Corruption as a structural determinant of growth for small and medium-sized enterprises

An empirical analysis on firm productivity, corruption and the missing middle.

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Academic year 2017/18

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Acknowledgments

I would like to thank my supervisors Prof. W. Parienté from Université Catholique de Louvain and Prof. P. Raposo from Católica Lisbon School of Business and Economics. Without your guidance, advice and all other support throughout the process of writing my thesis, I would not have been able to realize this work. I am also thankful to The World Bank for granting access to the data on the Enterprise Surveys. Finally, I thank Finja Zhang, Chloe Stenson and Lukas Pöhler for their helpful comments and suggestions.

Abstract

The purpose of this study is to connect the research fields on corruption, firm productivity and the under-represented amount of medium-sized firms in developing countries characterizing the missing middle. This is done in an empirical study that exploits an extended firm-level data set in numerous economies with a focus on Sub-Saharan Africa, Latin America, the Caribbean and Asia. I use perceived corruption in a country to estimate the effect of corruption on firm productivity in a fixed effects estimation aiming attention at heterogeneity across firm sizes and regions. Results imply that reducing corruption has, in general, a positive effect on firm productivity measured in annual sales as well as in the number of employees, although this effect weakens with increasing firm size. The levels depend on the region that a firm is located in. I find that reducing corruption has the potential to induce growth for small firms in particular, with over-proportionate benefits in comparison to bigger firms. Therefore, fighting corruption can balance out the asymmetric firm size distribution. Furthermore, I explore mechanisms through which corruption impacts firm performance, discuss the results in a macroeconomic setting and identify the role of uncertainty for firms that arises due to changes in the level of corruption.

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Abbreviations

CPI	Corruption Perception Index
EAP	East Asia and Pacific
ECA	Europe and Central Asia
LAC	Latin America and the Caribbean
MENA	Middle East and Northern Africa
OLS	Ordinary Least Squares
PPP	Purchasing Power Parity
SA	South Asia
SME	Small and medium-sized enterprise
SSA	Sub-Saharan Africa

1 Introduction

Corruption is an extensively discussed topic in the literature. It takes various forms across countries and across different disciplines such as politics or economics, and is therefore ambiguous to measure. The common view among academics and policy makers suggests that, in general, decreasing corruption has a positive effect on economic development and equality. Yet, mechanisms are not fully explored.

As an unattached field of research, literature discusses whether there exists a so-called "missing middle" in developing countries, meaning that medium-sized enterprises are underrepresented in the distribution of firm sizes compared to small and big firms. It is widely accepted that there exists an over-proportionate amount of particularly small enterprises in developing countries. Similar to addressing corruption, closing the gap of the missing middle by inducing small firms to grow is considered to be a powerful means to create economic growth and fight inequality.

However, the mechanism of how corruption impacts the firm size distribution of a country through the channel of firm productivity has, to my best knowledge, not been examined in previous analyses. For this reason, I analyze in the following study whether and to what extent corruption determines the productivity of small and medium sized enterprises (SMEs) with a focus on countries in Sub-Saharan Africa, Latin America, the Caribbean and Asia. I connect the research fields of corruption, the missing middle and firm productivity by testing the hypothesis that lower levels of corruption can contribute to balancing out the unequal distribution of firm sizes.

To examine this research question, I conduct a fixed effects analysis in which I estimate the effect of changes in corruption on firm performance measured by total annual sales and the number of full-time employees. I use firm-level data from the Enterprise Surveys conducted by The World Bank (2018a) on 15,820 firms from 77 countries between 2002 and 2017, where in each firm, one to four interviews were held. I quantify corruption through the Corruption Perception Index (CPI), an index developed by Transparency International (2017) describing the level of perceived corruption in a country.

In the empirical analysis, I find that the general positive effect of drops in the corruption level on firm performance is highly heterogeneous across regions and firm sizes. Sales and the number of employees increase as a consequence of lower corruption for small firms, although this effect weakens with increasing firm size. For big firms, sales and the number of employees decrease after lowering corruption. Similarly, the effects are strongly influenced by regional differences. In all regions but Sub-Saharan Africa, decreases in the level of corruption create firm growth with respect to their sales and employees. A closer look at Sub-Saharan Africa discloses that particularly small firms benefit from their informal status, which is at risk when corruption levels drop.

Furthermore, I examine the channels through which changes in corruption impact firm performance, looking at access to finance, the acquisition of fixed assets and changes of expenditures on different inputs as well as regulatory burden. I show that the importance of each individual channel also varies with the specification of the region and firm size. Moreover, uncertainty for firms is shown to be a key variable with a negative impact on performance. Thus, the negative effects of higher unpredictability should be borne in mind when the results of my analysis are applied in the context of policy-making.

Overall, small firms in particular improve their performance as a response to drops in the level of corruption. The discussion of the results in a macroeconomic setting supports this. Moreover, decreasing corruption in small firms also contributes to more equality by balancing

out the disproportionate distribution of firm sizes, helping to remove the missing middle present in developing countries.

The remainder of this study is organized as follows. The next section briefly reviews the literature. Section 3 describes the data and methods of measuring the variables. Section 4 shows the estimation strategy. The main results discussing effects of corruption on firm productivity, and exploring differences depending on the region and firm size are presented in Section 5. The estimation is extended in Section 6, where I examine channels through which corruption works, embed the results in a macroeconomic context, and analyze symmetry as well as heterogeneity across levels of perceived corruption. Section 7 discusses robustness checks and Section 8 potential biases before Section 9 concludes.

2 Literature Review

Through this study, I aim to contribute to several fields of research, namely to the literature on the missing middle, corruption, and firm productivity. The following section lays out which connections of the three have already been established in the literature, and why I focus in my analysis on how changes in the level of corruption impact the missing middle through the channel of firm productivity.

An extended amount of research focuses on the distribution of firm sizes, hypothesizing that there exists a "missing middle" depicting an under-representation of medium-sized enterprises in developing countries. Being first documented by Liedholm and Mead (1987), there is ongoing debate as to whether such a gap exists (Tybout, 2000; Hsieh and Olken, 2014). However, scholars agree that the share of small enterprises in developing countries is disproportionately large, compared to that of developed countries. They believe that the development of SMEs goes hand in hand with the development of the whole economy by inducing economic growth, reducing poverty and diversifying societies (Schiffer and Weder, 2013). Big shares of international investments targeting development aim to close the gap of the missing middle even though mechanisms of which determinants impact the firm size distribution are not yet fully explored (Beck et al., 2005).

Among others, Svensson (2003) highlighted the lack of firm-level studies even through the research in this area has been conducted for in the meanwhile more than three decades. To conduct such studies is challenging due to the background of limited data availability. Research on such channels are still mainly on the country and regional level. Besides macroeconomic fields such as the impact of globalization on the firm size distribution (Garrett, 2004), topics from the microeconomic spectrum profoundly center around specific fields. Mostly discussed are regulatory policies such as taxation or the access to property rights (Braguinsky et al., 2011; Tarfasa et al., 2016). Small firms may be motivated to avoid growth to save on costly regulations, since small firms are exempt from certain regulations and can more easily avoid being detected by tax officials and regulators (Tybout, 2014). While governmental interventions mainly support big firms, medium-sized firms do not face any advantages (Hsieh and Olken, 2014). The state of the financial system is also a central influence, as medium-sized firms are excluded from micro-finance programs but lack the access to the banking system to secure loans (Hsieh and Olken, 2014; Tarfasa et al., 2016). Big firms on the other hand exhibit better business practices which lead to a higher growth in sales (McKenzie and Woodruff, 2015). Thereby, inequality between small and big firms continues to increase.

As a distinct area of research, the prevalence of corruption is a deeply discussed area. As corruption is not limited to developing countries and takes various forms across regions and fields of interest, its measurement and definitions are ambiguous. Khan (1996, p. 684) captures the variable components in his definition of corruption as "deviations from the formal rules governing the allocative decisions of public officials in response to offers to them of financial gain or political support".

In general, a distinction can be made between collusive and extortive corruption. Collusive corruption is characterized by both parties planing and benefiting from corrupt activities and affects economies of the whole world. Extortive corruption is asymmetric and more prevalent in developing countries (Søreide, 2014). Most of the research on corruption highlights regional differences concerning economies as a whole. While insufficient literature on firm-level characteristics is available, there is an extended discussion on the macro-level of corruption, determining factors being an important part of it. These can be grouped into the existence of rents, the absence of democracy and the state of institutional variables (Gaviria, 2002). Each of the mentioned fields contains numerous extensions, such as the discussion of political accountability (Aidt et al., 2008), the state of the legal system and financial structures (Beck et al., 2005). At the same time, effects of corruption differ for different regions.

In the context of economics, corruption has been explored in many dimensions. Scholars discuss economic mechanisms that impact corruption such as employment or firm productivity (Weber, 2008), its effect on poverty and inequality (Dutta et al., 2011; Bai et al., 2013), how market characteristics like competition impact corruption (Søreide, 2014; Gaviria, 2002) and the role of corruption in the context of the shadow economy (Dreher and Schneider, 2010). They commonly agree that corruption increases inequality. While some have established a limiting effect of economic growth on corruption (Bai et al., 2013), others highlight that economic development is not a sufficient condition, which seems reasonable in the context of East Asian economies that grew while keeping high levels of corruption (Jain, 2001; Campos et al., 1999). Additional factors like weak institutions must be considered to explain how economic growth can limit corruption (Weber, 2008).

With respect to the firm size, small firms are shown to be more negatively affected by corruption (Beck et al., 2005), the reason being that bigger firms could benefit more from using their extended capacities to use corruption (Peng and Luo, 2000).

Both the firm size and corruption are seen as determining factors of productivity. Regarding the firm size, medium-sized enterprises are shown to be less efficient (Pham and Takayama, 2015). Concerning corruption, a vicious cycle between economic development and decreasing corruption as reinforcing factors on the country-level is discussed. It has been shown that corruption can influence firm productivity on the firm-level (e.g. Dreher and Schneider, 2010; Dutta et al., 2011), where reduction of sales growth, employment and investments function as channels (Gaviria, 2002).

Thus, some connections of the missing middle, corruption and firm productivity have been explored. However, mechanisms specifically on the firm-level through which corruption impacts the firm productivity and therefore the firm size distribution are not deeply investigated. This is partly a consequence of a lack of reliable data on the sensitive topic of corruption, particularly on the firm-level. For this reason, the motivation of this study is to make use of an extended data set to establish an additional channel in the intersection of the presented research fields. Hereby, the above presented mechanisms will verify the results and enable the reader to understand the following analysis more deeply.

3 Data and Measurement

To connect research on corruption and the missing middle through the channel of firm productivity, I use data that characterizes the key variables of the distinct fields. In the following section, I will introduce my sources of data, and the central variables included in the empirical estimation. I will start with the measurement of firm productivity, then go on to illustrate the quantification of corruption and introduce additional control variables for the empirical regression. Afterwards, I will explain data used in the extensions that aim to verify why the results differ for different firm sizes and regions, and that probe whether the impact on the missing middle on macroeconomic determinants corresponds to the findings of the literature.

3.1 Measurement of Firm Performance

The main source of data on firm performance are firm-level surveys conducted by The World Bank (2018a). These surveys encompass information on a broad range of measures concerning the business environment. By stratifying the samples by size, sector and location of the firm, the surveys represent the private sector of the economies in question. The number of interviews per country depends on the size of the economy and varies typically between 150 to 1,800 interviews, focusing on formal enterprises with at least five employees. In each of the participating countries, one to four interviews were conducted between 2002 and 2017, although not all firms remained available for interviews over time.[1] Firms are included in the analysis if they participated in at least two interviews, which reduces the available database from 47,776 to 33,112 interviews.[2] Moreover, only the first two interviews of a firm are considered. This results in a data set with a total of 31,652 interviews and therefore 15,826 firms from 77 countries. There are accumulations of countries included in the two-panel data set in Sub-Saharan Africa, Latin America and the Caribbean, and Eastern Europe and Central Asia. A smaller cluster of participating countries can be found in South Asia. Few OECD countries are included.[3]

In my analysis, I use the value of total annual sales and the number of full-time employees taken from this database as dependent variables. These measures give different views on the productivity of firms, although Gaviria (2002) finds that the number of employees responds less sensitively to corruption than the value of sales. The values of the variables on sales and the number of employees refer to the fiscal year preceding the year in which the interview was conducted.[4] Categorical answers for refused, unknown or irrelevant responses are replaced as missing. Additionally to firms who did not participate in the second interview, I exclude around 15 percent of the given interviews from the analyses on sales due to missing values.[5] Moreover, the variables are winsorized at the 1 and 99 percent level to control for outliers which are suspected to be a result of measurement or coding errors as is common in surveys (Asiedu and Freeman, 2009). Since annual sales are reported in the local currency, I convert the values to international dollars by means of purchasing power parity (PPP) using the conversion index on the annual PPP from 2001 to 2017 (International Financial Statistics; The World Bank, 2018d).

[1] More information on the Enterprise Surveys is available on http://www.enterprisesurveys.org.

[2] Throughout the analysis, I will refer to these two data sets as the complete data set with all firms that participated in at least one interview and the two-panel data set only containing firms with at least two interviews.

[3] A list with all countries and a map illustrating the distribution are included in Annex A.1.

[4] Details on the exact questions for all variables can be found in Annex A.3.

[5] In absolute values, 5,060 of the responses to sales and 149 of the responses to the number of employees were set as missing.

The summary statistics are presented in Table 1. The comparison of the statistics of the complete sample and two-panel data set which can be found in Table A3 of the Annex shows that the mean and the standard deviation of the two-panel data set is higher than in the complete data set. The reduction of observations as well as the shift of the mean and the summary statistics indicates a systematic dropout of firms. Comparing the summary statistics by the firm sizes and regions reveals that particularly small firms did not participate in a second interview.

	(1)	(2)	(3)	(4)	(5)
VARIABLES	N	mean	sd	min	max
Sales	26,586	1.181×10^{9}	5.322×10^{10}	-33.84	8.091×10^{12}
Sales (winsorized)	26,586	45.03×10^{6}	263.3×10^{6}	354.0	2.369×10^{9}
Employees	31,492	112.0	586.5	0	64,000
Employees (winsorized)	31,492	92.99	214.2	2	1,500

Table 1: Descriptive statistics of the measures of performance for the two-panel data set.

Besides the construction of the data set, also the answers themselves must be critically regarded. As in other self-reported surveys, business owners and managers who answered the surveys are often higher qualified if they manage bigger firms (Braguinsky et al., 2011). As a consequence, higher-skilled leaders are expected to answer the questions more precisely. Finally, self-reported surveys often underlie a bias as managers report a better performance of the firm compared to the reality (McKenzie and Woodruff, 2015). However, the latter is expected to affect all types of firms and is limited by conducting anonymous interviews.

Possible biases should be kept in mind throughout the analysis and will be discussed in Section 8. To show that the results are valid despite described limitations, I conduct a series of robustness checks following the presentation of the empirical analysis that confirm my findings.

3.2 Measurement of Corruption

With the rise of research on corruption, definitions of corruption have been increasing as well. It is difficult to find a precise definition as corruption takes a multitude of different forms and is not limited to public or political activities. Instead, one must distinguish between sectors, performers, the significance of corrupt activities and the formalization (Andersson and Heywood, 2009). Furthermore, cultural influences need to be considered as certain activities might be assessed as corrupt only in some cultural contexts.

Conform to the ambiguous definition of corruption, different approaches to measure corruption can be found in the literature. Instrumental variables like schooling and population as used by Dutta et al. (2011), the age of a democracy (Aidt et al., 2008) or ethnolinguistic fractionalization (Aidt et al., 2008) are not suitable. They are either not meaningful for all economies included in the data set or cannot effectively explain corruption in all the dimensions necessary for the analysis. Although the Enterprise Surveys contain a question on how firms perceive to be impacted by corruption, the answers cannot serve as an adequate measurement of corruption since the productivity level of a firm is reported in the same year as the perception of corruption within that firm, which leads to an endogeneity bias. With this mind, I follow Aidt et al. (2008) who adopt the CPI published by Transparency International to quantify corruption.

Against the background of corruption being a multifaceted and therefore difficult phenomenon to measure, the CPI appears to be a suitable index for my analysis. Compared to other indexes

used in the literature or the assessment by individual firms, the CPI has several advantages. It addresses the multidimensionality of corruption through the inclusion of different views on corruption, comparability across economies in the whole world and long availability. The index is constructed from up to 13 different indexes from outside institutions, which returns a comprehensive view on how business people and experts from various areas assess the level of corruption in a given country. The current form of the index ranks 180 countries and regions by their perceived levels of public sector corruption on a scale from 0 to 100. The measure is available annually since 1995 although it ranged from 0 to 10 until 2012, where 0 represents a highly corrupt and 10 a clean country. To control for the update in the index, I re-scale the index after 2012 to values from 0 to 10.[6]

In order to measure the level of corruption, I consult the level of the CPI in a given country. Since the numbers of the interview refer to the last complete fiscal year, I use the values of the CPI between the year of the first interview and two years before the second interview to rule out endogeneity issues. In this case, the estimates could be biased if changes of the firm performance impact the level of perceived corruption, a channel which is established in the literature (Bai et al., 2013).

Considering the countries of all firms being part of the two-panel data set, countries included in the data set experienced changes in the CPI between -1.5 and 1.6 with an absolute average of 0.37 in the described period. Positive numbers represent decreases in the level of corruption in a country, vice versa. The distribution of the change is presented in Figure 1. Between the two interviews, the maximum change between two subsequent years ranges from -0.9 to 0.7 with an average absolute change of 0.25.

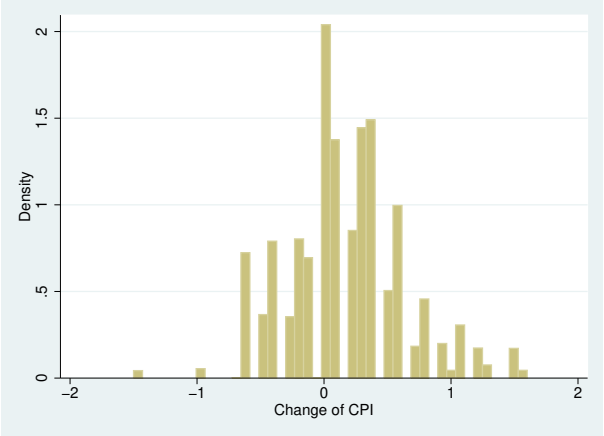

Figure 1: Distribution of the change in CPI between 2002 and 2017.

3.3 Measurement of other Firm Characteristics

Other explanatory variables include country fixed effects, firm characteristics, and time-dependent variables. These variables are selected to control for other influences on firm productivity than corruption to avoid an omitted variable bias. Moreover, they are used to show the effects of corruption on sub-groups. To ensure that regional effects (*Region*) of the firm

[6]Due to the unavailability of the measure for the Philippines and Zimbabwe, firms from these countries are excluded from the analysis.

and the height of income of a country (*Income group*) do not influence the analysis, categorical variables according to The World Bank classification are included in the analysis.[7]

To account for variables that vary for each firm, I include dummy variables on the firm size which are included conform to the previously presented discussion around SMEs (*Medium* and *Big*). The variable *Sector* captures differences in productivity across sectors. For example, manufacturing firms had historically less employees (Braguinsky et al., 2011). Similarly, better managers typically run bigger firms (Braguinsky et al., 2011) and managerial ties are crucial for the quality of firm performance (Peng and Luo, 2000). For this reason I include the years of experience the manager has in the sector (*Manager Experience*).

VARIABLES	N	mean	sd	min	max
Region	31,652	2.647	1.595	1	6
Income group	31,652	2.570	1.126	1	5
Medium	31,652	0.416	0.493	0	1
Big	31,652	0.319	0.466	0	1
Sector	29,688	30.76	20.08	0	99
Electricity: Access	31,619	1.626	1.607	0	11
Taxes: Obstacle	31,231	1.868	1.575	0	12
Licenses: Obstacle	31,158	1.353	2.009	0	11
Manager Experience	26,011	17.79	11.45	0	74
Finance: Access	31,007	1.680	1.745	0	12
Corruption: Obstacle	31,362	2.032	2.136	0	12
Land: Access	30,827	1.301	2.084	0	12
Period	31,652	2.117	2.283	0	8

Table 2: Descriptive statistics of the variables used as control variables.

Furthermore, a range of variables include how much of an obstacle tax rates, business licensing and permits, electricity, corruption, and access to finance and land are to a firm.[8] These are categorical variables of integers between 0 and 4 where 0 represents that the issue in question is no obstacle and 4 states that it is a very severe obstacle to firm operations. All of this data is drawn from the Enterprise Surveys and chosen based on the literature that justifies the importance of each of the categories. Tybout (2000) lays out how regulatory problems including taxes, licenses and access to finance influence productivity gaps across firms. Moreover, Braguinsky et al. (2011) state that a major contributor to difference in productivity between firms is an inefficient allocation of resources in developing countries, for which reason I consider access to land. Finally, including constraints to access electricity captures on the one side constraints to firms imposed by a lack of access to necessary infrastructure which is particularly prevalent in regions like Sub-Saharan Africa (Gelb et al., 2014), and on the other side explains the state of the public sector.

Along with variables identifying firm characteristics and country fixed effects, the empirical analysis contains variables explaining the timing of the interview as well as the shocks. As

[7]Regions are Latin America and the Caribbean; Europe and Central Asia; Middle East and Northern Africa; Sub-Saharan Africa; East Asia and Pacific; South Asia. Income Groups are Low Income; Lower Middle Income; Upper Middle Income; High Income: nonOECD; High Income: OECD.

[8]The respective abbreviations in the tables are *Taxes: Obstacle; Licenses: Obstacle; Electricity: Access; Corruption: Obstacle; Finance: Access; Land: Access.*

interviews were not conducted with the same intervals across countries, the variable *Period* identifies how many years passed between the two first interviews.

Note that the total amount of responses varies across variables since they were partially reported as missing or firms did not know, refused to respond or assessed the answer as irrelevant. The comparison between the two-panel data set and the complete data set shows only slight differences in the summary statistics. Firms in the two-panel data set assess the listed types of obstacles on average as less severe compared to the average from the complete sample. The summary statistics on both data sets can be found in Table A4 of the Annex.

3.4 Measurement of Variables in the Extensions

In order to extend the main results in Section 6, more covariates are needed. Among other analyses, I assess how mechanisms differ across regions and firm sizes, and how the results behave in a macroeconomic context. Table 3 presents the summary statistics for the additional variables of the two-panel data set.

VARIABLES	N	mean	sd	min	max
Channels:					
Credit	27,884	0.429	0.495	0	1
Assets	30,437	0.544	0.498	0	1
Equipment	16,820	28.38×10^6	633.7×10^6	0	3.138×10^{10}
Land	16,358	3.77×10^6	142.4×10^6	0	8.285×10^9
Labor	27,232	77.66×10^6	1.597×10^9	0	1.004×10^{11}
Material	15,421	206.1×10^6	7.43×10^9	0	6.025×10^{11}
Regulation	30,893	11.30	18.10	0	100
Macroeconomic Measures:					
Unemployment	1,216	8.395	6.845	0.160	38.04
GINI	581	38.56	9.504	16.20	64.70
GDP	1,231	2.401×10^{11}	6.788×10^{11}	1.242×10^9	5.931×10^{12}

Table 3: Descriptive statistics of the variables used in the extensions.

3.4.1 Channels of Corruption

To identify and explore mechanisms through which corruption impacts firm productivity, I consult a list of additional variables from the Enterprise Surveys. These include dummy variables on whether a firm holds a line of credit or loan from a financial institution (*Credit*), and whether it purchased fixed assets in the last fiscal year (*Assets*). Annual expenditures for such assets in form of equipment (*Equipment*) and land and buildings (*Land*) are included as well as total cost on raw materials and intermediate goods (*Material*), and total labor cost (*Labor*). As with the variable on total annual sales, these variables are given in local currency units for which reason I convert them into international dollars using PPP and winsorize these measures as described in Section 3.1 to control for outliers. Moreover, I include the percentage of time the manager spends in dealing with governmental regulation in my analysis (*Regulation*). The role of each of these variables will be discussed in depth in Section 6.1.

3.4.2 Macroeconomic Context

To discuss the results in a macroeconomic context, I firstly exploit the *GINI* coefficient to measure inequality within a country (The World Bank, 2018b). The index ranks countries between 0 and 100, where 0 depicts full equality and 100 depicts perfect inequality. Data on the *GDP* is also drawn from The World Bank (2018c) and converted from local currency units to international dollars by means of PPP. Finally, I analyze effects of corruption on *Unemployment* rates per country, which are presented in percent (International Labour Organization, 2017). As for the channels, each of the categories is discussed in detail together with the results (Section 6.2).

Taking all of this data together, I am able to construct a powerful firm-level data set on numerous economies, particularly from less developed regions. With this data set, I will be able to answer how corruption impacts firm productivity and therefore influence the firm size distribution. Additionally, the country-level data set including macroeconomic variables from the same countries will support the analysis.

4 Estimation Strategy

This section presents the estimation strategies, which are chosen to answer the question of how corruption determines firm growth of SMEs. Considering the available data presented in the previous section, the following estimators can exploit the variation between firms to the greatest extent. Simultaneously, the choice of strategies is motivated by a need to meet the assumptions of the respective estimation strategy such that the results are precise and reliable.

4.1 Fixed Effects Estimation

The fixed effects estimation is a suitable approach due to the panel dimension of the data set with two observations for each firm. This estimator utilizes deviations from the mean within firms from the sample. In a three-step procedure, the average value for the dependent and explanatory variables is computed by regressing these on a constant dummy. The resulting residuals are the deviations from each firm from the mean. Regressing the residuals of the respective dependent variable on the residuals of the vector of explanatory variables yields the vector of coefficients. The coefficients explain the effect of the explanatory variables on the measures of firm productivity.

The equation

$$[Y_{it} - \overline{Y}_i] = \beta [X_{it} - \overline{X}_i] + [\varepsilon_{it} - \overline{\varepsilon}_i]$$

corresponds to the explained procedure, where $\overline{Y}_i$ is the average of the respective productivity measures Y, $\overline{X}_i$ the average of the vector of explanatory variables X, and $\overline{\varepsilon}_i$ the average of error terms ε_{it} across the two interviews in $t = 1,2$ for firm i.[9] With only two interviews per firm, the fixed effects estimator is numerically equal to the first-difference estimator. With this specification, an Ordinary Least Squares (OLS) estimation can be conducted such that the coefficient β indicates the effect of a one-point change in the CPI on firm performance. Since I use the log-values of sales and the number of employees, the change must be interpreted as a percentage change.

[9] For more information, please consult Cameron and Trivedi (2008) who give a detailed overview on estimation strategies of panel data.

Time-invariant variables cancel out as their coefficients are zero as a result of the invariance to their average.[10] I confront this flaw by including interaction terms with variations in the CPI. In this way, I can exploit heterogeneity across firm sizes, regions, and in the extension also across levels of perceived corruption in the first interview.

The central assumption of the fixed effects estimator is strict exogeneity between the explanatory and dependent variables in order to guarantee consistency of the OLS estimator. The literature has established a strong correlation between the level of corruption in a country and economic growth (Bai et al., 2013) so that endogeneity between the CPI and the dependent variables must be assumed. To meet the exogeneity assumption, I consult the development of the CPI between the years of the first interview with the firms in the respective country and two years before their second interview. The time frame is chosen because the answers of the firms in the interviews refer to the last completed fiscal year. This is typically the year before the interview since interviews are conducted throughout the whole fiscal year.

The fixed effects estimator has been chosen because it is the approach with the least assumptions and therefore contains no arbitrary choices of shocks. Yet, by choosing the described timing, I need to assume that there is no recovery from shocks which might have happened between the years from which the two values of CPI are drawn. If there were big fluctuations between these two observation moments, this could bias my analysis in two ways depending on whether a country experienced increases or decreases in the corruption level which are not captured. The analysis of the development of CPIs per country shows that the evolution is smooth and not strongly fluctuating, and, therefore, that this assumption is considered to be met.

4.2 Logistic Regression

As previously mentioned, I do not only evaluate to what extent the level of corruption in a country has an impact on productivity measures, I also explore underlying mechanisms that cause such effects. The dependent variables of *Credit* and *Assets* are answered with the binary choices *Yes* or *No*. For this reason, I use a logistic regression instead of the fixed effects estimation. The coefficients are reported in log-odds values. To convert these values to the more intuitive odds ratio, one must exponentiate the reported coefficients. Subtracting the value 1 from the odds ratio yields the marginal effect.[11]

4.3 Difference-in-Differences Estimator

Finally, I use the difference-in-differences estimator to verify the results and to show whether positive and negative changes in the national level of corruption affect firms differently. This estimator compares a group experiencing an intervention to a control group without intervention over two points in time. I consider the two observation points as the two interviews a firm has given. Furthermore, I identify the maximum change of CPI a country experienced between the baseline year of the first interview and the year before the year to which the results of the interviews refer to guarantee exogeneity. A firm is in the treatment group if the country experienced an absolute maximum change of at least 0.2. Even though this is an arbitrary choice, a

[10] Even though the sector of a firm resembles a time invariant variable at first sight there is sufficient variation across time such that this variable is included in the analysis.

[11] Thus, the odds ratio is given by e^{β} and the marginal effect can be computed by $e^{\beta} - 1$, where β is the coefficient in the log-odds value.

robustness check using 0.3 instead of 0.2 confirms the results. This timing of the CPI is chosen, as with the fixed effects estimation, that could otherwise allow firm productivity to influence the level of perceived corruption.

The timing of when the maximum change of the CPI happened between the two interviews differs across countries. This is why I additionally control with the variable *Years after Shock* how many years a firm had to recover after the maximum change of CPI. The summary statistics are included in Table A4 of the Annex.

The difference-in-differences measure is powerful as it eliminates all firm-specific fixed effects as well as time-specific factors that impact all firms. The same control vector as in the fixed effects estimations is included to control for variant factors that cannot be canceled out by the difference-in-differences estimator. Yet, it must be assumed that the firms from both groups had a common trend in their development before the first interview took place.

The presented strategies are effective instruments to estimate to what extent perceived national corruption impacts firm productivity, how this varies by firm size and region, and what it implies for the asymmetric firm size distribution in developing countries. The results of the estimations are presented in the following section.

5 Empirical Results

This section is organized as follows. In the beginning, the effect of corruption on firm productivity is discussed without the specification of heterogeneous groups. Moreover, the role of the included control variables is laid out. In a further step, I investigate differences that arise with the specification of different firm sizes and regions in two heterogeneity analyses. This distinction by firm size enables me to draw conclusions on the effects of varying corruption on the distribution of SMEs discussed in terms of the missing middle.

5.1 Main Results

Table 4 presents the effects of a change in corruption (*Change CPI*) on sales and the number of employees. An increase of the CPI, representing declining corruption in a country, significantly predicts an increase of sales when controlling for the vector of control variables.[12] The effect on the number of employees is slightly negative, albeit not statistically significant when including the vector of covariates. The change in the sales and the number of employees measures the growth of these two indicators. Considering the average absolute change of 0.37 in the CPI that countries in the sample experienced between the year of the first and the year before the second interview, the average firm experiences a 5.5 percent increase in sales due to lower corruption. This confirms the prevalent opinion in the literature assessing increasing corruption to negatively impact firm growth (e.g. Fisman and Svensson, 2007).

The interpretation that increasing managerial experience positively affects firm growth is intuitive. Besides the experience of the manager and the number of years between the two interviews, the included control covariates are categorical variables in which firms rank the impact of different obstacles. Therefore, the analysis must be regarded relative to the baseline

[12]This vector contains, as described in Section 3.3, the number of years between the two interviews, the experience of the manager, the firm's sector, its rating of access to electricity, finance and land, and the perception of taxes, licenses and corruption being an obstacle to the firms operations.

of manufacturing firms who evaluate tax rates, business licenses and permits, corruption and the access to electricity, finances and land as no obstacle to the operations of the firm.[13] The results of each category of the covariates (not reported in the table) show that in most cases, not all of the categories are statistically significant. However, there are some peculiarities. The categorical variables that describe how firms assess the access to finance and how they perceive corruption are widely significant. The more negatively the operations are affected, the lower the growth of sales. This is in line with the literature stating that a lack of access to finance is a major drawback in the development of firms (Beck et al., 2005). On the other side, if corruption is rated as an obstacle to firm operations, independent from the extent, lowering corruption creates more sales growth compared to the case in which firms do not see corruption as an obstacle. These results will be discussed further in Section 6.1 and 6.4.

	(1)	(2)	(3)	(4)
VARIABLES	Log(Sales)	Log(Sales)	Log(Employees)	Log(Employees)
Change CPI	-0.0880**	0.149***	-0.0515***	-0.0132
	(0.0406)	(0.0536)	(0.0150)	(0.0228)
Period		-0.0495***		-0.00862***
		(0.00662)		(0.00284)
Manager Experience		0.00499***		0.00417***
		(0.00172)		(0.000724)
Sector		Yes		Yes
Electricity: Access		Yes		Yes
Tax rates: Obstacle		Yes		Yes
Licenses: Obstacle		Yes		Yes
Finance: Access		Yes		Yes
Corruption: Obstacle		Yes		Yes
Land: Access		Yes		Yes
Constant	14.16***	13.20***	3.485***	3.266***
	(0.133)	(0.203)	(0.0492)	(0.0863)
Observations	26,525	22,151	30,814	24,563
R-squared	0.000	0.037	0.001	0.037
Number of Firms	15,292	13,724	15,819	14,269

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4: Fixed effect estimation without controlling for heterogeneity.

Firms who report not knowing how to rate the categorical questions experience a lower positive influence of lowering corruption on the productivity levels. With the presented results of the firms who indicated not knowing the answer, one can suspect that firms whose answers are missing experience a lower increase in productivity after the corruption level decreases. If this proves to be correct, my analysis overestimates the effects of changes in corruption on productivity through the exclusion of the firms reporting missing values.

[13] This baseline is kept throughout the analysis.

5.2 Heterogeneity Analysis

The analysis of the two-panel data set has shown that decreased corruption contributes to growth of firm productivity. In the next step, I will verify whether this differs by firm size and across regions by introducing interaction terms between the corresponding variables and the change of the CPI. This is crucial to answer whether corruption can be a target to not only increase overall firm productivity, but particularly to favor small firms. If this proves to be possible, lowering corruption could be a means to close the gap of the missing middle. Furthermore, I will verify which regions would benefit the most from interventions in the level of corruption. In both cases, I will first give an overview of the results and then interpret them in the context of the available literature.

5.2.1 Firm Size

Firms are considered small with 0-9 employees, medium-sized with 10-49 employees and big with more than 50 employees at the time of the first interview. Table 5 presents the heterogeneity analysis of firm sizes using small firms as the baseline category. Small firms benefit the most from a decline in corruption. Their sales surge by 61.2 percent if the CPI increases by one point on the scale from 0 to 10, while medium-sized firms only experience a 3.0 percent increase and big firms a 4.6 percent decrease. This pattern is consistent with respect to the number of employees. With a one point increase in the CPI, the amount of full-time employees increases by 47.8 percent for small firms, but decreases by 3.0 percent for medium-sized firms and by 39.6 percent for big firms. All of the presented results are statistically significant at the one-percent level.

To verify the yielded outcome, I conduct the same fixed effects analysis on sub-samples of the data set, dividing it into samples of small, medium-sized and big firms. The results are in line with the above presented pattern where the positive effect of reducing corruption gets weaker as firm size increases. However, less of the results are significant at the common significance levels which can be explained by the smaller sample. Moreover, the predicted effect of a change in corruption on the productivity measures is more conservative and the estimations of the distinct groups are closer to each other. As such, the effect on sales ranges between 30.3 percent for small firms and 20.8 percent for big firms.

The results clearly indicate that corruption affects firms differently depending on their size. In many economies, policies like tax exemptions or looser labor regulations specifically target small firms (Hsieh and Olken, 2014). At the same time, the financial, legal or institutional environment contains obstacles that particularly hinder small firms, as will be shown in detail in Section 6.1. This is why small firms deliberately choose not to grow to avoid bureaucratic burden, taxes and other costs (Dutta et al., 2011). Instead, small firms in developing countries crucially rely on informally established market structures (Tybout, 2000).

VARIABLES	(1) Log(Sales)	(2) Log(Employees)
Change CPI	0.612***	0.478***
	(0.0910)	(0.0380)
Change CPI x Medium	-0.582***	-0.508***
	(0.106)	(0.0440)
Change CPI x Big	-0.658***	-0.874***
	(0.116)	(0.0482)
Period	-0.0532***	-0.0112***
	(0.00664)	(0.00280)
Manager Experience	0.00474***	0.00373***
	(0.00171)	(0.000713)
Sector	Yes	Yes
Electricity: Access	Yes	Yes
Tax rates: Obstacle	Yes	Yes
Licenses: Obstacle	Yes	Yes
Finance: Access	Yes	Yes
Corruption: Obstacle	Yes	Yes
Land: Access	Yes	Yes
Constant	13.21***	3.314***
	(0.202)	(0.0851)
Observations	22,151	24,563
R-squared	0.042	0.067
Number of Firms	13,724	14,269

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5: Fixed effect estimation: heterogeneity analysis on firm sizes.

In contrast, big firms differ in their access to financial and institutional access, their formal management practices and influence. For these reasons, corrupt habits take a different form in big firms compared to that of small firms. Big and influential firms are more likely to hold close ties with the political elite in a corrupt environment. Drops in the corruption level can therefore have ambiguous effects on different types of firms. While big firms are more likely to have close connections to political elites (Rock and Bonnett, 2004), their competitiveness is simultaneously lower compared to firms in an uncorrupt environment as they circumvent efficient practices through corruption (Gaviria, 2002). Therefore, corruption can imply that big firms lose their political influence and protection from the government, and must as a consequence adapt to competitive practices. This effect might be less important for small firms, which instead are able to gain simplified access to institutions or financial markets. Yet, they are more likely to lose their informal status and face increased bureaucratic and financial burden. The presented results suggest that the positive effect outweighs the negative for small firms, whereas bigger firms predominantly suffer from drops in the level of corruption. This is consistent with Beck et al. (2005) who find that the constraints of corruption particularly impair the operations of small firms.

This finding supports the hypothesis that decreasing corruption can be a means to benefit

small firms which grow stronger as a result, more so than comparably bigger firms. This in turn can even out the unequal firm size distribution. However, it is not plausible that such dynamics apply to all economies in the data set in a similar way. This is why I distinguish in the next step between regions in which firms are located.

5.2.2 Regions

While the previous heterogeneity analysis implies that small firms benefit more from drops in corruption, I will now examine differences across regions in a corresponding heterogeneity analysis. Through this, I want to evaluate whether the overall positive effect of decreasing corruption as found in Section 5.1 is robust across regions or whether some localities differ.

Table 6 presents the estimation with the baseline region being South Asia (SA). Overall, the significant results from all regions but Sub-Saharan Africa (SSA) indicate that a lower level of corruption yields a better firm performance with respect to sales and the number of employees as in the estimation without regional specifications. Drops in corruption have the most positive impact on productivity in East Asia and the Pacific (EAP), followed by Latin America and the Caribbean (LAC), South Asia, and Europe and Central Asia (ECA).

More specifically, a one point increase of the CPI leads to a 33.8 percent increase of sales in South Asia. The slightly negative impact on the number of employees is not significant. Firms located in East Asia and the Pacific experience even stronger effects from changes in the corruption level than firms in South Asia with a 64.6 percent increase of sales. The number of employees also grows by a statistically significant level of 7.03 percent.

The impact on firms in Europe and Central Asia, with respect to sales, is significantly lower than in South Asia. Sales in Europe and Central Asia grow by only 7.80 percent. The effect of reduced corruption for firms in Latin America and the Caribbean does not significantly differ from enterprises in South Asia. Yet, they experience a significant growth in the number of employees by 7.73 percent after a one point increase in the CPI.

While in all the above mentioned regions, the significant results have the same signs and only differ from one another in their extent, the results in Sub-Saharan Africa drastically deviate. In this region, the decrease of corruption has a negative effect on the number of sales. Although the number of employees increases by 11.63 percent for a one point increase of the CPI, the same change causes a 74.2 percent decline in sales.

Results for the Middle East and North Africa (MENA) are omitted since Yemen is the only country from this region contained in the data set.[14]

As for the firm size, the analysis is also conducted by sub-dividing the full sample into samples on each region. However, it must be kept in mind that this procedure drastically reduces the data set which has effects on the significance of some results. Results in South Asia where less than 500 firms from 4 countries responded to two interviews are no longer significant. Similarly, results in East Asia and the Pacific are not significant. In Europe and Central Asia, only the positive impact of decreasing corruption on a sales growth remains significant. However, both categories respond in the same direction to an increase of the CPI, albeit not always significantly as in the heterogeneity analysis. The effect on firms in Latin America and the Caribbean corresponds to previously stated results and remains not only significant with respect to both sales and employees, but also to the same extent as in the heterogeneity analysis. As before, Sub-Saharan Africa significantly deviates from the results on the other categories as

[14]This applies to all following regressions that imply specifications on the regions.

sales strongly decline with decreasing corruption. The number of employees remains positive, although not on a statistically significant level.

	(1)	(2)
VARIABLES	Log(Sales)	Log(Employees)
Change CPI	0.338***	-0.0797
	(0.125)	(0.0555)
Change CPI x EAP	0.308*	0.150**
	(0.171)	(0.0757)
Change CPI x SSA	-1.080***	0.196***
	(0.163)	(0.0715)
Change CPI x ECA	-0.260*	-0.0978
	(0.149)	(0.0646)
Change CPI x LAC	0.00232	0.157**
	(0.154)	(0.0667)
Period	-0.0359***	-0.00946***
	(0.00739)	(0.00314)
Manager Experience	0.00433**	0.00441***
	(0.00171)	(0.000724)
Sector	Yes	Yes
Electricity: Access	Yes	Yes
Tax rates: Obstacle	Yes	Yes
Licenses: Obstacle	Yes	Yes
Finance: Access	Yes	Yes
Corruption: Obstacle	Yes	Yes
Land: Access	Yes	Yes
Constant	13.40***	3.211***
	(0.213)	(0.0906)
Observations	22,151	24,563
R-squared	0.049	0.041
Number of Firms	13,724	14,269

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6: Fixed effect estimation: heterogeneity analysis on regions.

Literature highlights different effects of corruption, policies and productivity across regions (e.g. Asiedu and Freeman, 2009; Zhang, 2001). That consequences of corruption vary by region seems particularly plausible in the context of corruption being culturally variable and multifaceted in its form. While in Latin America, "corruption is unlikely to have positive effects" (Gaviria, 2002, p. 246), there is evidence at the country level of East and South Asian economies to simultaneously depict a high level of corruption and high GDP growth. Rock and Bonnett (2004) find that this is possible in countries that combine little political fractionalization and a long planning horizon for authorities in power. My results can be interpreted in line with this literature, as the region of East Asia and the Pacific only shows weak levels

of significance, particularly in the sub-sample despite being taken from a big sample. Hence, if firms in some countries are able to benefit from corruption whilst firms in other countries are not, the overall effect is indeterminate, which is particularly obvious in the sub-sample. In contrast, firms in Latin America and the Caribbean always benefit from drops in corruption.

Like in East Asia, literature focusing on Sub-Saharan Africa documents that corruption can contribute to growth by facilitating bureaucratic processes. Bribing officials to get access to infrastructure networks and to avoid regulatory burden prevails and is culturally accepted in at least a part of the region (Søreide, 2014). Establishing such alternative channels is discussed to be an efficient solution as the amount of the bribe in the bargaining for access can indicate the benefit of a firm. In this way, the most productive enterprises which benefit the most from bribing are identified (Fisman and Svensson, 2007). At the same time, strong ties to the political elite protect particularly big firms from competition and take away the incentive to operate economically efficiently, allowing them to rely instead on governmental support (Gelb et al., 2014; Gaviria, 2002). Changes towards a lower level of corruption would challenge firms to adapt to new structures which is likely to cause drops in firm productivity in the first place.

Besides separate heterogeneity analyses on differences across firm sizes and regions, a joint analysis has been conducted. The results coincide with the results stated above.[15] Remarkable in this case is the statistically significant effect of declining corruption on the number of employees. In small and medium-sized firms, a reduction of corruption is followed by a significant increased number of employees, while the number decreases in big firms. This is true for all regions but Sub-Saharan Africa, where also medium-sized firms experience a 2.9 percent decline of the number of employees.

Altogether, it would exceed the scope of this work to identify in detail reasons for which firms of different sizes in distinct regions differ with respect to changes in corruption. I am able to include variables which play decisive roles in affecting firm productivity and determining corruption but vary by regions like the access to infrastructure or the experience of the manager. Yet, additional analyses on the country level are needed. Particular factors which are dependent on the character which corruption takes in a region or country must be controlled to fully identify the drivers of regional differences across firm sizes. Here, the choice of the scope is essential. While for instance Latin America depicts regional patterns, the interpretation of regional indexes in other regions like East Asia is not meaningful since corruption takes different forms and effects across countries (Rock and Bonnett, 2004).

Nevertheless, I will explore in the next section channels through which corruption impacts firm performance. The goal is to identify similarities and differences across regions and firm sizes, and to give an overview on mechanisms which future research can further explore.

6 Extensions

The results stated above confirms the hypothesis that a decrease in corruption has an increasing effect on sales and in some cases on the number of employees. However, the analysis cannot explain the underlying mechanism. Therefore, it cannot be explained until now how lowering corruption contributes to balancing out the unbalanced firm size distribution. This is why I examine channels through which corruption is suspected to impact productivity levels of firms.

[15] The results are presented in Table A5 of the Annex. For the interpretation of the results table, individual numbers have to be simultaneously regarded relative to the firm size and region, thus small firms in South Asia.

Moreover, I put the results into a macroeconomic context to see whether the effects of lowering the level of corruption on the firm size can explain changes of economic growth and inequality on the country level. Finally, I distinguish between drops and surges of corruption and analyze the role of uncertainty.

6.1 Channels of Corruption

The channels that I examine through which corruption may impact firm productivity are categorized into (1) access to the financial system, (2) purchases of fixed assets, (3) expenditures and (4) governmental regulations. The analysis is performed on the whole sample and with two heterogeneity analyses controlling for the firm sizes and regions. I will give a brief overview on the effects without heterogeneity specifications.[16] However, the results with such specifications are more meaningful for answering how corruption impacts the productivity of SMEs and therefore the firm distribution. Thus, I will consider interaction terms on the firm size and the region (Tables 7 and 8) and interpret the results in depth with respect to each of the four categories.[17]

When not distinguishing between regions and firm sizes, firms are more likely to hold a credit or loan from a financial institution and to purchase fixed assets when corruption decreases. Expenditures on fixed assets in the form of equipment do not change significantly, whereas expenditures on land and buildings increase. Moreover, labor cost and cost on raw material and intermediate goods surge. The time the manager spends in dealing with governmental regulations does not change significantly.

6.1.1 Access to the financial System

An extensive part of the literature on drivers of the missing middle focuses on access to finance being a central impediment to growth, particularly for small firms (e.g. Beck et al., 2005; Tarfasa et al., 2016). This is why I analyze whether drops in corruption facilitate the access to financial means by looking at the probability at which establishments hold a line of credit or a loan from a financial institution.

The results illustrate the issue at stake. Although the odds of holding a credit or loan from a financial institution increase for firms of all sizes when corruption decreases, the likelihood increases with the number of employees (Table 7, regression (1)). This effect holds for all regions, although at different levels. Regarding the regions, the probability of holding such financial assets surges the most in firms from countries in Latin America and the Caribbean, followed by Europe and Central Asia, and East and South Asia and the Pacific. Firms in Sub-Saharan Africa experience the smallest increase of such a probability, with a surge of 8.4 percent after a one point increase of the CPI (Table 8, regression (1)).[18]

The regression in which I simultaneously control for regions and firm sizes shows that in Sub-Saharan Africa, the coefficient decreases for small firms while being positive for bigger firms. This peculiarity can hint at informal connections that have been established by the firms

[16]The table without any specification is included in Table A6 of the Annex. As before, a regression with the inclusion of both sub-samples at the same time is conducted but not reported in the main body due to the uninformative presentation of the results. It can be found in Table A7 of the Annex.

[17]As previously, the baseline categories in all following heterogeneity analyses on the firm size and regions are small firms in South Asia.

[18]This is computed by converting the given coefficients of the effect of *Change CPI* and *Change CPI x SSA* via the odds ratio to the marginal effects.

Table 7: Channels of corruption: heterogeneity analysis on firm sizes.

	Logistic Regression		Fixed Effects Regression				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	Credit	Assets	Log(Equipment)	Log(Land)	Log(Labor)	Log(Material)	Regulation
Change CPI	0.131***	0.0148	0.830	4.125**	0.669***	1.177***	-0.794
	(0.0139)	(0.0135)	(1.382)	(1.996)	(0.0842)	(0.206)	(1.156)
Change CPI x Medium	0.166***	0.152***	-0.417	1.358	-0.296***	-0.757***	1.382
	(0.0100)	(0.00970)	(1.570)	(2.263)	(0.0975)	(0.231)	(1.336)
Change CPI x Big	0.341***	0.318***	-1.814	0.658	-0.625***	-1.133***	-5.302***
	(0.0112)	(0.0109)	(1.587)	(2.288)	(0.107)	(0.245)	(1.468)
Period	-0.00912	-0.0959***	0.349***	-1.052***	-0.00419	-0.0413***	0.453***
	(0.00670)	(0.00657)	(0.0788)	(0.119)	(0.00618)	(0.0112)	(0.0835)
Manager Experience	0.0154***	0.00510***	0.0511***	-0.0592**	0.00241	0.00395	0.0402*
	(0.00125)	(0.00122)	(0.0193)	(0.0280)	(0.00160)	(0.00293)	(0.0214)
Sector	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Electricity: Access	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Tax rates: Obstacle	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Licenses: Obstacle	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Finance: Access	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Corruption: Obstacle	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Land: Access	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-1.994***	-0.706***	-0.326	-32.45***	13.46***	14.12***	13.16***
	(0.0865)	(0.0826)	(2.373)	(3.432)	(0.187)	(0.361)	(2.519)
Observations	24,316	24,453	13,431	12,907	21,813	11,103	23,004
R-squared			0.220	0.131	0.050	0.054	0.035
Number of firms			10,096	9,834	13,715	7,524	13,872

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 8: Channels of corruption: heterogeneity analysis on regions.

	Logistic Regression		Fixed Effects Regression				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	Credit	Assets	Log(Equipment)	Log(Land)	Log(Labor)	Log(Material)	Regulation
Change CPI	0.179***	-0.110***	-6.369***	0.864	0.407***	-0.0113	6.818***
	(0.0224)	(0.0240)	(1.874)	(2.663)	(0.113)	(0.264)	(1.560)
Change CPI x EAP	0.0347	0.143***	1.693	4.576	0.579***	0.631*	-10.68***
	(0.0247)	(0.0256)	(2.554)	(3.601)	(0.156)	(0.329)	(2.180)
Change CPI x SSA	-0.111***	0.218***	7.713***	15.22***	-0.517***	1.144***	-8.200***
	(0.0216)	(0.0225)	(2.490)	(3.618)	(0.150)	(0.358)	(2.116)
Change CPI x ECA	0.0901***	0.282***	5.655***	1.173	-0.0900	0.661**	-9.385***
	(0.0204)	(0.0220)	(2.104)	(2.997)	(0.136)	(0.330)	(1.869)
Change CPI x LAC	0.142***	0.282***	8.340***	5.011*	-0.0554	0.138	-10.90***
	(0.0202)	(0.0217)	(2.071)	(2.932)	(0.142)	(0.316)	(1.885)
Period	0.00520	-0.0894***	0.408***	-1.120***	-0.00208	-0.0571***	0.476***
	(0.00674)	(0.00659)	(0.0853)	(0.127)	(0.00689)	(0.0135)	(0.0923)
Manager Experience	0.0133***	0.00479***	0.0532***	-0.0532*	0.00245	0.00489*	0.0424**
	(0.00126)	(0.00123)	(0.0193)	(0.0280)	(0.00160)	(0.00295)	(0.0214)
Sector	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Electricity: Access	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Tax rates: Obstacle	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Licenses: Obstacle	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Finance: Access	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Corruption: Obstacle	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Land: Access	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-1.686***	-0.426***	-2.806	-37.72***	13.52***	13.81***	17.37***
	(0.0881)	(0.0850)	(2.464)	(3.593)	(0.198)	(0.387)	(2.663)
Observations	24,316	24,453	13,431	12,907	21,813	11,103	23,004
R-squared			0.225	0.139	0.054	0.052	0.036
Number of firms			10,096	9,834	13,715	7,524	13,872

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

previous to the change in the level of corruption to grant access to financial means. Such informal means that raise the efficiency on the firm-level are for instance the establishment of funds set up by firms and other informal credit systems (Tybout, 2000). With decreasing corruption, such channels are broken up leading to a drop in sales as previously shown. Moreover, uncertainty rises, a characteristic which has a negative impact on firm performance as will be discussed in Section 6.3.

A first intuition could be that the stronger effect on big firms implies that this channel cannot effectively explain why small firms benefit more from decreased corruption as seen in the previous section. However, based on the discussed literature, the result can also depict the restriction small firms face when trying to access the financial market. On the one hand, it is possible that small firms strongly benefit by gaining a slightly better access to financial assets. On the other hand, no conclusions about the height and effects of such loans and assets can be drawn by looking at the likelihood alone.

6.1.2 Fixed Assets

To examine which of the two interpretations is right, I consult the purchase of fixed assets. The analysis of the data set shows that the factors of whether firms hold financial assets and whether they purchase fixed assets are highly and positively correlated. I therefore reason that the means of these loans and credits are at least partially invested in fixed assets. While there is no significant change of the odds for small firms to purchase fixed assets if the level of corruption decreases, the odds do increase for medium-sized firms and even stronger for big firms (Table 7, regression (2)). As before, I suspect this to be an illustration that small firms, in particular, lack access to financial means. Out of these firms who do acquire fixed assets, no difference can be seen between different firm sizes in their increase of expenditures on equipment (regression (3)) or land and buildings (regression (4)). While the former does not significantly change for any of the firm sizes after a drop of corruption, the latter is significantly positive at the same level for all firm sizes.

Regarding regional differences, the acquisition of land and buildings only shows a significant increase in the regions of Sub-Saharan Africa and Latin America and the Caribbean when corruption decreases (Table 8, regression (4)). The effect on expenditures on equipment is more ambiguous. As with land and buildings, firms in Sub-Saharan Africa and Latin America and the Caribbean increase expenditures on equipment whereas firms in South, East and Central Asia, the Pacific and Europe decrease these expenditures with the fall of corruption.

6.1.3 Expenditures

Additionally to the acquisition of fixed assets, corruption also impacts the cost of labor and raw materials and intermediate goods. For all firm sizes, these costs increase when corruption is lower, although the effect converges to close to zero for big firms (Table 7, regressions (5) and (6)). Again, all of these values are highly significant, although this changes when distinguishing by region. In this case, cost of material and intermediate goods significantly increases in East Asia and the Pacific, Sub-Saharan Africa, and Europe and Central Asia (Table 8, regressions (5) and (6)). The labor cost significantly increases for all regions but significantly decreases in Sub-Saharan Africa.

The prevalence of an increasing effect on labor cost and material cost after a drop in corruption is intuitive and confirms increased purchases of these inputs to be a channel through which sales and employment surge. On the other side, the negative coefficient for Sub-Saharan African labor cost is counter-intuitive at first glance. Here, firms substitute labor with land if

there is a lower level of corruption, yet, the overall effect on the number of employees is positive. This paradox becomes comprehensible when consulting the regression simultaneously including both heterogeneous specifications of regions and firm sizes. Small firms increase both labor cost and the number of employees following a decrease in corruption. In contrast, medium-sized and big firms decrease both, while the effect is stronger for big firms.

Further, the analysis of simultaneously interacting regions and firm sizes illustrates that the amount of both types of cost increases at a comparable extent for small firms in all regions but Sub-Saharan Africa. Yet, medium-sized firms and big firms decrease the costs of raw material and intermediate goods stronger than the costs on labor and therefore substitute in the composition of their inputs. Together with the literature that explores how bigger firms with informal ties to the government produce less efficiently due to lowered competition (Gaviria, 2002), this could indicate a shift of big firms towards a more efficient production by adapting the input ratio. Smaller firms on the other hand can benefit from easier access to financial means and increase both inputs.

6.1.4 Regulations

Corruption is often seen as a means for firms to avoid regulatory burden, and therefore undermining effective bureaucratic regulation. Yet, corruption affects distinct types of firms differently. Big firms report regulations to be a stronger burden for their operations, whilst small firms decide not to grow in order to avoid such burden (Fisman and Svensson, 2007). The finding that the time spent on regulatory processes is only significant for big firms. They decrease the time with lower corruption which is in line with the literature (Table 7, regression (7)). This is true for all regions but South Asia. The effect is the strongest in Latin America and the Caribbean, followed by East Asia and the Pacific region, Europe and Central Asia, and Sub-Saharan Africa (Table 8, regression (7)).

Keeping in mind that initially, the burden of regulation increases with firm size, the unequal effect that reduces regulatory strains particularly for big firms balances out the overall effect between different firm sizes. Hence, the incentive to stay small in terms of the firm productivity in order to avoid bureaucratic processes diminishes. Therefore, decreasing regulatory burden is a means through which lower corruption encourages growth in productivity, specifically for small firms.

Altogether, each of the presented channels has the capability to influence the productivity of firms after decreases in the level of corruption. Yet, the effects greatly vary across firm sizes and regions such that no unique mechanism can be established. While the presented analyses show that lowering corruption impacts a variety of channels and that ultimately leads to better firm performance, I leave it to future research to conduct firm-level studies on specific countries and regions. These mechanisms and previously stated results show that fighting corruption is a promising strategy for policy makers to balance out the unequal firm size distribution and therefore achieve more equality. Yet, regional characteristics of corruption must be considered to better understand which of the discussed channels are the central ones to the country at stake.

6.2 Macroeconomic Context

As discussed in Section 2, growth of small firms is needed to close the gap of the missing middle and to thereby increase equality. In the following, I verify whether firm growth following lower corruption levels does indeed increase equality, and how other macroeconomic measures

are impacted. Consequently, I embed the presented results in a macroeconomic context by analyzing how perceived corruption is correlated with the level of GDP, the GINI coefficient and unemployment. To avoid reverse causality, I regress the lagged value of the CPI on contemporary values of the other variables in the period in which the interviews took place.

	(1)	(2)	(3)
VARIABLES	log(GDP)	GINI	Unemployment
lagged CPI	0.0580***	-1.176***	-1.232***
	(0.0132)	(0.231)	(0.132)
Constant	24.29***	42.58***	12.53***
	(0.209)	(1.320)	(0.859)
Observations	1,090	539	1,084
Number of countries	76	72	75

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 9: Estimation of the effect of changes in the CPI on macroeconomic variables.

Table 9 shows that the lagged CPI is positively correlated to the level of GDP given in international dollars, and negatively correlated with the GINI coefficient and unemployment. These results seem intuitive and support my analysis. As I have shown, a reduction of corruption leads, in general, to a better firm performance. As firms are an important driver of the GDP, higher firm productivity in an economy is likely to contribute to GDP growth which is confirmed with this data. Moreover, firm growth caused by a corruption drop can lead to a closure of the missing middle if it empowers small firms relatively more than big firms, as found to be the case in the analysis. This in turn is expected to lead to more equality. The negative coefficient of the GINI coefficient which represents less inequality supports this hypothesis. Therefore, a decline in the perceived corruption increases equality within the given country. This is in line with Dutta et al. (2011) who find evidence for corruption increasing inequality and poverty.

Finally, a decrease in unemployment following a decrease of corruption can be interpreted as a consequence of raised firm productivity, visible in the growth of the number of employees. I have shown that after a decline in corruption, firms in none of the regions significantly decrease the number of employees. While the employment in small firms grows significantly, medium-sized and big firms show a decrease in the number of employees. This appears contradictory at first sight, however, this is meaningful to better understand the results from the regressions on the firm-level. As initially described, the data set used in the empirical estimation is subject to a sample selection bias and cannot serve as a representation of the economies that are included. Although the estimation of Table 4 without any specification does not return a significant effect of reducing corruption on the number of employees, the reader should consider that particularly small firms dropped out of the complete data set and are therefore under-represented in the two-panel data set. Furthermore, small firms in particular increase the number of employees as shown in Table 5. This combination leads to the hypothesis that a representative data set including correct shares of different firm sizes would yield a positive coefficient for the effect of reduced corruption on employees in a comparable estimation. Even

though this cannot be empirically proven with the given data set, the macroeconomic regression supports this reasoning. The aggregated effect of drops in corruption yields in this case a decrease in unemployment.

Altogether, the macroeconomic analysis confirms the initially stated hypothesis that an improved performance of small firms generated by decreased corruption can close the gap of the missing middle and contribute to more equality.

6.3 Symmetry

Until now, the regressions have supported the hypothesis that lowering corruption contributes to a better firm performance, specifically of small firms, and that this can contribute to a closure of the missing middle. I will now compare the effects that arise depending on the direction in which the corruption level changes. The merit of the difference-in-differences estimator is that it does not only allow verification of previous results, but also an analysis of whether there are different effects of drops and surges of corruption. By sub-sampling the firms from the data in three groups that experienced either (1) no change of the CPI, (2) an increase in corruption or (3) a decrease in corruption, I yield estimates for both types of changes by the comparison with groups (2) and (3) with group (1). Regressions (1) and (3) of Table 10 present results for the group which experienced a decrease in the level of corruption, and regressions (2) and (4) present those who experienced an increase.

The results indicate that any change in corruption yield lower sales, with a more negative effect for firms who experience an increase in corruption. Regarding the number of employees, only firms who are exposed to an increase in corruption shrink in the number of employees, whereas the other group does not significantly differ from the baseline group who does not face drastic changes in the CPI.[19]

Even though this is at a first glance contradictory to previous results, literature on uncertainty gives a convincing explanation. Following Campos et al. (1999), not only the level of corruption, but also the predictability of changes in corruption is crucial. Since both kinds of changes in the corruption level cause uncertainty about the future development of corruption to which firms have to adapt, the negative impact seems reasonable. The fact that firms in countries with increases in the corruption level are more strongly affected than firms with decreases in corruption can explain the overall positive effect of a decrease in corruption which has been shown in previous analyses. Yet, uncertainty has a major impact as has also been seen in the analysis of individual regions, which is supported by this analysis.

Since the application of the difference-in-differences estimator contains stronger assumptions than the fixed effects analysis, the results should be critically regarded. Firstly, the threshold to define which firms are part of the treatment group is randomly chosen. Secondly, the estimator assumes a common trend of the different groups, which is a strong assumption as no data is available on this. By implementing a placebo treatment, I test the results on their robustness. After randomly dividing the firms into a treatment and control group, I repeat the analysis under the hypothesis that a random assignment of interventions should not yield significant effects. Indeed, the output does not include any significant results of the difference-in-differences estimator. Therefore, the significance of the non-randomly distributed sample described above is supported through this method.

[19]The vector of control variables includes, additionally to the variables previously included in the fixed effects analysis, a dummy variable on the timing, a dummy variable on whether a firm is in the treatment group or not and an interaction term of both which gives the coefficient of the difference-in-differences estimator. Moreover, the control variable *Years after Shock* is added which is described in Section 3.

VARIABLES	(1) Log(Sales)	(2) Log(Sales)	(3) Log(Employees)	(4) Log(Employees)
Time	-0.602***	-0.544***	-0.137**	-0.318***
	(0.124)	(0.114)	(0.0664)	(0.0624)
Low CPI		0.199***		-0.0645*
		(0.0603)		(0.0330)
Low CPI x Time		-0.604***		-0.0928**
		(0.0773)		(0.0423)
High CPI	0.0640		-0.141***	
	(0.0685)		(0.0359)	
High CPI x Time	-0.484***		0.00356	
	(0.0886)		(0.0466)	
Period	0.0391	0.0381	0.0305*	0.124***
	(0.0336)	(0.0309)	(0.0176)	(0.0170)
Years after Shock	0.146***	0.0969***	-0.00329	-0.0890***
	(0.0356)	(0.0306)	(0.0186)	(0.0165)
Manager Experience	0.00852***	0.0140***	0.00485***	0.00722***
	(0.00199)	(0.00167)	(0.00105)	(0.000911)
Region	Yes	Yes	Yes	Yes
Income Group	Yes	Yes	Yes	Yes
Sector	Yes	Yes	Yes	Yes
Electricity: Access	Yes	Yes	Yes	Yes
Tax rates: Obstacle	Yes	Yes	Yes	Yes
Licenses: Obstacle	Yes	Yes	Yes	Yes
Finance: Access	Yes	Yes	Yes	Yes
Corruption: Obstacle	Yes	Yes	Yes	Yes
Land: Access	Yes	Yes	Yes	Yes
Constant	13.22***	13.66***	3.043***	3.697***
	(0.149)	(0.143)	(0.0790)	(0.0789)
Observations	13,910	15,603	15,306	17,276
R-squared	0.133	0.145	0.121	0.119

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 10: Difference-in-differences: symmetry analysis.

6.4 Heterogeneity across Levels of perceived Corruption

Against the background of strong assumptions taken in the difference-in-differences estimation, the interpretation that firms always suffer from increased uncertainty should be carefully verified. For this reason, I extend previous heterogeneity analyses. In a fixed effects analysis, I take into consideration how firms assess corruption to impact the operations. This aims to capture the predictability about corruption. Firms who assess in the first interview corruption as a more severe obstacle are expected to face bigger uncertainties arising with changes in corruption. Therefore, a one point change of the CPI is suspected to impose a bigger change

compared to firms who rank corruption as no obstacle to their operations, which can hint at lower uncertainty. If uncertainty hinders the ability of firmsto benefit from decreased corruption, the second group is expected to be comparably better off when experiencing the same change in the CPI.

I categorize the data set into firms who perceive corruption (1) not to be an obstacle (2) to be a minor or moderate obstacle and (3) to be a major or very severe obstacle. This categorization in three instead of the five groups contained in the original data set is chosen to guarantee enough observations in each category. Only the assessment in the first interview is considered as changes in the corruption level on the country-wide index are correlated with the perceived corruption within a firm.[20] The returned coefficients from the impact of corruption are positive in all categories of perceived corruption and with regard to both measures of performance. The positive effect of reducing corruption on firms increases, the more firms consider corruption as an obstacle. Interaction terms on regions and firm sizes confirm the results, although most of the returned coefficients are not significant.

This indicates that firms can predict the influence of corruption on their firm operations considerably well, which supports the hypothesis from the previous section that predictability matters. Firms that are considered sensitive to changes in the corruption level assess corruption to be a more severe obstacle to their operations than comparably less sensitive firms. Furthermore, firms which consider themselves less exposed to changes in the prevalence of corruption are indeed less affected. Even though these firms benefit less from drops in corruption, they are not disturbed at the same scale by increases in corruption, which points at a reduced risk in such firms. Therefore, this analysis can support the hypothesis that reducing the level of corruption increases the firm productivity if the assessment of corruption being an obstacle reflects the uncertainty.

7 Robustness Checks

Previous empirical analyses have shown that corruption can impact the firm size distribution through enhancing the performance of small firms in particular. Yet, the validity of the variable that describes the total annual sales as well as the validity of the CPI were assumed. In the following section, I will test whether the results are robust to a modification of these variables.

7.1 Winsorizing Sales at the 5 Percent Level

The summary statistics of the variable describing total annual sales exhibit with 79.5 million international dollars not only a very high mean, but with 326 million also a high standard deviation when winsorizing at the 1 and 99 percent level. This could point to a large number of outliers that bias the results even after winsorizing at the more conservative level. For this reason, I winsorize the variable also at the 5 and 95 percent level to control for the potentially bigger number of outliers than expected in the previous analyses. This procedure decreases the mean and standard deviation to 21.2 million and 28 million respectively. The reported results of the fixed effects analysis including interaction terms on the firm size and regions as well as other control variables confirm the results with comparable coefficients to the previously conducted analyses.[21] This result validates the usage of the variable on sales winsorized at the 1 and 99 percent level.

[20] This is shown in Section 7.2.

[21] See Table A9 in the Annex.

7.2 Regressing the Corruption Perception Index on perceived Corruption

In Section 3.2, the advantages and disadvantages of using the CPI have been discussed. However, one might raise the concern that the CPI does not necessarily capture the effect of corruption on the operations of a firm. As an identification check of the CPI being a valid measure, I estimate the effect of an increasing CPI on the perceived corruption reported by a firm. The firm indicates on a range from 0 to 4 whether corruption is no, a minor, moderate, major or very severe obstacle. The outcome indicates that an increasing CPI, indicating a decreasing corruption level, is indeed correlated with the perception of firms that corruption is less of an obstacle to their operations. Therefore, the CPI is confirmed to be a valid measure to estimate corruption experienced by a firm. Note that the regression which is presented in Table 11 does not assume exogeneity. In fact, it is part of the character of the CPI to capture the assessment of firms about the level of corruption. Therefore, reverse causality is neither excluded nor aimed to be prevented.

VARIABLES	(1) Perceived Corruption: Firm level
CPI	-0.0712*
	(0.0421)
Period	-0.0220***
	(0.00573)
Manager Experience	0.00140
	(0.00148)
Constant	0.844***
	(0.157)
Sector	Yes
Electricity: Access	Yes
Tax rates: Obstacle	Yes
Licenses: Obstacle	Yes
Finance: Access	Yes
Corruption: Obstacle	Yes
Land: Access	Yes
Observations	22,556
Number of firms	14,017
R-squared	0.190

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 11: Estimation of the effect of changes in the CPI on perceived corruption within firms.

7.3 Double lag of the Corruption Perception Index

In the discussion on the measurement of corruption in Section 3.2, I have laid out how using the CPI of the year before the year to which the answers of the interview refer circumvents

endogeneity issues. The analysis of the development of the CPI suggests that there are no random shocks or major fluctuations which would not be captured by this timing, but instead confirms a steady development. This is why I hypothesize lagging the CPI by another year does not change the results, as Table 12 confirms.[22]

The pattern of the presented results is comparable to the results from Table 6. Yet, this estimation gives more conservative results for small firms. Regarding the regional specifications, the coefficients are mostly in line with the results presented before, although some of the significance levels change.

	(1)	(2)	(3)	(4)
VARIABLES	Log(Sales)	Log(Sales)	Log(Employees)	Log(Employees)
Change CPI (lag)	-0.0742	0.213***	0.0627***	0.292***
	(0.0516)	(0.0681)	(0.0196)	(0.0285)
Period		-0.0382***		2.70e-05
		(0.00619)		(0.00262)
Change CPI x Medium		-0.161**		-0.239***
		(0.0784)		(0.0325)
Change CPI x Big		-0.226**		-0.592***
		(0.0903)		(0.0377)
Manager Experience		0.00410**		0.00340***
		(0.00171)		(0.000714)
Sector		Yes		Yes
Electricity: Access		Yes		Yes
Tax rates: Obstacle		Yes		Yes
Licenses: Obstacle		Yes		Yes
Finance: Access		Yes		Yes
Corruption: Obstacle		Yes		Yes
Land: Access		Yes		Yes
Constant	14.11***	13.48***	3.114***	3.280***
	(0.166)	(0.220)	(0.0633)	(0.0926)
Observations	26,525	22,151	30,814	24,563
R-squared	0.000	0.038	0.001	0.063
Number of Firms	15,292	13,724	15,819	14,269

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 12: Fixed effects estimation: double lagged CPI (Reduced table).

[22]Note that this table only includes the specification controlling for the firm size and not for regions. The full table including the latter can be found in the Annex A.4.4.

8 Discussion of potential Biases

Not only are the results from the empirical estimations in line, but also the robustness checks confirm the validity of the methodological approach. Furthermore, the result that reducing corruption can be a means to create firm growth for small firms to close the gap in the firm size distribution is robust across the presented estimations. Yet, potential biases must be considered, as described in Section 3.

Due to the sensitivity of the topic and the big global coverage of my study, the data set contains numerous missing values and self-selection issues, which might imply overall biased results. The comparison of the descriptive statistics of the complete data set and the two-panel data set show that small firms in particular did not participate in the second survey and that the shares of firms from different regions change. The share of firms from South Asia, East Asia and the Pacific, Sub-Saharan Africa and the Middle East and Northern Africa is smaller in the two-panel data set compared to the complete data set.[23] This provides reason to believe that there are characteristics which drove self-selection of firms to drop out of the sample, leading to a sample selection bias. The bias caused by the dropout of small firms is likely exaggerated by an over-sampling of big firms which occurs because big firms create the most jobs despite being in the minority in the firm size distribution (The World Bank, 2018e). This is why I conduct a rather comparative study between firm sizes and regions, and interpret mostly positive or negative associations between corruption and firm performance in the respective contexts. Yet, the results taken together with the literature, robustness checks and the interpretation in a macroeconomic setting strongly suggest that the presented results are valid. Therefore, the study does not only convince by connecting the fields of research on corruption and the missing middle, but also by exploiting an extended firm-level data set on numerous economies.

9 Conclusion

This work explores whether corruption impacts the productivity of firms with a particular focus on SMEs. The analysis is motivated by the attempt to connect the research areas of corruption and the missing middle. I hypothesize that lowering the level of corruption contributes through increased firm productivity of specifically small firms to balancing out the asymmetric distribution of firm sizes. To probe this, I conduct fixed effects estimations with heterogeneity specification allowing me to extract the effect of changes in corruption on varying firm sizes and region in which firms are located. Furthermore, I explore the role of channels through which corruption impacts firm productivity, verify the effects in a macroeconomic context and discuss the role of uncertainty for firms.

The results show that lower corruption levels can influence productivity levels particularly for small firms. Therefore, anti-corruption measures are a promising channel to close the gap between small and big firms in developing countries and therefore contribute to more equality. Changes in the level of corruption significantly impact the value of sales and the number of employees of firms, factors that are taken as a measure of firm productivity. Yet, the effect varies by the region and the size of the firm as corruption is culturally flexible. Moreover, differing mechanisms of corruption, such as in political and economic relations, are prevalent. Small firms benefit more from drops in corruption than big firms which face only small or negative effects of lower corruption. The region in which the productivity increases most is

[23] For a comparison of the summary statistics between the two data sets, please consult Table A4 of the Annex. The disproportionate drop-out of small firms is illustrated in Annex A.2.

East Asia and the Pacific, followed by Latin America and the Caribbean, South Asia, Europe and Central Asia. Effects in Sub-Saharan Africa are negative. These variations can be explained by the different dimensions that corruption takes and a different extent to which firms adapt to prevailing levels of corruption. Small firms rather experience corruption in the form of informal activities to avoid costly burden, whereas bigger firms exploit benefits through the connections to political elites. If firms adapt well to the level of corruption, they can circumvent costly regulations. Furthermore, uncertainty about future shifts in the corruption level can negatively impact firm performance, which yields in some cases overall negative effects.

Mechanisms that explain the heterogeneous effects vary with the differentiation between firm sizes and regions of the firms. Drops in corruption help small firms to increase purchases on fixed assets and input goods through an easier access to the financial system. Big firms also increase such expenditures after drops in corruption, however often in a trade-off between the different types of assets. Furthermore, less regulatory burden contributes to increased productivity in the majority of regions and big firms.

In the context of policy making, this study supports anti-corruption measures as a powerful instrument to not only stimulate firm growth generally, but in this way to contribute to closing the gap of the missing middle since small firms experience proportionally stronger positive effects from decreasing the level of corruption. In this way, lower levels of corruption yield less inequality through the channel of increased firm performance of small enterprises. Nevertheless, policy makers should bear in mind that although anti-corruption measures have the potential to equal out the unbalanced firm size distribution and contribute to equality, policies targeting corruption cause uncertainties for firms. Following such measures, firms need to adapt to a new environment, leading to a burden in the form of adjustment cost to a new level of corruption.

Despite drawbacks arising as a consequence of missing data, this study is able to connect the research areas on corruption, firm productivity and the missing middle at the firm-level. As a whole, the analysis must be understood as an overview of how changing the level of corruption has different effects across regions and firm sizes. There is need for research on the development of policies targeting corruption for specific economies. Due to regional differences, further studies should be conducted on the firm-level with an explicit consideration of small enterprises. This will also help to identify better which mechanisms are at work to connect corruption with firm productivity depending on characteristics of the economy. Ultimately the analysis shows that the intersection between corruption and the missing middle is a promising field of research and has the potential to reveal auspicious channels that are able to contribute to more equality.

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