Corruption and Stock Price Volatility: Firm-Level Evidence

Chandan Kumar Jha[1], Prateek Sharma[2], and Sunny Kumar Singh[3]

[1]Madden School of Business, Le Moyne College, Syracuse, NY 13214.
E-mail: jhack@lemoyne.edu

[2]Indian Institute of Management, Udaipur, India.
E-mail: prateek.sharma@iimu.ac.in

[3]BITS Pilani, Hyderabad Campus, India.
E-mail: sunnysingh.econ@gmail.com

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Abstract

This paper assesses the effects of corruption on firm-level equity price volatility using a sample of over 3,000 firms from 31 countries around the world over the period of 2003–2014. We find that corruption, constructed using the responses from the World Bank Enterprise Survey to match the firm's size, industry, location, and country, is positively associated with equity price volatility. We further find that equity price volatility decreases with the asset size in the presence of corruption, indicating that smaller firms are disproportionately affected by corruption. We also find evidence of a positive association between corruption measured at the country level and stock price volatility, however, the effect of country-level corruption is found to be worse for firms with larger asset sizes.

JEL classification codes: L26; M13; G20

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1 Introduction

A high volatility in the stock market is undesirable because it will lead to lower levels of investments since most investors tend to be risk-averse (Guiso and Paiella, 2005). At firm-level, firms seek to minimize their stock price volatility because investors seek a greater risk-premium and hence a greater return from stocks whose prices are more volatile, causing an undesirable (downward) pressure on the stock price. Hence, it is important to investigate the determinants of stock price volatility, and various studies have identified several firm-level as well as macroeconomic factors that determine equity price risk (see, *e.g.*, Rosenberg and McKibben, 1973; Bartram et al., 2015; Engle and Rangel, 2008). Further, in a recent study, Pástor and Veronesi (2012) show that uncertainty about government policies is an important source of fluctuations in stock prices, and studies have suggested that corporate bribery can be used by firms to minimize uncertainty.[1] Lau et al. (2013), for example, argue that investors view bribery as a tool firms can use to mitigate the uncertainty they are facing and provide evidence that more corrupt countries have less volatile stock markets. At the same time, however, corruption causes inefficiency and bribe demands for government services lead to valuable resources being diverted away from productive uses (for example, innovation (Paunov, 2016)). Hence, at the firm-level, corruption can increase stock price volatility by introducing inefficiencies and by increasing the cost of doing business, which may create uncertainty regarding the future prospects of the business. Further, this effect will be larger for smaller firms due to the fact that the latter will have limited resources at their disposal to make informal payments to minimize uncertainty and may also suffer if large firms use bribery to gain undue advantages in securing government contracts. To the best of our knowledge, however, there are no studies that explore the effects of corrupt environment, in which a firm operates in, on its stock price volatility, nor are there any

[1] For instance, studies have shown that corruption and bribery can be used to evade corporate taxes (Alm et al., 2016) and to obtain preferential access to bank financing (Fungáčová et al., 2015).

studies that explore whether the presence of corruption has an asymmetric effect on the equity price volatility of firms depending on their asset sizes.

The primary objective of this study is to fill this important gap in the literature by documenting the effects of corruption on firm-level equity price volatility. Further, we investigate whether corruption has a heterogeneous impact on the stock price volatility of small firms compared to the large ones. By large, we mean asset size because firms with more assets will have a greater ability to make informal payments to get things done and, hence, weather the effects of any unfavorable policy changes or seek undue advantages such as securing government contract or even getting away with avoiding policy regulations or taxes (Alm et al., 2016). As a result, it is likely that investors would perceive large firms as safer in regions with a greater prevalence of corruption as opposed to regions where there is no corruption, and hence, all the firms are treated the same. Consequently, the effects of corruption on the equity price volatility will be milder for larger firms than the smaller ones.

It is important to note, as argued by Paunov (2016), that corruption does not only affect the firms that pay bribes but also the firms that decide to not pay bribes. For example, firms that operate in regions where corruption is prevalent, a firm that refuses to pay bribes will likely experience delays in receiving government services and, in certain cases, may even be denied certain services, *e.g.*, government contracts. Moreover, not all the firms are subject to the same level of corruption. Firms operating in certain industries are more prone to corruption than others, and corruption is higher in certain regions than others within a country, and firms with different sizes are prone to different levels of bribery (Safavian et al., 2001; Svensson, 2003; Beck and Peria, 2010). Hence, we define corruption at size-industry-location-country level for different time periods. Thus, all the firms, regardless of whether they paid a bribe or not, are assigned the level of corruption that is relevant to them depending on their size, industry they operate in, their location (capital city, city with a population greater than 1 million, and all others), and the country they are located in. We use the World Bank Enterprise Survey (WBES) data for over 3,000 firms from 30 developing and developed countries consisting of over 10,000 responses to construct the measure of corruption defined as the percentage of total sales made in informal payments.[2] Besides using the measure of corruption defined above, we also use country-level corruption, the Control of Corruption Index (CCI) from the World Bank, and investigate the effects of corruption measured at the country level on stock price volatility.

We follow Paunov (2016) in arguing that our methodology allows for the causal interpretation of corruption on stock price volatility for the reasons discussed next. First, the construction of corruption at an aggregate level avoids the possibility of reverse causality that would be a concern if firm-level corruption measure is used. It is unlikely that characteristics of an individual firm will influence the level of corruption measured at an aggregate level. In addition, the use of aggregate measures of corruption also mitigate potential measurement errors if some firms did not respond. Second, we systematically control for unobserved industry, location, country, and year characteristics that may be associated with corruption and/or equity price volatility and may cause a spurious relationship between the corrupt environment in which a firm operates in and its equity price volatility. Third, we control for the time varying macroeconomic factors and business conditions such as per capita gross domestic product (GDPPC) and the share of firms that have access to finances. Finally, we control for an extensive set of firm-level characteristics that may be associated with stock price volatility.

This paper makes several contributions to the literature on corruption and stock price volatility. To the best of our knowledge, our paper is the first one that uses firm-level data to study the effects of corruption relevant to a firm depending on its size, industry, location, and country on equity price volatility. Moreover, we report the results of different

[2] Similar methodology has been adopted by several recent studies in defining corruption (*e.g.*, Paunov, 2016; Fungáčová et al., 2015).

empirical specifications, including an identification strategy first proposed by Rajan and Zingales (1998) and subsequently used by several studies (*e.g.*, Paunov, 2016; Aghion et al., 2015), to document the causal effect of corruption on stock price volatility. Using a panel sample of over 3,000 firms from over 30 developing and developed countries, we document that corruption, measured at an aggregate level to match a firm's size, industry, location, and country, increases the stock price volatility of firms. We further show that this effect is larger for small firms measured by their asset. Moreover, the paper provides evidence that corruption measured at country-level is also associated with an increases in the stock price volatility. Interestingly, we find that the effect of country-level corruption on stock price volatility is greater for large firms than small firms. In sum, corruption, whether measured at country-level or less aggregated size-industry-location-country level, increases stock price volatility. However, whereas corruption specific to a firm is worse for small firms, country-level corruption is more harmful for large firms.

Stock Price Volatility

Previous studies have extensively studied and identified several firm-level and macroeconomic factors that influence stock price volatility. For instance, in one of the earliest papers investigating the determinants of systematic and specific risk in common stocks, Rosenberg and McKibben (1973) find that fundamental characteristics of the firms, such as dividend payout ratio, size, leverage, and accounting beta are significant predictors of the variance of a stock's return. Christie (1982) finds leverage and interest rates to be positively associated with stock price volatility. Using monthly returns from 1857 to 1987, Schwert (1989) finds that the volatility of macroeconomic factors, such as inflation and money growth, are weakly related with the volatility of stock returns. He further finds that leverage explains a small part of the temporal changes in volatility. In a cross-sectional analysis 50 countries, Engle and Rangel (2008) find evidence that volatility of real GDP and interest rates are the primary determinants of the long term trend in the volatility of stock returns. More recently, Bartram et al. (2015) find that firm size, maturity of the business, profitability, and profit volatility are the most important determinants of equity price volatility.

There is little work on the relationship between corporate corruption and equity volatility, and to the best of our knowledge, the extant literature has only examined the effects of corruption on stock market volatility.[3] For instance, using a sample of 14 emerging market economies, Lau et al. (2013) find that higher incidences of corporate corruption are associated with lower stock market volatility across countries. However, despite a voluminous literature on the determinants of equity price volatility, the effects of the prevalence of corruption on equity price volatility at the firm-level remains unexplored. Aggregated analyses at country-level mask important features of the relationship between corporate corruption and equity price volatility. Corporate corruption practices can vary across different industries and different regions within a country and not all firms are uniformly impacted by corruption within a country or even within a smaller geographical region. Several studies have shown that corruption has asymmetric effects on firms with different characteristics (Paunov, 2016; Safavian et al., 2001). For example, Safavian et al. (2001) provide evidence that there is differential effects of corruption on different businesses depending on the underlying characteristics of the firms and entrepreneurs. Similarly, Paunov (2016) finds that corruption has asymmetric effects on innovation depending on the size or the ownership pattern of the firms.

Based on the discussion above, it is possible that investigating the link between corruption and stock market volatility at country-level may provide very different conclusion compared studying the effect of corruption relevant to a firm on its stock price volatility. Hence, it is

[3] An exception seems to be Chen et al. (2018), who use corruption-related prosecution data to show that crackdown on corruption has a significant, negative impact on the crash risk of stock prices in China. But their study is specific to China, uses corruption related prosecution instead of the prevalence of corruption, and they look at the effect on stock price crash risk.

important to investigate the effect of corruption–relevant to a firm based on its size, industry, location, and country–on its equity price risk. This study fills this gap in the literature by investigating the effects of corrupt environment in which a firm operates in on its equity price volatility. Further, we investigate whether the corruption has asymmetric effect on equity price volatility by examining whether this effect systematically varies depending on the asset size of the firm. Our results indicate that higher-levels of corruption is associated with greater stock price volatility. Note that in a recent study, Lau et al. (2013) report a negative correlation between corruption and stock market volatility. Our findings, therefore, underscore the importance of studying the effects of corruption relevant to a firm on its equity price volatility because results are very different for a firm than for the entire stock market. Finally, we present evidence that corruption does have an asymmetric effect on equity price volatility of firms depending on their assets, and show that smaller firms are affected more adversely by corruption measured at size-industry-location-country level.

The rest of the paper is organized as follows. The next section provides the theoretical framework and outlines the empirical strategy. Section 3 defines the variables and describes the data used in the study. Results are reported in section 4 and section 5 concludes.

2 Theoretical Framework and Identification Strategy

In general, corruption acts as taxation and therefore is harmful for both small and large firms in the long-run because corruption will divert valuable resource from productive usage such as investments in research and development and may hurt innovation (Paunov, 2016). However, the effects of corruption on small firms may be different from its effects on large firms. A demand for bribe for the government services increases the cost of these services which may impact small firms more adversely than large firms. While large firms may be able to avail these services by paying a bribe, small firms may be denied or delayed some of these services due to limited resources at their disposal that can be devoted for making informal payments. Further, large firms may be able seek undue advantages by paying a bribe such as construction permits or government contracts. In the present context, therefore, while corruption may increase stock price volatility of all firms, this effect will be smaller for bigger firms because these firms may be able to bribe government officials to reduce the negative effects of such regulations (and may even benefit if the inability to pay bribes drives some smaller competitors out of business). Consequently, if an empirical specification fails to account for the interaction between the presence of corruption and firms' asset size, the estimates of corruption on stock price volatility may be biased. In other words, consider the following empirical specification

$$Volatility_{isjlct} = \alpha + \beta_c Corruption_{sjlct} + \delta \mathbf{X}_{isjlct} + \phi \mathbf{Y}_{ct} + \lambda_{sjlc} + \gamma_t + \varepsilon_{sjlct} \tag{1}$$

where $Volatility_{isjlct}$ denotes stock price volatility of firm i of size s operating in industry j in location l of country c in year t. $Corruption_{sjlct}$ measures the level of corruption relevant to the firm of size s operating in industry j in location l of country c in year t. $\mathbf{X}_{isjlct}$ denote firm-level characteristics and $\mathbf{Y}_{ct}$ denote country-level control variables. λ_{sjlc} is the size-industry-location-country fixed effect, and γ_t captures year fixed effects.

In this specification, β_c may be insignificant indicating that corruption has no significant impact on stock price volatility even though true β_c may be significantly different from 0 because this specification erroneously omits the interaction term between the presence of bribery and firm's asset size. A correct specification, based on our discussion, will include an interaction term between the presence of bribery and the asset size of the firm because larger firms may have an advantage in paying bribes that might reduce their stock price volatility. Hence, the correct specification allows for a differential impact of corruption based on firm's asset size as given below

$$
\begin{aligned}
Volatility_{isjlct} = \alpha + \beta_c Corruption_{sjlct} + \beta_i (Corruption_{sjlct} \times Asset_{isjlct}) \\
+ \beta_a Asset_{isjlct} + \delta \mathbf{X}_{isjlct} + \phi \mathbf{Y}_{ct} + \lambda_{sjlc} + \gamma_t + \varepsilon_{sjlct}
\end{aligned} \tag{2}
$$

If our hypotheses are correct, then we expect β_c to be positive and β_i to be negative indicating that the presence of corruption increases stock price volatility, but larger firms may be able to use bribery to their advantage and, hence, may be better able to weather adverse situations that may lead to high volatility in their stock prices compared to small firms. Note that the above-specification accounts for the size-industry-location-country and year fixed effects and, hence, the estimated coefficients are not driven due to the omission of fixed factors corresponding to firms' size-industry-location-country and/or year specific fixed factors.

In order to further augment the causal interpretation of our results, we employ an empirical strategy first proposed by Rajan and Zingales (1998) and most recently utilized by Paunov (2016) that allows for the identification of causal effects. This identification strategy relies on the assumption that corruption should have a greater impact on firms that operate in industries in which equity prices are more volatile. Since in different countries, different industries may have greater stock price volatility, we construct the volatility intensity of an industry, j, in a country, c, as described below. First, we compute the mean of (log) annual volatility of each industry in a country. Next, we compute the average of the mean volatility of the industries in the country obtained in the first step. Finally, the volatility intensity of industry, j, in a country, c, is computed by dividing the mean volatility in industry j by the average of the volatility of industries in the country. That is,

$$Intensity_{jc} = \frac{\frac{\sum_{n=1}^{n_{ijc}} \ln(\text{annual volatility})_{ijc}}{n_{ijc}}}{\frac{\sum_{n=1}^{n_{jc}} (\text{mean volatility})_{jc}}{n_{jc}}} \tag{3}$$

wherein subscripts i, j, and c denote firm, industry and country respectively. $Intensity_{jc}$ is the volatility intensity of industry j in country c relative to average volatility of all the industries in country c. n_{ijc} stands for the number of firm in industry j in country c and n_{jc} denotes the number of industries in country c.

We estimate the following specification in order to assess the effects of corruption on stock price volatility that allows for the differential impact of corruption on small and larger firms

$$\begin{aligned} Volatility_{isjlct} = \alpha &+ \beta_c(Intensity_{jc} \times Corruption_{sjlct}) \\ &+ \beta_i(Intensity_{jc} \times Corruption_{sjlct} \times Asset_{isjlct}) \\ &+ \beta_a Asset_{isjlct} + \delta \mathbf{X}_{isjlct} + \phi \mathbf{Y}_{ct} + \lambda_{sjlct} + \varepsilon_{sjlct} \end{aligned} \tag{4}$$

In the above equation, corruption variable, $Corruption_{sjlct}$, is interacted with the volatility intensity of the industry, $Intensity_{jc}$, since firms in industries with greater stock price volatility should be impacted more intensely by the presence of corruption. To assess whether firms with different asset sizes are differentially impacted, we interact the asset of the firm with the measures of corruption and intensity of the industry. In addition to the interaction effect, β_i, we also independently evaluate the effects of corruption (β_c) and asset size (β_a). Furthermore, we control for a large number of firm-level characteristics denoted by $\mathbf{X}_{isjlct}$. Note that the above specification allows for controlling for size-industry-location-country-year fixed effect denoted by λ_{sjlct}. As argued earlier, corruption measured in this way does not suffer from the same issues as corruption measured at the firm-level. The above specification, thus, allows for the causal interpretation of the estimated coefficients.

For the firm-level control variables, we largely follow Bartram et al. (2015), who explore the determinants of equity price risk of non-financial corporations. Firm size is measured by the logarithmic of total assets and firm's age is measured by number of years of existence. We expect a negative relationship between firm size and firm age with financial risk, as greater firm size and older firm is associated with lower equity price volatility. This finding is based on the simple intuition that larger and mature firms tend to have generally stable lines of business. Tangible assets is measured by logarithmic of total tangible assets (property, plant and equipment–serve as a proxy for the hardness of a firm's assets). The firm with fewer tangible assets found to be riskier if the recovery value upon bankruptcy is lower. *CAPEX*, measured by the ratio of capital expenditure to total assets, serves as a measure of a capital intensity as well as the growth potential of the firm. A higher *CAPEX* results into lower financial risk. A firm's profitability has been characterized in two ways: the level of profitability (measured as logarithmic of operating margin before depreciation) and profit volatility (measured as standard deviation of profit). It is expected that firms with higher profitability and lower profit volatility will have lower equity price risk (Pástor and Veronesi, 2003). We use different measures of financial leverage like total debt to market capitalization (measured as ratio of total debt to total market capitalization), total debt (logarithmic of total debt), debt to assets (ratio of total debt to total asset) and total cash holding (ratio of total cash holding to total market capitalization). Although firms choose the optimal amount of debt in their total financing, the financial risk increases with increase in debt after a certain level. Hence, we expect total debt to market capitalization, total debt, and debt to asset to be positively correlated with financial risk. On the other hand, a firm's financial risk decreases with increase in cash holding as they serve as liquid reserves and it also serves the role of precautionary savings to ensure against underinvestment (Acharya et al., 2007; Opler et al., 1999).

3 Data

3.1 Stock Price Volatility and Firm-Characteristics

The source of firm-level financial data is *Datastream* from Thomson Reuters. *Datastream* contains financial and macroeconomic data covering stock markets indices, equities, company fundamentals, fixed income securities, and key macroeconomic indicators for 175 countries and 60 markets. Our primary variable of interest is the annualized standard deviation of daily stock return for individual firms. In addition, a number of firm-level characteristics, such as the asset size, profitability, debt, cash holdings, dividend yield and coupon rate, are taken from *Datastream*.

3.2 Corruption Measures

Our primary measures of corruption are constructed using the data from the *World Bank Enterprise survey (WBES)*. The *WBES* is an anonymous survey of stratified random samples of firms. These representative firm-level surveys collect information on various aspects of the business environment, firm activities, market orientation, etc. We use four waves of the survey completed in 2005, 2008, 2012 and 2015. The questionnaires are designed in a way that each wave contains the information of three previous years. The disadvantage of the *WBES* database is missing data, especially for questions related to various measures of bribery and accounting information. Hence, it cannot be used alone in our study because it doesn't include questions on firm's financial structures that were consistently formulated over waves. Hence, we only use information on various measures of corruption, and few measures of control variables from the *WBES*. Given that the *WBES* is an anonymous survey of firms, it's not possible to exactly match firms from the two databases, a more general criterion for their merging is needed.

To link the firm-level variables from the *WBES* and *Datastream*, we utilize the merging approach used by Fungáčová et al. (2015). We define cells on the intersection of the following characteristics:

- Country
- Time period, corresponding to the four waves of the survey: 2003-05, 2006-08, 2009-12 and 2013-15
- Industry: two digit ISIC rev. 3.1 industry classification
- Firm size: micro (1-10 workers), small (11-49 workers), medium (50–99), and large (more than 100 workers)
- Location size: capital, city with a population above 1 million, and all others

We require that each cell includes at least 4 observations, and the dataset contains a median of 6 observations per cell, an average of 8.9 observations per cell, and a standard deviation of 7.95. For each cell, we compute the mean bribery from the *WBES* and assign it to every firm observation from *Datastream* within the same cell. We thus assume that all firms from the same cell face the same corrupt environment.

As argued earlier, defining corruption in this way does not suffer from the same endogeneity issue that would have been a concern if corruption was measured at the firm level. Moreover, existing research on bureaucratic corruption justifies the use of such a merging criterion. For instance, Svensson (2003) and Fisman and Miguel (2007) argue that the levels of bribery are industry and region-specific. They notably stress that firms from different industries depend differently on public officials, as they require different amounts of licenses and permits due to the specific characteristics of their activity. In our case, however, as we cannot identify regions from the WBES, we use the size of the location in the merging criterion like Paunov (2016). Firm size can also impact the level of bribery that affects firms.

Safavian et al. (2001) show that large firms can be more vulnerable to rent-extracting officials in Russia. Beck and Peria (2010) observe a negative relation between firm size and the degree to which the corruption of bank officials is considered an obstacle to the operation and growth of the business. This merging methodology leads to different characteristics of *Datastream* and WBES variables. All *Datastream* variables are firm-specific whereas all *WBES* variables are averages of the WBES firms in the same cell. Using the above-mentioned merging methodology adopted by previous literature, we define the measure of corruption used in the present study. The principle measures of corruption is *Bribe Intensity*, measured as the percentage of total annual sales paid in form of informal payment.

Moreover, we construct some additional variables using the *WBES data*–financial access and bank financing–for robustness checks. We adopt similar merging approach for these variables as corruption. We define bank financing as the proportion of the firm's total purchase of fixed assets that is financed by banks. And, financial access is defined as the share of the WBES firms, out of the total WBES firms in the same cell, which have a line of credit or a loan from a financial institution. Both these variables are expected to be negatively correlated with stock price volatility.

In addition to various firm-level controls, we also control for important macroeconomic variables–GDP per capita and inflation. The data source for the macroeconomic variables is the World Development Indicators from the World Bank.

Table 1 provides summary statistics for the sample used in this study. Our baseline specification consists of 3,194 firms in 6 different industries from 31 countries of the world over the period of 2003–2014. The baseline specification using corruption measure at country-level uses information on 3,317 firms in 6 industries from 33 countries over the same period. The selection of firms and countries is based on the availability of required data under study. As shown in Table A.1, the sample consists of both developing and developed countries.

4 Results

4.1 Main Results

The first three columns of Table 2 presents the results of the specification reported in equation 1. The coefficient of corruption is statistically insignificant in the first two columns, indicating that the corrupt environment in which a firm operates has no effect on its stock price volatility. However, as argued earlier, this specification ignores conceptually predicted asymmetric effects of corruption based on firm's asset size. Hence, in column 4, we present the estimates of the specification that takes this asymmetric effect into account by adding an interaction term between corruption variable and asset size as reported in equation 2. As expected, the coefficient of the corruption variable is positive and statistically highly significant, while that of the interaction term is negative and statistically highly significant. These results support our hypotheses that while corruption causes the equity price to be more volatile, the effect is larger for firms with small asset sizes. In columns 5, we control for the share of firms that have access to finance at the size-industry-location-country level. Coefficients of both the variables, corruption as well as the interaction of corruption and asset size, have the same sign as expected and are highly significant. In column 6, the results remain qualitatively similar when another indicator of financial access is added, *i.e.*, the percentage of firm's total assets financed by banks. Note that this result is similar to the findings of the previous studies (*e.g.*, Paunov, 2016) that find that corruption hurts small firms more than big ones.

The fourth column of Table 3 presents the results of our preferred specification presented in equation 4. In the first column, the coefficient of corruption variable interacted with intensity of the industry the firm operates in, is negative and statistically highly significant. However, when indicators of financial access interacted with volatility intensity is added in columns 2 and 3, this variable is no longer significant at conventional levels. In the next three columns, we add the interaction term between this corruption variable and asset size in the empirical specification to allow for the asymmetric effect. As can be seen in column, the corruption variable has a positive and statistically coefficient indicating that corruption positively impacts stock price volatility. Further, as expected, the coefficient of the interaction term between corruption, volatility intensity, and asset size is negative and statistically highly significant suggesting that the effect of corruption on stock price volatility is smaller for larger firms. Notice that size-industry-location-country-year fixed dummies are included in all the specification. Hence, not only the fixed factors but also the time varying factors related to the corrupt environment, in which a country operates, are not a concern for the estimates reported in this Table. In columns 5 and 6, we add the interaction between financial access variable and volatility intensity and the interaction between the percentage of total assets finance by banks and volatility intensity, respectively, both measured at the same level as corruption variable. The results remain qualitatively similar: while the coefficient of corruption variable is positive and significant, that of the interaction variable (corruption and asset size) is negative and statistically significant in both the columns. Further, as expected, both–the interaction between financial access variable and volatility intensity and the interaction between the percentage of total assets finance by banks and volatility intensity–is negative and significant indicating that a greater access to finance is negatively associated with stock price volatility.

Among control variables, several firm-level variables are significantly associated with equity price volatility. Consistent with the expectations, equity price volatility is smaller for larger and older firms. Moreover, capital expenditure is strongly and negatively associated with equity price volatility, whereas tangible assets are negatively, though slightly weakly, associated with equity price volatility. As expected, stock price volatility is higher for firms whose profits are more volatile and firms with greater debt. Somewhat surprisingly, cash holding is positively associated with stock price volatility, which could be because too much cash holding may not be viewed as efficient by stockholders.

In Table 4, we report the results of the specification given by equation 4 presented in the third column of Table 3 by industry. Note that for the Technology sector, there are only 169 observations making the inferences drawn for the industry unreliable given a large number of control variables and fixed effects dummies. Except for Consumer Services industry (column 4), corruption is positively associated with stock price volatility of firms in each industry. Further, in all these industries (again, except Consumer Services), the interaction term between the corruption variable and asset size is negative and statistically highly significant, suggesting the effect of on the stock price volatility of larger firms is smaller than that of smaller firms. Additionally, these results suggest that firms operating in Industrial Goods and Services and Consumer Goods industries are affected more by corruption than other industries. Overall, these results are consistent with those presented in Table 3 for the full sample.

4.2 Country-level corruption and equity price volatility

There are various reasons why the effect of country-level corruption on stock price volatility may be different from that of local-level corruption. Studies exploring the effects of country-level corruption on various economic outcomes typically utilize corruption perception indices (one of the following three–the Control of Corruption Index (CCI) from the World Bank, Corruption Perception Index (CPI) from Transparency International, and the International Country Risk Guide's (ICRG) corruption index). These indices are based on the perceptions of the businesses, individuals, non-government organizations, and country experts, and capture corruption at both petty and grand levels such as government and political corruption as well as corruption by tax and custom officials, judiciary, police, government offices, and more. Corruption in several of these sectors might have differential impact on big firms than small firms. For example, it is quite possible that certain types of corruption, notably political corruption and government corruption at higher-levels, impact bigger firms more adversely than smaller firms. Bigger firms might face greater scrutiny and regulations than smaller firms and hence may need to pay greater bribes. In support of this argument, Safavian et al. (2001) show that large firms can be more vulnerable to rent-extracting officials in Russia. In certain other cases, while it may possible for the smaller firms to avoid certain regulations by bribing officials, this option may not available to larger firms because of their visibility caused by their size. Hence, while large firms may have an advantage dealing with local-level corruption, this may not necessarily be true for country-level corruption. Following this discussion, in this section, we assess the effects of country-level corruption on stock price volatility and investigate whether the effect is asymmetric for small and large firms.

In order to allow for the causal interpretation, we again follow Paunov (2016) and estimate the following two specifications

$$\begin{aligned} Volatility_{isjlct} &= \alpha + \beta_c(Intensity_{jc} \times Corruption_{ct}) \\ &\quad + \delta \mathbf{X}_{isjlct} + \lambda_j + \lambda_l + \lambda_{ct} + \varepsilon_{isjlct} \end{aligned} \tag{5}$$

where $Corruption_{ct}$ measures the level of corruption in country c in year t. λ_j, λ_l, and λ_{ct} are industry, location, and country-year fixed effects respectively. Further, the above equation is augmented by adding the interaction term to investigate differential effect of corruption of stock price volatility depending on the asset size

$$\begin{aligned} Volatility_{isjlct} &= \alpha + \beta_c(Intensity_{jc} \times Corruption_{ct}) \\ &\quad + \beta_i(Intensity_{jc} \times Corruption_{ct} \times Asset_{isjlct}) \\ &\quad + \beta_a Asset_{isjlct} + \mathbf{X}_{isjlct} + \lambda_j + \lambda_l + \lambda_{ct} + \varepsilon_{isjlct} \end{aligned} \tag{6}$$

where $Asset_{isjlct}$ denotes (log) asset of firm i. To assess whether firms with different asset sizes are differentially impacted by country-level corruption, we interact the asset of the firm with our country-level measure of corruption and independently evaluate the effects of corruption (β_c), asset size (β_a), and the interaction effect (β_i).

The results are presented in Table 5. We control for a host of fixed effects including country-year fixed effects that ensures that estimates are not driven due to the omission of country-specific time varying factors such as GDPPC, inflation, or institutional quality. These results suggest that corruption is positively associated with stock price volatility of firms. Moreover, in contrast to the effects of corruption measured at size-industry-location-country level presented in Table 3, the stock price volatility increases with the size of the asset suggesting that bigger firms are affected more adversely by the prevalence of corruption measured at the country level. A potential explanation of these results lies in the fact that country-level corruption in a large part is influenced by political corruption, which may be more relevant for big firms. A change in the political party in power will then hurt big firms more than small firms causing the stock price volatility of larger firms to be higher in the presence of corruption. Our findings therefore suggest that while corruption measured at both size-industry-location-country level and country level cause firm-level stock price volatility to increase, the former is more harmful for smaller firms whereas the latter hurts the larger firm more.

5 Conclusion

This paper is the first to investigate the effects of corruption on stock price volatility at the firm-level. We create a measure of corruption that is most relevant to the firm based on its size, the industry it operates in, and its location within the country, and employ a very robust identification strategy that allows for the causal interpretation of the estimated coefficients. We also use corruption measured at the country-level. We find that a higher level of corruption, whether measured at the country-level or measured at size-industry-location-country level, is associated with a higher stock price volatility. We further find that the effect of size-industry-location-country level corruption is smaller for large forms and show that stock price volatility decreases with the asset size in the presence of corruption relevant to a firm. On the other hand, corruption measured at the country-level is shown to be worse for large firms: it is shown that stock price volatility rises with the asset size if country-level corruption is high. These relationship are shown to be robust to the inclusion of a number of firm-level characteristics and country-level control variables along with a host of fixed effects that account for unobserved heterogeneity across industry, location, and country. To the extent that most investors tend to be risk-averse, the results of this study suggest that corruption will result in a decrease in the investments in a country, which is consistent with the cross-country findings of the classical paper by Mauro (1995).

Strong policy implications can be derived from the empirical findings of this study. Since corruption increases stock price volatility of firms, which in turn, will hurt investments and hence economic growth (Adams, 2009), policy makers have strong incentive to constrain corruption. Further, since corruption (relevant to a firm) has greater effects on the stock price volatility of small firms, a higher level of corruption may result in the exclusion of small firms play an important role in the innovation leading to technological change and economic growth and provide job opportunities to many (Acs, 2012). Finally, in line with the the previous studies (*e.g.*, Paunov, 2016, the findings of this study also indicate that, since corruption has an asymmetric effect on the stock price volatility of small versus large firms, creating business associations to fight corruption may not be sufficient (Dixit, 2015). Hence, it may be important, wherever possible, to define a time-frame within which certain government services (*e.g.*, utility services, telephone connects, and such) must be provided after the application for the same has been submitted. Note, however, that this is alone not sufficient and must be complemented with some sort of measures that holds the responsible official accountable if the services has not been provided within the time-frame.

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Table 1: Summary Statistics

Variable	Mean	Std. Dev.	N
Corruption Variables			
Control of Corruption Index (CCI)	0.16	0.548	10083
$CCI_{ct} \times Intensity_{jc}$	0.16	0.547	10083
$CCI_{ct} \times Intensity_{jc} \times Asset_{isjltc}$	2.971	9.08	10083
Bribe as % of total Sales	2.318	4.738	10083
$Corruption_{sjltc}$*$Intensity_{jc}$	2.32	4.747	10083
$Corruption_{sjltc}$*$Intensity_{jc} \times Asset_{isjltc}$	31.754	62.033	10083
Firm-level Variables			
Annual volatility	4.49	0.582	10083
Assets	14.97	3.151	10083
Age	21.095	20.15	10083
Capital Expenditure	0.057	0.07	10083
Tangible Assets	0.383	0.255	10083
Profits	0.037	1.909	10083
Profit Volatility	-3.274	1.136	10083
Dividend Yield	0.033	0.395	10083
Coupon Rate	1.103	24.041	10083
Cash to Market Capital	0.343	1.558	10083
Debt to Market Capital	1.779	5.461	10083
Country-level Variables			
GDP per capita	8.572	0.89	10083
Inflation	5.91	3.553	10083
Additional Variables			
Access to Finance	0.392	0.23	10015
Bank Financing	0.191	0.14	10015
$Access\ to\ Finances_{sjlct} * Intensity_{jc}$	0.392	0.23	10015
Bank Financing $*Intensity_{jc}$	0.191	0.14	10015

Table 2: The effect of corruption on equity price volatility

	(1)	(2)	(3)	(4)	(5)	(6)
Corruption						
$Corruption_{sjlct}$	0.00962	0.00470	0.00630	0.127***	0.123***	0.124***
	(0.00844)	(0.00902)	(0.00890)	(0.0152)	(0.0152)	(0.0155)
$Corruption_{sjlct} * Asset_{isjlct}$				-0.00727***	-0.00745***	-0.00732***
				(0.000766)	(0.000761)	(0.000768)
Firm-level controls						
Assets_{isjlct}	-0.0499***	-0.0500***	-0.0499***	-0.0355***	-0.0352***	-0.0353***
	(0.00462)	(0.00464)	(0.00464)	(0.00447)	(0.00450)	(0.00449)
Age_{isjlct}	-0.00122***	-0.00119***	-0.00119***	-0.00112***	-0.00109***	-0.00109***
	(0.000352)	(0.000351)	(0.000351)	(0.000346)	(0.000344)	(0.000344)
$\text{Capital Expenditure}_{isjlct}$	-0.264***	-0.268***	-0.268***	-0.252**	-0.257***	-0.256**
	(0.0956)	(0.0962)	(0.0962)	(0.0985)	(0.0994)	(0.0993)
$\text{Tangible Assets}_{isjlct}$	-0.0555**	-0.0574**	-0.0583**	-0.0592**	-0.0609***	-0.0621***
	(0.0242)	(0.0242)	(0.0241)	(0.0234)	(0.0233)	(0.0234)
Profits_{isjlct}	0.00234	0.00279	0.00273	0.00216	0.00268	0.00260
	(0.00253)	(0.00283)	(0.00285)	(0.00255)	(0.00282)	(0.00284)
$\text{Profit Volatility}_{isjlct}$	0.0695***	0.0696***	0.0696***	0.0681***	0.0681***	0.0682***
	(0.00576)	(0.00582)	(0.00583)	(0.00570)	(0.00575)	(0.00576)
$\text{Dividend Yield}_{isjlct}$	-0.00410	0.00190	0.00223	-0.00447	0.00128	0.00193
	(0.0114)	(0.0134)	(0.0134)	(0.0115)	(0.0134)	(0.0134)
$\text{Coupon Rate}_{isjlct}$	0.000138	0.000134	0.000133	0.000148	0.000140	0.000142
	(0.000271)	(0.000274)	(0.000274)	(0.000271)	(0.000276)	(0.000275)
$\text{Cash to Market Capital}_{isjlct}$	0.0110	0.0118	0.0118	0.0105	0.0113	0.0112
	(0.0111)	(0.0110)	(0.0110)	(0.0113)	(0.0112)	(0.0112)
$\text{Debt to Market Capital}_{isjlct}$	0.0108***	0.0115***	0.0115***	0.0109***	0.0115***	0.0115***
	(0.00179)	(0.00179)	(0.00179)	(0.00180)	(0.00180)	(0.00180)
Small_{isjlct}	-1.766***	-0.208*	-0.249**	-1.489**	-0.814***	-0.841***
	(0.616)	(0.110)	(0.117)	(0.623)	(0.129)	(0.138)
Medium_{isjlct}	-0.737*	-0.738*	-0.939**	-0.566	-0.561	-0.782*
	(0.418)	(0.416)	(0.427)	(0.422)	(0.418)	(0.430)
Large_{isjlct}	-1.580**	-0.366***	-0.351***	-1.341**	-0.574***	-0.533***
	(0.618)	(0.103)	(0.102)	(0.624)	(0.105)	(0.104)
Macroeconomic controls						
$\text{GDP per capita}_{ct}$	-0.502*	-0.550**	-0.631**	-0.366	-0.428*	-0.503*
	(0.258)	(0.256)	(0.262)	(0.261)	(0.259)	(0.265)
Inflation_{ct}	-0.00717	-0.00542	-0.00695	-0.00922*	-0.00675	-0.00899*
	(0.00477)	(0.00481)	(0.00477)	(0.00478)	(0.00482)	(0.00477)
Additional controls						
$\text{Access to Finances}_{sjlct}$		0.192*			0.273**	
		(0.113)			(0.114)	
$\text{Bank Financing}_{sjlct}$			0.253			0.266
			(0.166)			(0.168)
Size-industry-location-country FE	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes		
Observations	10083	10015	10015	10083	10015	10015
R^2	0.256	0.257	0.257	0.263	0.264	0.264

Standard errors clustered by size, industry, location, country, and year in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Constant not reported.

Table 3: The effect of corruption on equity price volatility

	(1)	(2)	(3)	(4)	(5)	(6)
Corruption						
$Corruption_{sjlct} * Intensity_{jc}$	-0.0837***	-0.00320	0.000345	0.0620***	0.146***	0.147***
	(0.00256)	(0.00215)	(0.00196)	(0.0145)	(0.0148)	(0.0146)
$Corruption_{sjlct} * Intensity_{jc} * Asset_{isjlct}$				-0.00869***	-0.00867***	-0.00867***
				(0.000860)	(0.000863)	(0.000863)
Firm-level controls						
Assets_{isjlct}	-0.0509***	-0.0508***	-0.0508***	-0.0335***	-0.0334***	-0.0334***
	(0.00521)	(0.00523)	(0.00523)	(0.00509)	(0.00512)	(0.00512)
Age_{isjlct}	-0.00133***	-0.00129***	-0.00129***	-0.00121***	-0.00117***	-0.00117***
	(0.000402)	(0.000401)	(0.000401)	(0.000393)	(0.000393)	(0.000393)
Capital $\text{Expenditure}_{isjlct}$	-0.275**	-0.270**	-0.270**	-0.255**	-0.250**	-0.250**
	(0.109)	(0.108)	(0.108)	(0.112)	(0.112)	(0.112)
Tangible Assets_{isjlct}	-0.0440	-0.0452*	-0.0452*	-0.0521**	-0.0531**	-0.0531**
	(0.0268)	(0.0268)	(0.0268)	(0.0256)	(0.0257)	(0.0257)
Profits_{isjlct}	0.00335	0.00350	0.00350	0.00330	0.00344	0.00344
	(0.00304)	(0.00299)	(0.00299)	(0.00294)	(0.00289)	(0.00289)
Profit $\text{Volatility}_{isjlct}$	0.0729***	0.0733***	0.0733***	0.0709***	0.0712***	0.0712***
	(0.00666)	(0.00672)	(0.00672)	(0.00657)	(0.00663)	(0.00663)
Dividend Yield_{isjlct}	0.000578	0.00510	0.00510	0.000609	0.00500	0.00500
	(0.0125)	(0.0146)	(0.0146)	(0.0125)	(0.0147)	(0.0147)
Coupon Rate_{isjlct}	0.000119	0.000119	0.000119	0.000123	0.000124	0.000124
	(0.000366)	(0.000366)	(0.000366)	(0.000371)	(0.000371)	(0.000371)
Cash to Market Capital_{isjlct}	0.0147	0.0160	0.0160	0.0143	0.0155	0.0155
	(0.0113)	(0.0111)	(0.0111)	(0.0116)	(0.0113)	(0.0113)
Debt to Market Capital_{isjlct}	0.0104***	0.0111***	0.0111***	0.0105***	0.0112***	0.0112***
	(0.00197)	(0.00197)	(0.00197)	(0.00197)	(0.00197)	(0.00197)
Small_{isjlct}	1.007***	-1.036***	-1.721***	1.075***	-1.084***	-1.700***
	(0.0424)	(0.0315)	(0.0204)	(0.0412)	(0.0311)	(0.0200)
Medium_{isjlct}	1.651***	-0.638***	0.0898**	1.726***	-0.673***	0.164***
	(0.0417)	(0.0278)	(0.0380)	(0.0403)	(0.0263)	(0.0383)
Large_{isjlct}	0.608***	-0.640***	-2.000***	0.683***	-0.637***	-1.973***
	(0.0374)	(0.0272)	(0.0320)	(0.0363)	(0.0263)	(0.0305)
Macroeconomic controls						
GDP per capita_{ct}	0.810***	0.0247**	-0.361***	0.859***	0.0303***	-0.333***
	(0.0166)	(0.0121)	(0.0151)	(0.0162)	(0.0107)	(0.0147)
Inflation_{ct}	0.0545***	-0.0520***	0.0506***	0.0535***	-0.0590***	0.0494***
	(0.000954)	(0.00158)	(0.00376)	(0.000968)	(0.00167)	(0.00367)
Additional controls						
Access to Finances_{sjlct}* Intensity_{jc}		-0.0504**			-0.0588***	
		(0.0224)			(0.0199)	
Bank Financing_{sjlct}* Intensity_{jc}			-0.712***			-0.772***
			(0.0470)			(0.0457)
Size-industry-location-country-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10083	10015	10015	10083	10015	10015
R^2	0.380	0.381	0.381	0.388	0.389	0.389

Standard errors clustered by size, industry, location, country, and year in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Constant not reported.

Table 4: The effect of corruption on equity price volatility by industry

	Basic Material	Industrial Goods & Services	Consumer Goods	Consumer Services	Technology
	(1)	(2)	(3)	(4)	(5)
Corruption					
$Corruption_{sjlct} * Intensity_{jc}$	0.0558**	0.146***	0.148***	0.0414	-0.979
	(0.0261)	(0.0176)	(0.0244)	(0.0602)	(0.754)
$Corruption_{sjlct} * Intensity_{jc} * Asset_{isjlct}$	-0.00573***	-0.00890***	-0.0106***	0.00150	0.0502
	(0.00191)	(0.00106)	(0.00171)	(0.00679)	(0.0398)
Firm-level controls					
Assets_{isjlct}	-0.0354***	-0.0339***	-0.0377***	-0.0463***	-0.0628
	(0.0116)	(0.00762)	(0.0102)	(0.0163)	(0.0375)
Age_{isjlct}	-0.000728	-0.00158***	-0.000390	-0.00360***	-0.00879
	(0.000973)	(0.000565)	(0.000683)	(0.00120)	(0.00691)
$\text{Capital Expenditure}_{isjlct}$	-0.152	-0.143	-0.360*	-0.658***	-0.219
	(0.349)	(0.158)	(0.209)	(0.217)	(0.608)
$\text{Tangible Assets}_{isjlct}$	0.181**	-0.0897*	-0.0627	-0.0829**	-0.0498
	(0.0908)	(0.0510)	(0.0651)	(0.0359)	(0.231)
Profits_{isjlct}	0.00219	0.00322	0.00328	0.00697	0.0697
	(0.00732)	(0.0131)	(0.00354)	(0.00808)	(0.113)
$\text{Profit Volatility}_{isjlct}$	0.0761***	0.0710***	0.0594***	0.0608***	0.0706*
	(0.0203)	(0.00944)	(0.0129)	(0.0156)	(0.0359)
$\text{Dividend Yield}_{isjlct}$	0.0234	0.0111*	-0.294*	-0.804	-1.270***
	(0.0294)	(0.00668)	(0.159)	(0.719)	(0.332)
$\text{Coupon Rate}_{isjlct}$	0.000198	0.000130	0.000650	-0.00176***	-0.0176***
	(0.000201)	(0.000517)	(0.000527)	(0.000269)	(0.00400)
$\text{Cash to Market Capital}_{isjlct}$	-0.0183	0.00755	0.0262***	0.0322	0.0846
	(0.0281)	(0.0108)	(0.00991)	(0.0681)	(0.0584)
$\text{Debt to Market Capital}_{isjlct}$	0.0119***	0.00865***	0.0142***	0.0346***	0.00577
	(0.00323)	(0.00316)	(0.00326)	(0.0119)	(0.00592)
Small_{isjlct}	0.0941	-0.136	-0.526***	-1.512***	0.00551
	(0.0953)	(0.0921)	(0.0495)	(0.424)	(0.308)
Medium_{isjlct}	-0.560***	0.118	-0.394***	-2.424***	-0.461
	(0.0645)	(0.0822)	(0.0667)	(0.156)	(0.368)
Large_{isjlct}	-1.329***	-0.00908	-0.509***	-2.168***	-0.240
	(0.0936)	(0.0837)	(0.0776)	(0.153)	(0.387)
Macroeconomic controls					
$\text{GDP per capita}_{ct}$	0.709***	-0.0838***	0.477***	-0.411***	0.390*
	(0.0209)	(0.0119)	(0.0305)	(0.133)	(0.221)
Inflation_{ct}	-0.0905***	-0.0581***	0.0631***	-0.267***	0.0316
	(0.00763)	(0.00367)	(0.00368)	(0.0184)	(0.0345)
Size-industry-location-country-year FE	Yes	Yes	Yes	Yes	Yes
Observations	1610	3798	3027	1447	169
R^2	0.384	0.378	0.368	0.463	0.476

Standard errors clustered by size, industry, location, country, and year in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Constant not reported.

Table 5: The effect of country-level corruption on equity price volatility

	(1)	(2)	(3)	(4)	(5)	(6)
$Corruption_{ct} * Intensity_{jc}$	1.492**	1.548**	1.553**	1.104*	1.163*	1.169*
	(0.636)	(0.637)	(0.637)	(0.643)	(0.645)	(0.645)
$Corruption_{ct} * Intensity_{jc} * Asset_{isjlct}$				0.0205***	0.0203***	0.0203***
				(0.00717)	(0.00725)	(0.00725)
Firm-level controls						
Assets_{isjlct}	-0.0488***	-0.0487***	-0.0487***	-0.0502***	-0.0500***	-0.0501***
	(0.00602)	(0.00606)	(0.00605)	(0.00585)	(0.00590)	(0.00589)
Age_{isjlct}	-0.00128***	-0.00124***	-0.00124***	-0.00115***	-0.00112***	-0.00112***
	(0.000310)	(0.000310)	(0.000311)	(0.000324)	(0.000324)	(0.000326)
$\text{Capital Expenditure}_{isjlct}$	-0.313***	-0.309***	-0.309***	-0.338***	-0.335***	-0.334***
	(0.0985)	(0.0986)	(0.0990)	(0.0949)	(0.0952)	(0.0955)
$\text{Tangible Assets}_{isjlct}$	-0.0364	-0.0379	-0.0376	-0.0361	-0.0376	-0.0373
	(0.0249)	(0.0247)	(0.0247)	(0.0250)	(0.0248)	(0.0248)
Profits_{isjlct}	0.00233	0.00213	0.00211	0.00204	0.00189	0.00187
	(0.00229)	(0.00288)	(0.00289)	(0.00238)	(0.00297)	(0.00299)
$\text{Profit Volatility}_{isjlct}$	0.0731***	0.0733***	0.0733***	0.0706***	0.0708***	0.0708***
	(0.00684)	(0.00693)	(0.00693)	(0.00665)	(0.00674)	(0.00674)
$\text{Dividend Yield}_{isjlct}$	-0.00105	-0.00119	-0.00137	-0.000899	-0.000425	-0.000600
	(0.0109)	(0.0147)	(0.0147)	(0.0111)	(0.0146)	(0.0146)
$\text{Coupon Rate}_{isjlct}$	0.000203	0.000208	0.000205	0.000201	0.000206	0.000203
	(0.000251)	(0.000253)	(0.000253)	(0.000251)	(0.000253)	(0.000253)
$\text{Cash to Market Capital}_{isjlct}$	0.00868	0.00884	0.00888	0.00896	0.00912	0.00917
	(0.0116)	(0.0118)	(0.0118)	(0.0116)	(0.0117)	(0.0118)
$\text{Debt to Market Capital}_{isjlct}$	0.0103***	0.0107***	0.0107***	0.0105***	0.0109***	0.0108***
	(0.00210)	(0.00207)	(0.00207)	(0.00208)	(0.00205)	(0.00205)
Small_{isjlct}	-0.0161	-0.0173	-0.0178	-0.0152	-0.0163	-0.0169
	(0.0128)	(0.0129)	(0.0132)	(0.0128)	(0.0129)	(0.0132)
Medium_{isjlct}	0.0128	0.00940	0.0106	0.0132	0.0101	0.0111
	(0.0130)	(0.0151)	(0.0132)	(0.0130)	(0.0150)	(0.0132)
Large_{isjlct}	0.00295	-0.00341	-0.00102	0.00417	-0.00176	0.000237
	(0.0125)	(0.0176)	(0.0130)	(0.0124)	(0.0175)	(0.0129)
Additional controls						
$\text{Access to Finances}_{sjlct}$		0.0306			0.0285	
		(0.0587)			(0.0584)	
$\text{Bank Financing}_{sjlct}$			0.0650			0.0642
			(0.0601)			(0.0602)
Industry fixed effects	Yes	Yes	Yes	Yes		
Location fixed effects	Yes	Yes	Yes	Yes		
Observations	10525	10457	10457	10525	10457	10457
R^2	0.204	0.205	0.205	0.206	0.206	0.206

Standard errors clustered by country, industry, and year in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Constant not reported.

Appendix

Table A.1: List of Countries

Country	Observations	Percent	Cum.
Argentina	166	1.69	1.69
Bangladesh	40	0.41	2.1
Bosnia and Herzegovina	47	0.48	2.58
Brazil	387	3.95	6.53
Bulgaria	166	1.69	8.23
Chile	374	3.82	12.05
China	111	1.13	13.18
Colombia	49	0.5	13.68
Croatia	116	1.18	14.86
Czech Republic	9	0.09	14.96
Hungary	8	0.08	15.04
India	2,180	22.26	37.29
Indonesia	897	9.16	46.45
Israel	442	4.51	50.96
Jordan	154	1.57	52.54
Latvia	35	0.36	52.89
Lithuania	20	0.2	53.1
Malaysia	1,087	11.1	64.2
Mexico	348	3.55	67.75
Montenegro	6	0.06	67.81
Morocco	40	0.41	68.22
Nigeria	52	0.53	68.75
Pakistan	42	0.43	69.18
Peru	167	1.7	70.88
Philippines	352	3.59	74.48
Poland	523	5.34	79.82
Romania	109	1.11	80.93
Serbia	18	0.18	81.11
Slovenia	42	0.43	81.54
Sweden	252	2.57	84.11
Thailand	535	5.46	89.58
Turkey	957	9.77	99.35
Ukraine	64	0.65	100
Total	9,795	100	