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.....  
název disertace

Komise pro obhajoby doktorských disertací v oboru ekonomické teorie a jejich dějiny

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## Summary

The thesis consists of four parts and deals with various issues of measuring and identifying partially hidden links in applied economic research. The portfolio of selected problems carries out new dimensions of applied financial research, unexplored methods of data aggregation and dataset merging, sensitivity of macroeconomic data definitions, and survey design questions associated with tax avoidance. Although, it covers different fields of applied research, the six papers selected aim to combine a good understanding of the data with a link to economic theory.

Part 1 is devoted to research on the capital structure of the European firms, and their stability in particular. According to a strong stream of financial research, the capital structure of firms remains almost unchanged during their lives. This stability of leverage ratios is mainly generated by an unobserved firm-specific effect that is liable for the majority of the variation in capital structure. In terms of methodology, our approach differs from existing studies by focusing on the question of capital structure stability and its sources. We investigate whether the capital structure of firms in Central and East European (CEE) countries exhibits a similar level of persistence as in the US or rather actively changes in response to economic evolution. Using a large dataset of CEE firms we demonstrate that even substantial changes in the economic environment do not affect the stability of firms' leverage due to the presence of credit constraints. We are aware that credit constraints and a lack of internal resources may restrain firms from changing their capital structure and pay special attention to this scenario. Financially unconstrained firms are more responsive to economic changes and adjust to the target substantially faster than constrained firms. Moreover, accounting for the ownership structure of firms boosts the explanatory power of the model in the subsample of unconstrained firms, suggesting that annual information on ownership and ownership changes, together with financial constraints, have the potential to be an answer to the puzzle of stability in capital structure.

Part 2 studies in detail differences in countries' growth rates across different data sources. Since the path-breaking work of Barro (1991), estimation of cross-country growth regressions has become a boom industry. Literally hundreds of studies have extended the basic framework by incorporating various possible determinants of growth rate differences across countries and over time. Results are often found to be sensitive to specification, time period or sample coverage (see Levine and Renelt, 1992; Sala-i-Martin, 1997; Kalaitzidakis et. al., 2000; and Islam, 2003). Several authors have observed that results may depend on the source and data collection methods for right-hand variables (see, for example, Knowles, 2001 and Atkinson and Brandolini, 2001). In this section we investigate a heretofore generally overlooked and potentially serious issue regarding the majority of cross-country growth studies: Measured rates of growth in real per capita income differ drastically depending on the data source. This phenomenon occurs largely because data sets differ in whether and how they adjust for changes in relative prices across countries. Using replication of several recent studies of growth determinants shows that results are sensitive to the choice of data in important ways. Previous warnings

against using data adjusted to increase cross-country comparability to study within-country patterns over time (growth rates) have been largely ignored at the cost of possibly contaminating the conclusions.

Part 3 aims to seek out evidence that tax evasion is not just a product of greed; tax compliance doesn't result solely from deterrence, but also contains dimensions of morality. For example, tax evasion may also be a form of legitimate protest by citizens against a government they find to be inefficient and unresponsive to their needs. The obvious problem when asking people about their participation in the underground economy is that they will be reluctant to disclose their participation in it, and if they do so, they can later "justify" it by claiming that they evaded taxes because they believed government services to be of low quality. To avoid these problems, our survey proceeds in several stages. First, we titled the survey "Satisfaction with Services" and we initially ask our respondents general demographic questions as well as questions related to government and the quality of its services. When answering these questions respondents have no idea that questions about tax evasion will follow and thus they cannot justify their evasion by referencing poor quality of government services. Secondly, we ask respondents whether they know of anyone who has participated in the underground economy. Respondents might not feel ashamed about answering this question honestly. Knowing people who participated in the underground economy could be a weak signal that the respondent also participates. Next we ask whether the respondent has ever bought goods or services in the underground economy. Finally, and this is perhaps the question to which respondents will give the least honest reply, we ask whether they have themselves ever participated in the underground economy and what is the nature of this participation. No survey studies of the link between willingness-to-pay taxes and the quality of government services seem to exist for transition countries. Hanousek, Palda (2004) in a survey of the Czech and Slovak Republics, Hungary, and Poland, find strong evidence that citizens will avoid taxes if they do not believe they are getting quality government services for the taxes levied upon them.<sup>1</sup>

Part 4 deals with various determinants of firm performance; we analyze the evolution of efficiency in European firms during 2001–2011 and assess how efficiency is affected by firm and market characteristics, as well as ownership structures. We provide evidence that ownership structures are of considerable importance and indicate numerous detailed results. Moreover, we study the extent of effects of the bribery environment on firm performance. We employ a rich firm-level panel dataset with a widely accepted measure of bureaucratic corruption (bribery) that allows us to alleviate some of the methodological concerns of existing research. Our approach is to combine the information on firm bribery practices, measured as the frequency of bribing public officials to 'get things done,' from BEEPS and firm financial data from the Amadeus database. In this section, the endogeneity problem is largely reduced due to several reasons. First of all, we control for firm fixed effects, which removes

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<sup>1</sup> In a detailed regression analysis, Hanousek and Palda (2004) confirmed a very strong tendency for those who are very unsatisfied with government services to become frequent or sometime tax evaders. In particular, moving from the second lowest to the lowest level of belief in the quality of government services on a five point scale will increase tax evasion by almost 13%.

time-invariant unobservable factors that could potentially cause both firm performance and bribing behavior. The identification in our regression analysis thus comes from within firm variation over time, and we assume bribery measures to be exogenous. Second, instead of analyzing the bribery behavior of individual firms, we employ more aggregated measures – bribery mean and dispersion in a local market defined by industry, firm-size, and location-size characteristics. Arguably, an individual firm has a negligible influence on these aggregate measures.

Hanousek and Kochanova (2016) suggest that while a higher level of bribery impairs sales and labor productivity growth, firms grow faster in local environments with a higher dispersion of individual firm bribes. Hence bribery ‘greases the wheels’ of doing business for individual firms, but harms firms’ collective economic performance. In a more detailed stochastic frontier analysis we find that firm efficiency is on average lower in environments characterized by a high level of corruption. The effects are stronger for honest firms; foreign-controlled firms, especially if their headquarters are located in low-corruption countries, and firms who are led by female CEOs. These results are consistent with the idea that foreign firms’ propensity to behave corruptly is affected by the cultural norms of the firm’s home country, the legal restrictions they are subject to, and their relative lack of local market knowledge, and that women differ in their preferences for risk and propensity to abide by the law. (See Hanousek, Shamshur and Tresl, 2015).

# 1. Stability of leverage ratio could be a result of ownership structure and financial constraints

## 1.1. Outline.

The choice of capital structure is an important decision for a firm because it affects the maximization of profit and impacts the firm's ability to successfully operate in a competitive environment. An extensive literature covers the choice of capital structure by firms and includes influential contributions by De Jong and Van Dijk (2007), Frank and Goyal (2009), Rajan and Zingales (1995), and Titman and Wessels (1988) to name a few.

According to a strong stream of literature, the capital structure of firms remains almost unchanged during their lives, meaning that leverage ratios are significantly stable over time (Lemmon et al., 2008). The behavior of leverage ratios is to some extent driven by six determinants identified by Frank and Goyal (2009). However, the stability of the leverage ratios is mainly generated by an unobserved firm-specific effect that is liable for the majority of the variation in capital structure (Lemmon et al., 2008).

Specifically Lemmon et al. (2008) show that traditional leverage determinants explain a minor part of the variation in leverage (at most 30%), while 60% remains unexplained. As the authors focus on the US economy, which is relatively stable over time,<sup>2</sup> it is not clear whether leverage ratios exhibit a similar level of persistence when the economic environment changes rapidly over time. The impact of substantial changes in the economy on capital structure stability has not been studied yet.<sup>3</sup> To answer this question Hanousek and Shamshur (2011) used data from European emerging markets that were exposed to a higher degree of instability due to a major transformation of their economies and several external shocks. The major changes include a transition from a central planning to a market economy including privatization, the Russian financial crisis, and EU enlargement.

In terms of methodology, our approach differs from the existing studies by focusing on the question of capital structure stability and its sources.<sup>4</sup> We investigate whether the capital structure of firms in Eastern and Central European countries exhibits a similar level of persistence as in the US or rather actively changes in response to economic evolution. We are aware that credit constraints and a lack of internal resources may restrain firms from changing their capital structure and pay special attention to this scenario. In addition, we attempt to investigate to what extent

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<sup>2</sup> Lemmon et al. (2008) use a sample that consists of all non-financial firm-year observations between 1963 and 2003. This time span includes the US savings and loan crisis in the 1980s and the dot-com bubble. However, neither of these crises caused a deep recession in or depression of production and investment in the economy as a whole. The financial sector was stabilized and continued growing after the infusion of funds. So, neither crisis dramatically affected the capital structure of firms.

<sup>3</sup> In the US context, it could be investigated how the capital structure of firms changes in response to the financial crisis of 2008.

<sup>4</sup> There are only a few papers that attempt to study the capital structure of firms in transition economies. For example, Cornelli, Portes, and Schaffer (1996); Delcours (2007); and Joeveer (2006) focus on capital structure determinants and found firms to behave differently, e.g., there are negative relations between asset tangibility and leverage. Haas and Peeters (2006) and Nivorozhkin (2005) employ a dynamic capital structure model and report firms to be significantly underleveraged.

the ownership structure is able to explain the unexplained firm-specific variation in leverage. The motivation for the inclusion of this factor into the model is based on the existing differences in ownership patterns between the US and Europe. In the US, dispersed ownership prevails, while in Europe it is more concentrated. Majority ownership not only grants the right to make important strategic decisions, but also creates strong incentives to monitor managers. The controlling share owner is directly interested in firm performance and is likely to take part in firm capital structure decisions. Thus, the ownership structure seems to be an important determinant of firm capital structure in countries with concentrated ownership.

## 1.2. Data

The firm-level data are obtained from the AMADEUS database constructed by Bureau Van Dijk. This database is the most comprehensive source containing financial information on public and private companies in Europe. In this study we use data from a module containing about one million companies in 41 European countries. We focus on seven Eastern European countries (the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, and Slovakia) in 1996–2006.<sup>5</sup>

The mean leverage in all countries is in the 40 percent range, however, it is lower in Estonia (0.37) and about 50 percent in the Czech Republic and Latvia. The largest firms in terms of total assets are located in Poland. In terms of profitability, firms' mean return in assets is larger than their median return. This implies that firms' profitability distribution is positively skewed and most firms have low profitability, while only a few firms have very high profitability. The average age of firms in our sample is about 7 years. All detailed descriptive statistics could be found in Hanousek and Shamshur (2011).

## 1.3. Model and results

### *The Determinants of Leverage in Transition Economies*

As a starting point for studying the determinants of leverage ratios we use cross-sectional regressions similar to those in Rajan and Zingales (1995) and Frank and Goyal (2009).

$$Y_{ijt} = \alpha + \beta X_{ijt-1} + \nu_t + \gamma_j + \varepsilon_{ijt}, \quad (1)$$

where  $Y_{ijt}$  is the leverage<sup>6</sup> of firm  $i$  in country  $j$  at time  $t$ ;  $X$  is a set of leverage

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<sup>5</sup> We would like to thank the Organizational Dynamics Graduate Studies Program at the University of Pennsylvania for access to this dataset.

<sup>6</sup> In our choice of leverage definition we assume that in the region trade credit is a major component of the total liabilities that is not used for financing purposes. Hence the leverage measure used in the results presented below is a compromise between two leverage measures that are widely used in the literature: broad leverage and narrow leverage. Nevertheless, we also used broad leverage defined as total liabilities over total assets as a robustness check; the results were similar in terms of sign, magnitude, and significance. The results are available upon request.

determinants;<sup>7</sup>  $v$  is a time fixed effect and  $\varepsilon$  is a random error term. Since the residuals of a given firm can be correlated across years (unobserved firm effect) and the sample contains more firms than years, an appropriate method is to include dummy variables for each time period and each country and then cluster by firm. Using this approach requires year and firm effects to be unchanged over time. When the year effect is fixed, time dummies will remove the correlation between observations in the same time period and only the firm effect will be in the data. The assumption of a fixed firm effect is quite fair because we have a short panel where it is impossible to distinguish between permanent and temporary firm effects (Petersen, 2009). Detailed set of firm level determinants is not presented here; it is discussed and provided in details in Table 3, see Hanousek and Shamshur (2011). Instead we will concentrate on main research questions associated with the leverage.

*How much of the Variation in Leverage is Firm-specific and Time-invariant?*

The recent findings of Lemmon et al. (2008) point out that traditional leverage determinants account only for a modest part of the variation in leverage, while the firm fixed effect regression explains about sixty percent of the variation. In order to investigate whether the fixed effect is responsible for the majority of the variation in leverage in transition economies, we run the following regression (Lemmon et al., 2008).

$$Y_{ijt} = \alpha + \beta X_{ijt-1} + \eta_i + v_t + \gamma_j + u_{ijt},$$

$$u_{ijt} = \rho u_{ijt-1} + w_{ijt} \tag{2}$$

where  $u$  is a stationary component,  $w$  stands for a random disturbance that is assumed to be possibly heteroskedastic but serially and cross-sectionally uncorrelated, and  $\eta$  is a firm fixed effect.

Overall results are in line of general expectations: larger firms tend to have higher leverage opportunities because they are more diversified and face lower bankruptcy risk and the corruption index has a positive significant coefficient in the fixed effect model for both listed and unlisted firms. (Table 5, Hanousek, Shamshur, 2011).

Further, we run the regression of leverage on firm fixed effects to answer the question how much of the variation is firm-specific and time-invariant. The adjusted  $R^2$  from this regression is about sixty-five percent, which is even higher compared to the US. Then the sensitivity analysis considers only firms with at least five, seven, and ten years of non-missing data for book assets and confirms that the unobserved firm-specific time-invariant component is still responsible for about sixty percent of the variation in leverage of those long-living firms. This result is quite surprising given the rapidly changing economic environment during the transition in the considered countries. Therefore, we proceed to further investigate the leverage stability sources.

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<sup>7</sup> The leverage determinants suggested by the theory and by recent studies of capital structure as well as their expected signs in transition economies are summarized in Table 2.



### Where Does the Stability Come from?

The traditional leverage model itself does not take into account that a firm could be heavily dependent on the availability of external finance and in that case would not be able to change its capital structure even if it was eager to do so. During the transition financial constraints were particularly severe. To find out whether the presence of credit constraints might be responsible for the observed stability in firms' capital structure, we separate between financially constrained and unconstrained firms using an endogenous switching regression with unknown sample separation. This methodology helps to avoid the prior assignment of a firm into a particular group, because it could be quite subjective and the results depend heavily on the separation criterion applied (Moyen, 2004). Moreover, the proposed method allows allocating the observational units to a specific regime depending on the value of the latent decision variable relative to the threshold value (Maddala and Nelson, 1994).

We assume that a firm could be in either a constrained or unconstrained regime, but the points of structural change are not observable and are estimated together with the leverage equation for each regime. Thus, the model is composed of a system of three equations estimated simultaneously:

$$\begin{aligned} Y_{1ijt} &= \beta_1 X_{ijt} + \varepsilon_{1ijt}, \\ Y_{2ijt} &= \beta_2 X_{ijt} + \varepsilon_{2ijt}, \\ y_{ijt}^* &= \delta Z_{ijt} + u_{ijt}, \end{aligned} \quad (3)$$

where  $Y_{ijt}$  is the leverage of firm  $i$  in country  $j$  at time  $t$ ,  $X_{ijt}$  are leverage determinants, and  $\varepsilon$  is a random error term. The first two equations in the system of equations (3) are leverage regressions for constrained and unconstrained regimes, and the selection equation  $y_{ijt}^* = \delta Z_{ijt} + u_{ijt}$  estimates the likelihood of the firm to operate in one regime or the other.  $Z_{ijt}$  contains the determinants of a firm's propensity of being in either regime at time  $t$ . The change of regime occurs when  $y_{ijt}^*$  reaches a certain unobservable threshold value. So, the status of the firm might change over time.

The selection rule is defined as:

$$\begin{aligned} Y_{ijt} &= Y_{1ijt}, \text{ iff } y_{ijt}^* < 0, \\ Y_{ijt} &= Y_{2ijt}, \text{ iff } y_{ijt}^* \geq 0 \end{aligned} \quad (4)$$

The parameters  $\beta_1$ ,  $\beta_2$ , and  $\delta$  are estimated using maximum likelihood. It is necessary to assume that  $\varepsilon_{1ijt}$ ,  $\varepsilon_{2ijt}$ , and  $u_{ijt}$  are jointly normally distributed with zero mean and covariance matrix  $\Sigma$ .

$$\Sigma = \begin{pmatrix} \sigma_1^2 & \sigma_{12} & \sigma_{1u} \\ \sigma_{21} & \sigma_2^2 & \sigma_{2u} \\ \sigma_{u1} & \sigma_{u2} & \sigma_u^2 \end{pmatrix},$$

where  $\sigma_u^2$  is normalized to 1, because from the switching regression it is only possible to estimate  $\delta/\sigma_u$ , not  $\delta$  and  $\sigma_u$  separately. It is also assumed that off-diagonal terms (the covariances) are not equal to zero, although  $\sigma_{12}$  is not estimable since it does not appear in the likelihood function equation (5). Still, the non-zero covariance assumption is needed to allow the shocks of leverage to be correlated with the shocks to a firm's characteristics. This assumption is particularly important because

$Y_{1ijt}$  and  $Y_{2ijt}$  are included in the  $y_{ijt}^*$  regressors, meaning that they affect the classification of observations in the regimes. As  $\sigma_{1u}$  and  $\sigma_{2u}$  are different from zero, the switch is endogenous, thus, the endogenous switching model with unknown sample separation should be applied. Hence, the log-likelihood function for all the observations subject to maximization is given by

$$\ln L = \sum_{i=1}^N \sum_{j=1}^M \sum_{t=1}^T \ln \left\{ \Phi \left( \frac{-\delta Z_{ijt} - \frac{\sigma_{1u}}{\sigma_1^2} \varepsilon_{1ijt}}{\sqrt{1 - \frac{\sigma_{1u}^2}{\sigma_1^2}}} \right) \phi(\varepsilon_{1ijt}, \sigma_1) + \left[ 1 - \Phi \left( \frac{-\delta Z_{ijt} - \frac{\sigma_{2u}}{\sigma_2^2} \varepsilon_{2ijt}}{\sqrt{1 - \frac{\sigma_{2u}^2}{\sigma_2^2}}} \right) \right] \phi(\varepsilon_{2ijt}, \sigma_2) \right\} \quad (5)$$

where  $\phi(\cdot)$  is the normal density distribution and  $\Phi(\cdot)$  is the normal cumulative distribution function.

The next step is the estimation of the endogenous switching regression model with unknown sample separation. The model is estimated by maximum likelihood and the leverage regressions are estimated in first differences to account for fixed effects. Year dummies are also included to control for fixed-year effects. As in the previous sections the model is estimated over the period 1996–2006.

Estimation results clearly demonstrate that the firms' capital structure decisions are different in the two regimes. These differences are well pronounced for all leverage determinants. In both regimes the size of the firm, its tangibility and industry median leverage are positively related to leverage. However, the changes in the size and tangibility of the firm generate a much greater increase in the leverage of constrained firms. This finding is quite intuitive because financial institutions consider the total assets of the firm and tangible assets in particular as collateral. The industry median leverage has a significantly higher impact on the leverage of constrained firms. Constrained firms have few opportunities to borrow, thus they strive to adjust their leverage to the median industry leverage, while unconstrained firms might focus on their own target level rather than the common benchmark. (Table 7, Hanousek, Shamshur, 2011).

Constrained firms tend to be smaller and younger, and have smaller tangible assets. Constraints are associated with higher short-term debt and lower long-term debt, as long-term debt entails higher information costs than short-term debt because stronger proof of creditworthiness is needed—only unconstrained firms could obtain it. Constrained firms also have higher growth opportunities and lower levels of financial slack. It is interesting yet understandable that higher soft budget constraints are associated with higher financial constraints.<sup>8</sup> Financially constrained firms receive help from the government in the form of direct government subsidies without the expectation of future repayment or in the form of tax reductions, trade credits, and cheap bank credit. These financial flows are mostly used for survival rather than

<sup>8</sup> The situation when a firm is for some period not generating any profit (or accumulating losses) but still receives positive financial flows has three main explanations: it is 1) a promising startup company, 2) a foreign-owned local entity, or 3) a local firm with government support or ownership. In all three cases accumulating debt while not having good prospects for profit would eventually cause the firm to become financially constrained. Since we analyze firms from CEE countries, we have chosen to name the variable “soft budget constraint” to reflect the main stream of the existing literature.

investment, restructuring, or optimizing capital structure purposes (Grosfeld and Roland, 1997; Konings et al., 2003; Lizal and Svejnar, 2002).

Coming back to the question of capital structure stability in the financial-constraints framework, an unobservable firm-specific component is responsible for about 70% of the variation in the leverage of constrained firms and 59% of the variation in the leverage of unconstrained firms. This finding is consistent with the financing constraints literature, which suggests that financially unconstrained firms should be more responsive to changes in the economic environment. Moreover, the estimated speed of adjustment is different for constrained firms (25.5%) and unconstrained firms (38.8%). As expected, unconstrained firms adjust substantially faster towards their targets. (Table 8, Hanousek, Shamshur, 2011).

### *Ownership Structure of the Firm as a Determinant of Firm Capital Structure*

Besides analyzing the stability of capital structure and the variation explained by previously identified determinants, we suggest looking at the ownership structure of the firm as a potentially important determinant of capital structure. The potential link between ownership structure and financial efficiency has been widely accepted.<sup>9</sup> These results could also bring into consideration a link between equity ownership, firm value, and leverage (see also Brailsford et al., 2002 and Demsetz, 1983). Let us note that US-based studies regarding ownership mostly consider management position as an owner and a reduction of managerial opportunism in the case of managerial share ownership (ibid). On the other hand, studying European firms, for example, could raise ownership concentration issues. European firms tend to be controlled by a majority owner and the remaining shares are held by small investors. The majority owner of the firm is directly interested in the firm's performance and tries to reduce the risk of default through financing choices. Obviously, higher debt levels are more likely to lead to default. However, Shleifer and Vishny (1989) argue that the overall effect of large shareholders on firms could be ambiguous and has to be tested empirically. The main hypothesis explored in the literature is that the key agency costs in firms with concentrated ownership shift from the traditional principal-agent conflict to the dominant shareholder's incentive to consume private benefits at the expense of other minority shareholders.<sup>10</sup>

In order to study the impact of ownership control on leverage, we consider several ownership concentration categories whose impact on firms in CEE markets has been established by Hanousek et al. (2007). Based on an overlap in corporate laws in transition countries we distinguish four ownership categories: majority ownership (>50%); blocking minority ownership (in some countries >25, in some

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<sup>9</sup> See Shleifer and Vishny (1986) for the motivation or Estrin et al. (2009) for a recent overview related to the situation in CEE countries.

<sup>10</sup> See Shleifer and Vishny (1997) for the first systematic survey of the costs and benefits of large shareholders. Also see Faccio et al. (2001) for the systematic behavioral patterns of outside shareholders in Western Europe and East Asia and Gugler (2003), Gugler and Yurtoglu (2003), and Bena and Hanousek (2008) for studies of the ownership role in firm dividend policy in CEE countries.

>33%, but in all cases <50%);<sup>11</sup> and legal minority ownership (in some cases >5%, in others >10%, but in all cases < 25 or <33%).<sup>12</sup> Let us note that we are using country-specific (blocking) minority and legal minority levels.<sup>13</sup>

Adding ownership categories explains only about 3% of the unobserved firm-specific variation. However, accounting for firm ownership structure significantly improves (by 8.7%) the explanatory power of the model in a subsample of unconstrained firms. Moreover, ownership domicile enhances the  $R^2$  by an additional 1%. The story is different for the subsample of constrained firms: ownership adds only 0.8% to the explanatory power of the model. This result is expected, though. Owners of unconstrained firms make capital structure decisions that are optimal and stimulate firms' growth and prosperity, while owners of constrained firms are restricted in their choices by such external forces as credit constraints. This story is also supported by our previous finding of the lower adjustment speed for constrained firms. In addition, the latest available ownership structure captures almost 9% of the unexplained firm-specific (fixed effect) variation in leverage, meaning that using annual information on ownership and ownership changes could only increase the portion of the explained unobserved variation. Therefore, it can be concluded that ownership structure in CEE countries plays a quite important role in determining the capital structure decisions of firms.

#### **1.4 Empirical contribution.**

According to a recent finding, the capital structure of firms remains almost unchanged during their lives. This stability of leverage ratios is mainly generated by an unobserved firm-specific effect that is liable for the majority of the variation in capital structure. We demonstrate that even substantial changes in the economic environment do not affect the stability of firms' leverage due to the presence of credit constraints. Financially unconstrained firms are more responsive to economic changes and adjust to the target substantially faster than constrained firms. Moreover, accounting for the ownership structure of firms boosts the explanatory power of the model in the subsample of unconstrained firms, suggesting that annual information on ownership and ownership changes together with financial constraints have the potential to be an answer to the puzzle of stability in capital structure.

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<sup>11</sup> According to corporate laws, the Czech Republic, Lithuania, and Slovakia have a 33% threshold and Estonia, Hungary, Latvia, and Poland have a 25% threshold.

<sup>12</sup> 5% in Hungary and Slovakia, while others have 10%. The thresholds are taken from corporate laws.

<sup>13</sup> The ownership categories defined above were not chosen ad hoc. The categories represent certain positions and ownership rights. As a robustness check we use 33% and 20% blocking minority thresholds for all countries and obtain qualitatively the same results.

## 2. Results of growth regressions could be strongly dependent on data source.

### Outline.

Since the path-breaking work of Barro (1991), estimation of cross-country growth regressions has become a boom industry. Literally hundreds of studies have extended the basic framework by incorporating various possible determinants of growth rate differences across countries and over time. Results are often found to be sensitive to specification, time period or sample coverage (see Levine and Renelt, 1992; Sala-i-Martin, 1997; Kalaitzidakis et. al., 2000; and Islam, 2003). Several authors have observed that results may depend on the source and data collection methods for right-hand variables (see, for example, Knowles, 2001 and Atkinson and Brandolini, 2001). In this paper we investigate a heretofore generally overlooked and potentially serious issue regarding the majority of cross-country growth studies.

### 2.1 Data Sources for Growth

Economic research on growth generally uses one of three interrelated, and widely available, data sets: the IMF's International Financial Statistics (IFS), the World Bank's World Development Indicators (WDI) and the Penn World Tables (PWT).

The International Monetary Fund regularly collects and organizes data provided by national statistical agencies into the IFS data, which are distributed in hard-copy, on CD-ROM, and on-line.<sup>1</sup> Real GDP and growth of real GDP are reported using national price weights and indigenous inflation levels.

The WDI data set combines data from the IFS with additional data directly collected by World Bank staff and ad hoc adjustments based on expert judgement. The data set contains three real GDP measures, GDP in constant local currency units, GDP in constant US dollars (1995 dollars in the latest release) and GDP in Purchasing Power parity adjusted constant US dollars. What is sometimes ignored is that all conversions from local currencies into dollars are made using a single exchange rate for the base year. Thus, growth rates reported in local currency or constant US dollars should be identical. Although in principle the WDI and IFS real GDP estimates should be identical up to a scalar multiplier and should, therefore, yield identical growth rates (see Nordhaus, 2007), in fact, as will be seen below, they frequently differ and are far less than perfectly correlated. Nordhaus (2007) suggests that such differences, which are much larger for the entire set of countries we analyze than for the six developed countries for which he reports growth rates, may be due to data revisions and adjustments.

Raw data from in the WDI (except for data for developed countries which is obtained from the Organization for Economic Cooperation and Development (OECD)) are further processed by the Center for International Comparisons at the University of Pennsylvania to produce the Penn World Tables (PWT) data set. Also known by the names of its principle authors as the Summers and Heston data, the PWT are the

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<sup>1</sup>Since summaries of the data are also published in the IMF's biannual World Economic Outlook, this data is sometimes referred to in the literature as the WEO data.

basis for the widely used Barro-Lee data set.

The main focus of the PWT project is to create cross-sectional comparability in national accounts data. Thus, each country's disaggregated current price expenditures are converted to a common currency unit using price parities based on the benchmarking studies of the United Nations International Comparison Program (ICP). In effect, relative domestic prices for individual goods are set equal to the weighted average of relative prices for that good in all countries, or what are called "international prices." Because weights are derived from GDP levels, the actual price vector used to compare GDP across countries is roughly that of an upper-middle or even upper income country.<sup>14</sup> This level of prices is then normalized so that the level of GDP in the U.S. is the same in the weighted international currency units and in U. S. Dollars.

As of version 6.1 PWT contains 115 benchmark countries ( i.e. countries included in the ICP) and 53 additional nonbenchmark countries. Purchasing power parities for the latter group are obtained as a combination of extrapolation of past benchmark value (if available) and predicted values from an equation regressing the price level for benchmark countries on three international cost of living comparisons that exist for both benchmark and nonbenchmark countries.<sup>3</sup> Since the ICP only benchmarks countries at irregular intervals, data for other years are obtained by extrapolating benchmarked levels using domestic measures of price changes.<sup>4</sup>

Although, in principle, any of these three interrelated cross-country data sources could be used for empirical work analyzing growth, in practice, the vast majority of studies have used the Penn World Tables. In a quasi-random sample of seventy-five recent studies,<sup>5</sup> three-quarters used the PWT, 15 percent the WDI and the remaining 10 percent the IFS. This pattern may be partly due to the easy accessibility of the PWT, but it is more likely to be due to a desire for comparability with previous studies.<sup>6</sup>

There is broad consensus that the PWT represents a reasonable means of normalizing cross-country comparisons in living standards at a given time, particularly given its relative low demands for data. Neary (2004) provides a theoretical justification for this assertion, although Hill (1999) claims that the PWT systematically understates income differentials across countries, while exchange-rate-based comparisons tend to overstate such differentials.

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<sup>2</sup> Nuxoll (1994) calculates that the assumed prices are close to those of Hungary in PWT 5.1, while Dowrick and Akmal (2005) suggest that the constant international price vector underlying PWT 5.6 is "most closely represented by the price structure of a relatively rich country such as Hong Kong, Japan or the U.K. (p. 211)."

<sup>3</sup> Regressions are estimated using the United Nation's International Civil Service Index, the U.S. State Department Index and an index provided by Employment Conditions Abroad, an organization of multinational firms, governments and nonprofit agencies.

<sup>4</sup> While other PPP-based times series (e.g. Maddison, 2003) could, in theory, be used to calculate growth rates for empirical studies, these are rarely used and will not be analyzed here.

<sup>5</sup> The sample consisted of papers on the reading list of a graduate-level course on determinants of growth taught by one of the authors supplemented by papers our research assistant easily found in the Econ-Lit data base.

<sup>6</sup> Coverage of countries and years are somewhat different for the three data sets. The December 2005 version of the IFS provides GDP data for 153 countries, and goes back as far as 1948 for some countries. WDI contain data for 207 countries and begins in 1960, while the PWT consists of data for 168 countries since 1960.

Unfortunately, the adjustments made to create cross-country comparability in the PWT data can introduce problems when analyzing growth. This phenomenon has long been known in theory, even if ignored in practice.

Nuxoll (1994) makes a similar point, observing that due to the Gerschenkron effect (Gerschenkron, 1951), the use of international prices should serve to overstate growth rates for countries richer than the reference price level and understate it for countries poorer than that level. The PWT growth rates will exceed those derived from own-country prices when the sectors growing in importance within a country are those in which domestic prices are lower than the international prices. Intuitively, such a pattern makes economic sense. Relative demand should be increasing for sectors with relatively low prices. In effect, growth rates calculated from PWT data will confound real physical changes in output within a country with changes in that country's price structure relative to world prices

This point is further reiterated by Temple (1999) and Nordhaus (2007). The latter echoes Nuxoll, stating: "when calculating convergence among different countries, modelers should consider the superlative PPP technique described here. That is, convergence should use true (PPP) measures of output differentials and growth rates at national prices (p. 267)." Despite these cautions, very few empirical papers have adopted the suggested strategy of using PPP adjusted initial income levels and own-country real growth rates to estimate cross-country growth equations. Notable exceptions are Yanikkaya (2003), Butkiewicz and Yanikkaya (2005), and Gerring et. al. (2005).

It turns out that ignoring this caution may have seriously affected our understanding of growth determinants. Below, we engage in two exercises designed to establish the disparities among the different data sets used in the literature to purportedly measure the same concept - economic growth.

## **2.2 Comparison of Growth Rates across Data Sets**

Using the observations that all three data sets have in common, we computed growth rates from adjacent year observations of real per capita GDP as reported in the data source.<sup>7</sup> In all, we are able to compute a total of 3,583 comparisons between any two data sets for years in which all three sources report data, and between 3,788 and 4,594 pairwise comparisons across data sets. First we establish that growth rates do, in fact, differ substantially depending on which data source was used to compute them.

Several points stand out from the comparisons. Most critical is the fact that while mean real growth rates are almost identical across the three data sets, there is surprisingly low correlation among various measures of what is supposedly the same variable. In particular, the correlation between IFS and PWT growth rates is only 0.68. When it is analyzed in details we see that differences between growth rates are generally higher and correlations are substantially lower for Low Income countries, results that may hold implications for studies of the determinants of development and convergence. Moreover, there is very little time trend in the degree of concordance across the growth measures.

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<sup>7</sup>For more detail on the exact data definitions, see Hanousek, Hajkova, Filer, 2008.

The key point is that measured growth rates appear to be sensitive to adjustments made to the basic data to achieve cross-country compatibility in income levels in a single year. Moreover, the data sets frequently do not even agree on the direction of GDP change. It is striking that approximately 14 percent of the time the IFS and PWT have opposite signs, with one series showing positive growth while the other shows the same economy contracting. In addition, this divergence is especially pronounced in low income countries. Of course, divergence in the direction of the change in GDP is made more likely in low income countries by their lower average growth rate in general. The divergences in sign are symmetrical, such that the combination of positive growth in IFS data and negative growth in PWT data is as likely as the combination of negative IFS growth and positive PWT growth.

It is clear from the wide divergence in growth measures across data sources that the widely-ignored caution that researchers should be sensitive to the source of their data and, in general, use national accounts data to determine growth rates is potentially important. We now establish just how important by replicating several recent studies.

## 2.3 Replication Results

Our replication strategy is simple. We selected four studies published in major journals since 2000 and requested the original data from the authors.<sup>9</sup> In each case we selected a basic equation using relatively simple econometric techniques.<sup>10</sup> We first replicated the results reported in the original paper and then replaced the dependent variable (growth rate) in the original data with growth rates calculated from own-country data as reported in the IFS data base and the income level variable on the right-hand side of the estimated equation with cross-country comparable PPP-adjusted data from the Penn World Tables. Thus, our alternative specification is precisely the one suggested as theoretically correct by Nuxoll (1994) and Nordhaus (2007).<sup>11</sup> Because, as explained in the appendix, we have excluded country/period sets where there are breaks in the underlying series, sample sizes are frequently reduced in the alternative data as we have cleaned them. When this is the case, we have repeated the analysis using the original data (including the growth measure) applied to the reduced sample derived from the alternative data.

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<sup>9</sup>We also attempted to replicate Bosworth and Collins (2003) but were unable to create a matched data set containing more than 50% of the original sample and so have not analyzed these results. No replications of growth regressions where we were able to create a matched data set containing more than half the observations have been excluded from the results reported. We hope that the results reported below will encourage others to repeat our exercise with a large number of other studies.

<sup>10</sup>We often tried replications of more sophisticated techniques, but these results were generally even less stable to minor perturbation in data than simple OLS or IV estimates.

<sup>11</sup>We also conducted two alternative data substitution strategies. The first replaced only the dependent variable from the studies being replicated with growth rates calculated from all three commonly used data sets (IFS, WDI and PWT). The second replaced both the growth rate and initial income level with values from the three data sets. Both of these alternative substitutions reinforce the pattern reported whereby results are highly sensitive to the choice of which data source to use. They are not reported here since they are not consistent with the theoretical argument that own-country data should be used to calculate growth rate and data that is adjusted to be comparable across countries should be used for initial income levels. See Hanousek, Hajkova, Filer (2008).



A) *Inequality and Growth (Forbes, American Economic Review, 2000)*

Forbes (2000) investigates the link between income inequality and growth rates, finding that “in the short and medium term, an increase in a country’s level of income inequality has a significant positive relationship with subsequent economic growth.” Income data for the study is taken from 1995 World Bank data. Hanousek, Hajkova, Filer (2008), Table 5, compares OLS estimates of the relationship between growth and income inequality as reported by Forbes as well as alternative estimates of the same specification using growth rates from the IFS and income levels from the PWT. The impact of this substitution is substantial. The variable of interest in her paper, income inequality, no longer has a significant impact on growth, supporting results in the original paper from more sophisticated analytical techniques. Initial income, on the other hand, which was reported as unrelated to growth in the original paper, is significantly negatively related to growth (suggesting convergence) when using the more appropriate data.

B) *Labor Force Quality and Growth (Hanushek and Kimko, American Economic Review, 2000)*

Hanushek and Kimko (2000) investigate the effect of labor-force quality as measured by international mathematics and science test scores on economic growth, finding a strong positive and causal relationship. Data on income and growth are taken from Penn World Tables (Summers and Heston). The most striking difference is that the key variable of interest, labor force quality, is not significant when using growth rates measured in own-country prices (IFS data), although the results suggest that this may be due more to changes in sample size resulting from the elimination of years where the IFS reports breaks in the methodology used to collect data series than to variable definitions.

C) *Equity Markets and Growth (Rousseau and Wachtel, Journal of Banking and Finance, 2000)*

Rousseau and Wachtel (2000) investigate the impact of equity market development on growth using three measures of equity market development, the ratio of liquid liabilities (M3) to GDP, the ratio of market capitalization to GDP and the ratio of total value traded to GDP. Income and growth measures come from the WDI data. Of the three measures of equity market development, in cross-sectional IV regressions<sup>14</sup> using eight-year country averages for the periods 1980-1987 and 1988 - 1995 and initial values from 1980 and 1988, only the ratio of value traded to GDP was a significant predictor of growth.

In each case the impact of initial income levels on growth is substantially more negative when growth rates are calculated using own-country prices. The estimated impact of the financial market depth variables is, however, unaffected by the change of data set. On the other hand, the measure of market distortions (the black market exchange rate premium), which was not significantly related to growth in the regressions reported in the paper, significantly inhibits growth using the alternative,

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<sup>14</sup>Instruments include initial values of the regressors, inflation rate, and the ratios of M3, market capitalization, value traded, government expenditure and international trade to GDP.

more appropriate measure of growth rates.

*D) Financial Development and Growth (Aghion, Howitt and Mayer-Foulkes, Quarterly Journal of Economics, 2005)*

Aghion, Howitt and Mayer-Foulkes (2005) extend the work of Levine, Laoyza and Beck (2000) examining the role of financial intermediation on growth, adding an interaction term between various measures of financial development and initial GDP. A negative coefficient on this term is interpreted as “evidence that low financial development makes convergence less likely.” Estimates are performed using a country’s legal origins and legal origins interacted with initial output as instruments for financial development. Income level data comes from the Penn World Tables while growth rates were calculated from WDI data.

Again, the estimated impact of initial income on growth, which was positive and sometimes significant using the original data, becomes much smaller, and sometimes negative although insignificant, using the alternative growth measures. In addition, the key interaction variable tends to be both smaller in magnitude and less significant than reported in the original paper.

#### **2.4 Empirical contribution.**

We were one of the first researchers that analyze and document that growth rates calculated from different data sets measure conceptually different things, depending on how they treat changes in relative prices across countries over time. We have demonstrated that there are substantial differences in growth rates as measured in three widely-available data sets. Correlations across the data sets of what is supposedly the same measure, annual rate of growth in real GDP per capita, are as low as 0.68 overall and as low as 0.52 for low-income countries where relative prices are likely to be very different from those used to calculate PWT comparisons.

We have also replicated simple results from four recent studies of determinants of differences in long-term growth across countries. In each case, we retained the specification and all data from the original study except for initial income levels and measures of growth used as the dependent variable, which we calculated own-country data for growth rates and PPP adjusted cross-country comparable data for initial income levels. In particular, in order to preserve cross-country comparisons in each time period, data contained in the Penn World Tables may confound real growth rates with changes in price structures. This potential problem has long been known but has generally been ignored in cross-country growth regressions.

When these alternative sources resulted in a reduced sample size, we also reestimated the relationship using the original data but smaller sample. In each case, the results could most charitably be described as “fragile.” Key relationships change in size and significance, frequently leading to fundamentally different conclusions were the analysis to be based on seemingly simple changes of data set.

### 3. Morality and tax evasion: Tax evasion as a reflection of dissatisfaction with the governmental services.

#### **Outline.**

Tax evasion is one of the central problems facing the governments of transition countries. Corrupt tax officials, lack of resources to collect taxes, and populations versed in skirting rules, force transition countries to adopt systems of taxation that unduly target those narrow groups from who money can be extracted. This narrow targeting violates the central principle of efficient taxation, which is to tax at low rates on a broad base. Tax evasion raises what Browning (1976) calls the marginal cost of public funds. Governments of transition countries have attacked the problem of tax evasion by cracking down on evaders. By now there exists a strong and growing research movement encompassing, theory, experiments, and surveys that support the notion that citizens who believe they are getting quality government services will be more willing to pay their taxes than citizens who do not believe government is serving them well. Feld and Tyran (2002) discuss these researches in depth. Of the three survey studies Feld and Tyran discuss, two focus on England and one on Sweden. No survey studies of the link between willingness-to-pay taxes and the quality of government services seem to exist for transition countries. Hanousek, Palda (2004) in a survey of the Czech and Slovak Republics, Hungary, and Poland, find strong evidence that citizens will avoid taxes if they do not believe they are getting quality government services for the taxes levied upon them.

#### **3.1 Data**

The goal of this research stream is to seek out evidence that tax evasion is not just a product of greed; tax compliance is not solely results of deterrence, but also carries morality dimensions. For example, tax evasion may also be a form of legitimate protest by citizens against a government they find to be inefficient and unresponsive to their needs. The first step in our analysis was to construct and explore a detailed survey we conducted (face-to-face interviews) of the Czech and Slovak Republics in 2002, as well as a more limited surveys for Hungary and Poland. Some results we present are comparable to a survey we conducted in 2000, and where these results are comparable we present both years.<sup>15</sup>

We have chosen the survey method of analyzing tax evasion because this method is rich in demographic information. We can use demographic information to see what characteristics of respondents are associated with evasion. The survey method also allows us to ask respondents what they believe is the probability of being caught evading and what penalties they believe they face, whether they believe evasion to be moral, and whether they believe their wealth needs to be safeguarded by tax evasion, whether government is giving them quality services for the taxes they pay. These subjective data allow us to probe the effects of incentives on the decision to evade. Survey data suffer from the lies respondents tell. We shall see that even

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<sup>15</sup> . Detailed description of the surveys including questionnaires, summary tables and results explicitly mentioned in the text are available from authors upon a request or at <http://home.cerge-ei.cz/hanousek/evasion>.

though lying may pervade the data, solid relations emerged between the questions we asked and whether people evaded.

The main problems we faced in our survey were in knowing how much tax people evade and what factors we can attribute to their evasion. The obvious problem when asking people about their participation in the underground economy is that they will be reluctant to confess their participation and if they do so, then can later in the survey “justify” it by claiming that they evaded taxes because they believed government services to be of low quality.

To avoid this problems and ex-post justification, our survey tackles this problem in stages. First, we called survey “Satisfaction with services” and we start asking our respondents general demographic questions and questions related to government and quality of services provided by the government. When answering these questions respondents have no idea that questions about tax evasion will follow and thus they cannot justify their evasion by claiming a poor quality of government services. Second we ask respondents whether they know of anyone who has participated in the underground economy. Respondents might not feel ashamed about answering this question honestly. Knowing people who participated in the underground economy could be a weak signal that the respondent also participates. Next we ask whether the respondent has ever bought goods or services in the underground economy. Finally, and this is perhaps the question to which respondents will give the least honest reply, we ask whether they have themselves ever participated in the underground economy and what is the nature of this participation.

### **3.2 Results: Quality of governmental services and tax evasion**

Hanousek and Palda (2004) show the answer to what people thought about the size of the underground economy. If people are rational observers of their surroundings, their opinions about the size of the underground economy might be a fair estimate of the actual underground economy. Giving an opinion about the size of the underground economy is not likely to threaten a respondent so that we can expect the answers to be honest.

The most intimate questions in our survey ask the respondent with what frequency he has worked and not declared his income and how much money he earned from activities upon which he did not declare to the publicans.

Our quality of government services index was but one measure of the manner in which individuals perceive government. We asked several other questions covering several more detailed dimensions of government services and correlated these impressions with the willingness to pay taxes. Even (non-parametric) cross-correlation of evasion with these questions measuring quality of the government services shows that people who think well of their government are more inclined to pay their taxes than are people who bear a grudge against the state. The only possible discrepancy in this table is that those who believed corruption was a big problem tended to evade less than those who believed corruption was not a problem. We say “possible” discrepancy because we could also surmise that those who see corruption as a major problem could also be those who would like to evade taxes but who do not have ability or knowledge to bribe tax officials.

In a detailed regression analysis Hanousek and Palda (2004) confirmed very strong tendency for those who are very unsatisfied with government services to become frequent or sometime tax evaders. In particular, moving from the second lowest to the lowest level of belief in the quality of government services on a five point scale will increase tax evasion by almost 13%.

The skeptical reader may ask whether the person who evades taxes justifies his evasion by citing that the quality of government services is low, and whether frequent tax evaders are not those who perceive a low probability of being caught. Simultaneity of this sort plagues social survey research. Matsusaka and Palda (1993) analyzed the causes of voter participation and managed to replace voter perceptions of closeness with an objective measure of true closeness of a political race in each district they studied. Notably, when using objective measures of election closeness they found no relation between closeness and the propensity to cast one's ballot. Using subjective measures of closeness they had found such a relation. We have no objective measures of quality of government services with which to work and so our finding that people who perceive good quality government services will feel inclined to pay their taxes. Our "trick" to help us avoid this vexatious question of simultaneity is to ask respondents early on in the survey whether they perceive government services to be of good quality. Only much later in the survey do we ask questions about tax evasion. It is impossible at that point for respondents who claim high tax evasion to go back and correct their answers about how they perceived the quality of government services.

Honest and efficient governments that wish to increase tax-compliance might wish to pay special attention to letting their subjects know what the government is doing for them. Letting subjects know is not just a matter of television advertising but of all the channels through which political information can move. Unlimited campaign advertising, decentralized spending and tax, and citizens' initiatives are keys to promoting a citizenry informed about its government. Our findings provide no "quick-fix" advice for politicians starved for revenues. Our findings indicate that quality of government services and taxes collected join each other in a virtuous circle.

### **3.3 Empirical contribution**

Hanousek and Palda (2004) has analyzed tax evasion in the Czech and Slovak Republics by using a 2002 survey of 1089 Czechs and 501 Slovaks. They sought to explain why people evade taxes in both republics and found that, among other forces driving tax evasion, the willingness of citizens to pay increases as they perceive the quality of government services to be good.

We introduced morality dimension into empirical tax-evasion research. In particular, Eurobarometr surveys on tax evasion used most of our survey structure and lately get expanded into tax morality research conducted by many researchers.

#### 4. Firm performance: Bribery, Ownership and managerial effects.

##### Outline.

What determines corporate efficiency is a central question in economics and finance. A long tradition in economics argues that, as firms grow larger, they lose focus and become more complacent and prone to agency problems (Monsen and Downs, 1965; Leibenstein, 1966; Mueller, 1972; Jensen and Meckling, 1976; Dhawan, 2001; Campa and Kedia, 2002; Villalonga, 2004). Moreover, competition tends to keep managers on their toes and promotes efficiency (Aghion et al., 1999; Raith, 2003; Bloom and Van Reenen, 2007). In finance, the free-cash flow hypothesis similarly suggests that leverage helps constrain managerial discretion (because firms have to repay debt) and promotes efficiency (Jensen, 1986). Ownership concentration and foreign ownership are also believed to be conducive to more efficient operation and project selection (Aitken and Harrison, 1999; Blomström et al., 2001; Gugler, 2001; Sánchez-Ballesta and García-Meca, 2007; Temouri et al., 2008). Yet, to date empirical research on the determinants of corporate performance and/or efficiency is fragmented (Shyu, 2013; Arocena and Oliveros, 2012; Cabeza-García and Gómez-Ansón, 2011; Margaritis and Psillaki, 2010; Weill, 2008; Barth et al., 2003; Dilling-Hansen et al., 2003; Palia and Lichtenberg, 1999). The extant literature typically analyzes the effects of firm size, competition, capital structure and ownership types in isolation, despite the fact that these factors may be closely intertwined. Moreover, the literature generally focuses on specific industries or countries, which raises concerns about the ability to generalize results.

For our research we use a sizeable dataset covering more than 3 million firm/year observations in Europe; the data are on firms operating in “old” European Union (EU) countries and “new” EU countries and cover manufacturing as well as services sectors. Hanousek, Kocenda and Shamshur (2015) take a comprehensive approach. In terms of methodology they employ a stochastic production frontier model and account for firms’ capital structure, other characteristics, ownership structures, and permanent and transitory effects.

Their results indicate that several factors contribute to corporate efficiency in Europe. We find that larger firms are less efficient than smaller firms, and that leverage contributes to corporate efficiency. Furthermore, moderate competition in the product market is associated with greater efficiency, but only for firms operating in old EU countries. In new EU manufacturing firms the effect of moderate and low competition is about equally beneficial but only during the crisis period. In countries with weak policies and legal systems corruption is considered a strong constraint on growth and development.

The existing literature on the effects of corruption on firm performance is, however, divided. One branch considers corruption a ‘grease the wheels’ instrument that helps overcome cumbersome bureaucratic constraints, inefficient provision of public services, and rigid laws (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: some papers find that bribery is harmful (McArthur and Teal, 2004; Fisman and Svensson, 2007; De Rosa et al., 2015), while others find positive effect (Vial and Hanoteau, 2010). Overall the evidence remains scarce due to the lack of available data.

Hanousek and Kochanova (2016) contribute to the firm-level empirical research on bureaucratic corruption and firm performance, and explain the divergent effects of corruption found in previous studies. They employ a rich firm-level panel dataset with widely accepted measure of bureaucratic corruption (bribery) that allows us to alleviate some of the methodological concerns of existing research. In particular, they focus on a group of countries from CEE, as they have similar history of transition to market economy, but are still institutionally diverse.

Our approach is to combine the information on firm bribery practices, measured as the frequency to bribe public officials to ‘get things done,’ from BEEPS<sup>16</sup> and firm financial data from the Amadeus database. This gives us a large firm-level panel data for 14 CEE countries over 1999 – 2007, which have more accurate and detailed information on firms’ economic activity and bribery than BEEPS alone. Previous studies that use firm bribery practices and performance from anonymous surveys such as BEEPS or WBES suffer from missing data, as firms often reluctant to reveal their financial records (Gaviria, 2002; McArthur and Teal, 2004; Fisman and Svensson 2007; De Rosa et al., 2015).<sup>17</sup> Those studies also deal with cross-sectional data, while we are able to exploit the panel structure of our dataset. In the regression analysis we control for firm fixed effects, which eliminate time-invariant factors that could simultaneously cause bribery and firm performance. This is an important step to diminish the endogeneity of bribery measure, given the recognized difficulties to find exogenous variation to explain corruption.

To combine two datasets we introduce ‘local bribery environments.’ We define ‘local markets,’ in which firms operate, as clusters jointly formed by survey wave, country, double-digit industry, firm size, and location size. This is relevant, since bureaucratic corruption might be a local phenomenon that depends on not only on country, but industry, firm and markets size. Then we analyze how the ‘local bribery environments’ – characterized by the means and dispersions of individual firm bribes – influence the economic performance of firms. We compute the mean and standard deviation of the bribery measure from BEEPS for the universe of local markets. For firms from Amadeus we can also identify those markets, and thereby each firm is assigned characteristics of local bribery environment. Economically, the mean bribery approximates the equilibrium level of bribery in a local market. The bribery dispersion, meanwhile, represents the pervasiveness of bureaucratic corruption and availability of opportunities to extract benefits from bribery for some firms.

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<sup>16</sup> BEEPS (Business Environment and Enterprise Performance Survey) is a part of the global WBES (World Bank Enterprise Survey)

<sup>17</sup> For example, in the widely-used BEEPS and WBES databases about 40 to 50% of firms do not report their performance indicators..

The use of the notion of local bribery environments is another step to reduce the endogeneity of bribery measures, since an individual firm performance less likely affects the bribery environment, than its own bribing behavior. The joint use of two independent data sources also alleviates this concern, because not the same firms report financial statements and bribery. Further attempts to deal with endogeneity would likely reduce the endogeneity bias in the same direction, therefore, our empirical results are estimated at the lower bound.

Similar to many papers (Gaviria, 2002; Beck et al., 2005; Fisman and Svensson, 2007; Vial and Hanoteau, 2010) we measure firms performance as sales and labor productivity growth of firms, as these enhance wealth and employment creation, and stimulate economic development. The results of the empirical analysis, identified from within-firm variation, show that the ambiguous consequences of corruption found in previous studies can be explained by the different effects of the mean and dispersion of bureaucratic corruption in the local environment. 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 dispersion of individual firm bribes facilitates firm performance. Moreover, firms are more likely increase their growth rates in the environments with both higher bribery mean and higher dispersion. We also find that these impacts are more pronounced in the case of labor productivity growth. These results are robust to various specification checks.

Our results suggest that in more dispersed local bribery environments at least some firms that bribe receive preferential treatments from public officials, and non-bribing firms are likely to be efficient in production and growth. The existence of a certain number of bribing firms in a local market, therefore, stimulates aggregate firm performance. This finding is in line with Acemoglu and Verdier (2000), as positive effects from bribery dispersion can overshoot negative effects from bribery mean. The chance to receive benefits from bribery for particular firms may be one reason why corruption does not vanish in spite of its overall growth restraining effect (Mauro, 1995; Aidt, 2009). In addition, we find that our results vary for different types of firms. Smaller and more stable firms are least affected by bribery, while service firms are able to gain 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 remainder of the paper is structured as follows. Section 2 introduces the notion of 'local bribery environments' and discusses its relation to firm performance. Section 3 describes the data and explains the merging of the financial information and the bribery practices of firms. Section 4 outlines the empirical methodology. Section 5 presents the results and robustness checks, and section 6 concludes.

#### **4.1 Local Bribery Environments and Firm Performance**

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 local markets that are comprised of firms sharing a similar size, area of economic activity (industry), and location size. We characterize these local markets by the levels of bribery mean and dispersion of individual firm bribes, which we term the 'local bribery environments.'<sup>18</sup> 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. Bribery dispersion reflects firms' willingness to bribe (Bliss and Tella, 1997; Svensson, 2003; Luo and Han, 2008), the discretionary power of public officials and uncertainty in a local market. We outline possible links between firm growth and local bribery environments below.

Higher bribes or frequency to bribe 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 undermines innovations and investment (O'Toole and Tarp, 2014), and can limit exporting and importing activities essential for firm growth. In the same vein, if public officials demand bribes repetitively, firms may chose inefficient technology and lower investments, as show Choi and Thum (2004). Bribery 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 (Kaufmann and Wei, 2000). Finally, higher bribes can provoke reallocation of talent from production to rent-seeking (Murphy et al., 1991, Dal Bo and Rossi, 2007). In this case, one would expect a negative relationship between bribery mean and firm performance. Some empirical research finds either an insignificant or negative impact of bribery on the sales growth or productivity of firms (for example, Gaviria, 2002; McArthur and Teal, 2004; Fisman and Svensson, 2007). For CEE and the former Soviet Union countries, De Rosa et al. (2015) show that bribery more negatively affects firm productivity in non-EU countries and in those with weaker institutions.

However, if bribery works as a 'grease the wheels' instrument, it can help overcome some bureaucratic constraints and inefficient public services provision. This would create a positive relationship between bribery mean and firm performance (Huntington, 1968; Lui, 1985; Lein, 1986; and Vial and Hanoteau, 2010, presents empirical evidence for Indonesia).

The relationship between bribery dispersion of individual firm bribes and firm performance is less straightforward. Given a positive level of bribery mean, in an environment with low bribery dispersion all firms bribe in the same way. Corruption is pervasive and can be seen as a tax or an additional fee for public services provision. This should not create distortions other than those connected to the bribery mean.

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<sup>18</sup> 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. Del Monte and Papagni (2007) and Ledyeva et al. (2013) demonstrate the variation of corruption across regions in Italy and in Russia, respectively. However, it is unlikely that all firms in a local market always bribe equally.

In an environment with higher bribery dispersion either only part of firms bribes or the variation of frequency to bribe is very high. This possibility is well documented in the empirical literature (e.g., Svensson, 2003; Luo and Han, 2008). However, theoretical research does not provide a clear guidance on the effects of bribery dispersion on firm performance. We thus highlight a few outcomes.

In order higher bribery dispersion to facilitate joint firm performance in a local market, bribery should benefit all or the majority of bribing firms. This situation could happen when bribing firms are able to exploit favorable opportunities from bribery, and are efficient in giving bribes. At the same time public officials are able well discriminate firms to extract more bribes in a local market.<sup>19</sup> Non-bribing firms must be efficient in complying with bureaucratic regulations, and benefit from better allocation of their production recourses, as otherwise, bribing firms would crowd out those that do not bribe.<sup>20</sup> This does not imply, however, that bribing firms must be always less efficient in production. Such outcome would be in line with Acemoglu and Verdier (2000), showing that when the government intervenes to correct market failures, a small amount of corruption may exist as part of an optimal allocation of resources. Infante and Smirnova (2009) demonstrate that in weaker institutional environments, rent-seeking bureaucrats can help improve the productivity of entrepreneurs. Similarly, De Vaal and Ebben (2011) suggest that when the initial quality of institutions is below a certain threshold, bureaucratic corruption facilitates economic performance, as it takes the role of institutions. These papers, however, discuss beneficial effects of corruption for social welfare, while we focus on the effects for aggregate firm performance in local markets.

In contrast, if bribery helps only a minority of bribing firms, creates negative externalities (Kaufmann and Wei, 2000), and does not incentivize non-bribing firms to perform better, then in a more dispersed local bribery environment firm performance can deteriorate. This could happen, for example, when public officials target the most productive firms, which in response degrade their technology and investment (Choi and Thum, 2004). Such outcome is in line with Mauro (1995), Aidt (2009) and O'Toole and Tarp, (2014).

Finally, higher bribery dispersion can be perceived as a higher uncertainty in a local market, which can lead to negative outcomes (Shleifer and Vishny, 1993; Choi and Thum, 2004). Given the disagreement on effects of bribery on firm performance in the literature, and missing theoretical predictions regarding possible impact of bribery dispersion, we have a strong incentive to analyze the relationship between the characteristics of the local bribery environment and firm performance.<sup>21</sup> In the next section we describe our data, the definitions of local bribery environments and other variables prior to empirical analysis.

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<sup>19</sup> Diaby and Sylwester (2014), for instance, show that bribes are higher when bureaucracy is decentralized.

<sup>20</sup> 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.

<sup>21</sup> The analysis of the specific channels through which bribery can impact firm growth, however, is beyond the scope of this paper.

## 4.2 Data

The bribery measure is taken from BEEPS, an anonymous survey of a stratified random sample of firms from CEE and former Soviet Union countries.<sup>22</sup> It consists of a rich set of questions about firms' activity, market orientation, financial performance, and employment as well as infrastructural, criminal, corruption, and legal environments. A disadvantage of BEEPS is missing data for questions related to accounting information (40–50% missing data on sales, assets, costs, etc.), which 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). Each wave of BEEPS covers the three preceding years; we use the three waves completed in 2002, 2005, and 2008.

The financial data comes from the Amadeus database. It contains detailed balance sheet and income statement data, industry codes as well as the exact identification of European firms.<sup>23</sup> Because non-active (unresponsive or exiting from the market) firms are excluded from the database after a certain period, we have merged several editions of Amadeus (2003, 2007, and 2010).

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

Both the BEEPS and Amadeus databases tend to understate very small firms, and Amadeus tends to overstate large firms (Klapper et al., 2006). In addition during data cleaning of Amadeus we removed firms with less than two employees that potentially could have been created for purposes of tax evasion (Klapper et al., 2006).<sup>24</sup> Due to these facts, we conduct analysis for different subsamples of firms, in particular, for firms of different sizes and industrial sectors.

### *Combining Information from the BEEPS and Amadeus Databases*

The joint use of the BEEPS and Amadeus databases provides a good opportunity to study the effects of local bribery environments on firm performance. To combine bribery practices with firm financial information we define clusters that represent local markets, using the following criteria: i. country; ii. time period (1999–2001, 2002–2004, and 2005–2007, corresponding to the waves of BEEPS); iii. 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 iv. location size (capital, city with population above 1 million, and city with

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<sup>22</sup> 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.

<sup>23</sup> Details about the Amadeus database can be found at <http://www.bvdep.com>.

<sup>24</sup> The data cleaning procedure as well as a detailed comparison of firm distributions in BEEPS and Amadeus with the whole population of firms retrieved from OECD.STAN for eight OECD countries is available in the Online Appendix.

population below 1 million). A resulting cluster combines all criteria: country, time, industry, firm size and location size.<sup>25</sup>

It is straightforward to identify clusters in both databases. In BEEPS and Amadeus firms report industry and employment data. In BEEPS firms record the size of location. In Amadeus firms report the address of registration, which we use to identify capitals and cities with population above 1 million (these are only in Russia and Ukraine) to construct a location size variable.

The criteria defining clusters explain 40% of the total variation of the bribery measure in BEEPS.<sup>26</sup> We require each cluster to have at least 4 firms, which reduces sample size to 10,097 firms (67% of the original sample) available for use in BEEPS, and we obtain 1,137 clusters in total. The average number of firms in a cluster is 8.87 and the median is 6. For each cluster we compute the mean and standard deviation of individual firm bribes and assign them to every firm in the Amadeus database operating in the same cluster.

The initial sample size available for use in Amadeus is around 1,450,000. When combining two datasets, only two clusters computed using BEEPS have no counterparts in Amadeus. About 48% of observations from Amadeus got assigned characteristics of the local bribery environments,<sup>27</sup> which yields around 700,000 firm-year observations useful for analysis. Given the structure of the data, the mean and standard deviation of the bribery measure are a good way to describe bureaucratic corruption environment in the local market. They represent an equilibrium bribery level and the dispersion of individual firm bribes.<sup>28</sup>

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<sup>25</sup> 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.

<sup>26</sup> 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.

<sup>27</sup> 48% of observations from Amadeus merged with BEEPS is a large number, since a complete number of clusters in the roster would be  $8100=14(\text{country}) \times 3(\text{wave}) \times 2(3 \text{ for Russia and Ukraine, location size}) \times 3(\text{firm size}) \times 30(\text{industry})$ . But because BEEPS does not cover all firms, industries, etc. combinations, and we disregard clusters with less than 4 firms, we have only 1,137 clusters (14%). Additional summary statistics are available in the Online Appendix. For example, after merging around half of the sample belongs to Russia and Ukraine, while in BEEPS these countries represent only 30%. This redistribution across countries, however, does not affect our results, as we show in the robustness check.

<sup>28</sup> Anos-Casero and Udomsaph (2009) and Commander and Svejnar (2011) also attempt to combine two datasets using the 2002 and 2005 waves of BEEPS for 7 – 8 CEE countries. Our main departure from these papers is that we separate micro firms with fewer than 10 employees from small firms with 11-49 employees. This is motivated by the fact that originally nearly 45% of firms in BEEPS and 40% of firms in Amadeus are 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. Anos-Casero and Udomsaph (2009) and Commander and Svejnar (2011) study how business constraints impact TFP and efficiency to generate revenue. A recent paper by Fungacova et al. (2015) uses exactly the same criteria defining clusters as we do. It studies whether bribery affects firm-level bank debt. None of these papers, however, examine the dispersion of individual firm bribes or business constraints within clusters.

## *Definitions of Variables*

The bribery measure is obtained 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.?"*<sup>29</sup>

Amongst the questions about corruption, this one is the most neutral, and virtually the only one that occurs consistently across all three waves. The variable is categorical and takes values from 1 to 6. Higher values stand for higher frequency to bribe. For convenience we rescale it to a variable that varies from 0 to 1 by subtracting 1 from the original value and dividing the result by 5.

The dependent and control firm-level variables come from the Amadeus dataset. For performance variables we consider real sales growth and real labor productivity growth as used in previous studies (Gaviria, 2002; Beck et al., 2005; Fisman and Svensson, 2007; Vial and Hanoteau, 2010).<sup>30</sup> Real sales are approximated by the firm operational revenue in 2000 prices, and labor productivity is real sales per employee. We take first differences of the logarithms of these measures to derive yearly growth rates. Further, we average these growth rates over three-year periods in order to match the variation of bribery mean and dispersion. Essentially, we moved from the nine-year time span to the three-period time span for the regression analysis.

We expect that a local bribery environment may have somewhat different effects on these performance measures. We opt for the analysis of sales, as company turnover is not directly affected by corporate income taxes and transfers. On the other hand, labor productivity should reflect changes in employment structure and therefore 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.

For controls we employ the usual set of variables used in the firm-level financial studies. To proxy firm size we use the logarithms of total assets and number of employees, as well as their squares to control for possible non-linearity. Market share is 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 is the reported cash flow scaled by total assets. All control variables are from 1999, 2002, and 2005 to control for initial conditions, as we move to the three-period panel data.

Our control variables can correlate with bribery measures and reduce the omitted-variable bias. Firms with lower market shares, for instance, can be more

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<sup>29</sup> 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 own experience.

<sup>30</sup> 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.

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.

Finally, to proxy for the strength of country-level institutions, we use the Rule of Law indicator. We obtain it from the Worldwide Governance Indicators (WGI) database compiled by the World Bank. Appendix B details definitions of all employed variables. Summary statistics of all employed variables and their pairwise correlations are in Tables 1 and 2.

### **4.3 Empirical Methodology**

The identification of the relation between bribery and firm performance 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 may have a greater willingness and ability to pay bribes. This reverse causality can be further induced by unobservable factors that correlate with both firm performance and bribery practices, such as managerial talent and firm culture.

In the context of this study, the endogeneity problem is largely reduced due to several facts. First of all, we control for firm fixed effects that remove time-invariant unobservable factors that could potentially cause both firm performance and bribing behavior. The identification in our regression analysis thus comes from within firm variation over time, and we assume bribery measures to be exogenous. Second, instead of bribing behavior of individual firms, we employ more aggregated measures – bribery mean and dispersion in a local market defined by industry, firm-size, and location-size characteristics. Arguably, an individual firm has a negligible influence on these aggregate measures.<sup>31</sup> This influence is further decreased when firm performance and bribery measures come from different independent data sources (Anos-Casero and Udomsaph, 2009).

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 a bias of the estimates (upward bias if better performing firms are ready to bribe more frequently). Admittedly, firm fixed effects do not account for temporal endogeneity. The bias due

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<sup>31</sup> 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), Aterido et al. (2011), and Commander and Svejnar (2011).

to temporal endogeneity, however, has likely the same direction as the 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.<sup>32</sup>

$$y_{it} = \beta_0 + \beta_1 \text{Bribery Mean}_{ct} + \beta_2 \text{Bribery Dispersion}_{ct} + \gamma X_{it-1} + u_i + v_t + \zeta_s + \varepsilon_{it}, \quad (6)$$

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).  $\text{Bribery Mean}_{ct}$  and  $\text{Bribery Dispersion}_{ct}$  are the mean and standard deviation of the frequency to pay bribes in cluster  $c$ . The coefficients of interest are  $\beta_1$  and  $\beta_2$ . 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 conditions, and to reduce possible endogeneity between them and firm performance measures. The full set of control variables is described in Section 3. The term  $u_j$  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  $\zeta_s$  captures unobserved firm-size fixed effects (micro, small, and medium-large firms) 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,<sup>33</sup> and  $\varepsilon_{it}$  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 as the data for CEE countries are highly volatile.<sup>34</sup>

Finally, we are concerned about measurement error in the bribery variables. Under the assumption of the classical measurement error – it does not correlate with the error from the regression – the coefficients of interest would be biased towards zero. This assumption seems plausible as we use combined two independent datasets. In addition, we believe that the possible measurement error is averaged out in our bribery mean measure; this, however, may not be a case for bribery dispersion.

<sup>32</sup> 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).

<sup>33</sup> 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 over time. 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.

<sup>34</sup> Cook’s distance is a measure based on the difference between the regression parameter estimates  $\hat{\beta}_i$  and what they become if the  $i^{\text{th}}$  data point is deleted  $\hat{\beta}_{-i}$ . Observations, for which this distance exceeds  $4/N$  are removed as outliers, where  $N$  is the number of observations used in the regression (Cook, 1977).

The retained measurement error, therefore, could be a second source of an attenuation of the estimates.

Results of Hanousek and Kochanova (2016) suggest that while higher level of bribery impairs sales and labor productivity growth, firms grow faster in local environments with higher dispersion of individual firm bribes. Hence bribery 'greases the wheels' of doing business for individual firms, but harms firms' collective economic performance. In more dispersed environments, firms that are more efficient in bribery (but not necessarily inefficient in production) – those that have more information about 'greasing the wheels', are discriminated by the public officials in a mutually beneficial way, with lower costs or higher willingness to bribe – apparently bribe more frequently. 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 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 in a local market.

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

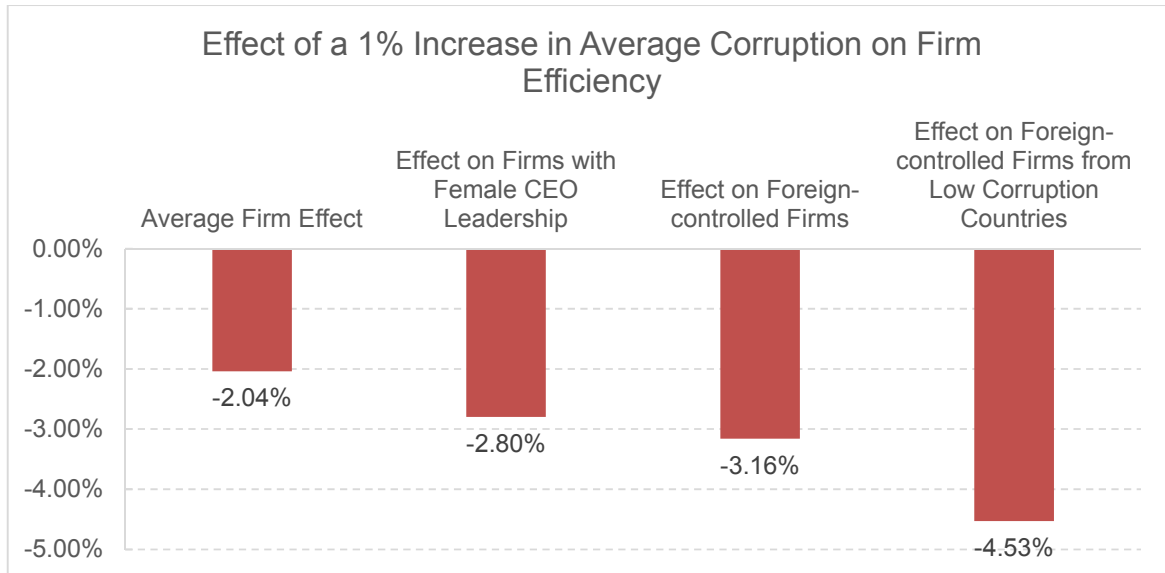
#### **4.4 Empirical extensions**

One can use stochastic frontier approach to assess how much firm (in)efficiency is driven by above discussed factors like firm size, competition, ownership and bribery environment. Hanousek, Kocenda and Shamshur (2015) show that (i) larger firms are less efficient than smaller firms, (ii) greater leverage contributes to corporate efficiency, (iii) a moderately competitive environment exhibits a more beneficial effect to efficiency than low competition, (iv) domestic majority owners improve firms' efficiency more than foreign owners, and (v) there is a positive disciplining effect on firm efficiency when a majority owner must account for the presence of minority shareholders. More interesting results are obtained when we consider the effect of corruption environment measured using stochastic frontier approach.

Following conventional wisdom and results of Hanousek, and Kochanova (2015, 2016), we find that firm efficiency is on average lower in environments characterized by a high level of corruption, as represented in Figure 1. A 1% increase in the average level of corruption leads to lower firm efficiencies. The effects are stronger for honest firms; foreign-controlled firms, especially if their headquarters are located in low-corruption countries, and firms who are led by female CEOs. These results are consistent with the idea that foreign firms' propensity to behave corruptly is affected by the cultural norms of the firm's home country, the legal restrictions they are subject to, and their relative lack of local market knowledge, and that women differ in their preferences for risk and propensity to abide by the law. (See Hanousek, Shamshur and Tressl, 2015)

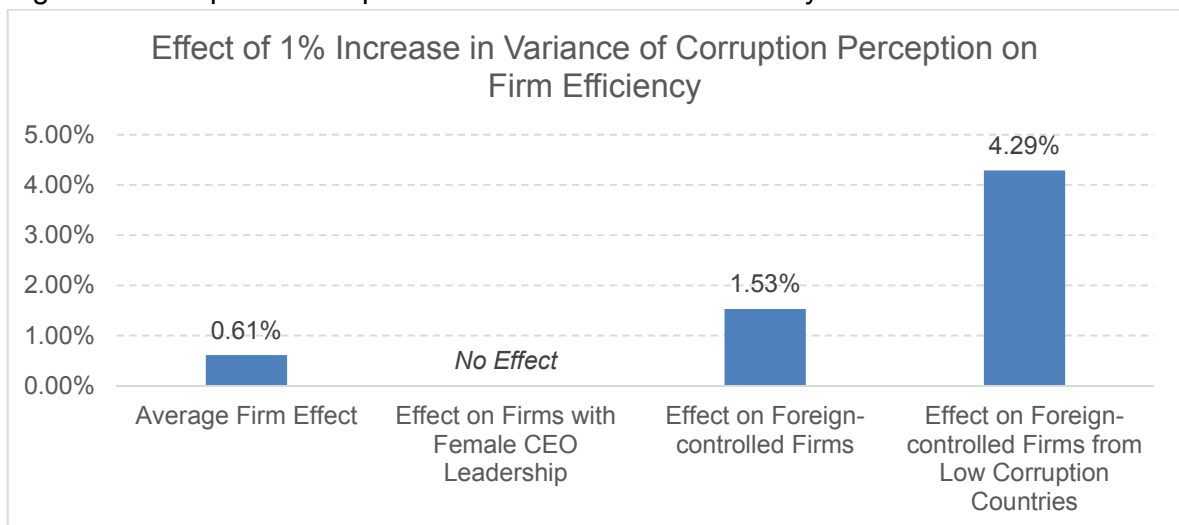


Figure 1: Corruption and Firm Efficiency



The negative average effect may however be offset because greater variance in corruption perceptions is associated with greater efficiency. Figure 2 displays the results. A 1% increase in corruption perception variation improves firm efficiency for the average and especially for the honest firms. This suggests that firms follow different strategies. Some firms attempt to gain unfair advantage by corrupting officials, but others behave honestly. To the extent that the latter are forced to improve their efficiency to compete and survive, the heterogeneity in how firms react to a bribery environment may be conducive to superior operational performance. Unfortunately, we do not find an offsetting effect for firms with female CEO leadership.

Figure 2: Corruption Perception Variation and Firm Efficiency



#### 4.5 Empirical contribution

Our analysis contributes to a better understanding of how operating in a corrupt environment affects firm behavior. It indicates that just looking at measures such as average level of corruption in an environment, without considering dispersion across sectors or regions, may be misleading. We also find that the effect of perceived corruption on efficiency is conditional on firm characteristics. Our results suggest that firm attributes usually associated with “honesty” (foreign-controlled, from a low-corruption country, managed by a female CEO), are less likely to be beneficial in environments characterized by high corruption, especially when there are no niches relatively free from corruption where honest firms can operate. Studying interactions between firm-level characteristics and environmental factors is a promising direction for future work on corruption. Lastly, the results of this paper also provide some basic direction for policy makers. Countries that experience concentrated corruption in certain sub-environments may enact trade policies to provide incentives for foreign companies, especially those from low-corruption countries, to enter the selected market. The incentives, however, have to be strong enough to offset the unfavorable business environment.

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