Will money talk? Firm bribery and credit access

Shusen Qi

Abstract

Corruption constitutes a major obstacle to productivity and growth. This paper examines a microeconomic channel through bank lending whereby corruption constrains firms' access to credit. Firm-level information on bribery and credit access are utilised in a cross-country setting. The estimates demonstrate that credit access is tighter for firms that bribe more frequently. A one-point increase in bribery, for example, tightens firms' credit access by 7.8 per cent. This detrimental impact is mainly driven by supply-side rather than by demand-side factors, and is more pronounced when there are fewer foreign banks in the vicinity of the firm; or if the competition is very low or very high in the local banking market. Lastly, bribery also impedes firm growth, partially through the tightening of firms' credit access.

Keywords: Bribery, credit access, local banking structure

JEL Classification Number: G21, K42, O16

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1. Introduction

Corruption is found to significantly impede economic growth (Mauro, 1995) and investment (Rajan & Zingales, 1998; Wei, 2000) on the macro level. Corruption decreases firms' growth (Fisman & Svensson, 2007) and competitiveness (Gaviria, 2002) on the micro level. As bank credit is a major source of external finance and a driving force for economic growth (Levine, Loayza, & Beck, 2000), a well-functioning banking system can enhance the performance and productivity of the whole economy (Beck & Levine, 2004; Levine & Zervos, 1998). Therefore, it is fairly essential to investigate the firm-level impact of corruption on access to bank credit, which could potentially be a microeconomic channel for corruption to affect growth.[1]

Yet, despite its importance, only a few studies have investigated the impact of corruption on credit access and the results may be mixed and not definite. In this paper, I investigate the firm-level impact of bribery on credit access in a cross-country setting, with both firm-level measures of bribery and access to credit. The five essential ingredients in the identification strategy are, therefore: (i) the variation across firms in their credit access, to be explained by (ii) the variation across firms in bribery, and instrumented by (iii) the locality-sector average of bribery, and interacted with (iv) the variation in local banking structures, and accounting for (v) country, sector and wave fixed effects, as well as various firm and locality controls. All in all, the sample covers 12,006 firms across 22 transition countries from Europe, the Baltic States and the Caucasus from 2007 to 2014.[2]

I focus on transition countries as they are excellent settings for my study. First, most of the countries are greatly affected by corruption and many of them are moving aggressively to address this issue by introducing stricter regulations and anti-corruption laws (Fungáčová, Kochanova and Weill, 2015). Second, given the fact that the company law and creditor rights protections are relatively weak in these countries, how to deal with bribery is expected to be more important for banks operating there (Brown, Jappelli and Pagano, 2009). Lastly, these transition countries present considerable intra-country variation for both the credit market and the corruption practices during this period, which is essential for the identification.

The estimates demonstrate that credit access is tighter for firms that are more involved in bribery, which is also the case when firm bribery is instrumented by locality-sector average of bribery. The matching estimates demonstrate similar results, and the findings are robust in various alternative empirical settings. These findings are also economically relevant. For example, a one-point (or about a one standard deviation) increase in bribery tightens firms'

[1] Other channels have been presented by Pellegrini and Gerlagh (2004) and Mo (2010), including investment, trading, political stability and human capital.

[2] The 22 countries include: Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Estonia, Georgia, Hungary, Latvia, Lithuania, FYR Macedonia, Moldova, Montenegro, Poland, Romania, Serbia, Slovak Republic, Slovenia and Ukraine. Specifically, the data includes 153 firms in 2007, 4,613 firms in 2008, 757 firms in 2009, 398 firms in 2012, 5,919 firms in 2013, and 166 firms in 2014.

credit access by 7.8 per cent. The findings might be explained either by the law and finance theory that bureaucratic corruption induces greater uncertainty on banks' enforcement and claims, therefore discouraging banks from lending to the bribing firms, or by the information asymmetry theory that, due to adverse selection, only risky firms remain in the corrupted market so credit rationing occurs and banks do not want to take excessive risks by lending to these bribing firms. Furthermore, this detrimental impact is mainly driven by supply-side rather than demand-side factors. In other words, the impact is not predominately driven by firms being more willing to bribe if they need credit but by banks being less willing to lend to bribing firms. More specifically, this impact is less pronounced in localities with more foreign banks as they lack the knowledge to distinguish corrupted from uncorrupted firms and are less aware of the risks associated with corruption in the domestic markets; or if the competition among banks is either very low or very high, which might affect banks' risk-taking behaviour. Lastly, bribery is also found to impede firm growth, which is partially through the tightening of firms' credit access.

This paper contributes to the current literature in four dimensions. First, it utilises firm-level measures of both bribery and credit access, which allows me to identify the microeconomic impact of bribery on firms' credit access. Therefore, this paper overcomes the limitations of aggregate data at the country level, which ignores compositional changes within a country.[3]

Second, this paper contributes to identifying the impact of bribery in the sense that it better deals with the endogeneity issue, which is a major limitation in other studies. For example, this paper instruments firm bribery by the locality-sector average of bribery and utilises the matching estimates.

Third, this paper disentangles the supply-side and demand-side driving factors of the detrimental impact of bribery on credit access. Moreover, by matching bank branches with firms based on their geographical locations, this paper is also able to identify and estimate the supply-side impact of bribery on firms' credit access across different local banking structures.

Lastly, this paper, for the first time, presents a bank lending channel for corruption to impede economic growth, which is important to understand the mechanisms between corruption and growth.

This research is also fairly relevant from a policy perspective, as corruption has been a major challenge in transition countries and lots of countries are making intensive efforts to combat this issue. This paper gives the first useful insight into the microeconomic impact of bribery on firms' credit access, as well as on their growth. Specifically, bribery significantly tightens firms' credit access and hampers their economic growth. Therefore, combating corruption is fairly urgent and vital in order to restore both the credit market and economic growth. Furthermore, this detrimental impact is mainly driven by supply-side factors, including the

[3] To the best of my knowledge, Fungáčová, Kochanova and Weill (2015) is the only other cross-country paper that studies the impact of bribery on bank credit at the firm-level. They combine information on bribery from the Business Environment and Enterprise Performance Survey (BEEPS II, III, and IV) with firm-level accounting data on bank debt ratios from Amadeus.

local banking structures. These findings highlight the importance of cooperation among regulatory authorities to combat corruption. The banking market regulations, for example, on foreign bank entry, or on inter-bank competition, might exert a significant impact on the effectiveness of corruption regulations. In this sense, banking market regulations may exert noticeable externality regarding corruption, and this suggests that a broader framework should be incorporated in corruption regulations.

The paper proceeds as follows. Section 2 reviews the theoretical evidence on the impact of bribery. Section 3 discusses the data and defines the variables, Section 4 describes the methodology and section 5 demonstrates the empirical findings. Section 6 concludes.

2. The impact of bribery

Bribery can take place in a wide range of business settings, from dealing with taxes, courts, customs, licences, permits, regulations and services to applying for bank credit. This section reviews the theoretical linkage between bribery and firms' credit access under the bureaucratic framework and during the lending process, both with contradictory views.

If bribery is viewed broadly under the bureaucratic framework, it is expected to reduce bank credit based on the law and finance theory pioneered by La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1997). They report that better creditor protections are associated with larger and broader credit markets. Later on, Levine (1998, 1999), Djankov, McLiesh and Shleifer (2007), Bae and Goyal (2009) and Weill (2011) confirm that stronger creditor protection leads to more bank credit while poor law enforcement hampers bank credit. The intuition is that in case of loan default, the bank may wish to force repayment, grab collateral or even take control of the borrower. Consequently, creditor protections that empower banks to take such actions exert an influence on banks' lending behaviour. However, bureaucratic corruption can induce greater uncertainty on banks' claims and their enforcement actions against corrupted firms in case of loan default. Therefore, this decreased enforcement power against the defaulting borrowers diminishes banks' willingness to lend to bribing firms.

Information asymmetry, which may be quite severe in the lending process, may also play an important role. This is because banks may not be able to fully evaluate the risks associated with a certain borrower, where adverse selection occurs. Stiglitz and Weiss (1981) show that credit rationing occurs in the sense that rejected loan applicants cannot get a loan even if they offer to pay higher interest rates. This is because, due to adverse selection, only safe borrowers withdraw with higher interest rates, and the remaining borrowers are more likely to be a bigger risk. Similarly, when corruption is severe, due to adverse selection, only safe borrowers would withdraw and the remaining borrowers are riskier in general. For that reason, credit rationing occurs, which hampers bank lending.

However, as first explained by Leff (1964) and Leys (1965), corruption may also "grease the wheels". Specifically, in a second best world where institutions are all ill-functioning, bribery may be beneficial in the sense that bribery helps firms to circumvent inefficient institutions, thereby increasing efficiency and growth. Therefore, banks might be better off if they lend to these more efficient bribing firms.

Bribery may also take place during the lending process through bribing bank officials (Beck, Demirgüç-Kunt, Laeven and Maksimovic, 2006). On the one hand, bank officials might ask for a bribe to grant a loan. In this case, bribery acts as a tax on borrowers through an increasing cost of the loan, which decreases loan demand and reduces bank credit in general (Weill, 2011; Jõeveer, 2013). On the other hand, borrowers might offer a bribe to bank officials in order to get a loan. Bank officials might bias their behaviour towards their personal benefit and therefore corruption may increase bank credit as well (Fungáčová, Kochanova and Weill, 2015).

3. Data and variables

In order to empirically investigate the impact of bribery on credit access at the firm level in a cross-country setting, I utilise firm-level information on both bribery and credit access, and locality-level information on banking structures. Table 1 reports detailed variable definitions and data sources.

Table 1: Variable definitions and sources

Variable	Definitions	Sources
Firm-level		
Firm Bribery	= 1 to 6, higher values indicate more frequent involvement in bribery	BEEPS IV/V
Locality-sector Average of Bribery	= 1 to 6, locality-sector average of bribery	BEEPS IV/V
Firm Needs Bribe for a Loan	= 1 if a firm does not apply for any loan because it is necessary to bribe, = 0 otherwise	BEEPS IV/V
Financing Obstacle for Firm	= 1 to 4, higher values indicate more problematic access to credit	BEEPS IV/V
Credit Constraint of Firm	= 1 if a firm is credit constrained, = 0 otherwise	BEEPS IV/V
Firm Needs Credit	= 1 if a firm need credit in the last fiscal year, = 0 otherwise	BEEPS IV/V
Firm Growth	= 1 if a firm expects an increase in sales in the next fiscal year, = 0 otherwise	BEEPS IV/V
Foreign Firm	= 1 if more than 50 percent of the firm's shares are foreign owned, = 0 otherwise	BEEPS IV/V
Firm Innovation	= 1 if a firm introduced new or significantly improved products/services during last three years, = 0 otherwise	BEEPS IV/V
Firm Size	= 1 to 3, higher values indicate larger firm size	BEEPS IV/V
Audited Firm	= 1 if a firm is audited, = 0 otherwise	BEEPS IV/V
Female Managed Firm	= 1 if the top manager of a firm is female, = 0 otherwise	BEEPS IV/V
Sole Proprietorship Firm	= 1 if a firm is a sole proprietorship, = 0 otherwise	BEEPS IV/V
Publicly Listed Firm	= 1 if a firm is publicly listed, = 0 otherwise	BEEPS IV/V
Privatised Firm	= 1 if a firm is privatised from state-owned enterprise, = 0 otherwise	BEEPS IV/V
Locality-level: within City		
Share of Foreign Banks	Share of foreign bank branches within the same city or town of the firm	BEPS II
Share of Relationship Banks	Share of relationship bank branches within the same city or town of the firm	BEPS II
Herfindahl-Hirschmann Index	Herfindahl-Hirschmann Index of banks within the same city or town of the firm	BEPS II
Locality-level: within Circle		
Share of Foreign Banks	Share of foreign bank branches within a radius of 10 kilometers around the firm	BEPS II
Share of Relationship Banks	Share of relationship bank branches within a radius of 10 kilometers around the firm	BEPS II
Herfindahl-Hirschmann Index	Herfindahl-Hirschmann Index of banks within a radius of 10 kilometers around the firm	BEPS II

Source: BEEPS IV/V and BEPS II

Notes: This table includes the variable definitions and sources. BEEPS IV and V are the fourth and fifth wave of the Business Environment and Enterprise Performance Survey (BEEPS) conducted in 2008-09 and 2012-14. BEPS II is the second round of the EBRD Banking Environment and Performance Survey (BEPS).

3.1 Firm-level variables

Firm-level data are obtained from the fourth and fifth waves of the Business Environment and Enterprise Performance Survey (BEEPS IV and V), which is conducted jointly by the European Bank for Reconstruction and Development (EBRD) and the World Bank. This survey consists of a representative sample of firms from transition countries in Europe, the Baltic States and the Caucasus. BEEPS IV was conducted in 2008-09, and BEEPS V in 2012-14. These two waves of the survey provide the most detailed information on firm bribery and their credit access, with a high degree of consistency in their survey designs. BEEPS consists of a representative sample of firms from transition countries in Europe, the Baltic States and the Caucasus, and covers a broad range of business environment aspects as far as credit access and bribery practices are concerned. The final sample covers 12,006 firms in total, including 5,523 firms from BEEPS IV and 6,483 firms from BEEPS V, across 22 transition countries.

To measure firms' bribery behaviour (*Firm Bribery*), I follow Fungáčová, Kochanova and Weill (2015) in using BEEPS question Q39:

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

Firms' responses are captured in a categorical variable ranging from 1 to 6, where higher values correspond to more frequent involvement in bribery. In order to deal with perception biases, the BEEPS survey poses this non-self-incriminating question to elicit the desired information. Obviously, a firm observes its own bribery and is very unlikely to have any direct information on the bribery of other firms in its line of business. So the response to this question is very likely to be informed by its own bribery level (Joulfaian, 2009).

This question measures the bureaucratic bribery in a broad sense, but not bribery practices during the lending process. There is almost zero correlation (equals -0.013 and insignificant) between *Firm Bribery* and the response "It is necessary to make informal payments to get bank loans" to BEEPS question K17: "What was the main reason the establishment did not apply for any line of credit or loan in the last fiscal year?" (*Firm Needs Bribe for a Loan*). *Firm Needs Bribe for a Loan* also shows no correlation with firms' credit access. Lastly, only 0.9 per cent of firms choose this option as the main reason for not applying for any line of credit or loan last year, indicating that corruption is not a major deterrent during the lending process in these countries.

Firm Bribery measures broad bureaucratic corruption, and then the question is whether banks can observe these bribery behaviours and act accordingly. Being involved in local networks of business and government, and the experience in the domestic markets could grant banks the ability to distinguish between corrupted and uncorrupted firms. For example, if obtaining an import licence takes six months on average in a corrupted locality, it is very likely that a

firm has bribed government officials if the firm obtains the licence within a month. Even if the banks cannot tell precisely which firms are corrupted, a bank may at least have some knowledge if a certain type of firm in a certain industry in a certain locality is more corrupted. Similar to the Stiglitz and Weiss (1981) argument, adverse selection only excludes safe borrowers from these corrupted markets and credit rationing occurs, in that banks do not want to lend to firms in these markets because the firms are likely to be riskier.

To measure firms' credit access (*Financing Obstacle for Firm*), I first follow Brown, Jappelli, and Pagano (2009) to utilise BEEPS question K30: "Is access to finance, which includes availability and cost, interest rates, fees and collateral requirements, No Obstacle, a Minor Obstacle, a Moderate Obstacle, or a Major Obstacle to the current operations of this establishment?". Firms' responses are coded on a scale from 1 to 4, where higher values correspond to more financing obstacles. This measure captures firms' perception about their own credit access and could disentangle the confounding effect of credit demand and credit access, which is a common problem in using firms' bank debt ratio as the dependent variable. It represents a full sample of firms and can distinguish between firms that do not need credit and those that are actually discouraged from applying credit. Furthermore, as empirically established by Hainz and Nabokin (2013), this perception-based measure of credit access is "surprisingly precise".

Financing Obstacle for Firm may be criticised for being mainly based on firms' perceptions instead of practices.[4] To overcome this argument, I also utilise a practical-based measure of firms' credit access, *Credit Constraint of Firm*, as indicated by Popov and Udell (2012) and Beck, Degryse, De Haas and Van Horen (2015) as the robustness check. Specifically, I employ BEEPS question K16: "Did the establishment apply for any loans or lines of credit in the last fiscal year?" For firms that answer "No", I move to question K17, which asks: "What was the main reason the establishment did not apply for any line of credit or loan in the last fiscal year?" For firms that answer "Yes", the question K18a subsequently asks: "In the last fiscal year, did this establishment apply for any new loans or new credit lines that were rejected?" I classify firms that answer both "Yes" to K16 and "No" to K18a as credit unconstrained, and firms are constrained if they either answer "Yes" to K18a or answer "Interest rates are not favorable"; "Collateral requirements are too high"; "Size of loan and maturity are insufficient"; or "Did not think it would be approved" to question K17. This strategy allows me to measure firms' credit access in practice and also differentiate between firms that do not apply for any loan because they do not need one and those that do not apply because they are discouraged.

This paper uses *Financing Obstacle for Firm* rather than *Credit Constraint of Firm* as the primary measure for firms' credit access for two reasons. First, selection bias might exist in *Credit Constraint of Firm*, in the sense that it is only observable if the firm needs credit in the last fiscal year. But the perception-based measure, *Financing Obstacle for Firm*, can reveal the credit access situation for a full sample of firms, including firms that do not need a loan in

[4] Firms' perceptions about credit access are most likely to be formed based on their practices, in this sense, perceptions can truthfully reveal firms' credit access situation in practice.

the last fiscal year. Intuitively, assume if a firm gets a loan just before the last fiscal year, but with a lot of difficulties, then this firm may not need a loan in the last year and cannot be captured by *Credit Constraint of Firm*. However, this firm appears to have very limited access to credit in reality, which can be measured with the self-reported *Financing Obstacle for Firm*. Second, *Financing Obstacle for Firm* provides more variation than *Credit Constraint of Firm* in measuring the degree of firms' credit access. For example, assume there are two firms, A and B, and both firms apply for two loans. For firm A, one application is approved and the other is rejected, while both applications are rejected for firm B. In the context of *Credit Constraint of Firm*, both firm A and firm B are classified as credit constrained and are treated as the same. However, in reality, firm B is more credit constrained than firm A. This difference cannot be reflected by *Credit Constraint of Firm* but can be possibly revealed by *Financing Obstacle for Firm* that, for example, firm A self-selects into "a Minor Obstacle" and firm B enters "a Major Obstacle".

I also construct other firm-level variables using BEEPS. *Firm Needs Credit* is equal to 0 if a firm answers "Do not need a loan" to K17: "What was the main reason the establishment did not apply for any line of credit or loan in the last fiscal year?" Expected future growth of the firm is measured by the question S.1a: "In the next fiscal year, do you expect this establishment's annual sales to increase, stay the same or decrease?" *Firm Growth* dummy is equal to 1 if a firm answers "Increase" and 0 otherwise. *Foreign Firm* is defined if more than 50 per cent of the firm's shares are foreign-owned. *Firm Innovation* is equal to 1 if a firm introduces new or significantly improved products or services during the last three years (excluding the simple resale of new goods purchased from others and changes of a sole aesthetic nature). A set of commonly used control variables are also included. Specifically, I include *Firm Size*, which is classified into small (0-19 employees), medium (20-99 employees) and large (100+ employees) firms based on the number of permanent full-time employees. Based on whether firms' annual financial statements are checked and certified by an external auditor, a firm is classified into audited and unaudited firms (*Audited Firm*). *Female Managed Firm* measures whether the top manager of a firm is female. Firm ownerships are also included, including whether a firm is a *Sole Proprietorship Firm*; is a *Publicly Listed Firm*; and is a *Privatised Firm* from a former state-owned enterprise.

3.2 Locality-level variables

For locality-level variables – that is, the local banking structures – I turn to the second round of the Banking Environment and Performance Survey (BEPS II), jointly undertaken by the EBRD and Tilburg University. I obtain bank information on both their ownerships (foreign versus domestic) and lending techniques (relationship versus transaction lending). As part of BEPS II, a specialised team of consultants further collected the geographical coordinates and the establishment dates of all bank branches across the sample countries. The survey collected both contemporaneous and historical information on branch locations, which allows me to paint a gradually changing picture of the branch landscape.

Following Beck, Degryse, De Haas and Van Horen (2015), I connect the firm and branch data in two ways. First, I match firms and bank branches by locality (city or town). The underlying assumption is that a firm has access to all bank branches in the locality where it operates. Second, I draw a circle with a radius that equals 10 km around the geo-coordinates of each firm and link the firm to only those bank branches inside that circle.[5] After matching (identifying the bank branches that surround each firm), I construct variables at the locality (or circle) level that measure the key characteristics of these banks, namely *Share of Foreign Banks*, *Share of Relationship Banks*[6] and *Herfindahl-Hirschmann Index*. All of these locality-level variables are averages that are weighted by the number of branches a bank operates within a locality or circle. This enables me to distinguish between firms that are surrounded by foreign versus domestic banks and relationship versus transaction banks, as well as firms in banking markets where competition is either very low or very high.

3.3 Summary statistics

Table 2 shows the summary statistics for the full sample, as well as for BEEPS IV and BEEPS V separately. Starting with the firm-level variables, it shows that on average, access to finance is a minor or moderate obstacle to firms and this obstacle is most severe during the financial crisis. These numbers point to a substantial tightening of bank credit during the crisis that peaks in 2008-09 at 2.46. Regarding credit access in practice, 33 per cent of firms who need a loan are credit constrained in general and this number increases over time (from 30 per cent in 2008-09 to 36 per cent in 2012-14). However, there are fewer firms needing credit over time. Specifically, 62 per cent of firms needed credit in 2008-09 and only 49 per cent did in 2012-14. Therefore, credit demand declines but credit access tightens. What's more, firms are less frequently involved in bribery over time, indicating better control of corruption in transition countries. Specifically, *Firm Bribery* drops from 2.03 in 2008-09 to 1.88 in 2012-14.

[5] I also draw a circle with a radius of 5 km and the results are very similar.

[6] To distinguish between relationship banks and transaction banks, I follow Beck, Degryse, De Haas and Van Horen (2015) methodology. Specifically, I use the Banking Environment and Performance Survey (BEPS) question where CEOs were asked to rate on a five-point scale the importance of the following techniques when dealing with SMEs or large enterprises: relationship lending; fundamental and cash-flow analysis; business collateral; and personal collateral. I categorise banks that find relationship lending "very important" for both SMEs and large enterprises as relationship banks and banks that consider it only "important" or "neither important nor unimportant" as transactional banks.

Table 2: Summary statistics

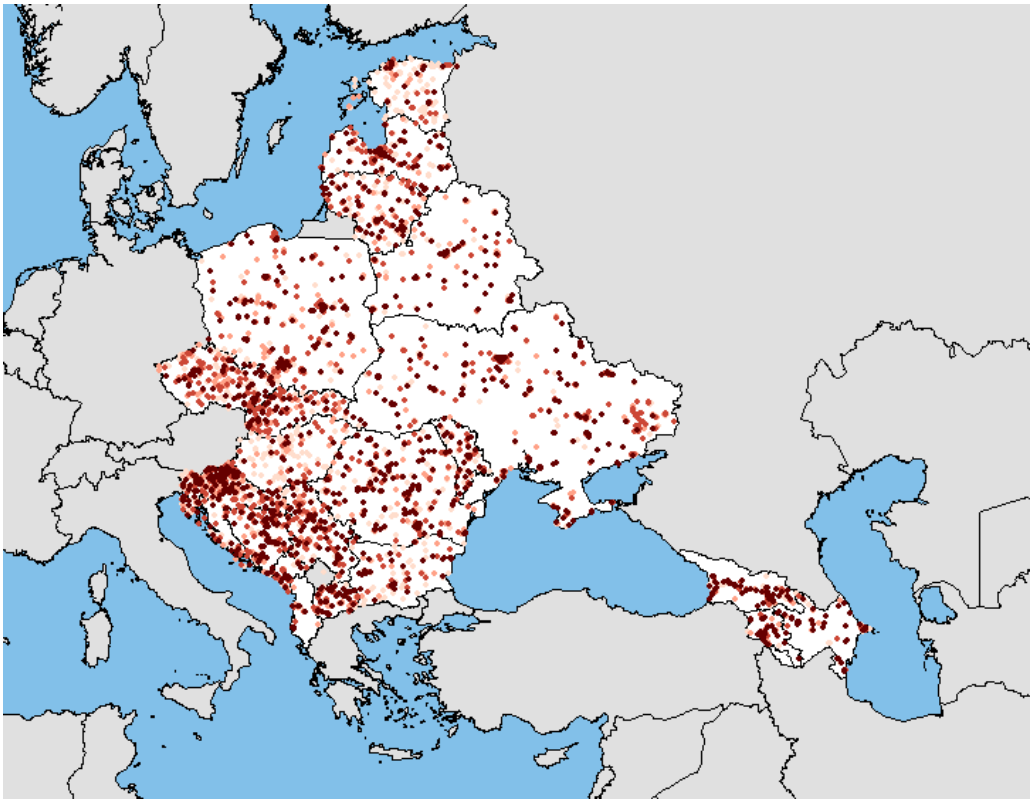
Variable	Full sample					BEEPS IV in 2008-09					BEEPS V in 2012-14				
	Obs.	Mean	Std.	Min.	Max.	Obs.	Mean	Std.	Min.	Max.	Obs.	Mean	Std.	Min.	Max.
Firm-level															
Firm Bribery	12,006	1.95	1.18	1	6	5,523	2.03	1.26	1	6	6,483	1.88	1.11	1	6
Locality-sector Average of Bribery	12,006	1.95	0.77	1	6	5,523	2.03	0.89	1	6	6,483	1.88	0.81	1	6
Firm Needs Bribe for a Loan	2,426	0.01	0.10	0	1	1,012	0.01	0.11	0	1	1,414	0.01	0.08	0	1
Financing Obstacle for Firm	12,006	2.26	1.18	1	4	5,523	2.46	1.18	1	4	6,483	2.08	1.15	1	4
Credit Constraint of Firm	6,590	0.33	0.47	0	1	3,449	0.30	0.46	0	1	3,141	0.36	0.48	0	1
Firm Needs Credit	12,006	0.55	0.50	0	1	5,523	0.62	0.48	0	1	6,361	0.49	0.50	0	1
Firm Growth	5,976	0.47	0.50	0	1	1,468	0.49	0.50	0	1	4,508	0.46	0.50	0	1
Foreign Firm	12,006	0.08	0.28	0	1	5,523	0.10	0.29	0	1	6,483	0.07	0.26	0	1
Firm Innovation	12,006	0.41	0.49	0	1	5,523	0.57	0.49	0	1	6,483	0.27	0.44	0	1
Firm Size	12,006	1.68	0.76	1	3	5,523	1.87	0.80	1	3	6,483	1.53	0.70	1	3
Audited Firm	12,006	0.42	0.49	0	1	5,523	0.48	0.50	0	1	6,483	0.36	0.48	0	1
Female Managed Firm	12,006	0.21	0.40	0	1	5,523	0.20	0.40	0	1	6,483	0.21	0.41	0	1
Sole Proprietorship Firm	12,006	0.14	0.35	0	1	5,523	0.17	0.38	0	1	6,483	0.11	0.31	0	1
Publicly Listed Firm	12,006	0.06	0.25	0	1	5,523	0.12	0.32	0	1	6,483	0.02	0.14	0	1
Privatised Firm	12,006	0.15	0.36	0	1	5,523	0.20	0.40	0	1	6,483	0.11	0.31	0	1
Locality-level: within City															
Share of Foreign Banks	12,006	0.54	0.31	0	1	5,523	0.55	0.30	0	1	6,483	0.53	0.31	0	1
Share of Relationship Banks	12,006	0.38	0.23	0	1	5,523	0.38	0.23	0	1	6,483	0.37	0.24	0	1
Herfindahl-Hirschmann Index	12,006	0.15	0.17	0	1	5,523	0.15	0.17	0	1	6,483	0.14	0.17	0	1
Locality-level: within Circle															
Share of Foreign Banks	12,006	0.58	0.28	0	1	5,523	0.58	0.28	0	1	6,483	0.59	0.28	0	1
Share of Relationship Banks	12,006	0.41	0.21	0	1	5,523	0.41	0.21	0	1	6,483	0.41	0.22	0	1
Herfindahl-Hirschmann Index	12,006	0.16	0.16	0	1	5,523	0.16	0.17	0	1	6,483	0.16	0.15	0	1

Source: BEEPS IV/V and BEPS II.

Notes: This table reports the summary statistics for the firm-level and locality-level variables for the full sample, as well as for BEEPS IV and V separately. Definitions and sources of the variables are provided in Table 1.

Behind these averages lies substantial variation across firms within each country (see charts 1 and 2). Each dot represents an individual firm in the sample. Darker red indicates more tightened access to credit and more frequent involvement in bribery. For that reason, these transition countries serve as the great setting for my analysis that both corruption and credit access demonstrate substantial variations on the firm level, which is essential for the identification.

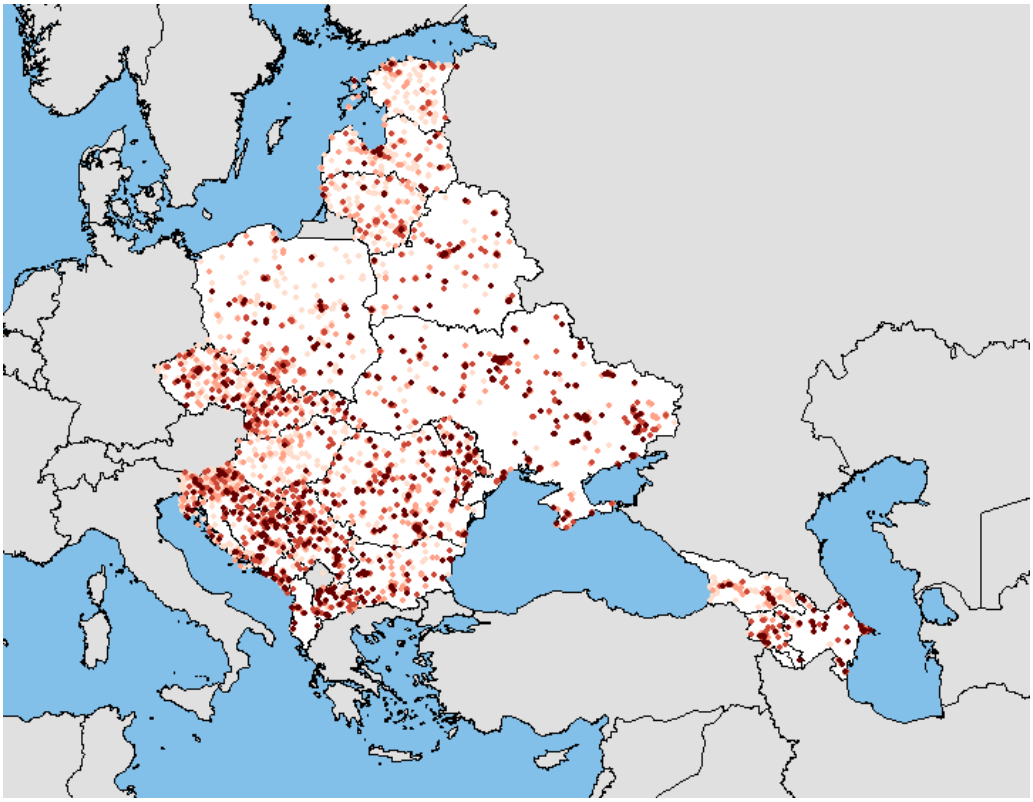
Chart 1: Heat map of financing obstacles for firms



Source: BEEPS IV/V

Notes: This heat map reports the financing obstacle for all firms in the sample. Darker red indicates more severe financing obstacles for a firm, and vice versa.

Chart 2: Heat map of firm bribery



Source: BEEPS IV/V

Notes: This heat map reports the bribery of all firms in the sample. Darker red indicates a firm bribing more frequent, and vice versa.

On the locality level, foreign ownership of banks is a key characteristic of the banking sector in transition countries. Following privatisation policies, the market share of foreign banks is rather high in these transition countries. At the locality level or 10 km circle level, more than 50 per cent of all the bank branches are foreign-owned. The share of relationship banks is 38 per cent in general and stays quite stable over time at the locality level, which indicates that both relationship lending and transaction lending are important lending techniques used by banks in these countries. The Herfindahl-Hirschman Index stays around 0.15, indicating that the banking markets are moderately concentrated in these countries. The statistics and patterns remain similar and consistent no matter how the firms are matched with the bank branches (either within the same locality or within a 10 km circle). Therefore, from what the data can tell, no systemic change occurs in the banking structures during and after the crisis.

4. Methodology

In order to estimate and identify the causal impact of bribery on a firm's access to credit, I start by regressing *Financing Obstacle for Firm* on *Firm Bribery* while accounting for the country, sector and wave fixed effects, as well as other related firm-level and locality-level controls. Specifically, I estimate by OLS regression models of the form:

$$Financing\ Obstacle\ for\ Firm_i =$$

$$\alpha_c + \alpha_s + \alpha_w + \beta Firm\ Bribery_i + \gamma X_i + \delta Y_l + \varepsilon_i \quad (1)$$

where *i* indexes firms, *c* indexes countries, *s* indexes industry sectors, *l* indexes localities and *w* indexes BEEPS waves. *Financing Obstacle for Firm* measures the extent to which access to credit is an obstacle for the operation of the firm. *Firm Bribery* measures how frequent firms are involved in bribery. α_c, α_s and α_w are the country, sector and wave fixed effects, to control for all the unobserved country, sector and wave specific characteristics. α_{cs}, α_{cw} and α_{sw}, which stand for country-sector, country-wave and sector-wave fixed effects, are also included in some regression specifications to more strictly control for the unobservable characteristics at lower levels. Moreover, these fixed effects also control for country-specific, sector-specific and year-specific credit shocks, which may otherwise bias the estimates. *X* represents firm-level control variables including *Firm Size*, *Audited Firm, Female Managed Firm, Sole Proprietorship Firm, Publicly Listed Firm* and *Privatised Firm*. Y shows locality-level controls as *Share of Foreign Banks, Share of Relationship Banks* and *Herfindahl-Hirschmann Index.* ε is the error term. Robust standard errors are clustered at the country-sector level. The main coefficient of interest is β, which identifies the causal impact of bribery on firms' credit access.

In order to tackle the potential endogeneity issue, I then follow Fisman and Svensson (2007) to instrument *Firm Bribery* by *Locality-sector Average of Bribery*. For each individual firm, *Firm Bribery* is averaged across all other firms within the same locality and the same sector, but excludes the firm itself.[7] *Locality-sector Average of Bribery* is rather exogenous and is very likely to be determined by the underlying technologies or business modes of the sector and the rent extraction inclinations or talents of the bureaucrats, which is exogenous to the firm. For instance, such sector-specific factors include the extent to which the sector is reliant on imports or exports, and the dependence of public goods and services. Similarly, rent extraction through bribery might differ across localities simply because some bureaucrats are more effective at extracting bribes than others. Bribery also tends to be more common in markets with ill-functioning institutions. So instrumenting *Firm Bribery* by *Locality-sector Average of Bribery* can get rid of the omitted unobservables that are correlated with bribery at the firm, but not the locality-sector, level.

[7] For locality sectors with only one single firm, this firm is dropped from the instrumental regression, as it is meaningless to instrument a firm by itself. Specifically, 2,556 out of 12,006 firms are single in a locality sector, which are dropped out of sample. On average, there are 26 other firms within each locality sector.

Matching estimates are further employed to match out the related firm characteristics, as well as other omitted drivers at the country (locality), sector and wave (year) level (Ioannidou and Ongena, 2010). Specifically, I use exact matching to match each bribing firm with all similar non-bribing firms based on various sets of variables, and the average treatment effect for the treated (bribing firms) is reported accordingly. A bribing firm is defined if *Firm Bribery* is ranging between 4 and 6. A significantly positive difference in firms' credit access between bribing and non-bribing firms would suggest that credit access is more limited for the bribing firms, or in other words, bribery limits firms' credit access. I match on the same set of firm characteristics as in the regression analysis, as well as on country (locality), sector and wave (year).

A set of robustness checks is also examined to further pin down the causal impact of bribery on firms' credit access, including stricter control of the clustering strategy and fixed effects. Specific analysis on different types of firms is implemented to rule out other possible causal impacts. Finally, a small panel is established based on the set of firms participating in both waves of the BEEPS survey, where I can include the firm fixed effects to control for all the time-invariant firm-specific characteristics that may drive the results.

Significant coefficient estimates in model (1) can be explained either by firms being more willing to bribe as they need more credit or by banks being less willing to lend to bribing firms. Therefore, in order to disentangle between supply and demand effects, I investigate if the impact of bribery on firms' credit access varies between firms with or without demand for credit in the last fiscal year, namely *Firm Needs Credit*. Intuitively, if a firm needs a loan in the last fiscal year, this firm is more likely to bribe, and at the same time, is also more likely to encounter tighter credit access. This methodology has been used by Beck & Brown (2015) in order to disentangle the supply and demand effects for household credit. The following model is estimated:

$$Financing\ Obstacle\ for\ Firm_i = \alpha_c + \alpha_s + \alpha_w + \beta_1 Firm\ Bribery_i +$$

$$\beta_2 Firm\ Bribery_i * Firm\ Needs\ Credit_i + \beta_3 Firm\ Needs\ Credit_i + \gamma X_i + \delta Y_l + \varepsilon_i \qquad (2)$$

where *Firm Needs Credit* specifies whether a firm needs any credit in the last fiscal year. β_1 estimates the baseline impact of bribery on firms' credit access. If the estimates in model (1) are not predominantly driven by demand-side factors, then an insignificant estimate of β_2 is expected. Country, sector and wave fixed effects, as well as the same set of controls, are included, and robust standard errors are clustered at the country-sector level.

Then I focus on the supply-side of credit, namely, does the impact of bribery on firms' credit access vary across different local banking structures in the vicinity of the firm, and if yes, which effects are more pronounced? The intuition is that different types of banks may differ in credit supply, and may also discriminate certain type of borrowers – that is bribing firms – and cherry-pick their preferred clients. For example, Popov and Udell (2012) present that banking market conditions could exert a strong impact on firms' credit access. Beck and Brown (2015) document that, for instance, foreign banks might cherry-pick financially more

transparent clients in the retail credit market. Therefore, various local banking structures in the vicinity of the firm might differentiate credit supply to the bribing firms, and shape the relationship between bribery and credit access differently.

Specifically, I focus on three aspects of the local banking markets, including *Share of Foreign Banks*, *Share of Relationship Banks* and *Herfindahl-Hirschmann Index*. Foreign banks have been shown to exert significant impacts on credit supply and demand. For example, at the bank level, De Haas and Van Lelyveld (2006) show that during a crisis, domestic banks contract their credit base while foreign banks do not, while at the firm level, Brown, Ongena, Popov and Yeşin (2011) find that foreign bank presence discourages firms from applying for a loan but does not lead to stricter loan approval decisions. Furthermore, foreign banks are more likely to cherry-pick transparent firms, which may in turn lead to lower average lending rates (Degryse, Havrylchyk, Jurzyk and Kozak, 2012). Finally, foreign banks are important for credit access. Clarke, Cull and Peria (2006) find a positive link between access to credit and foreign bank presence. However, Beck and Peria (2010) indicate that foreign bank participation only benefits rich and urban areas. Regarding bribery, the stronger control of employees inside foreign banks and the presence of foreign managers result in less involvement in domestic networks. For that reason, foreign banks are less able to distinguish between corrupted and uncorrupted firms, compared with domestic banks. At the same time, foreign banks may also be less aware of the risks associated with corruption in the domestic market.

Bank lending techniques also affect firms' access to credit, as has been shown both theoretically (Berger and Udell, 2002) and empirically (Cole, 1998; Elsas and Krahnen, 1998). For example, relationship banks are found to be able to expand credit supply, especially during a financial crisis (Beck, Degryse, De Haas and Van Horen, 2015; Bolton, Freixas, Gambacorta and Mistrulli, 2016). Transaction banks rely more on collateral and hard information, while relationship banks do the opposite, repeatedly interacting with customers in order to obtain the proprietary customer-specific information, which requires softer information and more subtle judgements (Boot, 2000). When it comes to bribery, relationship lenders might be better at differentiating between corrupted and uncorrupted firms. However, relationship banks themselves may also be more prone to corruption and leave more room for bribery.

Competition in the banking market is essential for economic growth (Cetorelli and Gambera, 2001), efficiency (Bertrand, Schoar and Thesmar, 2007) and stability (Beck, De Jonghe and Schepens, 2013; Bekaert, Harvey, Lundblad and Siegel, 2013). More closely, Dick and Lehnert (2010) document that increased competition among banks expands credit supply based on the experience of the relaxation of entry restrictions in the United States. Likewise, in states with higher interstate branch openness, firms are more likely to borrow at lower rates (Rice & Strahan, 2010). Beck, Demirguc-Kunt and Maksimovic (2004) show empirical evidence that firms in concentrated bank markets have less access to credit while Guzman (2000) provides the theoretical mechanisms. Market competition also induces bank flight to captivity (Dell'Ariccia and Marquez, 2004). Importantly, Martinez-Miera and Repullo (2010)

theoretically show a U-shaped relationship between competition and the risk of bank failure, that is, the risk of bank failure is higher when competition is either very low or very high. As a result, to circumvent excessive risk-taking and to maintain solvent, banks might be more conservative and less willing to lend to bribing firms when competition is very low or very high.

To explicitly examine the impact from the supply-side, bribery is interacted seperately with one of the three measures of the local banking structures around the vicinity of the firm and the following regression is estimated:

$$Financing\ Obstacle\ for\ Firm_i = \alpha_c + \alpha_s + \alpha_w + \beta_1 Firm\ Bribery_i + \beta_2 Firm\ Bribery_i$$

$$* Local\ Banking\ Structure_l + \beta_3 Local\ Banking\ Structure_l + \gamma X_i + \delta Y_l + \varepsilon_i \quad (3)$$

where *Local Banking Structure* represents the local banking structures, including *Share of Foreign Banks, Share of Relationship Banks* and *Herfindahl-Hirschmann Index*. β_1 estimates the baseline impact of bribery on credit access and β_2 gives the estimates of additional supply-side impact across various local banking structures. Again, country, sector and wave fixed effects, as well as the same set of firm and locality controls, are included and robust standard errors are clustered at the country-sector level.

Finally, as shown by literature, corruption significantly obstructs economic growth on both the macro and micro level. Based on the experience of the Asian crisis, Rajan and Zingales (1998) indicate that a relationship-based economic system, which includes corruption behaviours, can hold back investment and economic growth. More recently, Fisman and Svensson (2007) find firm-level evidence that corruption would result in lower firm growth. So it is interesting to investigate the economic outcomes of bribery – that is, firm growth. Furthermore, as shown by Pellegrini and Gerlagh (2004) and Mo (2010), corruption affects economic growth through various channels including investment, trading, political stability and human capital. This paper, for the first time, provides a microeconomic channel through bank lending for corruption to affect firm growth. Therefore, this paper explicitly tests if part of the impact of bribery on firm growth can be explained by the tightening of firm access to credit. In order to verify these two hypotheses, the following model is used:

$$Firm\ Growth_i = \alpha_c + \alpha_s + \alpha_w +$$

$$\beta_1 Firm\ Bribery_i + \beta_2 Financing\ Obstacle\ for\ Firm_i + \gamma X_i + \delta Y_l + \varepsilon_i \quad (4)$$

The above model is first estimated excluding *Financing Obstacle for Firm* and β_1 captures the general impact of bribery on firm growth. Then *Financing Obstacle for Firm* is included in the regression estimates. In this setting, β_1 captures the impact of bribery on firm growth through other channels than the bank lending channel and β_2 demonstrates the impact of bank lending on firm growth. The bank lending channel for bribery to affect firm growth is verified if β_2 enters significantly negative and if the magnitude of β_1 decreases. The same set of fixed effects, clustering and control variables are utilised.

5. Results

In accordance with the empirical settings in section 4, I start with the baseline estimates in model (1), which is followed by various empirical settings to pin down the causal impact of bribery on firm credit access. Afterwards, I disentangle the supply and demand effects by estimating model (2). Furthermore, the supply-side impact of local banking structures in the vicinity of the firm is estimated by model (3). Finally, real economic outcomes of bribery are analysed in model (4), as well as the bank lending channel for bribery to affect firm growth.

5.1 Baseline estimates

This section shows the baseline estimates regarding the impact of bribery on firms' credit access, starting from Table 3. *Financing Obstacle for Firm* is the dependent variable, and the robust standard errors are clustered at the country-sector level. Column (1) starts with the most basic specification that only includes *Firm Bribery* as the sole explanatory variable. In columns (2) and (3), firm-level and locality-level control variables are included respectively. The country, sector and wave fixed effects are included in column (4) while country-sector, country-wave and sector-wave fixed effects are specified in column (5). These two sets of fixed effects account for the time-invariant omitted unobservables at these levels, as well as country, sector or wave-specific credit supply shocks. Across all specifications the estimates endorse that bribery significantly tightens firms' access to credit, where the impact is also economically relevant. For example, in column (4), which is in accordance with model (1), a one-point (or approximately a one standard deviation) increase in bribery tightens firms' credit access by 7.8 per cent compared with its mean.

Table 3: Baseline estimates

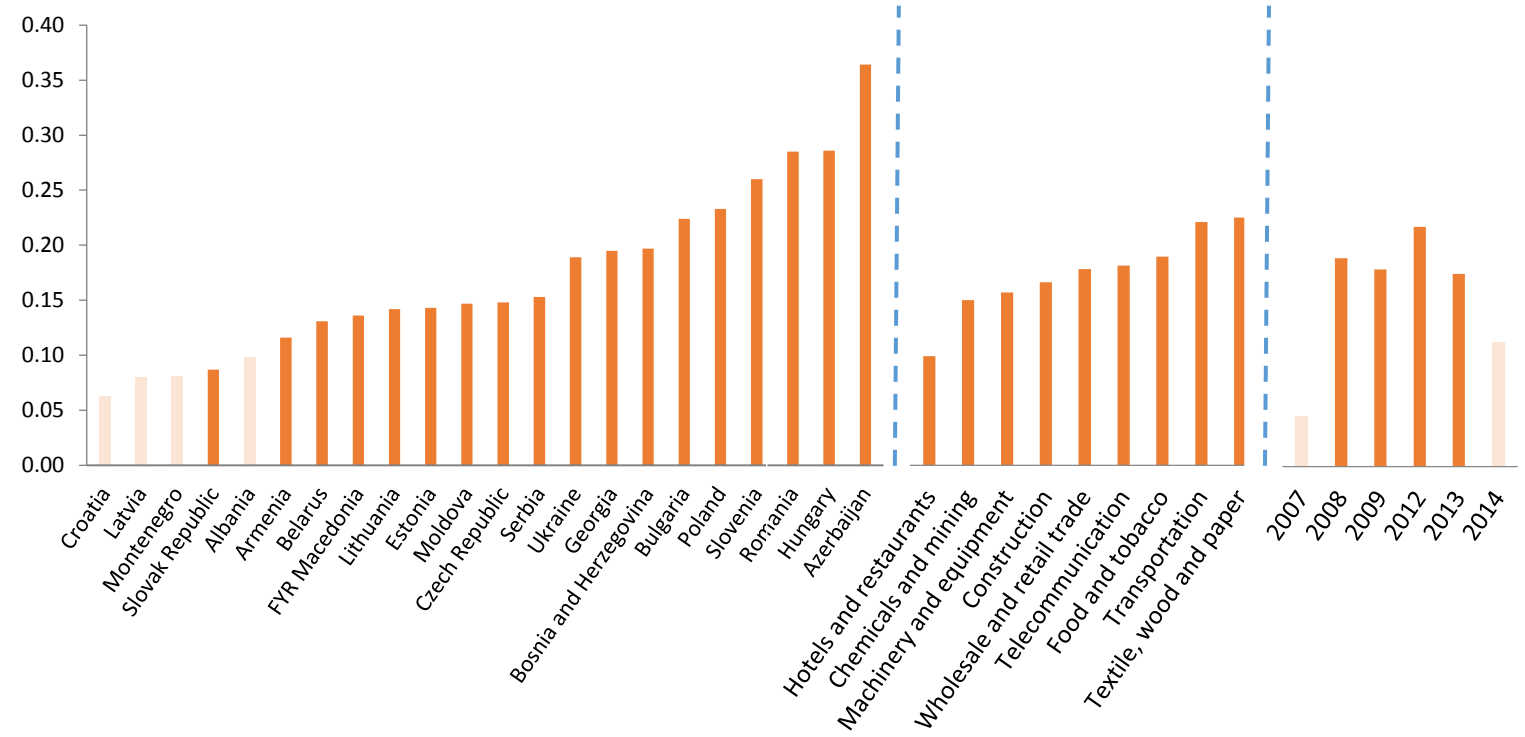
Dependent Variable	Financing Obstacle for Firm				
Model	(1)	(2)	(3)	(4)	(5)
Firm Bribery	0.208***	0.206***	0.207***	0.176***	0.179***
	[0.013]	[0.012]	[0.012]	[0.012]	[0.012]
Firm Size		0.019	0.019	-0.049***	-0.046**
		[0.020]	[0.020]	[0.018]	[0.019]
Audited Firm		-0.048	-0.046	-0.018	0.001
		[0.029]	[0.029]	[0.028]	[0.029]
Female Managed Firm		-0.037	-0.039	-0.013	-0.010
		[0.030]	[0.030]	[0.026]	[0.026]
Sole Proprietorship Firm		0.121***	0.118***	0.035	0.042
		[0.039]	[0.039]	[0.034]	[0.034]
Publicly Listed Firm		0.197***	0.199***	0.105**	0.062
		[0.060]	[0.060]	[0.050]	[0.051]
Privatised Firm		0.078*	0.072*	0.015	0.015
		[0.041]	[0.041]	[0.035]	[0.034]
Share of Foreign Banks			0.006	-0.064	-0.072
			[0.065]	[0.072]	[0.074]
Share of Relationship Banks			-0.129	-0.002	0.029
			[0.079]	[0.097]	[0.100]
Herfindahl-Hirschmann Index			0.075	0.103*	0.092
			[0.069]	[0.062]	[0.063]
Country Fixed Effects	No	No	No	Yes	No
Sector Fixed Effects	No	No	No	Yes	No
Wave Fixed Effects	No	No	No	Yes	No
Country*Sector Fixed Effects	No	No	No	No	Yes
Country*Wave Fixed Effects	No	No	No	No	Yes
Sector*Wave Fixed Effects	No	No	No	No	Yes
R-squared	0.043	0.047	0.048	0.102	0.128
Observations	12,006	12,006	12,006	12,006	12,006

Source: author's calculations.

Notes: This table reports the baseline estimates. Table 1 contains all definitions and Table 2 the summary statistics for each included variable. Coefficients are listed in the first row, robust country*sector clustered standard errors are reported below in the brackets, and the corresponding significance levels are placed adjacently. *** significant at 1%, ** significant at 5%, * significant at 10%.

The impact is not driven by a specific country, sector or year, as shown in Chart 3. To be more specific, the baseline impact of bribery on credit access is estimated separately for each country, sector and year. The height of bars shows the magnitude of the coefficient of *Firm Bribery* and the coefficients that are significantly different from zero at the 10 per cent level have darker shades. I find a significantly positive relationship between *Firm Bribery* and *Financing Obstacle for Firm* for most of the countries and years, as well as for all the sectors.

Chart 3: Impact of bribery on credit access by country, sector and year



Source: author's calculations.

Notes: This chart contains information on the relationship between bribery and access to credit across countries, sectors and years in the sample. In the chart, the height of the bars shows the magnitude of the coefficient of *Firm Bribery* when regressing *Financing Obstacle for Firm* on *Firm Bribery* under baseline regression for each country, sector or year separately. The bars are sorted from low to high and the country, sector and year labels are mentioned on the x-axis. The coefficients that are significantly different from zero at the 10 per cent level have a darker shade.

5.2 Robustness estimates

Several robustness checks are examined to mitigate the endogeneity issue, and to pin down causality in the baseline regressions. I start with Table 4 where *Firm Bribery* is instrumented by *Locality-sector Average of Bribery*. The second-stage estimates are presented in columns (1) and (2), and columns (3) and (4) display the corresponding first-stage results. Reduced form estimates are reported in columns (5) and (6). The estimates in the first-stage confirm that *Firm Bribery* is significantly positively correlated with *Locality-sector Average of Bribery*. Intuitively, a firm that is operating in a corrupted sector or is based in a corrupted locality is more likely to bribe. The reduced form estimates suggest that the instrument is relevant in the sense that firms' access to credit is more limited for firms that operate in a more corrupted environment. I further test the weak instrument by calculating the Kleibergen-Paap rk Wald F statistic, which is above the Stock-Yogo critical value and thus rejects the null hypothesis that the instrument is weak.[8] The second-stage estimates confirm the baseline estimates in Table 3 that bribery tightens firms' credit access, with increased economic magnitudes. To be more specific, as shown in column (1), a one-point (or around a one standard deviation) increase in bribery now significantly constrains firms' access to credit by 16.1 per cent.

[8] In this paper, the standard errors are assumed to be non i.i.d. and are clustered at the country-sector level, so the Cragg-Donald Wald F statistic is no longer valid, and a correspondingly robust Kleibergen-Paap rk Wald F statistic is reported instead.

Table 4: Instrumental variable estimates

Dependent variable	Second-stage: Financing Obstacle for Firm		First-stage: Firm Bribery		Reduced form: Financing Obstacle for Firm	
Model	(1)	(2)	(3)	(4)	(5)	(6)
Firm Bribery	0.364***	0.412***				
	[0.081]	[0.096]				
Locality-sector Average of Bribery			0.255***	0.220***	0.093***	0.091***
			[0.030]	[0.033]	[0.026]	[0.027]
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes
Locality Controls	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	No	Yes	No	Yes	No
Sector Fixed Effects	Yes	No	Yes	No	Yes	No
Wave Fixed Effects	Yes	No	Yes	No	Yes	No
Country*Sector Fixed Effects	No	Yes	No	Yes	No	Yes
Country*Wave Fixed Effects	No	Yes	No	Yes	No	Yes
Sector*Wave Fixed Effects	No	Yes	No	Yes	No	Yes
Weak instrument F statistic	70.890	45.271				
R-squared	0.077	0.092	0.130	0.160	0.080	0.111
Observations	9,440	9,440	9,440	9,440	9,440	9,440

Source: author's calculations.

Notes: This table reports the instrumental variable estimates. Columns (1)-(2) report the second-stage estimates from IV regressions. First-stage estimates are reported in columns (3)-(4), and reduced form estimates are shown in columns (5)-(6). F statistics for weak instrument are reported below. Table 1 contains all definitions and Table 2 the summary statistics for each included variable. Coefficients are listed in the first row, robust country*sector clustered standard errors are reported below in the brackets, and the corresponding significance levels are placed adjacently. *** significant at 1%, ** significant at 5%, * significant at 10%.

In Table 5, exact matching is further utilised to match out the related firm characteristics, as well as country (locality), sector and wave (year) level omitted unobservables. The average treatment effect for the treated (bribing firms) is reported. Bribing firms are matched with all similar non-bribing firms based on country, sector and wave in column (1). Column (2) further includes the same set of firm-level characteristics as in the baseline estimates in the matching variables. Columns (3) and (4) take the matching into lower levels at locality and year. Across all specifications, bribing firms are found to face more severe financing obstacles, suggesting that credit access is more limited for the bribing firms. Economically, based on model (2), bribing firms are 21.9 per cent more constrained in their access to credit.

Table 5: Exact matching estimates

Model	(1)	(2)	(3)	(4)
Difference in Financing Obstacle for Firm	0.481***	0.496***	0.360***	0.346***
	[0.035]	[0.046]	[0.048]	[0.084]
Matching Variables				
Country	Yes	Yes	No	No
Locality	No	No	Yes	Yes
Sector	Yes	Yes	Yes	Yes
Wave	Yes	Yes	No	No
Year	No	No	Yes	Yes
Firm Size	No	Yes	No	Yes
Audited Firm	No	Yes	No	Yes
Female Managed Firm	No	Yes	No	Yes
Sole Proprietorship Firm	No	Yes	No	Yes
Publicly Listed Firm	No	Yes	No	Yes
Privatised Firm	No	Yes	No	Yes
Number of Matched Bribing Firms	1,268	995	835	354

Source: author's calculations.

Notes: This table reports the difference in financing obstacle between firms that bribe frequently and matched non-bribing firms. Bribing firms are those for which *Firm Bribery* ranges from 4 to 6 and non-bribing firms are those for which *Firm Bribery* ranges from 1 to 3. Exact matching is applied and average treatment effects for bribing firms (ATET) are reported. Table 1 contains all definitions and Table 2 the summary statistics for each included variable. Differences are listed in the first row, standard errors are reported below in the brackets, and the corresponding significance levels are placed adjacently. *** significant at 1%, ** significant at 5%, * significant at 10%.

Financing Obstacle for Firm may be criticised by the fact that it is mainly based on firms' perceptions instead of practices. However, the counter-argument is that firms' perceptions about their access to credit are most likely to be based on their own experiences. Therefore, the perception-based measures can reveal the true situation of firms' access to credit. To be more prudent, in order to deal with this argument, I utilise a practical-based measure of credit access, *Credit Constraint of Firm*, which has been used by Popov and Udell (2012) and Beck, Degryse, De Haas and Van Horen (2015) as robustness in Table 6. OLS and IV regressions are implemented in columns (1-2) and (3-4) respectively. The same set of firm and locality level controls and fixed effects are utilised. Significantly positive coefficients are found which confirms the validity of the baseline results using *Financing Obstacle for Firm* as the dependent variable, which is also supported by Hainz and Nabokin (2013).

Table 6: Impact in practice

Dependent variable	Credit constraint of firm			
Model	(1)	(2)	(3)	(4)
Firm Bribery	0.012**	0.010*	0.070**	0.077**
	[0.005]	[0.005]	[0.030]	[0.032]
Method	OLS	OLS	IV	IV
Firm Controls	Yes	Yes	Yes	Yes
Locality Controls	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	No	Yes	No
Sector Fixed Effects	Yes	No	Yes	No
Wave Fixed Effects	Yes	No	Yes	No
Country*Sector Fixed Effects	No	Yes	No	Yes
Country*Wave Fixed Effects	No	Yes	No	Yes
Sector*Wave Fixed Effects	No	Yes	No	Yes
R-squared	0.098	0.133	0.077	0.108
Observations	6,590	6,590	6,590	6,590

Source: author's calculations.

Notes: This table reports the impact of bribery on access to credit in practice. Table 1 contains all definitions and Table 2 the summary statistics for each included variable. Coefficients are listed in the first row, robust country*sector clustered standard errors are reported below in the brackets, and the corresponding significance levels are placed adjacently. *** significant at 1%, ** significant at 5%, * significant at 10%.

Table 7 shows the estimates with stricter clustering strategies and fixed effects. In baseline estimates, standard errors are clustered at the country-sector level, where characteristics of firms within the same country and same sector are assumed to be correlated. In panel A of Table 7, this assumption is relaxed. Standard errors are clustered at the country, sector and locality level instead. The significant coefficient estimates show that the baseline results are robust to alternative clustering strategies. Furthermore, robustness is also examined with stricter control of fixed effects in panel B. Specifically, in column (1), instead of country fixed effects, locality fixed effects are utilised, which can control for the unobservables that vary within the country but are locality specific. In column (2), wave fixed effects are replaced by year fixed effects. This is because even within each wave of the survey, firms are surveyed in different years. For example, BEEPS IV includes interviews that took place in 2007, 2008 and 2009 (153 firms in 2007, 4,613 firms in 2008 and 757 firms in 2009), and BEEPS V covers the period 2012-14 (398 firms in 2012, 5,919 firms in 2013 and 166 firms in 2014). As a result, year fixed effects have stricter control for unobserved year-specific omitted variables. The estimates confirm the baseline findings, even with stricter control of fixed effects.

Table 7: Clustering and fixed effects

Dependent variable	Financing Obstacle for Firm		
Panel A: Clustering			
Model	(1)	(2)	(3)
Firm Bribery	0.176***	0.176***	0.176***
	[0.015]	[0.008]	[0.011]
Clustering	Country	Sector	Locality
Firm Controls	Yes	Yes	Yes
Locality Controls	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes
Sector Fixed Effects	Yes	Yes	Yes
Wave Fixed Effects	Yes	Yes	Yes
R-squared	0.102	0.102	0.102
Observations	12,006	12,006	12,006
Panel B: Fixed Effects			
Model	(1)	(2)	(3)
Firm Bribery	0.162***	0.177***	0.162***
	[0.013]	[0.012]	[0.013]
Firm Controls	Yes	Yes	Yes
Locality Controls	Yes	Yes	Yes
Country Fixed Effects	No	Yes	No
Sector Fixed Effects	Yes	Yes	Yes
Wave Fixed Effects	Yes	No	No
Locality Fixed Effects	Yes	No	Yes
Year Fixed Effects	No	Yes	Yes
R-squared	0.314	0.103	0.314
Observations	12,006	12,006	12,006

Source: author's calculations.

Notes: This table reports the estimates with alternative clustering and fixed effects. Table 1 contains all definitions and Table 2 the summary statistics for each included variable. Coefficients are listed in the first row, robust clustered standard errors are reported below in the brackets, and the corresponding significance levels are placed adjacently. *** significant at 1%, ** significant at 5%, * significant at 10%.

When firms launch establishments abroad and become multinational, they are distinguished from the already established firms in the host country – that is, domestic firms. Foreign firms bring proprietary technology that is used in their home countries (Grilli, 1989). Similarly, foreign firms may also come along with culture from their home country and, in this case, bribery behaviour. Therefore, the bribery behaviour of foreign firms is less likely to be affected by host country conditions, which makes it more exogenous. To take advantage of this exogeneity, I test the validity of the baseline estimates for foreign firms and domestic firms separately in panel A of Table 8. The estimates confirm that bribery tightens firms' credit access, for both foreign firms and domestic firms. Another possible concern comes with firm expansion, that is, the findings of the baseline estimates may be explained by the fact that on the one hand an expanding firm is more likely to encounter obstacles in credit

access, while on the other hand this firm is also more likely to bribe in order to obtain the required licences or permits. Therefore, firm expansion may simultaneously drive *Financing Obstacle for Firm* and *Firm Bribery*. In order to tease this out, I use *Firm Innovation* that is equal to 1 if the firm has introduced new or significantly improved products or services during the last three years and 0 otherwise, to distinguish between expanding and non-expanding firms. Panel B shows the estimate separately for both types of firms. The detrimental effect of bribery on firms' credit access comes out significantly for both the expanding firms and non-expanding firms, which confirms that the findings of this paper are not dominantly driven by firm expansion.

Table 8: Firm types

Dependent Variable	Financing Obstacle for Firm			
Panel A: Foreign versus Domestic Firms				
	Foreign Firms		Domestic Firms	
Model	(1)	(2)	(3)	(4)
Firm Bribery	0.136***	0.167***	0.180***	0.182***
	[0.031]	[0.039]	[0.012]	[0.013]
R-squared	0.114	0.276	0.104	0.132
Observations	1,003	1,003	11,003	11,003
Panel B: Non-expanding versus Expanding Firms				
	Non-expanding Firms		Expanding Firms	
Model	(1)	(2)	(3)	(4)
Firm Bribery	0.197***	0.198***	0.143***	0.150***
	[0.015]	[0.016]	[0.015]	[0.016]
R-squared	0.102	0.140	0.101	0.148
Observations	7,092	7,092	4,914	4,914
Firm Controls	Yes	Yes	Yes	Yes
Locality Controls	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	No	Yes	No
Sector Fixed Effects	Yes	No	Yes	No
Wave Fixed Effects	Yes	No	Yes	No
Country*Sector Fixed Effects	No	Yes	No	Yes
Country*Wave Fixed Effects	No	Yes	No	Yes
Sector*Wave Fixed Effects	No	Yes	No	Yes

Source: author's calculations.

Notes: This table reports the robustness estimates across various types of firms. Table 1 contains all definitions and Table 2 the summary statistics for each included variable. Coefficients are listed in the first row, robust country*sector clustered standard errors are reported below in the brackets, and the corresponding significance levels are placed adjacently. *** significant at 1%, ** significant at 5%, * significant at 10%.

Finally, other unobserved firm characteristics may still induce endogeneity concerns of the estimates. In order to tackle this issue, I repeat the baseline analysis using a panel generated from the two waves of BEEPS. Of the total 5,523 firms covered by the BEEPS IV, 1,264 firms are also surveyed in BEEPS V, which enables me to construct a panel with 1,264 firms across 22 transition countries over BEEPS IV and V. The results are presented in Table 9. Specifically, columns (1) and (2) utilise the same specifications as in the baseline estimates and firm fixed effects are included in columns (3) and (4) to control for all omitted firm-level time-invariant unobservables. The significantly positive coefficient estimates confirm that bribery tightens firms' credit access, even after controlling for firm fixed effects.

Table 9: Panel data estimates

Dependent variable	Financing Obstacle for Firm			
Model	(1)	(2)	(3)	(4)
Firm Bribery	0.175***	0.168***	0.201***	0.184***
	[0.022]	[0.024]	[0.039]	[0.040]
Firm Controls	Yes	Yes	Yes	Yes
Locality Controls	Yes	Yes	Yes	Yes
Firm Fixed Effects	No	No	Yes	Yes
Country Fixed Effects	Yes	No	No	No
Sector Fixed Effects	Yes	No	No	No
Wave Fixed Effects	Yes	No	Yes	No
Country*Sector Fixed Effects	No	Yes	No	Yes
Country*Wave Fixed Effects	No	Yes	No	Yes
Sector*Wave Fixed Effects	No	Yes	No	No
R-squared	0.108	0.196	0.603	0.638
Observations	2,528	2,528	2,528	2,528

Source: author's calculations.

Notes: This table reports the robustness check with panel data (only include firms that participate in both BEEPS IV and V). Table 1 contains all definitions and Table 2 the summary statistics for each included variable. Coefficients are listed in the first row, robust country*sector clustered standard errors are reported below in the brackets, and the corresponding significance levels are placed adjacently. *** significant at 1%, ** significant at 5%, * significant at 10%.

5.3 Demand versus supply

The detrimental effects of bribery on credit access can be driven by either demand-side or supply-side factors. From the demand side, firms that need credit may be more incentivised to bribe and, at the same time, may be more likely to encounter obstacles to obtaining credit. From the supply side, banks may also tailor their lending strategies so they do not lend to bribing firms, either because of the increased uncertainty over banks' power to enforce repayment in the case of loan default, or the fact that the remaining borrowers are more likely to be a worse risk due to adverse selection. Therefore, in order to disentangle the demand-side impact from the supply-side impact, I implement the methodology in Beck & Brown (2015) to test whether the detrimental effects of bribery on firm access to credit differentiates between firms with or without demand for credit in the last fiscal year, which is indicated by *Firm Needs Credit*.

Estimates are shown in Table 10. *Firm Needs Credit* is included in the baseline regression in columns (1) and (2) and the estimates indicate that conditional on all the other factors, firms that need a loan in the last fiscal year are more likely to be constrained in their credit access. Columns (3) and (4) include the interaction term between *Firm Bribery* and *Firm Needs Credit*. The insignificant coefficient estimates of the interaction term indicate that the detrimental impact of bribery on firms' credit access is not predominantly driven by demand-side factors. Therefore, the results confirm that the detrimental impact of bribery on

firms' credit access is mainly driven by banks not willing to lend to bribing firms, either because of the increased enforcement risk or due to the adverse selection issue.

Table 10: Demand versus supply

Dependent variable	Financing Obstacle for Firm			
Model	(1)	(2)	(3)	(4)
Firm Bribery	0.147***	0.150***	0.144***	0.148***
	[0.011]	[0.012]	[0.016]	[0.016]
Firm Needs Credit	0.690***	0.684***	0.680***	0.678***
	[0.023]	[0.024]	[0.040]	[0.040]
Firm Bribery*Firm Needs Credit			0.005	0.003
			[0.017]	[0.017]
Firm Controls	Yes	Yes	Yes	Yes
Locality Controls	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	No	Yes	No
Sector Fixed Effects	Yes	No	Yes	No
Wave Fixed Effects	Yes	No	Yes	No
Country*Sector Fixed Effects	No	Yes	No	Yes
Country*Wave Fixed Effects	No	Yes	No	Yes
Sector*Wave Fixed Effects	No	Yes	No	Yes
R-squared	0.180	0.203	0.180	0.203
Observations	12,006	12,006	12,006	12,006

Source: author's calculations.

Notes: This table disentangles demand-side from supply-side drivers of the results. Table 1 contains all definitions and Table 2 the summary statistics for each included variable. Coefficients are listed in the first row, robust country*sector clustered standard errors are reported below in the brackets, and the corresponding significance levels are placed adjacently. *** significant at 1%, ** significant at 5%, * significant at 10%.

5.4 Local banking structures

As supply-side factors are found to be the main drivers behind bribery affecting credit access, I turn to the supply-side impact by interacting with various types of local banking structures. Specifically, I examine if and how different types of banks may distinguish and treat bribery differently, by testing the impact of bribery on credit access across different locality banking structures.

Regression results are reported in Table 11. Panel A presents the results when *Firm Bribery* is interacted with continuous measures of the local banking structures in the vicinity of the firm. This specification tests if local banking structures exert a linear heterogeneous effect. Specifically, *Firm Bribery* is interacted with the *Share of Foreign Banks*, *Share of Relationship Banks* and *Herfindahl-Hirschmann Index* separately. These local banking structure measures are also included in the regressions, but are not reported. Country, sector, and wave fixed effects are utilised with the same set of controls. Estimates of which firms are

matched with bank branches either within the locality or within the 10 km circle are reported in columns (1-3) and columns (4-6) respectively. Results show that the impact of bribery on firms' credit access is less pronounced in localities with a higher share of foreign banks, which is valid regardless of whether firms and bank branches are matched by locality or by circle. Within the locality, the detrimental impact of bribery is also less strong in cities with more relationship banks at the 10 per cent significance level. But the significance disappears when firms and bank branches are matched by circle. No linear effect is found regarding banking market concentration. The results are also economically significant. For example, as indicated by model (1), in Slupsk of Poland where the share of foreign banks is 45 per cent, a one-point increase in bribery would decrease firms' credit access by 8.2 per cent. However, in Warsaw where 70 per cent of bank branches are foreign owned, the impact of bribery on credit access is 6.9 per cent.

Then I examine the non-linear effects of local banking structures on the relationship between bribery and credit access.[9] The intuition is that the local banking structures may only make a difference in extreme cases, where the market is dominated by a certain type of bank. In these cases, firms in those local markets have no choice other than being served by a particular type of bank. In contrast, in local markets where there are considerable mixes of different types of bank, firms still get a choice. Specifically, *Foreign Bank Market* is defined if *Share of Foreign Banks* is greater than or equal to 80 per cent, while *Domestic Bank Market* is defined if it is no more than 20 per cent. Similarly, *Relationship Bank Market* is defined if *Share of Relationship Banks* is greater than or equal to 80 per cent, while *Transaction Bank Market* is defined when it is no more than 20 per cent. According to the US Department of Justice, a market with *Herfindahl-Hirschmann Index* of less than 0.1 is considered to be "well diversified"; a result between 0.1 and 0.18 "moderately concentrated"; and a result of 0.18 or greater "highly concentrated". Hence, I define *Low Competition Bank Market* if *Herfindahl-Hirschmann Index* is no less than 0.18, and *High Competition Bank Market* if it is smaller than 0.1.

Results are shown in panel B of Table 11. Firms in foreign bank market are less affected by bribery while in the domestic bank market the impact is more pronounced. This may be because foreign banks are less involved in domestic networks and so don't have the necessary knowledge to distinguish between corrupted and uncorrupted firms. At the same time, foreign banks may be also less aware of the risks associated with corruption in the domestic market. There is no significant difference between relationship and transaction lenders at the five per cent significance level. Importantly, the detrimental impact of bribery on credit access is stronger when competition is either very low or very high. A possible explanation lies in the U-shaped relationship between competition and the risk of bank failure (Martinez-Miera and Repullo, 2010), where the risk of bank failure is higher when competition is either very low or very high. Therefore, in order to avoid excessive risk-taking and to maintain solvent, banks

[9] Hermes and Lensink (2001) present a non-linear relationship between foreign bank entry and domestic bank performance, indicating that the impact only takes place after foreign bank penetration reaches a certain level. Similar results are found for the impact of foreign bank presence on investment (Lensink and Murinde, 2006). Martinez-Miera and Repullo (2010) show the theoretic existence of a non-linear relationship between bank competition and risk-taking behaviours.

would be less willing to lend to bribing firms in both cases. Economically, within the locality, bribing firms located in the foreign bank market and domestic bank market are 3.5 per cent better off and 3.0 percent worse off respectively in terms of their credit access. Firms in high and low competition bank markets are 2.8 per cent and 3.5 per cent worse off respectively than firms in a market where competition is moderate.

Table 11: Effects of local banking structures

Dependent variable	Financing Obstacle for Firm					
	Within locality			Within 10 km circle		
Panel A: Linear Effects						
Model	(1)	(2)	(3)	(4)	(5)	(6)
Firm Bribery	0.238***	0.205***	0.175***	0.248***	0.198***	0.183***
	[0.022]	[0.019]	[0.015]	[0.026]	[0.022]	[0.015]
Firm Bribery* Share of Foreign Banks	-0.116***			-0.127***		
	[0.036]			[0.039]		
Share of Relationship Banks		-0.077*			-0.054	
		[0.039]			[0.043]	
Herfindahl-Hirschmann Index			0.007			-0.047
			[0.063]			[0.057]
R-squared	0.103	0.102	0.102	0.103	0.102	0.102
Observations	12,006	12,006	12,006	12,006	12,006	12,006
Panel B: Non-linear Effects						
Model	(1)	(2)	(3)	(4)	(5)	(6)
Firm Bribery	0.182***	0.168***	0.125***	0.186***	0.173***	0.132***
	[0.014]	[0.014]	[0.017]	[0.013]	[0.013]	[0.017]
Firm Bribery * Foreign Bank Market	-0.078***			-0.074***		
	[0.022]			[0.022]		
Domestic Bank Market	0.067**			0.070**		
	[0.028]			[0.029]		
Relationship Bank Market		-0.046			-0.020	
		[0.053]			[0.067]	
Transaction Bank Market		0.044*			0.026	
		[0.025]			[0.025]	
Low Competition Bank Market			0.064**			0.050**
			[0.025]			[0.024]
High Competition Bank Market			0.078***			0.073***
			[0.025]			[0.025]

R-squared	0.104	0.103	0.103	0.104	0.102	0.103
Observations	12,006	12,006	12,006	12,006	12,006	12,006
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes
Locality Controls	Yes	Yes	Yes	Yes	Yes	Yes
Interaction Controls	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Sector Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Wave Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

Source: author's calculations.

Notes: This table reports the supply side impact across different local banking structures around the firm. Continuous measures of the local banking structures are applied in Panel A and Panel B utilises discrete measures. *Foreign Bank Market* is defined when *Share of Foreign Banks* is greater than or equal to 80 per cent, while *Domestic Bank Market* is defined when it is no more than 20 per cent. *Relationship Bank Market* is defined when *Share of Relationship Banks* is greater than or equal to 80 per cent, while *Transaction Bank Market* is defined when it is no more than 20 per cent. *Low Competition Bank Market* is defined when *Herfindahl-hirschmann Index* is larger than or equal to 0.18, while *High Competition Bank Market* is defined when it is smaller than 0.1. Table 1 contains all definitions and Table 2 the summary statistics for each included variable. All the other interaction controls are included separately but are not reported. Firms are matched with bank branches on the locality or circle level. Coefficients are listed in the first row, robust country*sector clustered standard errors are reported below in the brackets, and the corresponding significance levels are placed adjacently. *** significant at 1%, ** significant at 5%, * significant at 10%.

5.5 Economic impact

Finally, I investigate the economic outcome of bribery on expected firm growth in the next fiscal year. This is to examine the findings of Fisman and Svensson (2007) that bribery impedes firm growth. Furthermore, I also analyse the bank lending channel for corruption to affect firm growth. Specifically, this is tested by including *Financing Obstacle for Firm* in the estimates and test if the impact of bribery on firm growth becomes less pronounced and if the impact of credit access enters significantly at the same time.

Results are shown in Table 12. The general impact of bribery on firm growth is presented in columns (1) and (2). The significantly negative coefficient estimates of *Firm Bribery* confirm the findings of previous literature that corruption impedes firm growth. Then in columns (3) and (4), *Financing Obstacle for Firm* enters significantly negative. Economically, comparing estimates in columns (1) and (3), a one-point increase in *Firm Bribery* decreases future firm growth by 1.3 per cent in general, but this impact decreases to 1.1 per cent when *Financing Obstacle for Firm* is also included. Moreover, a one-point increase in *Financing Obstacle for Firm* decreases firm growth by 1.1 per cent. The R-squared barely changes after the inclusion of *Financing Obstacle for Firm*. Therefore, *Financing Obstacle for Firm* absorbs some of the impact of *Firm Bribery* on *Firm Growth*, and implies the existence of a bank lending channel for bribery to affect firm growth.

Table 12: Impact on firm growth

Dependent variable	Firm Growth			
Model	(1)	(2)	(3)	(4)
Firm Bribery	-0.013**	-0.014**	-0.011*	-0.010*
	[0.006]	[0.006]	[0.006]	[0.006]
Financing Obstacle for Firm			-0.011*	-0.012*
			[0.006]	[0.006]
Firm Controls	Yes	Yes	Yes	Yes
Locality Controls	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	No	Yes	No
Sector Fixed Effects	Yes	No	Yes	No
Wave Fixed Effects	Yes	No	Yes	No
Country*Sector Fixed Effects	No	Yes	No	Yes
Country*Wave Fixed Effects	No	Yes	No	Yes
Sector*Wave Fixed Effects	No	Yes	No	Yes
R-squared	0.072	0.110	0.073	0.111
Observations	5,976	5,976	5,976	5,976

Source: author's calculations.

Notes: This table reports the impact of bribery and credit access on firm growth. Table 1 contains all definitions and Table 2 the summary statistics for each included variable. Coefficients are listed in the first row, robust country*sector clustered standard errors are reported below in the brackets, and the corresponding significance levels are placed adjacently. *** significant at 1%, ** significant at 5%, * significant at 10%.

6. Conclusion

This paper provides firm-level evidence on the impact of bribery on firms' access to credit. The baseline estimates indicate that access to credit is more limited for firms that are more frequently involved in bribery practices, which is also the case when bribery is instrumented by the locality-sector average of bribery. The matching estimates show similar results, and the results are also robust in various alternative empirical settings. The findings of this paper can be explained under the law and finance theory pioneered by La Porta, Lopez-de-Silanes, Shleifer and Vishny (1997) that bureaucratic corruption induces greater uncertainty on banks' claims and enforcement actions, which diminishes banks' willingness to lend to bribing firms. The results can also be clarified by the information asymmetry theory by Stiglitz and Weiss (1981) that due to adverse selection, corruption would only withdraw safe borrowers and the remaining borrowers are more likely to be a bigger risk. Hence, credit rationing occurs, where banks do not want to take excessive risks by lending to these bribing firms. All in all, the estimates in this paper support the theoretical hypothesis that bribery limits firms' credit access.

This paper further shows that the detrimental effect of bribery on credit access is mainly driven by supply-side rather than demand-side factors. More explicitly from the supply-side, the impact is less pronounced if there are more foreign banks in the vicinity of the firm; or if competition in the local banking market is either very low or very high. Bribery is also found to significantly impede firm growth, which is partially through the tightening of firms' credit access. Economically, a one-point (or roughly a one standard deviation) increase in bribery tightens firms' credit access by 7.8 per cent and decreases firm growth by 1.3 per cent.

This research is also important politically as it provides an insight into the microeconomic impact of bribery on firms' credit access, as well as on firm growth. What is more, this paper shows, from the supply-side, how local banking structures may shape the relationship between bribery and credit access.

These findings highlight the importance of combating corruption in order to restore the credit market and trigger economic growth, as well as the importance of cooperation among regulatory authorities in tackling corruption. Banking regulations on market competition, or on foreign bank entry, may exert a significant impact on the effectiveness of corruption regulations, which suggests that a much broader framework should be incorporated in corruption regulations.

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