ltime_4 _ltime_5 _ltime_6 _ltime_7 _ltime_8
_ltime_9 _ltime_10 _ltime_11 _ltime_12

Arellano-Bond test for AR(1) in first differences: $z = -4.51$ Pr > $z = 0.000$
Arellano-Bond test for AR(2) in first differences: $z = 1.13$ Pr > $z = 0.259$

Sargan test of overid. restrictions: $chi2(3) = 4.91$ Prob > $chi2 = 0.179$
(Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: $chi2(3) = 4.47$ Prob > $chi2 = 0.215$
(Robust, but weakened by many instruments.)

Table 3. Panel Data Regression Results Using IIX as Instrument for Openness

41
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<tr>
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<th>(1) Consts</th>
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<td>L.corru</td>
<td>0.342**</td>
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<td>(0.034)</td>
<td>(0.000)</td>
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<td>lgopen</td>
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<td>0.833***</td>
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<tr>
<td>_Itime_2</td>
<td>-1.433*</td>
<td>-3.419***</td>
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<td>(0.092)</td>
<td>(0.003)</td>
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<td>-3.478***</td>
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<td>(0.003)</td>
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<td>-3.475***</td>
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<td>_Itime_5</td>
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<td>_Itime_6</td>
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<td>-3.544***</td>
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<td>(0.085)</td>
<td>(0.003)</td>
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<tr>
<td>_Itime_7</td>
<td>-1.549*</td>
<td>-3.600***</td>
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<td>-3.620***</td>
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<td>(0.083)</td>
<td>(0.003)</td>
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<tr>
<td>_Itime_11</td>
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<td>-3.528***</td>
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<td>(0.080)</td>
<td>(0.003)</td>
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<td>_Itime_12</td>
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<td>-3.570***</td>
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<td>(0.080)</td>
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<td>1276</td>
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<tr>
<td>F</td>
<td>3.197</td>
<td>10.89</td>
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* p<0.10, ** p<0.05, *** p<0.01

Table 4. Compare Panel Data Regressions
5. Collusive Corruption Indicator

The corruption literature distinguishes two types of corruption, coercive and collusive, where coercive corruption extorts rents from businesses and collusive corruption helps firms reduce costs (Sequeira and Djankov 2010). In the case of collusive corruption, firms increase their fixed cost in the form of bribery payments to government officials to reduce their variable costs. Examples of this type of corruption are bribery payments to increase per unit value added tax (VAT) to reduce overall variable cost and to reduce the number of CO₂ permits required for a certain level of production. Firms can also avoid variable costs needed to satisfy various health, safety, working condition, and fire regulations by bribing public officials.

Pham (2013) finds that although changes in incentives to bribe for firms only operating domestically and exporting firms are different when a country increases its trade openness by reducing variable costs associated with exporting, the total bribery expense to all firms across the economy increases. Firms may have more incentives to bribe government officials to reduce their variable costs when the country opens up to higher level of international trade if more firms can be exporters and they can expand their productions in aggregate. In particular, the amount of collusive bribery increases proportionally to the increase in total production as a result of trade liberalization. I would like to examine the relationship between trade openness and the level of collusive corruption, as opposed to the level of general corruption measured by the corruption index from WGI. Alexeev and Song (2012) propose the use of data from Enterprise Surveys (ES) to measure the level of collusive corruption and find that stronger product market competition is associated with greater corruption of this type.

Enterprise Surveys collects information from surveying firms in mainly developing countries and the question of interest for this paper is “It is said that establishments are sometimes required
to make gifts or informal payments to public officials to "get things done" with regard to customs, taxes, licenses, regulations, services etc. On average, what percentage of total annual sales, or estimated total annual value, do establishments like this one pay in informal payments or gifts to public officials for this purpose?" Survey participants can provide the percentage of total annual sales paid as informal payment and the absolute value of the payment, declare that no payments or gifts are paid, choose "don’t know" option, or refuse to answer the question. The aggregate country-level data is on the percentage of firms expecting to give gifts to public officials (to get things done) where refusal to provide either number is interpreted that the firm does pay collusive bribes. The question refers to payments and gifts to public officials that are in line with our examples of collusive corruption, as opposed to the corruption index in WGI that aggregates various corruption measures and does not specify how corruption is estimated. Therefore, using this indicator as a measure of collusive corruption can shed some light on the relationship between this particular type of corruption and trade openness.

Constructed trade share and IIX are still appropriate instruments for trade openness in this section. While constructed trade share provides a measure of expected aggregate trade flow for one country, IIX includes information about comparative advantage and disadvantage of the country in each sector and how much the sector relies on good institutions. Levchenko (2008) uses the lobbying framework to model incentives of the group in power to maintain or improve institutional quality to maximize their rents. Collusive corruption, while reducing variable costs for firms, generates rents for government officials. If an industry is institutionally intensive, it may benefit both firms and public officials to increase the level of collusive corruption since it facilitates cost reduction for firms. Thus, firms become more comparatively advantageous and attract more business while public officials enjoy more bribery.
According to Enterprise Surveys, over 130,000 firms in 135 countries have participated between 2002 and 2012. Some countries have data for several years and others only have been surveyed once. Cross-sectional regression for one year does not yield useful results since the number of countries being surveyed in one particular year and having data on instrumental variable for trade openness (constructed trade share or $IIX$) is smaller than 30 observations. Moreover, the data set does not have observations for one country over many years so panel data regression using xtabond2 is not possible. I choose to use 2SLS with year fixed effects on all observations with available data on collusive corruption and instrumental variable for trade openness. With constructed trade share, the sample has 130 observations and with $IIX$, the sample contains 176 observations.

The country-level indicator from ES only gives us a broad view of the perceived level of collusive corruption in a country. In contrast, computing a new index by average the total value or the percentage of total sale paid to public officials to “get things done” across firms in the country may provide us with more detailed information on this type of corruption. One drawback of this new index is that we ignore firms that choose the “don’t know” option and those that refuse to answer the question. Based on the results in Pham (2013), we do not expect strongly and significantly negative correlation between trade openness and collusive corruption level, as opposed to the findings with the perceived level of general corruption previously. Columns (2) and (4) in both Tables 5 and 6 are regression results with the logarithm of the percentage of firms expecting to pay collusive bribe in a country as the dependent variable. Columns (3) and (6) are regression results with the logarithm of the average percentage of total annual sale a firm pays for collusive bribe in a country as the dependent variable. Note that the countries in the two samples used in this section are mainly emerging markets and developing countries. It is
different from the samples in previous sections that contain both developed and developing
countries. To have comparable results from the WGI and ES, I run the same regressions with the
same samples described in this section but have the corruption index used in previous sections as
the dependent variable. Results are in columns (1) and (3) in both Tables 5 and 6.

We see in Tables 5 and 6 that all coefficient estimates for log openness in ES regressions are
negative, which seems to support the results from previous sections. It is that all else equal,
countries with higher level of openness have a smaller percentage of firms expecting to pay bribe
to get things done. However, these coefficient estimates are not significant at 10% confidence
level. In contrast, the results obtained from WGI using these subsamples are significant and
similar to those obtained using the larger samples. Thus, the impact of trade openness in
reducing corruption is more definite when we use the corruption index from WGI than when we
use the collusive corruption indicator and constructed index from ES.

The results imply that trade openness is beneficial when the prevalent type of corruption in a
country is coercive and not when it is collusive. Coercive corruption extorts rents from firms,
making them less competitive and more vulnerable when competing with foreign firms as the
country relaxes their trade restrictions. On the other hand, collusive corruption provides firms
with an opportunity to reduce their variable costs. When their productions expand as a result of
trade liberalization, firms have an incentive to pay more collusive bribes in proportion to the
higher level of production.
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<td>Ctr (ES a1)</td>
<td>Ctr (ES a2)</td>
<td>Ctr (WGI b)</td>
<td>Ctr (ES b1)</td>
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<td>(0.084)</td>
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<td>-2.744</td>
<td>-3.862***</td>
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<td>(0.007)</td>
<td>(0.267)</td>
<td>(0.365)</td>
<td>(0.005)</td>
<td>(0.753)</td>
<td>(0.681)</td>
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<td>131</td>
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<td>F</td>
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<td>18.34</td>
<td>4.235</td>
<td>6.024</td>
<td>20.65</td>
<td>4.072</td>
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p-values in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Table 5. Compare Results Using WGI and ES Data (Percentage of Firms and CC Index) with Constructed Trade Share as Instrument for Log Openness
<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
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<th>(3)</th>
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<th>(5)</th>
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<td>Ctr (WGI a)</td>
<td>Ctr (ES a1)</td>
<td>Ctr (ES a2)</td>
<td>Ctr (WGI b)</td>
<td>Ctr (ES b1)</td>
<td>Ctr (ES b2)</td>
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<td>Log Openness</td>
<td>2.590**</td>
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<td>-1.132</td>
<td>2.827**</td>
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<td>-0.267</td>
<td>0.734*</td>
<td>0.441**</td>
<td>-0.141</td>
<td>-0.310</td>
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<td>(0.955)</td>
<td>(0.256)</td>
<td>(0.054)</td>
<td>(0.040)</td>
<td>(0.444)</td>
<td>(0.211)</td>
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<tr>
<td>Ethnic Fractionalization</td>
<td>-0.444</td>
<td>0.619**</td>
<td>0.488</td>
<td>0.391</td>
<td>0.211</td>
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<td>(0.020)</td>
<td>(0.141)</td>
<td>(0.533)</td>
<td>(0.614)</td>
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<td>2.793***</td>
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<tr>
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<td>(0.137)</td>
<td>(0.232)</td>
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<td>(0.405)</td>
<td>(0.952)</td>
<td>(0.701)</td>
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<td>Other Religions</td>
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<tr>
<td></td>
<td>(0.251)</td>
<td>(0.558)</td>
<td>(0.352)</td>
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<td>Absolute Latitude</td>
<td>2.752***</td>
<td>-1.063*</td>
<td>-1.651*</td>
<td>0.494</td>
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<td>(0.002)</td>
<td>(0.064)</td>
<td>(0.062)</td>
<td>(0.550)</td>
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<td>(0.356)</td>
<td>(0.599)</td>
<td>(0.953)</td>
<td>(0.016)</td>
<td>(0.368)</td>
<td>(0.565)</td>
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<td>174</td>
<td>176</td>
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<td>F</td>
<td>3.296</td>
<td>6.511</td>
<td>6.426</td>
<td>1.832</td>
<td>5.601</td>
<td>4.554</td>
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</table>

p-values in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Table 6. Compare Results Using WGI and ES Data with IIx as Instrument for Log Openness

6. Conclusion

The common finding in literature on corruption is that it has a negative impact on economic growth. This paper analyzes how trade openness affects the level of perceived corruption after controlling for latitude, colony history, legal origin, ethnolinguistic fractionalization, and religion affiliation. Countries with higher level of trade openness tend to have lower level of perceived corruption, confirmed by both data sets for 1996 and 2010. In addition, being further away from the equator and being former British colony or the United Kingdom are significantly correlated
with better institutional quality. In contrast, countries with socialist legal origin have significantly higher corruption level than common law countries. There appears to be a progression in institutional quality in German and Scandinavian legal origin countries, compared to common law countries. Finally, population with more Muslim affiliation tends to predict higher level of corruption, compared to Protestant affiliation.

We also explore the relationship between trade openness and corruption over time across 116 countries in the sample with the System GMM estimator. This estimator solves the problems of dynamic dependent variable, corruption index, endogenous independent variable, trade openness, and the existence of heteroskedasticity and autocorrelation in the data. By using the orthogonal deviation transformation on our variables, we can obtain appropriate instruments that are not correlated with the error term. Moreover, combing the transformed regression with the original one, we can study the variation in trade openness, its instruments, and corruption index across countries and over time. The panel data regression results indicated that corruption level is significantly positively correlated with its first lag and trade openness, regardless of whether trade openness is instrumented by constructed trade share or institutional intensity of exports.

Finally, we make the distinction between two types of corruption, coercive and collusive. Past studies have shown that trade openness may increase the collusive type of corruption due to higher incentives to bribe to reduce variable costs from firms. Different from the corruption index in WGI that measures a general perceived level of corruption in a country by aggregating various corruption indexes, the ES asks respondents specifically the percentage of total annual sales used to pay government officials to “get things done”. Using the ES indicator and the constructed collusive corruption index as a measure of collusive corruption, I find that the trade openness is less likely to reduce collusive corruption than to reduce the perceived level of
general corruption measured by WGI. Countries benefit from trade liberalization in reducing corruption when the type of corruption is coercive. Firms may have to face tough competition and having to pay coercive bribes makes them less competitive than others. The group in power will have to improve institutional quality by decreasing coercive corruption to gain comparative advantage when trading with other countries. On the other hand, collusive corruption does not interfere with firms’ comparative advantage. Firms are willing to pay more bribes to reduce variables costs if they can export and expand their productions.

List of Variables and Sources

BRICOL = Dummy variable taking value of 1 if a country is a former British colony or UK, 0 otherwise.

CORRU = Corruption index, ranging from -2.5 to 2.5. Source: WGI.

ES = Percentage of firms expecting to pay bribes to “get things done”. Source: Enterprise Survey.

ES1 = Average percentage of annual total sales paid to collusive corruption. Source: Enterprise Survey.


LAT = Distance from Equator of capital city measured as absolute value of latitude divided by 90, ranging from 0 to 1. Source: La Porta et al (1999).

LEENG = Dummy variable taking value of 1 for English common law countries, 0 otherwise. Source: La Porta et al (1999).
LEFRE = Dummy variable taking value of 1 for French legal origin countries, 0 otherwise.  

TEGRER = Dummy variable taking value of 1 for German legal origin countries, 0 otherwise.  

LESCAN = Dummy variable taking value of 1 for Scandinavian legal origin countries, 0 otherwise. Source: La Porta et al (1999).

LESOC = Dummy variable taking value of 1 for socialist legal origin countries, 0 otherwise. Source: La Porta et al (1999).

LGCTR = Natural logarithm of constructed trade share. Source: Frankel and Romer (1999).


LGOPEN = Natural logarithm of “real” openness. Real openness is calculated by the ratio of nominal imports plus exports to GDP in Purchasing-Power-Parity US Dollars (PPP GDP).  
Source: Penn World Tables 7.1.


REOTHER = Fraction of the population with other religious affiliation. Source: La Porta et al (1999)
References


