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BRIBERY ENVIRONMENT AND FIRM PERFORMANCE: EVIDENCE FROM CENTRAL AND EASTERN EUROPEAN COUNTRIES[†]

Abstract

We examine the relation between bureaucratic corruption and firm performance in CEE countries. While previous research uses data from BEEPS, which suffers from excessive non-reporting of corporate performance, we combine reliable firm financials from the Amadeus database with information on bribery practices from BEEPS. We show that differing consequences of corruption found in previous studies could be explained by the corruption environment in which a firm operates. Basically, higher mean bribery is associated with lower performance, while higher dispersion of individual firm bribes appears to facilitate firm performance. A detailed analysis is conducted by firm sector and size, and countries' institutional environments.

JEL Classification: D22, D73, O12 and P37
Keywords: bureaucratic corruption, cee countries, firm bribing behavior and firm performance

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1 Introduction

In countries with weak policies and legal systems, corruption is considered a strong constraint on growth and development. It is a central and problematic topic for the governments of these countries and for international organizations, whose task it is to uncover the sources of corruption to to fight it and help overcome it (Kaufmann, 2005; Khan, 2006).

The existing literature on the effects of corruption on firm performance, however, is divided. One branch of research considers corruption a 'grease the wheels' instrument that helps to overcome cumbersome bureaucratic constraints, inefficient provision of public services, and rigid laws (Leff, 1964; Huntington, 1968; Lui, 1985; Lein, 1986), especially when countries' institutions are weak and function poorly (Acemoglu and Verdier, 2000; Meon and Weill, 2010; De Vaal and Ebben, 2011). Another branch argues that corruption reduces economic performance due to rent seeking, increase of transaction costs and uncertainty, inefficient investments, and misallocation of production factors (Murphy et al., 1991; Shleifer and Vishny, 1993; Rose-Ackerman, 1997; Kaufmann and Wei, 2000). Empirical evidence at the firm level is also ambiguous (McArthur and Teal, 2004; Fisman and Svensson, 2007; De Rosa et al., 2010; Vial and Hanoteau, 2010), and overall, has remained scarce due to a lack of available data.

In this paper we aim to fill a gap in the firm-level empirical research on bureaucratic corruption (bribery) by overcoming the data and methodological shortcomings of previous studies. In most literature, information on firm bribery practices comes from anonymous surveys, in which firms may be reluctant to reveal their financial records. In the often-used BEEPS and WBES databases,[1] 40–50% of firms do not report their performance indicators. Moreover, responses to the survey questions are generally also subject to managers' level of pessimism or optimism. These features are likely to cause erroneous inferences from the data. Existing studies also mostly deal with cross-sectional data, an invitation to endogeneity problems, given recognized difficulties to find instruments to measure corruption.

To overcome these limitations, we avoid studying the effects of a particular firm's bribing behavior on its own performance. Instead, we introduce a 'local market' in which a firm operates as a cluster formed by country, industry, firm size, and location size. Within those markets we analyze how the 'local bribery environment' – characterized by the mean and dispersion of the bureaucratic corruption – influences the economic performance of a firm.

[1] BEEPS (Business Environment and Enterprise Performance Survey) is a part of the global WBES (World Bank Enterprise Survey).

For this purpose we use large, reliable and large data on firm financials from the Amadeus database, and to describe the local bribery environment we utilize the BEEPS database. We compute the mean and standard deviation of the bribery measure from BEEPS for each cluster defined by survey wave, country, double-digit industry, three firm-size categories, and three location-size categories. For each firm in the Amadeus database we can also identify the cluster to which it belongs, and therefore, each firm is assigned characteristics of the local bribery environment by the mean and dispersion of bureaucratic corruption within this cluster.[2] Economically, the mean of bribery proxies for the equilibrium level of bureaucratic corruption in a local market. The bribery dispersion, in turn, represents the bribing behavior of firms indicated by their willingness to pay bribes, existence of a variety of different bribing strategies, the discretionary power of public officials to extract bribes, and uncertainty regarding corruption environments. Higher dispersion means that only some of firms bribe in a local market.

Our approach results in large firm-level panel data for 14 CEE countries over 1999 – 2007 (around 702,000 firm-year observations). This dataset has more accurate information on firms' economic activity and bribery than BEEPS alone.[3] Endogeneity of bribery measure is reduced, since an individual firm less likely cause the mean level and dispersion of bribery in a local market. The joint use of two independent data sources further alleviates this concern. Moreover, in the regression analysis we control for firm fixed effects, which eliminate time-invariant factors that could simultaneously cause bribery and impact firm performance. Similarly to some previous research (Gaviria, 2002; Beck et al., 2005; Fisman and Svensson, 2007; Vial and Hanoteau, 2010) we focus on sales and labor productivity growth of firms, as these enhance wealth and employment creation, and stimulate development.

The results of the empirical analysis, identified from within-firm variation, show that the ambiguous consequences of corruption found in previous studies could be explained by divergent effects of the mean and dispersion of corruption. In particular, a higher bribery mean impedes both the real sales and the labor productivity growth of firms. This is generally consistent with the existing firm- and macro-level empirical research. In contrast, a higher bribery dispersion of individual firm bribes facilitates firm performance. We also find that these impacts are more pronounced in the case of labor productivity growth. Our results imply that at least some bribing firms receive preferential treatments from public officials, and non-

[2] These two statistics are the best way to describe bribery environment in the local market: average bribery level, and dispersion of individual firm bribes; given that we cannot obverse individual firm bribes.

[3] First, the firms in the employed dataset constitute the bulk of the economic activity of those 14 countries, which makes our analysis stronger because the potential bias due to focusing on specific sectors is negligible. Second, using cluster characteristics, one can assume that firm-specific perception and measurement error are averaged out.

bribing firms are likely more efficient in production and growth in dispersed local bribery environments. The existence of a certain number of bribing firms in a local market increases aggregate firm performance, which is in line with Acemoglu and Verdier (2000), as positive effects from bribery dispersion can overshoot negative effect from bribery mean. The chance to receive benefits from bribery for particular firms, therefore, may be one reason why corruption does not vanish in spite of its overall growth restraining effect. A possible task for policymakers could be to increase the transparency of interactions between firms and public officials. That could reduce the discretionary power of both and lower preferential gains from corruption.

In addition, we find that our results are not identical for different types of firms. Smaller and more stable firms are least affected by bribery, while service firms are able to gain the most in environments with higher corruption dispersion. We also observe that in countries with stronger institutions, the effects of bribery mean and dispersion are more pronounced.

The reminder of the paper is structured as follows. The next section discusses the theoretical background and empirical evidence of the relation between bribery and firm performance, and introduces the notion of 'local bribery environments'. Section 3 describes the data and the procedure to combine financial information with the bribery practices of firms. Section 4 outlines the empirical methodology, section 5 presents the results and robustness checks, and section 6 concludes.

2. Links Between Bribery and Firm Performance

2.1 Theoretical and empirical background

According to the 'grease the wheels' hypothesis, firms can benefit from bribery if it helps them to overcome bureaucratic constraints, inefficient public services, or rigid or bad laws (Leff, 1964; Huntington, 1968). Using the queue model, Lui (1985), for instance, shows that bribes can expedite obtaining public services. Beck and Maher (1986) and Lein (1986) suggest that bribing is similar to bidding in a competitive auction, which results in an efficient allocation of public services, licenses, and permits.

This view, however, has been extensively criticized. In his later work, Lein (1990) shows that outcomes in the auction model can be inefficient if there is discrimination among firms. Using a general equilibrium framework, Kaufmann and Wei (2000) argue that public officials have incentives to increase the burden of bureaucracy in order to extract more bribes, thereby eliminating the possible benefits to firms. Rose-Ackerman (1997) suggests that less efficient

firms that, however, have better connections with public officials and/or larger market power, may offer higher bribes and obtain public services faster. Further, bribing can be too costly and hinder firms' profits, subsequent production, and growth (Sanyal, 2004). It creates even greater market distortions than taxation (Shleifer and Vishny, 1993) and forces the reallocation of talent from production to rent-seeking (Murphy et al., 1991). Dal Bo and Rossi (2007) also demonstrate that corruption increases inefficiency of firms by shifting managerial talent to non-productive activities.

The effects of corruption and bribery could differ, however, by institutional environments. Acemoglu and Verdier (2000) suggest that when a government intervenes to correct market failures, a certain amount of corruption may exist as part of optimal allocation. Infante and Smirnova (2009) show that in weaker institutional environments, rent-seeking bureaucrats can help improve the productivity of entrepreneurs. Similarly, De Vaal and Ebben (2011) demonstrate that when the initial quality of institutions is below a certain threshold, bureaucratic corruption facilitates economic performance. In a cross-country empirical study Meon and Weill (2010) find that corruption helps improve aggregate efficiency, especially in countries with weaker institutions.

The empirical firm-level evidence on the relationship between bureaucratic corruption and firm performance is inconclusive. Some research finds either an insignificant or negative impact of bribery on the sales growth or productivity of firms (for example, Gaviria (2002) for Latin America, McArthur and Teal (2004) for Africa, and Fisman and Svensson (2007) for Uganda). For CEE and the former Soviet Union region, De Rosa et al. (2010) show that bribery more negatively affects firm productivity in non-EU countries and in those with weaker overall institutional environments. Vial and Hanoteau's (2010) plant-level study for Indonesia, however, reports a positive effect of corruption on firm growth. Both theoretical arguments and empirical evidence regarding the consequences of bribery on firm performance, thus, are ambiguous. In this study we attempt to shed light on the issue and contribute to the empirical literature by utilizing an improved dataset and methodology.

2.2 Local bribery environments

The institutional environment of a country largely determines its level of economic development, overall corruption, and the behavior and performance of firms (Acemoglu, 2003). However, a country may consist of many narrow local markets that can be heterogeneous with respect to economic conditions as well as bribery practices. A small furniture company located in a rural area, for instance, may face a different demand for and

provide a different supply of bribes than a large retail firm located in a capital city. In this paper we focus on a local market that is comprised of firms sharing a similar size, area of economic activity (industry), and location. This local market can be characterized by the levels of bribery mean and bribery dispersion of individual firm bribes, which we term the 'local bribery environment'.

The notion of the 'local bribery environment' is aligned with the arguments of Svensson (2003) and Fisman and Svensson (2007) that bribery is industry- and region-specific. They suggest that a firm depends more on public officials, and therefore might have to pay higher bribes (or pay bribes more often) if it requires more permits and licenses due to specifics of its economic activity or location. However, it is unlikely that all firms in a local market always bribe equally. There can be various reasons for the dispersion of individual firm bribes. Among them are firms' differences in the 'willingness to pay' bribes (Bliss and Tella, 1997; Svensson, 2003), which may be influenced by the presence of foreign ownership, trading partners (Svensson, 2003; Luo and Han, 2008), profitability, and ties to public officials and political parties (Collins et al., 2009). Other reasons are the degree of discretionary power of public officials, and uncertainty associated with corruption in a local market.

To analyze the effect of the local bribery environment on firm performance, therefore, we focus on two characteristics, the mean and dispersion of bureaucratic corruption. Bribery mean can be viewed as an equilibrium level of corruption in a local market, defined by the demand from public officials and supply by firms, which all firms in a local market potentially might face. On the one hand, bribery can help overcome bureaucratic constraints and inefficient public services provision. That would create a positive relationship between bribery mean and firm performance. However, higher bribes can alter firms' incentives to grow, such that they prefer to remain small and less visible to public officials (Gauthier and Goyette, 2014). Bribery can also restrain firms from obtaining licenses and permissions, which can undermine innovations and investment (O'Toole and Tarp, 2014), and limiting exporting and importing activities essential for firm growth. It can also cause longer delays in public services provision and thereby project interruptions if bureaucrats tend to increase red tape in order to extract more bribes. Finally, higher bribes can provoke rent-seeking firm behavior when firm manages and public officials enrich each other, but not a firm. In this case, one would expect a negative relationship between bribery mean and firm performance.

Bribery dispersion reflects firms' willingness to bribe and the discretionary power of public officials in a local market. If all firms bribe in the same way, bribery can be seen as a tax or an additional fee for public services. This would not create distortions other than those connected

to the bribery mean. In an environment with higher bribery dispersion, both bribing and non-bribing firms operate together. If bribery benefits all or the majority of bribing firms, then they should compete with more productive non-bribing firms as otherwise, bribing firms would crowd out those that do not bribe.[4] This could happen when bribing firms are able to exploit larger variety of strategies to briber, are efficient in bribery and know how to get benefits from it, while public officials are able well discriminate firms to extract bribes. Non-bribing firms must be efficient in complying with bureaucratic regulations as well as in production and growth. In this situation, a higher dispersion of bribery can facilitate joint firm performance. However, if bribery helps only a minority of bribing firms, creates negative externalities, and does not incentivize non-bribing firms to perform better, then in a more dispersed local bribery environment firm performance can deteriorate. Finally, higher bribery dispersion can be perceived as a higher uncertainty in a local market. Firms do not know how much, when, and to whom to bribe, while public officials are unpredictable. In such a case higher bribery dispersion would be also negatively associated with firm performance.

In this paper we aim to analyze the relationship between the characteristics of the local bribery environment and firm performance.[5]

3. Data

3.1 Data sources

Bribery measure is taken from BEEPS, an anonymous survey of a stratified random sample of firms from CEE and former Soviet Union countries.[6] It consists of a rich set of questions about firms' activity, market orientation, financial performance, and employment as well as infrastructural, criminal, corruption, financial, and legal environments. Each wave of BEEPS covers the three preceding years; we use the three waves completed in 2002, 2005, and 2008. A disadvantage of BEEPS is missing data for questions related to accounting information (40–50% missing data on sales, assets, costs, etc.). This can imply a biased inference from the data analysis. For instance, the worst-performing firms may not report their accounting information and complain more about corruption (Jensen et al., 2010).

[4] Hanousek and Palda (2009), for example, show that in an uneven environment, efficient non-tax-evading firms are crowded out by inefficient tax-evading firms.
[5] Analysis of the channels through which bribery can impact firm growth, however, is beyond the scope of this paper.
[6] BEEPS is collected jointly by the World Bank and the European Bank for Reconstruction and Development. The data are available online at https://www.enterprisesurveys.org and at http://ebrd-beeps.com/data/. Data for this paper was downloaded from the first source.

Financial data comes from the Amadeus database, a product of Bureau van Dijk. It consists of full and standardized information from balance sheets and profit-loss account items in addition to industry codes and the exact identification of European firms.[7] Because non-active (unresponsive or exited from the market) firms are excluded from the database after a certain period, we have merged several editions of Amadeus (2003, 2007, and 2010).

Both the BEEPS and Amadeus databases tend to understate micro firms, and Amadeus tends to overstate large firms (Klapper, 2006).[8] Due to this, we conduct our analysis for different subsamples of firms, in particular, for firms of different sizes and industrial sectors.

3.2 Combining information from the BEEPS and Amadeus databases

In this paper we aim to study the effect of local bribery environments on firm performance. The joint use of the BEEPS and Amadeus databases provides an excellent opportunity for this purpose.

To combine bribery practices with firm financials, first, we define clusters representing local markets. The criteria defining clusters are the following: 1) country, 2) time period (1999–2001, 2002–2004, or 2005–2007, corresponding to the waves of BEEPS), 3) industry (two-digit ISIC rev 3.1 industry code), 4) firm size (micro firms with 2–10 employees, small firms with 11–49 employees, and medium and large firms with more than 50 employees), and 4) location size (capital, city with population above 1 million, or city with population below 1 million).[9] It is straightforward to identify clusters in two databases. In both BEEPS and Amadeus, firms report industry and employment. In BEEPS, firms record the size of location, while in Amadeus, they report address of registration. Using names of cities/town, therefore, we identify capitals and cities with populations above 1 million (these are only in Russian and Ukraine) to construct location size variable.

Second, for each cluster we compute the mean and standard deviation of the bribery measure using BEEPS and assign them to every firm in the Amadeus database operating in the same cluster. Given the nature of the data, these mean and standard deviation of the bribery measure are the best way to describe bureaucratic corruption environment in the local market: an equilibrium bribery level, and dispersion of the bribing behavior of firms.

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[7] Details about the Amadeus database can be found at http://www.bvdep.com.

[8] A detailed comparison of eight OECD countries with the whole population of firms retrieved from OECD.STAN is available in the Online Appendix.

[9] Unfortunately, we cannot utilize 'regions' in the criteria defining local markets, as would be in accordance with Svensson (2003) and Fisman and Svensson (2007), since regions are not consistently defined in BEEPS. In the robustness check, therefore, we show that the results of this study remain the same for the subsample of firms located in the capital cities only and for the case when size of location is omitted from the criteria defining clusters.

We aware of only two papers that have attempted to combine data from BEEPS and Amadeus in a somewhat similar way: Anos-Casero and Udomsaph (2009) and Commander and Svejnar (2011). To combine the data, these authors compute the means of business constraints within defined cells and assign them to every firm from Amadeus belonging to the same cell.[10] In contrast to these studies, in the criteria defining our clusters/cells we separate micro firms with fewer than 10 employees from small firms with 11 – 49 employees and we combine firms with 50 – 249 and greater than 250 employees. This is motivated by the fact that originally nearly 45% of firms in BEEPS and 40% of firms in Amadeus are such micro firms. Clearly, micro firms might be exempted from some bureaucratic regulations and taxes (WB, 2004; EC, 2011), and consequently they may encounter demands from public officials less often.

Our criteria defining clusters explain 40% of the total variation of the bribery measure in BEEPS.[11] We require each cluster to have at least 4 firms, which reduces sample size to 10,097 firms (67% of the original sample), and we obtain 1,137 cells in BEEPS. The average number of firms in a cell is 8.87 and the median is 6. Only two clusters computed using BEEPS have no counterparts in Amadeus. About 48% of observations from Amadeus are assigned characteristics of the local bribery environments extracted from BEEPS,[12] which yields around 702,000 observations.

Our final dataset results in unbalanced panel data for 1999–2007, where the bribery measures remain constant over three-year periods. In addition to the availability of high quality firm-level financial data, the advantage of our dataset is the reduction of measurement error and firm-specific perception (due to managers' optimism or pessimism) in the bribery mean measure by averaging them out. Another advantage is the alleviation of the endogeneity between firm performance and bribery, which we discuss in detail in the next section.

3.3 Data coverage and definitions of variables

[10] Both papers use the 2002 and 2005 waves of BEEPS and merge data for 7 – 8 CEE countries. Anos-Casero and Udomsaph (2009) define cells at the country – survey wave – size of location (capital, city with population over 1 million, city with population below 1 million) – firm size (2-49 or more than 50 employees) dimension for all manufacturing firms together. Commander and Svejnar (2011) define cells at the country – survey wave – industry (two digit code) – firm size (2-49, 50-249, or more than 250 employees) level. These papers do not utilize the standard deviation of business constraints within cells.

[11] This result is R^2 obtained from the analysis-of-variance (ANOVA) with the bribery measure as a dependent variable and all interactions between country, year, industry, firm size, and location size as independent variables.

[12] A complete number of clusters in the roster would be 8100=14(country)*3(wave)*2(3 for Russia and Ukraine, location size)*3(firm size)*30(industry), but because BEEPS does not cover all firms, industries, etc. combinations, and we disregard cells with less than 4 firms, we have only 1,137 cells (14%). The Amadeus database has the best coverage of the firm financials for the CEE countries, therefore, 48% of observations from Amadeus merged with BEEPS is a large number. Additional summary statistics are available in the Online Appendix.

For the analysis we chose 14 CEE countries that are well covered in both Amadeus and BEEPS: Slovenia, Hungary, Poland, the Czech Republic, Slovakia, Estonia, Latvia, Lithuania, Bulgaria, Romania, Serbia, Croatia, Russia, and Ukraine. These countries are similar in that they started the transition to a market economy at approximately the same time. However, they are quite different in overall corruption levels, as Figure 1 shows for the Control of Corruption indicator obtained from the Worldwide Governance Indicators (WDI) database compiled by the World Bank.

The bribery measure used in this paper is derived from answers to the following BEEPS question:

Thinking about officials, would you say the following statement is always, usually, frequently, sometimes, seldom, or never true: "It is common for firms in my line of business to have to pay some irregular "additional payments/gifts" to get things done with regard to customs, taxes, licenses, regulations, services, etc.?[13]

Among the questions about corruption, this one is the most neutral, and virtually the only one that occurs consistently across all three waves. The original variable is categorical and takes values from 1 to 6; for convenience we rescale it to a variable that varies from 0 to 1 by subtracting 1 from the original and dividing the result by 5. In this way it can be also interpreted as the intensity of bribery or the probability of bribes. Figure 2 offers a country-time variation of the bribery measure. This measure is heterogeneous across countries and in general decreases over time.

For our performance variables we consider real sales growth and real labor productivity growth (as in Gaviria, 2002; Beck et al., 2005; Fisman and Svensson, 2007; Vial and Hanoteau, 2010).[14] Real sales are approximated by the firm operational revenue in 2000 prices, and labor productivity is real sales per employee. We employ logarithmic transformation of annual growth rates by using the first differences of the natural logarithms of real sales and labor productivity. In the regression analysis we use three-year averages of these growth rates to match the variation in bribery measures. We expect that a local bribery environment may have a somewhat different effect on these performance measures. We opt for the analysis of sales, company turnover is not affected by taxes or other transfers. On the other hand, labor productivity should reflect changes in employment structure and therefore

[13] The framing 'in my line of business' or 'typical firm like yours' is a common approach to provide more confidence to respondents and at the same time to elicit their experience.

[14] We do not measure productivity as TFP (total factor productivity) or value-added per employee, because Amadeus has many missing values in the intermediate material and staff cost variables for CEE countries; Russia, Latvia, and Lithuania do not report them at all. We use a simplified version of productivity that allows firms' capital and intermediate costs to be flexible.

reveal firm performance potential in a longer horizon. The dynamics of these firm characteristics are important for development, as they enhance economic welfare and employment creation.

Among the control variables we use logarithms of total assets and the number of employees as well as their squares to control for firm size and possible non-linearity of size. Market share is computed as the ratio of sales of a firm to total sales in an industry defined at the four-digit level. Firm profitability is defined as EBIT (Earnings Before Interest and Taxes) over total assets. Leverage equates to book leverage ratio (total debt over total assets), and cash flow scaled by total assets. These variables are the usual set of controls used in the firm-level financial studies. They can also correlate with bribery measures and reduce the omitted-variable bias. Firms with lower market shares, for instance, can be more engaged in bribery in order to survive on the market. Luo and Han (2008) report such a correlation in a study of the determinants of bribery and graft using WBES for several developing countries. More profitable firms may have a higher willingness to pay and can pay larger bribes and/or more frequently (Bliss and Tella, 1997; Svensson, 2003). Firm leverage can also correlate with bribery if unofficial payments are needed to obtain external financing (Beck et al., 2005; Fungacova et al., 2015). The availability of cash can also open greater opportunities for bribe payments. In addition, the control variables restrict the sample to those firms that report all essential financial information, making it more homogeneous across countries. We measure these variables in 1999, 2002 and 2005. Summary statistics of all variables used in our model and their pairwise correlations are presented in Tables 1 and 2.

4. Empirical Methodology

Theoretical reasoning suggests the possibility of both positive and negative impact of bribery on firm performance. This paper aims to empirically assess which effect prevails in CEE countries. The identification of the relation between bribery and firm performance, however, is not straightforward due to possible endogeneity. Bribery may influence firm performance by increasing or reducing constraints on operation and growth, while better performing firms, for example, may have a greater willingness and ability to pay bribes. This reverse causality may be induced by further unobservable factors that correlate with both firm performance and bribing practices, such as managerial talent and firm culture.

In the context of this study, the endogeneity problem is reduced due to several facts. First, the bribing behavior of individual firms is not observed. Instead, we employ more aggregated measures of bribery: its mean and dispersion in a local market, as defined by industry, firm-

size, and location-size characteristics. Arguably, an individual firm has a negligible influence on these aggregate measures.[15] This influence is decreased further when firm performance and bribery measures come from different independent data sources (Anos-Casero and Udomsaph, 2009). More importantly, the panel structure of the data allows us to control for firm fixed effects and to remove time-invariant unobservable factors that could potentially cause both firm performance and bribing behavior.[16] The short length of our panel increases the likelihood of these unobservable factors being fixed over time. Nevertheless, in the next section we first compare the estimates identified from within-firm variation with the estimates identified from within-cluster variation to demonstrate the reduction of the endogeneity bias. This occurs because average firm performance within a cluster more likely affects mean bribery, inducing an upward bias of the estimates (if better performing firms are ready to bribe more frequently). Admittedly, firm fixed effects do not account for temporal endogeneity. The bias due to temporal endogeneity, however, likely has the same direction as bias due to permanent endogeneity. Our estimates, therefore, are at the lower bound.

Our empirical specification is a typical growth equation, originally proposed by Evans (1987), where the dependent variable is the growth rate and the independent variables are lagged to control for initial conditions.[17]

$$y_{it} = \beta_0 + \beta_1 Bribery\ Mean_{ct} + \beta_2 Bribery\ Dispersion_{ct} + \gamma X_{it-1} + \upsilon_i + \nu_t + \varsigma_s + \varepsilon_{it}, \quad (1)$$

where y_{it} is the performance measure of firm i at time period t; it is either real sales or labor productivity growth rates, averaged over three-year periods (1999-2001, 2003-2004, 2005-2007). $Bribery\ Mean_{ct}$ and $Bribery\ Dispersion_{ct}$ are the mean and standard deviation of the frequency to pay bribes computed from BEEPS in cluster c.

The coefficients of interest are β_1 and β_2. Their positive signs would favor the 'grease the wheels' hypothesis of corruption.

The vector X_{it-1} stands for the vector of firm-level control variables. They are measured at the beginning of each time period (i.e. at 1999, 2002, and 2005) to control for the initial

[15] In view of the difficulty to find appropriate instruments for bribery measures, the use of industry- location or industry-location-firm size average measures of bribery or obstacles to firm growth and operation instead of firm-specific measures is a handy approach to reduce the endogeneity problem in existing research, which employs cross-sectional data from BEEPS, WBES, or IC (Investment Climate). See, for example, Dollar et al. (2005), Kinda et al. (2009), Aterido et al. (2011), and Commander and Svejnar (2011).

[16] In addition, controlling for firm fixed effects is a usual approach in studies involving financial panel data analysis due to the huge heterogeneity of individual firms and possible endogeneity between variables (see, for example, Chi, 2005; Hanousek et al., 2007; and Del Carpio et al., 2012).

[17] Similar specifications are also widely used in the literature that studies the effects of privatization, political connections, and other events on firm performance, see, for example, Hanousek et al. (2007) and Boubakri et al. (2008).

conditions, to reduce possible endogeneity between them and firm performance measures. The full set of control variables is described in the previous section. The term υ_i removes unobserved firm fixed effects that can create across-time correlation of the residuals of a given firm (e.g. managerial skill). The term v_t removes unobserved time fixed effects that can be responsible for the correlation of the residuals across different firms in a given year (e.g. aggregate shocks or business cycles). The term ς_s captures unobserved firm-size fixed effects (micro, small, and medium-large firms)[18] that can lead to the correlation of the residuals across firms of a given size class due to, e.g., specific regulations attached to firms of a particular size; ε_{it} is the *i.i.d.* random component. We estimate specification (1) using standard errors robust to heteroskedasticity and clustered at the firm level. In addition, we account for influential observations using Cook's distance,[19] as the data for CEE countries is highly volatile.

Finally, we are concerned about measurement error in the bribery variables. Under the assumption of classical measurement error, that if it does not correlate with the error from a regression, the coefficients of interest would be biased toward zero. This assumption seems plausible, as we use two independent datasets together. In addition, we believe that possible measurement error is averaged out in our bribery mean measure (this, however, may not be a case for the dispersion of bribery). The retained measurement error, therefore, could be a second source of attenuation of the estimates.

5. Results and Discussion

5.1 Baseline results

Table 3 reports the results of the estimation of specification (1). Odd columns present the results for the dependent variable, real sales growth, and even columns present labor productivity growth. In columns I–IV we control for time, country, industry, location, and firm-size fixed effects. In columns V–VIII we add firm fixed effects.

INSERT TABLE 3 ABOUT HERE

[18] We control for firm-size fixed effects, because firm size is included in the criteria defining clusters, and some firms move from one size category to another. The country, location and industry factors from the criteria are removed when firm fixed effects are taken into account. The exclusion of firm-size fixed effects, however, does not affect the results.

[19] Cook's distance is a measure based on the difference between the regression parameter estimates β̂ and what they become if the ith data point is deleted $\hat{\beta}_{-i}$. Observations, for which this distance exceeds 4/N, where N is the number of observations used in the regression, are removed as outliers.

If better firm performance is generally associated with higher participation in bribery, then $\hat{\beta}_1$ in within-cluster regressions (columns I–IV) should be biased upward, because cluster-level firm performance may more likely affect cluster-level bribery. Controlling for firm fixed effects should reduce this bias. Indeed, $\hat{\beta}_1$ is smaller (more negative) in columns V–VIII compared to columns I–IV, advocating for the lessening of endogeneity bias, and the use of firm fixed effects regressions.[20] Any further attempts to control for endogeneity would reduce this bias in the same direction.

The comparison of columns I–II with III–IV and of columns V–VI with VII–VIII also shows that the inclusion of bribery dispersion variable into regressions does not change the sign or significance of $\hat{\beta}_1$. This permits us to analyze both bribery mean and dispersion variables together. The bottom of Table 3 shows the average effects of the bribery mean and dispersion on firm performance as well as their sum.[21]

Having the regressions from columns VII and VIII as benchmarks, all else being equal, the increase in the bribery mean by its average value is associated with a 3.0% and 4.3% decrease in corresponding firm performance measures. These numbers are relatively large, since the average real sales growth is 4.6% and the average labor productivity growth is -3.1% in our sample. The results thus show that bribery is a burden for firm performance, which is consistent with some previous findings at both the micro (Fisman and Svensson, 2007; De Rosa et al., 2010) and macro (Mauro, 1995; Campos et al., 2010) levels.

The estimates of the coefficients on bribery dispersion, in contrast, are positive for both dependent variables, and highly significant. For a given level of bribery mean in a local market, the average bribery dispersion effects are 4.7% and 5.9% for the two performance measures. The sum of the average bribery mean and dispersion effects is positive and equals 1.7% for sales growth and 1.6% for labor productivity growth.

These results suggest that while higher level os bribery retard sales and labor productivity growth, firms can benefit from bribery if they operate in more dispersed local environments. This implies that bribery 'greases the wheels' of doing business for individual firms, but harms firms' collective economic performance. Keeping the mean bribery level constant, in more bribery dispersed local environments, firms that are more efficient in bribery – that is,

[20] In the case of bribery dispersion, in within-cluster regression, its impact on firm growth is also more diluted than in within-firm regression.

[21] We compute the average effects as a product of the sample average value of the bribery mean or bribery dispersion and the corresponding estimated coefficient. For example, in column VII of Table 3, the average effect of the bribery mean on sales growth is $(-0.096\times0.311)\times100\% \approx -2.97\%$, where -0.096 is the estimate of the coefficient on the bribery mean and 0.311 is the sample average of the bribery mean variable.

firms that have more information about opportunities to 'grease the wheels', discriminated by the public officials in a mutually beneficial way, with lower costs or higher willingness to bribe – apparently bribe more frequently than their peers. Owing to bribes, they most likely generate higher growth rates than if they were not to bribe. Their non-bribing (or less frequently bribing) counterparts must be more efficient in production and growth to compete with bribing firms. In this case, both types of firms are able to generate increasing sales and labor productivity growth rates within a local market.[22]

In less dispersed local bribery environments, if the number of bribing firms prevails, a negative externality from bribery (such as, for instance, incentives to induce the bureaucratic burden by public officials) can slow growth rates. If the number of non-bribing firms dominates, then there can be fewer incentives for firms to be more efficient in production and growth, and compete aggressively with occasionally bribing firms.

The results also show that the effects of bribery mean and dispersion seem to be sounder for labor productivity than for sales growth rates. This suggests that participation in bribery affects the employment structure of firms. In highly corrupt environments, firms likely employ a non-optimal (higher) number of workers due to misallocation of talent, in accordance with Murphy et al. (1991) and Dal Bo and Rossi (2007). A portion of employees may be engaged in unproductive activities: searching for ways to circumvent rigid laws and bureaucratic constraints, and bargaining with public officials. It may also be the case that public officials (or local government), having established a connection with a firm, do not allow it to dismiss its workers in order to keep high employment figures in the region and therefore more loyal voters. However, bribing firms that have an opportunity to gain a competitive edge over their non-bribing counterparts (in more heterogeneous local environments) are able to adjust the employment structure to an optimal level and increase effectiveness.

The results thus show that bribery can work as the 'grease the wheels' instrument, in spite of its overall damaging effect. In addition, the existence of a certain number of bribing firms in a local market increases aggregate firm performance, as positive effect from bribery dispersion exceeds negative effect from bribery mean. This is in line with Acemoglu and Verdier (2000), Infante and Smirnova (2009) and De Vaal and Ebben (2011).The following subsections examine the effect of bribery with respect to the heterogeneity of firms and environments to

[22] Since we do not observe the bribing behavior of individual firms, it still might be the case, however, that bribing firms exhibit superior increasing growth rates while their non-bribing counterparts – decreasing rates, or the other way around, but together their growth rates are increasing.

understand better what drives the relation between bribery and firm performance. The last subsection describes robustness checks.

5.2 Heterogeneity of firms

Manufacturing and service firms

In our dataset, firms from manufacturing sectors represent only 14.5% of the sample. On average, they tend to have lower sales growth, higher labor productivity growth, and pay bribes less often than firms from service sectors.[23] Table 4 presents the results of the estimation of specification (1) for manufacturing, service, and construction firms separately. In this table, for the sake of space, we present only average bribery mean and dispersion effects, while the full estimation results are available in Online Appendix. The estimated coefficients on the bribery mean and dispersion are drastically different for the manufacturing and services firms.

INSERT TABLE 4 ABOUT HERE

Higher bribery means in a local environment significantly retard the performance of manufacturing firms, especially real sales growth. Operating in more bribery heterogeneous environments does not bring firms benefits either (see columns I–II, Panel A in Table 4). The larger size of manufacturing firms can make them more visible and attractive to public officials eager for additional unofficial income. At the same time size can make these firms less flexible in responding to the bribery and lessen capacity to extract benefits in dispersed local environments. Manufacturing firms also tend to have a larger share of foreign ownership and exports, which is usually associated with higher management standards, stricter attitudes against corruption and, perhaps, a poorer ability to deal with it.[24]

Another explanation for the result may be that our bribery measure does not reflect well the nature of bribing practices among manufacturing firms. These firms arguably require fewer permits, licenses, and inspections than do service firms (compare, for instance, a furniture manufacturing firm with a restaurant that has to comply with food quality standards), but might depend more heavily on relationships with customers and supply chains. Their corruption practices, therefore, might instead consist of kickbacks between businesses.

Service firms, in contrast to manufacturing, are usually smaller, more flexible, and likely to interact more often with public officials. Although on average they suffer as well from higher

[23] These statistics are available in Online Appendix.
[24] Unfortunately, data limitations do not allow us to control for firm ownership structure or export shares.

bribery mean, they are able to gain significantly in local markets with higher bribery dispersion, as columns III-IV in Table 4 demonstrate. To a large extent these service firms belong to wholesale and retail trade industries, as they represent about a half of the whole sample. Approximately 15% of the sample belongs to the construction industry. The last two columns in Table 4 show that construction firms are able to gain very high returns to dispersed bribery environments, possibly related to bribery associated with public construction tenders, building permits, related regulations, etc.

Firm size

The literature usually documents corruption as a greater obstacle for micro and small firms than for large firms, and hence it impedes the performance of smaller firms more (e.g., UNIDO/UNODC,2007; Beck et al.,2005; and Aterido et al.,2011). This is explained, for example, by the fact that smaller firms have weaker bargaining power and less influence on public officials. In the present study, however, the bribery variable measures the frequency of paying bribes 'to get things done' and may not reflect corruption as an obstacle. We observe that the bribery mean increases with firm size, hence, we do not expect the same results as the cited literature suggests.

Panel A in Table 4 presents the results of the estimation of specification (1) for three subsamples of micro, small, and medium and large firms. The signs of the coefficients on bribery mean and dispersion are the same as in the case for the whole sample; the magnitudes, however, are different for the three subsamples. It turns out that the growth rates of micro firms are the least affected by bribery, larger firms suffer the most from higher bribery mean, and small firms are able to extract the greatest benefits in more heterogeneous local environments.

One explanation for this finding is that firms of different class size carry different regulatory burden. These differences are usually designed to promote the growth and development of small businesses and encourage entrepreneurship (WB, 2004; EC, 2011). Thus, smaller (micro) firms are often required to comply with softer regulatory standards such as reporting and keeping records for inspections. They may also be exempted from some taxes, or have lower tax rates (Gauthier and Goyette, 2014). Further, smaller amounts of bribes can be extracted from firms with a smaller number of employees and turnover.

Firm dynamics

The number of firms increases over time in our dataset, allowing us to capture firm dynamics to some extent. Therefore, we examine whether local bribery environments affect the

performance of entering, exited, and stable firms differently. About 8.5% of firms remain in the sample during all three periods, 24.8% of the sample are new firms that appear in the second period and remain in the third, and only 3.3% are those that have exited from the sample in the last period. The remaining firms that are present in the sample only in one time period, or only in the first and the third are not considered. Let us note that due to the data structure, the number of entering and exited firms in our dataset represents only a rough approximation of actual firm dynamics.

Entering and exited firms on average pay bribes more frequently and have lower sales growth. Entering firms have negative and exited firms have large positive labor productivity growth rates, suggesting that the former are increasing and the latter are decreasing the number of employees.[25]

Panel C in Table C reports the results of specification (1) estimated for these three subsamples. The coefficients on the bribery mean and dispersion are significant and have the same signs as in the estimates for the whole sample. However, bribing practices seem to have a stronger effect on the performance of firms that are at the beginning or at the end of their business experience. The strong negative impact of bribery mean on the growth rates of exited firms could be associated with costly bureaucratic exit procedures related to bankruptcy or retreat from the market, and final tax administration. These firms might also attempt to fight for survival in the early stages of exit. Costly bribes for entering firms might be needed for the firms to become established. It is notable that the sum of average bribery mean and dispersion effects is negative for stable firms. This fact should incite incumbent firms to protest against corruption.

5.3 Heterogeneity of Environments

Countries' institutional environments

Although the countries from of CEE region underwent transition at approximately the same time, they are heterogeneous with respect to the quality of formal and informal institutional frameworks, as well as their overall corruption levels (Figures 1). Unsurprisingly, countries that entered the European Union in 2004 (Slovenia, Hungary, Poland, the Czech Republic, Slovakia, Estonia, Latvia, and Lithuania) tend to have less corruption, while Russia and Ukraine are the most corrupt, according to the Control of Corruption indicator. In this section we analyze how local bribery environments affect firm performance depending on levels of countries' institutional strength.

[25] See tables in Online Appendix

For this purpose we use the Rule of Law indicator from the WGI database to proxy for countries' institutions. It captures the incidence of crime, effectiveness of the judiciary, and enforcement of contracts. We rescale this indicator to a variable that ranges from 0 to 1, where higher values stand for weaker Rule of Law. We augment the specification (1) with interaction terms between the Rule of Law and bribery measures to see how country institutions are associated with the bribery – performance relationship.

INSERT TABLE 5 ABOUT HERE

Columns I-II in Table 5 report the coefficients[26] of interest from the estimation of these specifications, and Figure 3 depicts the average bribery mean and dispersion effects for different values of the Rule of Law indicator. The results suggest that although the bribery mean has a negative impact on firm growth rates, in countries with weaker institutions this impact is less pronounced. In countries with the weakest Rule of Law indicator, such as in Serbia between 1999 and 2001, the effect even positive. The weakening of institutions also decreases growth gains from the bribery dispersion in local markets; however, they never become negative in our sample of countries. Hence, a higher probability of being caught and stricter law enforcements make bribery more detrimental, and at the same time the possibility to discriminate amongst firms brings higher benefits. We thus provide some empirical evidence for the theoretical conjectures of Infante and Smirnova (2009) and De Vaal and Ebben (2011) that some amount of corruption can result in efficient outcome, but we contradict the empirical evidence of De Rosa et al. (2010) showing that bribery is more harmful in non-EU countries.

Local bribery environments

Our baseline results show that, *ceteris paribus*, a higher bribery mean (dispersion) leads to lower (higher) economic performance of firms. In this subsection we examine the interaction between these two characteristics of local bribery environments. In particular, we are interested in how bribery mean affects firm growth rates depending on the extent of bribery dispersion.

Columns III-IV in Table 5 offer the results of estimation of the specification (1), in which the interaction term between bribery mean and dispersion is included. The coefficient on the interaction term is positive, large and significant. This implies that firms will more likely increase their growth rates if they operate in local environments with higher both bribery mean and dispersion; in environments where both corruption stakes and discretionary power

[26] Full results are available in the Online Appendix.

of public officials are higher. Figure 4 shows average bribery effects on sales and productivity growth rates for the range of bribery dispersion values. When bribery dispersion exceeds 0.4, these effects become positive. This value of bribery dispersion falls into the 95th percentile of the sample distribution. If bribery dispersion equals zero and bribery mean increases by its sample mean value, then firms growth decreases to the negative rates -8% and -9% for sales and labor productivity correspondingly. In the environments where all firms uniformly participate in bribery practices, therefore, corruption is extremely harmful.

5.4 Robustness Checks

In this section we describe various robustness checks which we conduct to verify the stability of our results. The estimation results are available in the Online Appendix.

As a first robustness check we use bribery measures constructed as dummy variables from the original frequency of paying bribes. The first measure takes value one if firms report that they bribe public officials sometimes, frequently, usually, or always to 'get things done', and zero otherwise, as in De Rosa et al. (2010). The second measure takes value one if firms report that they bribe seldom, sometimes, frequently, usually, or always, and zero if never. These measures are averaged within clusters. The bribery dispersion we compute as before. The estimates of the coefficients of interest in the two regressions with new bribery measures remain qualitatively the same as for the main bribery measure; only their magnitudes are slightly smaller. The results therefore are not influenced by the construction of bribery measure.

Although the bribery measure is consistently defined across three waves of BEEPS, the structure of the questionnaire and stratification of surveyed firms were slightly changed in the last wave. In addition, the number of firms in the Amadeus database increases over time. To see if these changes impact the results, we estimate specification (1) separately for the first and second, and for the second and third time periods. In addition, we estimate specification (1) separately for Russia and Ukraine only, and for the rest of the countries excluding Russia and Ukraine, since these are the most corrupt and represent about half of the whole sample. Again, the estimates confirm that sample restrictions do not affect the main outcome.

To ensure a stable structure of BEEPS within clusters, rather than unconditional averaging of the bribery measure from BEEPS, we compute the bribery mean variable keeping constant such firm characteristics as foreign ownership, export, and firm age. We then use this 'conditional' bribery mean variable to estimate specification (1). The bribery dispersion variable, meantime, remains the same. The main results stay qualitatively the same.

Structuring the BEEPS and Amadeus data within clusters in another way, we compute the bribery mean and dispersion variables using the bribery measure from BEEPS multiplied by the proportions of young and old firms within corresponding clusters from Amadeus. When we use these weighted bribery measures to estimate specification (1), the coefficients of interest only increased in absolute values.

The main analysis assumes growth rates averaged over three years and control variables measured at the beginnings of the three-year periods. As a robustness check we estimate specification (1) on yearly data (nine years in total) with lagged control variables, using two methods. First, we use conventional firm, firm-size and time fixed effects estimation as before. Second, we include a lag of the dependent variable among the explanatory variables to control for autocorrelation in residuals and apply Arellano and Bond's (1991) dynamic panel data estimation technique.[27] The coefficients of interest are not qualitatively different from the main results, meaning that neither the data structure nor possible autocorrelation drive the results.

In the main analysis we require each cluster to have no fewer than four observations in order to compute bribery mean and dispersion. Obviously, the higher the number of observations in a cluster, the better is the measurement accuracy of these variables. Therefore, we also conducted the analysis under a constraint of no fewer than three observations and no fewer than five observations in each cluster. The results are qualitatively the same. The magnitudes of the coefficients of interest, however, become larger when bribery level and dispersion are computed more accurately.[28]

Given that we can only use location size, but not region in the criteria defining clusters, we check if the results remain the same when location size is excluded from the criteria. First, we estimate specification (1) for the subsample of firms located in the capitals of countries, since they are the only cities exactly identified in BEEPS and the Amadeus data. Second, we estimate (1) on the dataset when location size is omitted from the criteria. Remarkably, the results remain qualitatively the same in both cases.

In our bribery mean variable, the measurement error and perception bias are likely reduced due to averaging out. The aggregation, however, does not solve the problem of missing data (about 10% of the sample in BEEPS do not report frequency of bribing; this, however, is the

[27] In particular, we estimate specification (1) in first differences and use the second lags of independent variables (except for the bribery level and dispersion, since they do not change across the three year periods) as instruments.

[28] This fact also confirms that possible measurement error in our bribery variables could lead to attenuation of the estimates.

smallest number relative to other questions about corruption). To check whether missing values affect the results, we estimate specification (1) putting lower weights on clusters with a higher number of missing observations (the weight is equal to the ratio of the number of non-missing values to the total number of observations in a cluster). The estimated coefficients of interest are nearly identical to those from the main analysis, ruling out the problem of missing data in the original bribery measure.

For another robustness check, we do not account for influential outliers using Cook's distance; we change the rule for defining outliers from 1% of top and bottom of distribution to 5%; and do not use data imputation (see Online Appendix). The estimates of the coefficients of interest remain virtually the same as before and, therefore, robust to the definition of outliers and the imputation procedure. The stricter rule for outliers accounting, though, slightly increases the magnitudes of the coefficients on the bribery level and dispersion and doubles the overall fit of the regressions.

Finally, in specification (1) we add variables that measure different obstacles to firms' operation and growth obtained from BEEPS. These measures are averaged within our clusters in the same way as the bribery measure. By including these obstacles we check whether the bribery mean and dispersion explain the participation of firms in bribery, but not other phenomena. We analyze the cases for corruption, tax administration, and obtaining business licenses and permits obstacles. The inclusion of these obstacles into the specification does not change the significance and signs of the main results.

6. Conclusion

This study empirically examines the relationship between 'local bribery environments' and firm performance in Central and Eastern European countries. It provides an explanation for divergent consequences of bureaucratic corruption found in previous research.

To overcome the data and methodological limitations of existing empirical literature on bureaucratic corruption, we combine large and reliable firm financial data from the Amadeus database with firm bribery practices data from BEEPS. We define local markets by clusters of firms sharing the same country, industry, firm size and location size characteristics. Within those clusters we compute the mean and standard deviation of the frequency of paying bribes to public officials to 'get things done', and assign them to each firm from the Amadeus database belonging to the same cluster. Bribery mean and dispersion of individual firm bribes, thus, describe a local bribery environment: equilibrium level of bureaucratic corruption in a local market, and bribing behavior of firms shaped by firms' willingness to bribe,

discretionary power of public officials to extract bribes, and uncertainty about environments. Our focus on local bribery environments, the use of two data sources and the panel structure of the data help us to mitigate the endogeneity concerns between bribery and firm performance measures.

Exploring within-firm variation, the results of the analysis suggest that a higher bribery mean in a local market retards both real sales and labor productivity growth. The increase in the bribery mean by its average value is associated with about 3.0% and 4.3% decrease in corresponding firm performance measures. This outcome complements some of the existing empirical research on the consequences of corruption at the macro and micro levels. We also find, however, that conditional on a given level of bureaucratic corruption, a higher bribery dispersion facilitates firm performance. The average bribery dispersion effects are positive and equal to 4.7% and 5.9% for the two performance measures, so that the trade-offs between bribery mean and dispersion are positive, too. These results are robust to various specification checks and sample restrictions. They, however, presumably are estimated at the lower bound.

The results imply that at least some bribing firms receive preferential treatment from public officials, while non-bribing firms seem to be more efficient in production and growth in more dispersed bribery environments. The presence of a certain number of bribing firms in a local market increases aggregate performance, which is in line with Acemoglu and Verdier (2000). High dispersion of individual firm bribes in some environments can thus explain the persistence of corruption and advocate the 'grease the wheels' hypothesis.

The main findings of the paper hold most strongly for services and construction firms. The effects of a local bribery environment appear to be more important for firms with more than 10 employees, and for those that are at the beginning or at the end of their business experience, although the scope of our data does not allow us to directly address the impact of bribery on firm survival. The impact of bribery mean and dispersion on firm performance also seem to be less sound in countries with weaker institutions, to some extent supporting the theoretical conjectures of Infante and Smirnova (2009) and De Vaal and Ebben (2011).

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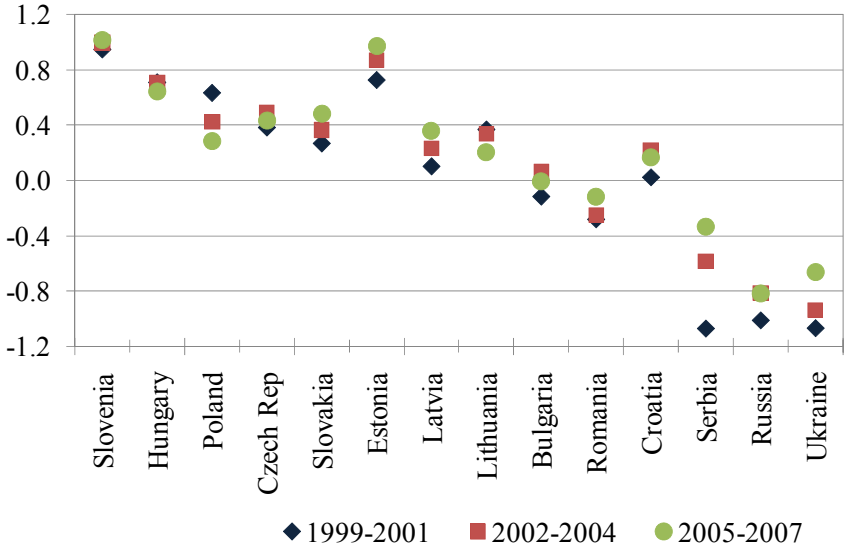
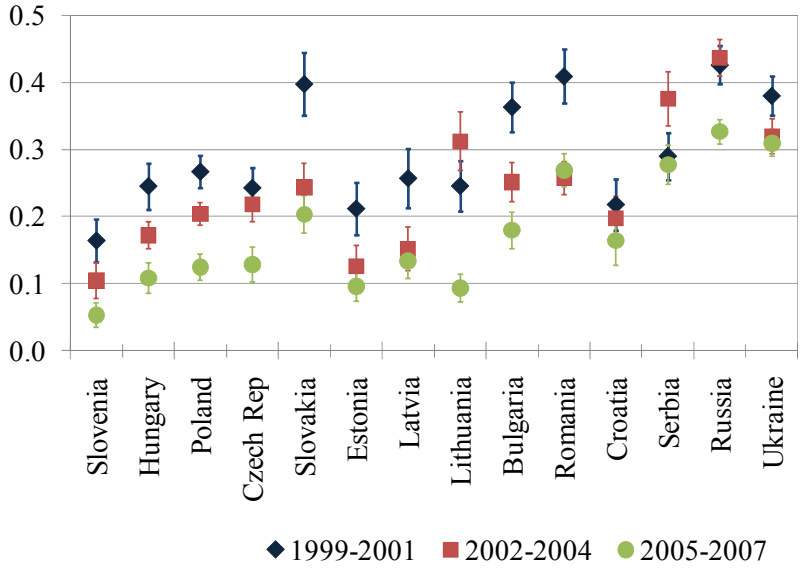
Figures and Tables

Figure 1: Control of Corruption indicator



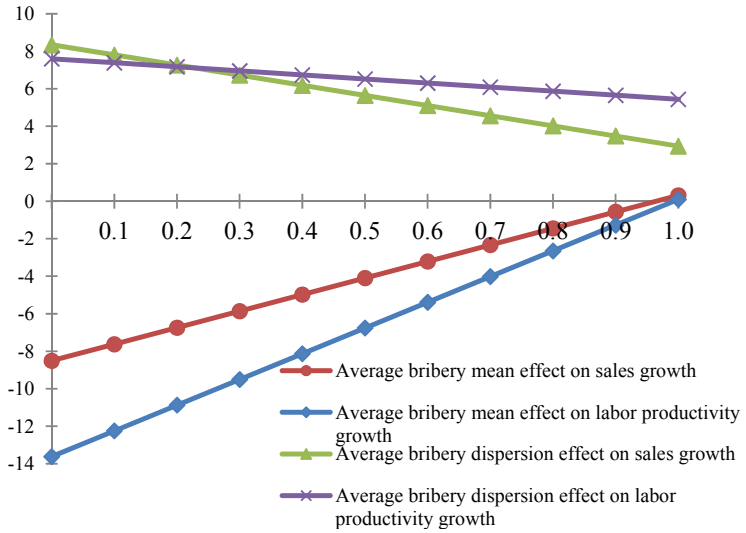
Note: The Figure shows the variation of the Control of Corruption indicator across countries and time periods. For each time period the average value over three years is taken. Higher values stand for lower overall corruption levels.

Figure 2: Bribery mean



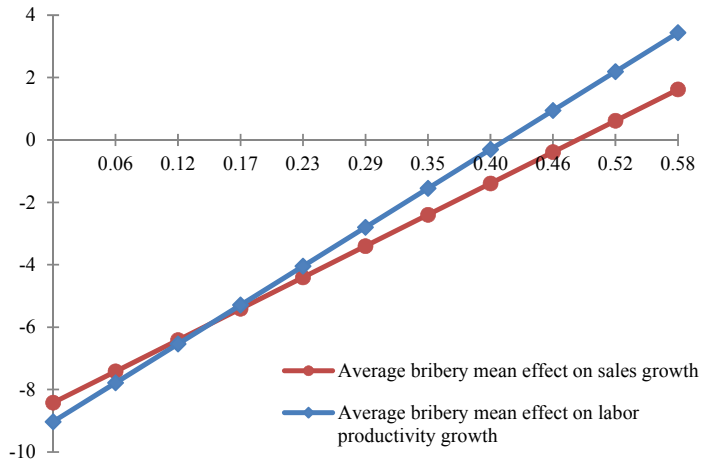
Note: The Figure shows the variation of the bribery mean constructed from BEEPS (before linking it to firm financials from Amadeus) across countries and time periods. Spikes represent confidence intervals. Higher values indicate a higher frequency of bribing.

Figure 3: Average bribery mean and dispersion effects depending on countries's institutions



Note: The Figure shows average bribery mean and dispersion effects (on the vertical axis, measured in percentages) depending on different values of the Rule of Law indicator (on the horisontal axis) for sales and labor productivity growth rates. Higher values of the Rule of Law indicator represents stronger institutions.

Figure 5: Average bribery mean effects depending on bribery dispersion



Note: The Figure shows average bribery mean effects (on the vertical axis, measured in per cents) depending on different values of the bribery dispersion (on the horisontal axis) for sales and labor productivity growth rates.

Table 1: Summary statistics

	Mean	Median	SD	Min	Max
Sales growth	0.05	0.04	0.52	-3.92	4.53
Productivity growth	-0.03	-0.03	0.47	-3.58	4.55
Total Assets	4.14	4.05	2.04	-4.14	14.75
Employees	2.61	2.40	1.36	0.18	11.34
Total Assets Sq.	21.33	16.40	18.71	0.00	217.68
Employees Sq.	8.65	5.75	8.95	0.03	128.52
Profitability	0.11	0.07	0.33	-5.96	33.71
Market Share	0.00	0.00	0.02	0.00	1.00
Leverage	0.67	0.67	0.47	0.00	24.83
Cash Flow	0.06	0.03	0.36	-16.81	137.31
Bribery Mean	0.30	0.29	0.14	0.00	0.80
Bribery Dispersion	0.27	0.28	0.09	0.00	0.58
Rule of Law	0.68	0.83	0.26	0.00	1.00

Note: Table reports summary statistics of employed variables for the whole sample. Number of observations is 678381, non-missing for all variables.

Table 2: Pairwise correlations

		1	2	3	4	5	6	7	8	9	10	11	12
1	Sales growth												
2	Productivity growth	0.60 [a]											
3	Total Assets	-0.03 [a]	0.04 [a]										
4	Employees	-0.08 [a]	0.07 [a]	0.67 [a]									
5	Total Assets Sq.	-0.02 [a]	0.04 [a]	0.95 [a]	0.69 [a]								
6	Employees Sq.	-0.06 [a]	0.06 [a]	0.66 [a]	0.96 [a]	0.72 [a]							
7	Profitability	0.04 [a]	-0.02 [a]	-0.06 [a]	-0.02 [a]	-0.06 [a]	-0.03 [a]						
8	Market Share	-0.00	0.01 [a]	0.19 [a]	0.17 [a]	0.25 [a]	0.21 [a]	-0.00 [a]					
9	Leverage	0.01 [a]	-0.02 [a]	-0.12 [a]	-0.11 [a]	-0.10 [a]	-0.10 [a]	-0.25 [a]	-0.03 [a]				
10	Cash Flow	0.04 [a]	-0.01 [a]	-0.01 [a]	-0.02 [a]	-0.02 [a]	-0.02 [a]	0.65 [a]	-0.00	-0.25 [a]			
11	Bribery Mean	0.00	-0.02 [a]	-0.06 [a]	0.13 [a]	-0.07 [a]	0.13 [a]	0.02 [a]	-0.05 [a]	0.01 [a]	-0.00		
12	Bribery Dispersion	-0.00	-0.00	-0.16 [a]	-0.03 [a]	-0.15 [a]	-0.03 [a]	0.02 [a]	-0.05 [a]	0.00 [a]	-0.01 [a]	0.57 [a]	
13	Rule of Law	-0.03 [a]	-0.06 [a]	-0.25 [a]	0.12 [a]	-0.24 [a]	0.11 [a]	0.02 [a]	-0.09 [a]	0.01 [a]	-0.02 [a]	0.47 [a]	0.35 [a]

Note: Table reports pairwise correlations between employed variables. Number of observations is 678381, non-missing for all variables. [a] indicates a significant at 1%.

Table 3: Baseline results

	(I) Sales	(II) Productivity	(III) Sales	(IV) Productivity	(V) Sales	(VI) Productivity	(VII) Sales	(VIII) Productivity
Bribery Mean	-0.039[a]	-0.016[a]	-0.057[a]	-0.033[a]	-0.042[a]	-0.072[a]	-0.096[a]	-0.139[a]
	(0.004)	-0.004	(0.005)	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)
Bribery Dispersion			0.056[a]	0.054[a]			0.174[a]	0.219[a]
			(0.007)	(0.006)			(0.008)	(0.007)
Total Assets	-0.019[a]	0.003[a]	-0.019[a]	0.003[a]	-0.075[a]	-0.038[a]	-0.076[a]	-0.040[a]
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Employees	-0.260[a]	0.085[a]	-0.260[a]	0.084[a]	-0.072[a]	-0.005[c]	-0.070[a]	-0.004
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)
Total Assets Sq.	0.003[a]	-0.002[a]	0.003[a]	-0.002[a]	0.003[a]	-0.002[a]	0.003[a]	-0.002[a]
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Employees Sq.	0.017[a]	-0.001[a]	0.017[a]	-0.001[a]	-0.009[a]	0.021[a]	-0.009[a]	0.020[a]
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Profitability	0.009[a]	-0.053[a]	0.010[a]	-0.053[a]	0.003	-0.024[a]	0.001	-0.028[a]
	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)
Market Share	-0.046[a]	-0.406[a]	-0.048[a]	-0.407[a]	-0.928[a]	-1.108[a]	-0.916[a]	-1.045[a]
	(0.012)	(0.015)	(0.012)	(0.016)	(0.081)	(0.085)	(0.078)	(0.080)
Leverage	0.042[a]	0.008[a]	0.042[a]	0.008[a]	0.032[a]	0.040[a]	0.031[a]	0.039[a]
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Cash Flow	0.126[a]	0.047[a]	0.124[a]	0.048[a]	0.074[a]	0.031[a]	0.076[a]	0.037[a]
	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)
Time, Country, Industry, and Location size FEs	yes	yes	yes	yes	-	-	-	-
Firm, Time, and Firm size FEs	-	-	-	-	yes	yes	yes	yes
N observations	653,460	651,849	652,950	651,415	628,239	627,758	627,459	627,067
N group					446,205	446,280	445,678	445,807
R2 within	0.081	0.074	0.081	0.074	0.218	0.111	0.224	0.117
Average bribery mean effect	-1.22%	-0.49%	-1.79%	-1.02%	-1.29%	-2.22%	-2.97%	-4.32%
Average bribery dispersion effect			1.49%	1.45%			4.66%	5.87%
Average total effect			**-0.30%** [c]	**0.42%** [b]			**1.70%** [a]	**1.55%** [a]

Note: The Table reports the results of the estimation of specification (1) for two performance measures as dependent variables: real sales growth and labor productivity growth. All control variables are measured at the beginning of each time period (i.e., at 1999, 2002, or 2005). The average effects are the products of the estimated coefficients on bribery mean and dispersion and the sample mean values of the corresponding variables; the average total effect is the sum of these two effects. Standard errors shown in parentheses are robust to heteroskedasticity and clustered at the firm level. Cook's distance is used to account for influential observation. The symbols [a], [b], and [c] denote significance at the 1%, 5%, and 10% levels, respectively.

Table 4: Different types of firms

	(I) Sales	(II) Productivity	(III) Sales	(IV) Productivity	(V) Sales	(VI) Productivity
Panel A: Manufacturing and service firms						
	Manufacturing		Services		Construction	
N observations	88 917	88 960	442 567	441 964	96,137	96,402
Average bribery mean effect	-6.99 [a]	-3.95 [a]	-1.08 [a]	-3.57 [a]	-3.74 [a]	-5.05 [a]
Average bribery dispersion effect	-0.68	-2.37 [a]	3.65 [a]	6.30 [a]	10.42 [a]	7.79 [a]
Average total effect	**-7.67 [a]**	**-6.32 [a]**	**2.57 [a]**	**2.73 [a]**	**6.68 [a]**	**2.74 [a]**
Panel B: By firm size: Micro, small and large firms						
	2–10 employees		11–49 employees		50+ employees	
N observations	291 283	291 513	228 848	228 688	107 719	107 728
Average bribery mean effect	-0.76 [a]	-2.79 [a]	-3.80 [a]	-3.79 [a]	-6.78 [a]	-5.04 [a]
Average bribery dispersion effect	0.87 [c]	2.83 [a]	7.55 [a]	7.20 [a]	4.11 [a]	3.83 [a]
Average total effect	**0.11**	**0.04**	**3.74 [a]**	**3.41 [a]**	**-2.67 [a]**	**-1.21 [a]**
Panel C: Stable, new-entrant, and exited firms						
	Stable		New entrants		Exited	
N observations	101 841	101 859	212 722	213 066	28 004	28 072
Average bribery mean effect	-4.36 [a]	-2.79 [a]	-2.93 [a]	-5.29 [a]	-9.69 [a]	-5.63 [a]
Average bribery dispersion effect	4.01 [a]	2.60 [a]	5.74 [a]	6.07 [a]	6.20 [a]	11.73 [a]
Average total effect	**-0.35**	**-0.19**	**2.80 [a]**	**0.77 [b]**	**-3.49 [a]**	**6.10 [a]**

Note: The Table reports the average bribery mean and dispersion effects (in percentages) after estimation of specification (1) for different subsamples of firms for two performance measures as dependent variables: real sales growth and labor productivity growth. The average effects are the products of the estimated coefficients on bribery mean and dispersion and the sample mean values of the corresponding variables; the average total effect is the sum of these two effects. In Panel A firms are divided on subsamples of manufacturing (ISIC codes 15–36), services (ISIC codes 51–93) and construction (ISIC code 45) sectors. In panel B firms are divided into subsamples of micro (2–10 employees), small (11–49 employees), and medium and large (more than 50 employees) firms. In Panel C firms are divided into subsamples of stable (present in the sample during all three time periods), new-entrant (present in the sample in the second and third periods), and exited (present in the sample in the first and second periods) firms. Standard errors shown in parentheses are robust to heteroskedasticity and clustered at the firm level. Cook's distance is used to account for influential observation. The symbols [a], [b], and [c] denote significance at the 1%, 5%, and 10% levels, respectively.

Table 5: Heterogeneity of countries' and local environments

	(I) Sales	(II) Productivity	(III) Sales	(IV) Productivity
Bribery Mean	-0.274 [a]	-0.438 [a]	-0.271 [a]	-0.291 [a]
	(0.014)	(0.015)	(0.011)	(0.011)
Bribery Mean* Rule of Law	0.284 [a]	0.441 [a]		
	(0.020)	(0.020)		
Bribery Dispersion	0.312 [a]	0.284 [a]	-0.040 [a]	0.033 [b]
	(0.019)	(0.020)	(0.015)	(0.015)
Bribery Dispersion* Rule of Law	-0.202 [a]	-0.081 [a]		
	(0.027)	(0.027)		
Rule of Law	0.822 [a]	0.181 [a]		
	(0.020)	(0.019)		
Bribery Mean* Bribery Dispersion			0.688 [a]	0.588 [a]
			(0.040)	(0.040)
N observations	627,634	626,869	627,546	626,995
N group	446,004	445,806	445,726	445,773
R2 within	0.240	0.127	0.225	0.119

Note: The Table reports the results of the estimation of augmented specification (1) for two performance measures as dependent variables: real sales growth and labor productivity growth. In columns I-II, specification (1) includes bribery mean and dispersion variables interacted with the Rule of Law indicator. In columns III-IV, specification (1) includes interaction between bribery mean and dispersion variables. Standard errors shown in parentheses are robust to heteroskedasticity and clustered at the firm level. Cook's distance is used to account for influential observation. The symbols [a], [b], and [c] denote significance at the 1%, 5%, and 10% levels, respectively.