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In memory of my late mother, Akua Konadu.

« L’Université de Strasbourg n’entend donner ni approbation ni improbation aux opinions exprimées dans cette thèse. Ces opinions doivent être considérées comme propres à leur auteur »

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List of Abbreviations and Acronyms

CEO	Chief Executive Officer
CIA	Central Intelligence Agency
FTR	Future Time Reference
GDP	Gross Domestic Product
GFDD	Global Financial Development Database
IT	Information Technology
IV	Instrumental Variable
LLR	Loan Loss Reserves
LLP	Loan Loss Provisions
MENA	Middle East and North Africa
NPL	Non-Performing Loans
OLS	Ordinary Least Squares
ROA	Return On Assets
SFA	Stochastic Frontier Approach
SIC	Standard Industrial Classification
SME	Small and Medium-sized Enterprise
TC	Total Cost
U.S	United States
WALS	World Atlas of Language Structures
WBES	World Bank Enterprises Survey
CPI	Corruption Perception Index
WB	World Bank
WDI	World Development Indicators
WGI	World Governance Indicators

General Introduction

> "Institutions provide the incentive structure of an economy; as that structure evolves, it shapes the direction of economic change towards growth, stagnation, or decline."
> North (1991, p. 97)

More than 30 years ago, Douglass North (1990) underlined the role of institutions as a key determinant of economic performance. He argued that institutions, defined as the "rules of the game in a society or, more formally, are the humanly devised constraints that shape human interactions", affect transaction costs by reducing uncertainty and thereby create a stable structure that enhance human exchange.[1] In a society, institutions shape human interactions by defining what individuals are constrained from doing and, sometimes, the terms under which certain activities are allowed to be undertaken. Through their impact on social interactions, institutions influence the performance of an economy.

Since the 1990s, the notion that institutions are crucial in determining economic performance has been widely supported in the literature. Hall and Jones (1999) have shown that variations in output per worker, capital accumulation, and productivity across countries are primarily driven by differences in institutions. In a similar vein, Acemoglu, Johnson and Robinson (2001) have argued that institutions, measured by the mortality rates among early European settlers in a colony, are strongly correlated to economic performance. Along similar lines, Rodrik, Subramanian and Trebbi (2004) have provided evidence that the quality of institutions trumps other development factors, like geographic location or international trade, in explaining the cross-country differences in income levels. Dias and Tebaldi (2012) have shown that strong institutions enhance economic development by fostering human capital accumulation and decreasing income inequality, while Tebaldi and Elmslie (2013) have

[1] Many scholars think of institutions in a similar way. For example, Lin and Nugent (1995, p. 2306–2307) define institutions as "a set of humanly devised behavioral rules that govern and shape the interactions of human beings, in part by helping them to form expectations of what other people will do". Kasper, Streit and Boettke (2012, p. 32) see institutions as "a man-made rules which constrain people's (possibly arbitrary and opportunistic) behavior in human interaction".

documented a positive link between institutional quality and growth through the innovation channel. Some studies went even further by attributing the cause of poverty in third world countries to the lack of strong institutional framework in these countries. For example, Douglass North (1990, p. 110) asserts:

> "Third World countries are poor because the institutional constraints define a set of payoffs to political/economic activity that do not encourage productive activity".

Good institutions enhance economic activity by structuring incentives that induce productive behavior from economic agents. Acemoglu (2003) describes three main characteristics of good institutions: *(i)* they effectively enforce property rights which creates the incentives for individuals to invest and engage in productive activities in a society; *(ii)* they set constraints on human behavior especially the actions of elites, politicians, and other powerful groups, by creating checks and balances in order to minimize the concentration of unlimited political and economic power on the elites; and *(iii)* they create a level of equal participation for a large section of the society, so as to allow economic agents the opportunities to utilize their skills and talents at best.

Institutions can be divided into two aspects: formal and informal. On the one hand, formal institutions include rules, laws, constitution, contracts, and form of government. They are explicit and codified, and determine the political system including governance structure, the economic system such as the rules that govern property rights, and the enforcement system like the judiciary system. On the other hand, informal institutions consist of the traditions, customs, conventions, and all other norms of behavior that shape interactions, and thus, are part of the cultural heritage of a society. They are "usually unwritten, that are created, communicated, and enforced outside of officially sanctioned channels" (Helmke and Levitsky, 2004, p. 727). The informal rules, North (1990, p. 36) argues, are the most influential institutional constraints. He writes:

> "In our daily interaction with others, whether within the family, in external social relations, or in business activities, the governing structure is overwhelmingly defined by codes of conduct, norms of behavior and conventions. Underlying these informal constraints are formal rules, but

these are seldom the obvious and immediate source of choice in daily interactions".

Given the fundamental role of institutions for growth, as I have explicitly discussed above, one question which constitutes the main focus of this dissertation arises: **Is finance one channel through which these formal and informal institutions influence economic development?**

Better-functioning banks exert a significant impact on economic growth, particularly through their role in mobilizing savings and allocating capital to productive uses (Popov, 2018). At the macroeconomic and microeconomic levels, the empirical evidence largely suggest that the level of financial development has a positive, long run effect on economic growth (e.g., King and Levine, 1993; Beck et al., 2000, 2007). Levine (2005) discusses four broad mechanisms through which finance can enhance economic growth: *(i)* the mobilization of savings through risk diversification and risk management; *(ii)* the facilitation of exchange by reducing transaction costs; *(iii)* the efficiency in the allocation of capital through the production of *ex ante* information on investment opportunities; and *(iv)* the increase in the willingness of investors to invest in new projects through *ex post* monitoring and corporate governance.

The question of why substantial differences in the level of financial development persist across countries has been strongly linked to the differences in institutional characteristics.[2] Indeed, underdeveloped financial markets are plagued by high transaction and information costs, and institutions are important in that they overcome the effects of these costs by reducing uncertainty. For example, laws that protect property rights are an essential aspect of financial transactions as they reduce the consequences of information asymmetry. Culture and other informal institutions also determine participation in financial markets by shaping the beliefs, attitudes, and decision-making of economic agents.

La Porta et al. (1997; 1998) argue in the law and finance literature that the unevenness of financial development across countries can be explained by the differences in legal systems.

[2] Fergusson (2006) provides an excellent overview of a large body of literature on the relationship between institutions and financial development.

They show that compared with French civil law, the English common law origin rigorously protects creditor rights and enforce contracts, and hence, lead to better financial outcomes. Complementing this study, Levine (1998) shows that banks are better-developed in countries that have strong legal institutions. Johnson, McMillan and Woodruff (2002) stress the role of property rights protection in the financial development process. They show that in countries where entrepreneurs feel more secure about the protection of property rights, they are more likely to reinvest their profits. Huang (2010) and Roe and Siegel (2011) argue for the impact of political institutions on financial development. Lensink and Meesters (2014) show the beneficial role of well-developed institutions for the efficient operation of banks. Clearly, literature points to the pivotal role of institutions on financial development.

While formal institutions have been largely investigated, relatively little attention has been devoted to the link between informal institutions and financial development. The seminal paper of Stulz and Williamson (2003) attempt to examine why investor protection, a formal institution which has been stressed as a key determinant of financial development, differs across countries. They find that religious beliefs, an informal institution, significantly explain the cross-country differences in the degree of investor protection. Specifically, they suggest that Catholic countries are associated with weaker protection of creditor rights. Since then, studies on the link between culture and finance have started to draw interest from scholars.[3] For example, Guiso, Sapienza and Zingales (2004) provide evidence for the role of social trust on financial development. Similarly, bank risk taking behavior has been shown to be influenced by national culture, measured by individualism and trust (Mourouzidou-Damtsa et al., 2019), and local religiosity (Adhikari and Agrawal, 2016). Drori et al. (2018) show that language, an informal institution, matter to the extent that it shapes the degree to which microfinance institutions are successful in reaching out to women and supporting their entrepreneurship activities.

Overall, there is mounting evidence suggesting that formal and informal institutions are important for financial development. Researchers have therefore now turned attention to identifying the specific mechanisms which link institutions and finance.

[3] See Aggarwal, Faccio and Guedhami (2016) for a comprehensive survey on the link between culture and finance.

In this dissertation, I intend to explore deeper and contribute to this discussion by addressing one key question: **how do institutions influence bank behavior?** In particular, I focus on both formal and informal institutions, and investigate their role in shaping bank behavior. In each chapter, I attempt to examine one aspect of institutions and study how they influence the behavior of banks. Since well-functioning financial intermediaries strengthen the efficiency of capital allocation and contribute to alleviate the financing constraints that hamper firm and industrial expansion, I contribute to the literature by emphasizing finance as one main channel through which institutions matter for growth. I also pay close attention to the case of developing and emerging countries by employing a world-wide sample in all chapters. Due to the fact that these countries are generally characterized by poor institutions, this study is important to provide major policy implications.

This dissertation is structured around five chapters. The first two chapters examine the impact of language, an informal institution, in shaping the attitudes of economic agents and banks towards risk and inclusive financial sector. The third and fourth chapters explore the role of formal institutions in affecting bank performance and facilitating access to credit. The first four chapters constitute a strong base, which allows me to investigate further in the last chapter whether financial development eases the external financing constraints for firms, which is an important determinant of firm growth. In this way, I am able to link institutions to growth by highlighting financial development as a key channel. I then discuss some important policy implications of the main results and provide directions for future research in the concluding section.

The first chapter[4] analyses how language shapes bank risk taking behavior. Recent studies have shown that people who speak different languages think and act differently (Boroditsky, 2001). Language, like culture, influences the behavior of economic agents.

Languages have different ways of making reference to future events: some languages, such as English, have a dedicated tense to mark the future, whereas others, like Chinese, do not grammatically separate the future from the present. Does this linguistic distinction affect the formation of beliefs and thereby influence speakers' intertemporal preferences? Chen (2013) finds that speakers of languages that grammatically mark the future tense have less

[4] Co-written with Laurent Weill, published in Journal of Financial Services Research (2021).

future-oriented behavior by saving less, investing less in their health, and retiring with less wealth. Similarly, Godlewski and Weill (2021) show that banks in countries with languages that grammatically distinguish between the present and future events issue loans with lower spreads and use lower collateral.

A follow-up question is whether this linguistic distinction influences the risk taking behavior of banks. We argue that the use of a language that grammatical marks the future may diminish the importance of the future by dissociating the present and the future. It may then lead banks to take more risk since it reduces the perception of potential losses associated with risky activities.

To investigate this hypothesis, we employ a sample of 1,401 banks located in 81 countries over the period 2010 to 2017. Our results show that banks from countries with languages that grammatically separate the future from the present take more risk. We also find that the use of future tense marking is associated with the occurrence of banking crises. Overall, our results highlight the role of language, an informal institution, in explaining the cross-country differences in bank risk-taking.

The second chapter[5] studies the impact of language on financial inclusion. Financial inclusion refers to the access and use of formal financial services, and has been identified as an important driver of economic development. Despite considerable efforts by international organizations and governments to promote financial inclusion, significant gender gap persists. One important question which has surprisingly received little attention in the literature is: why do women have lower use of financial services than men? Understanding the causes of the gender gap is important as it helps policymakers to design policies aimed at reducing gender inequality and fostering economic development.

Existing studies argue for the role of factors including legal discrimination against women (Demirgüc-Kunt, Klapper and Singer, 2013) and behavioral reasons (Beck, Behr and Madestam, 2018) in explaining the gender gaps in financial inclusion.

[5] This chapter is co-written with Laurent Weill and has been published in Economics of Transition and Institutional Change (2021).

We provide a new source that explains the gender gap: gender marking in language. We predict that languages that require reference to gender lead individuals to draw subtle distinctions between genders. This aspect of language reinforces traditional views of gender roles in the minds of speakers, thereby exerting an impact on women's financial inclusion.

The aim of this study is to examine whether gender marking in language influences the gender gap in financial inclusion. We set the analysis at the individual-level by employing a sample of roughly 350,000 individuals from 117 countries. Our results show that language matters for financial inclusion. We find evidence that gender-marking in language exerts an influence on the gender gap in financial inclusion.

The third chapter[6] focuses on the link between democracy and access to credit. Building on the recent study of Delis, Hasan and Ongena (2020) that democracy reduces cost of credit on syndicated loans, we examine the impact of democratic development on access to credit for firms as one microeconomic channel through which democracy may affect the growth of an economy, as observed by Acemoglu et al. (2019).

Compared to autocracies, democracies are political systems which have characteristics that provide an environment where access to credit is likely to be greater. Democratic development is expected to alleviate credit constraints for three reasons: *(i)* favoring inclusive institutions, including financial inclusion of small firms; *(ii)* strengthening the institutional framework increasing the incentives for banks to lend; and *(iii)* reducing information asymmetries.

We perform regressions at the firm-level using a large dataset of over 46,000 firms in 108 countries. We combine data on access to credit from the World Bank Enterprises Survey (WBES) with democracy indicators from the Polity IV project. We find evidence of a negative relationship between democratic development and credit constraints for firms. Additionally, we observe that democratic development contributes to reduce borrower discouragement and

[6] Co-written with Laurent Weill.

leads to more bank loan approval decisions. Our key finding is therefore that democracy favors access to credit.

Chapter four explores the relationship between corruption and bank efficiency. Corruption is a "global scourge" that affects both developing and developed countries. As argued by Ezebilo, Odhuno and Kavan (2019, p. 3), "corruption emanates from the failures of the formal institution and asymmetry between formal and informal institutions".

The consequences of corruption on bank activity have received renewed interest in recent years. Previous studies emphasize the effect of corruption on aspects of bank performance including lending (e.g., Weill, 2011), and portfolio quality (e.g., Park, 2012). Another channel through corruption may influence bank activity is by impacting banks' costs. Indeed, the evidence suggests that rampant corruption induces greater uncertainty regarding the costs of doing business in a country.

The objective of this study is to investigate the impact of corruption on bank cost efficiency. Cost efficiency of banks measures the ability of a bank to operate at the minimal cost by comparing its cost structure to that of a best-practice bank. Using a broad sample of 2,257 commercial banks in 126 countries for the 2011-2018 period, I employ the stochastic frontier approach to estimate bank efficiency, a technique which has been widely adopted in the literature.

The results suggest that high degree of corruption reduces the cost efficiency of banks. I further find that the negative effect of corruption on cost efficiency does not vary with bank size and the level of a country's development. This finding highlights the detrimental effect of greater corruption on bank performance in terms of cost advantages.

The fifth chapter[7] provides evidence on the impact of bank efficiency and access to credit. This last chapter builds on the works of the four previous chapters. We examine how bank efficiency facilitates access to credit for firms. Since access to credit constitutes a major

[7] Co-written with Laurent Weill, currently to be revised and resubmitted in Economic Systems.

obstacle to firm growth, we examine how financial development contributes to economic growth by alleviating firms' financing constraints.

Cost efficiency informs about the bank performance to produce with the lowest costs. Following the prediction of economic theory, we expect that greater ability of a bank to produce with the lowest costs should lead to lower banking prices, including lower loan rates. It should then reduce the financing obstacle generated by high loan rates and thus enhance better access to credit.

To examine how bank efficiency affects firms' access to credit, we use firm-level data on access to credit from World Bank Enterprise Survey (WBES) together with data from Bank Focus database to estimate bank efficiency with the stochastic frontier approach. We consider a large sample of about 54,000 firms from 76 countries.

Our findings show that bank efficiency facilitates better access to credit for firms. This effect takes place through the demand channel: when bank efficiency is higher, borrower discouragement is reduced with more firms applying for a loan. In additional estimations, we find that the beneficial effect of bank efficiency on access to credit is observed for all firms whatever their size and tends to be more pronounced in countries with better institutional and economic framework.

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Chapter 1[8]

How Language Shapes Bank Risk Taking

Abstract

We analyze the impact of language on risk-taking behavior of banks. Languages that grammatically distinguish between present and future events make the future feel more distant than the present and as thus favor a less future-oriented behavior (Chen, American Economic Review, 2013). Our hypothesis is that these languages lead banks to take more risk since they reduce the perception of potential losses associated with risky activities. We investigate this hypothesis on a sample of 1,401 banks from 81 countries over the 2010-2017 period. We perform random effects regressions of bank risk, measured by the Z-score, on the type of language. We find that banks from countries with future tense marking take more risk in accordance with our prediction. This finding is robust to the inclusion of alternative culture indicators, to alternative definitions of bank risk and of future time reference. We also observe that future tense marking is associated with greater occurrence of banking crises. Our conclusion is thus that language contributes to explain the cross-country differences in bank risk-taking.

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1.1. Introduction

Languages differ, not only in how they employ sounds, but how they affect their speakers' representations of reality (Gumperz and Levinson, 1991; Boroditsky, 2001). The spoken language can consequently exert an influence on the actions undertaken by individuals, and thus can influence economic behavior (Mavisakalyan and Weber, 2018).

One linguistic feature has been particularly investigated in the literature in economics: the presence of future tense marking. Some languages like English, referred as strong future time reference (FTR) languages, force speakers to grammatically make a distinction between future and present events. Other languages like Chinese, referred as weak-FTR languages, allow speakers to naturally use the present tense to talk about future events as if these events were happening now. This linguistic feature can influence economic behavior: the use of a strong-FTR language diminishes the importance of the future by dissociating the present and the future. It can therefore lead to a less future-oriented behavior for economic agents.

This hypothesis has been confirmed by a bunch of recent works on individual and corporate decisions. Chen (2013) shows that speakers of strong-FTR languages have a less future-oriented behavior: they save less, invest less in their health, and retire with less wealth than speakers of weak-FTR languages. Mavisakalyan, Tarverdi, and Weber (2018) find that speakers of weak-FTR languages are more willing to address environmental problems than speakers of strong-FTR languages, supporting the hypothesis that they care more for the future. At the corporate level, Liang et al. (2014) show that firms with strong-FTR languages perform worse in corporate social responsibility, a future-oriented activity, than those with weak-FTR languages, while Chen et al. (2017) find that strong-FTR language firms have lower precautionary cash holdings than weak-FTR language firms, in line with the view that the former ones are less future-oriented.

We can question whether this linguistic distinction influences the risk-taking behavior of banks. The risk-taking behavior is influenced by how bank managers and employees consider the future. To view the future as more distant should contribute to increase the risk-taking behavior of banks since it reduces the perception of losses on risky activities. The objective of this paper is to investigate this hypothesis: we examine whether the future tense marking of

languages exerts an impact on the risk-taking behavior of banks. We investigate this question on a large cross-country dataset of banks since we need variation in languages across banks. We use a sample of 1,401 banks based in 81 countries over the 2010-2017 period.

Our results provide evidence for the influence of future tense marking on bank risk. We find that strong-FTR languages enhance bank risk. This finding is observed when we control for different culture indicators and when we test alternative measures of bank risk and of future time reference. This evidence is consistent with the hypothesis that strong-FTR languages influence banks to take higher risk.

Our paper therefore contributes to two strands of literature. First, we augment the vast literature on the determinants of bank risk-taking. It has identified a large set of factors like governance (Pathan, 2009; De Jonghe, Disli and Schoors, 2012: Körner, 2017), bank competition (Berger, Klapper and Turk-Ariss, 2009), but also political institutions (Ashraf, 2017) and religiosity (Adhikari and Agrawal, 2016). We extend this strand of research with the first study examining how language can shape the risk-taking behavior of banks. Second, we contribute to the literature on the impact of language on economic behavior. While this line of research has until now considered how language shapes the behavior of individuals and firms, we analyze how bank behavior is affected by language.

This work has important implications. From a positive perspective, the finding that strong-FTR language increases bank risk provides support to the view that language would explain cross-country differences in bank risk and in the frequency of banking crises. From a normative perspective, our finding suggests that regulators should monitor more intensely banks located in countries with a strong-FTR language to control the potential for "excessive risk-taking".

The rest of the paper is organized as follows. In Section 1.2, we discuss the background of our research question. Section 1.3 describes the data and the empirical method. Section 1.4 provides estimation results, and Section 1.5 shows the robustness checks. Section 1.6 concludes the paper.

1.2. Background

The *Linguistic Relativity Hypothesis*, also known as the Whorf-Sapir hypothesis, holds that the structure of a language has an influence on its speakers' behavior and how they conceptualize the world (Whorf, 1956). The strong version of this hypothesis states that language determines thought and controls the cognitive processes, while the weak version assumes that language exerts some constraints on cognition. Even if the strong version has been viewed as misguided, several studies support the weak version (e.g., Kay and Kempton, 1984; Slobin, 2003; Regier and Kay, 2009).

In line with the weak version, language would shape behavior without controlling the whole cognitive process. For example, Boroditsky (2001) uses an experimental approach to document that language is a powerful tool in shaping habitual thought, and thought about abstract domains like time. Winawer et al. (2007) have shown that for languages which have specific names for different shades of colors, speakers of such languages tend to recognize different color codes more easily. For example, Russian has specific names for different shades of blue, and as such, Russian speakers find it easier to remember and recognize different shades of blue than English speakers. In documenting the importance of language on influencing thoughts, Edward Sapir writes:

> "Human beings...are very much at the mercy of the particular language which has become the medium of expression for their society.... The fact of the matter is that the "real world" is to a large extent unconsciously built up on the language habits of the group." (Sapir, 1929, p. 209).

Regarding time, languages have different ways of grammatically making reference to future events. Weak-FTR languages like German or Chinese use the present tense to talk about future events. Strong-FTR languages like French or English force their speakers to change the structure of the tense when referring to events in the future, either through the use of an auxiliary verb (like in English[9]) or of a dedicated future tense form (like in French).

[9] English speakers can sometimes speak about future events with a non-future tense verb (for e.g. "the teacher arrives tomorrow"). However, as documented by Copley (2009), this way of speaking is only used when speakers want to talk about planned/scheduled/habitual events, or events arising from law-like properties of the world.

We can illustrate these differences across languages with an example. French and English speakers are required to switch from the present tense to the future tense when talking about expectations of the weather tomorrow:

1) English: a. It is cold today (PRESENT)
   b. It will/is going to be cold tomorrow (FUTURE)

2) French: a. Il fait soleil aujourd'hui (PRESENT)
   "*It is sunny today"*
   b. Il fera soleil demain (FUTURE)
   "*It will be sunny tomorrow*"

On the other hand, when German[10] and Chinese speakers expect the weather to be cloudy tomorrow, they would normally talk about it using the present tense:

3) German: a. Heute ist es bewölk (PRESENT)
   "Today it is cloudy"
   b. Morgen ist es bewölk (FUTURE)
   "*Tomorrow it is cloudy"*

4) Chinese: a. Jintian shi duoyun (PRESENT)
   "Today is cloudy"
   b. Mingtian shi duoyun (FUTURE)
   "*Tomorrow is cloudy"*

This linguistic distinction can then influence speaker's behavior and cognition by exerting an impact about the timing of future events. In strong-FTR languages, speakers perceive the future to be more distant when talking about future events. Symmetrically, speakers of weak-FTR languages can perceive the future as more immediate and certain to

[10] It is worth noting that Germans can make reference to the future with the future tense marker "werden". However, in German, like in other weak-FTR languages, speakers are not required to use this future tense marker every time they talk.

manifest since they are able to talk about future events in the present tense, i.e. as if the events were happening now.

Since a strong-FTR language makes the future feel more distant from the present, it can alter the importance of the risks associated with banking activities. For instance, a lending decision today is associated with potential loan losses tomorrow. As a consequence, a future perceived as more distant should contribute to reduce the reluctance of banks to grant loans since it diminishes the importance of costs associated with future loan losses. As summarized by Frederick, Loewenstein and O'Donoghue (2002), individuals have a tendency to discount future costs and benefits. It results in the fact that when an outcome is perceived as more distant in the future, individuals tend to discount more its potential costs or benefits.

A strong-FTR language should then be associated with higher risk-taking behavior of banks. Our hypothesis is thus that banks with strong-FTR languages have higher risk than banks with weak-FTR languages. This hypothesis accords with the role of future time reference in shaping intertemporal preferences for individual behavior (e.g. Chen, 2013) and corporate behavior (e.g., Chen et al., 2017). We therefore extend these former findings through an analysis of how language can shape intertemporal preferences for bank behavior.

1.3. Data and methodology

1.3.1. Data

We extract data from Orbis Bank for all variables related to bank characteristics. We consider the period 2010-2017. We keep only commercial banks to have a homogenous sample in terms of activities and use only consolidated statements for each bank. Data on language FTR is compiled from Chen (2013)'s classification of languages. Data on macroeconomic variables are collected from World Development Indicators and governance variables come from World Governance Indicators database.

We restrict the sample to countries for which Chen (2013) classifies their official language into strong-FTR and weak-FTR categories. We drop all observations with missing necessary accounting information and we eliminate countries with only one bank. We

winsorize all bank-level variables at 1% (lowest and highest values) to eliminate the effect of outliers. The final sample includes 1,401 banks from 81 countries with 73.02% of the banks located in strong-FTR countries.

1.3.2. Variables

We test whether language FTR shapes bank risk-taking. We use the Z-score of each bank to measure bank risk-taking. Z-score measures the insolvency risk and is commonly used in the literature to measure bank risk. Following previous studies (Berger, Klapper and Turk-Ariss, 2009; Houston et al., 2010), we calculate the Z-score as:

$$Z - score = \frac{ROA+CAR}{\delta(ROA)} \quad (1)$$

where ROA is the return on assets, CAR is the capital asset ratio which is measured as the ratio of equity to total assets, and δ(ROA) is the standard deviation of the return on assets calculated over the whole period of the study. Since the Z-score is a highly skewed bank risk measure, we take the natural log of the Z-score following the literature (e.g., Laeven and Levine, 2009). In the rest of the paper, we will refer to the logged Z-score as *Z-score*. The Z-score is inversely related to the probability of insolvency for the bank, hence a higher z-score is associated with lower bank risk.

The explanatory variable of interest in our study is the future time reference of the language. Following Chen (2013)'s classification, we create the dummy variable *Strong-FTR* which is equal to one if a bank's headquarters is located in a country with a strong-FTR language and zero otherwise.

We consider only countries with one FTR language form (i.e., having either a strong-FTR or weak-FTR language) for the official languages to ensure proper identification of the language of the bank with one exception, Switzerland. Countries with multiple languages with different FTR language forms generate identification problems. We exclude for instance Belgium, a country with approximately half of the population speaking Flemish (a weak-FTR language) and the other half speaking French (a strong-FTR language), since the vast majority of banks in the sample have their headquarters in the same city, Brussels. So we cannot disentangle based on the headquarters of the bank the FTR language form.

The only exception is Switzerland, which combines strong (French, Italian) and weak (German) FTR language forms, because headquarters of Swiss banks are located in various cities in the country (Zurich, Bern, Geneva, and Lausanne) for which we know the dominant language. Countries with multiple languages but with only one FTR language form do not generate problems. For instance, Canada has two official languages (English and French) but they are both strong-FTR languages. So we can associate this form to all Canadian banks.

We consider three bank variables to control for bank-specific characteristics. First, we control for bank size which is measured as the natural logarithm of total assets (*Bank Size*). We also include in our model the ratio of loans to total assets (*Loans to Assets*) to control for the structure of assets. Finally, we make use of the ratio of deposits to total assets (*Deposits to Assets*) to take into account the structure of funding.

We also control for the characteristics of the country with four variables. The level of economic development is controlled with the log of GDP per capita (*log(GDP/capita)*). Inflation is measured as the annual percentage change in consumer prices (*Inflation*). We also take into account the institutional framework with the legal rights index from the World Bank (*Legal Rights*) and for bank concentration with the Herfindahl index (*Herfindahl Index*). Finally, we control for continent fixed effects, as different languages within a continent may share similar components and characteristics.

Definition of all variables is reported in the Appendix 1.1. Table 1.1 presents the cross-country statistics with the number of banks and the average Z-score for each country in the sample. Interestingly, we observe that the mean Z-score for the banks in strong-FTR countries (3.54) is lower than those in weak-FTR countries (3.829). It suggests higher risk for banks located in strong-FTR countries in accordance with our hypothesis. Table 1.2 reports the descriptive statistics of the variables.

1.3.3. Methodology

In this paper, we examine how language future tense marking affects bank risk-taking behavior. We therefore formulate our model as:

$$Z\text{-}score_{ikt} = \alpha + \beta\, Strong\text{-}FTR_{kt} + \delta\, Bank\ Controls_{it} + \phi\, Country\ Controls_{kt} + \varepsilon_{ikt} \quad (2)$$

where *Z-score* is the measure of risk-taking for bank *i* in country *k* for year *t*; *Strong-FTR* is a dummy variable equal to one if a bank's headquarters is located in a country with a strong-FTR language and zero otherwise; *Bank Controls* is the set of bank-specific control variables (*Bank Size, Loans to Assets, Deposits to Assets*); *Country Controls* is the set of country-specific control variables *(log(GDP/capita), Inflation, Legal Rights, Herfindahl Index*), and ε is a random error term.

We use panel estimations with random effects. This estimation technique is robust to any first-order autoregressive disturbances within panels and heteroscedasticity across panels. Although fixed effects estimation is commonly suggested in the presence of bank unobserved effects, estimation with fixed effects is not appropriate in our case for two reasons.

First, since our variable of interest (language) is time-invariant, we cannot use fixed effects to estimate its effect on bank risk since it would be absorbed or wiped out by the demeaning transformation. "Sufficient variability over time in the predictor variables" is required for reliable fixed effect estimates (Treiman, 2009, p.370), and may lead to inconsistent and imprecise estimates in cases where the key variables do not significantly vary (Wooldridge, 2010, p. 326). Second, as noted by Baltagi (2005, p. 13), fixed effect estimators are not consistent when there is a fixed small "*T*" and a relatively large "*N*".[11] In our panel dataset, this is the case since we have $T = 8$ years and $N = 1{,}401$ banks. Also, fixed effect estimations may lead to a significant loss of degrees of freedom when there is a large *N* (Baltagi, 2005).

[11] See Lancaster (2000) for a review of the incidental parameter problem.

1.4. Results

1.4.1. Main estimations

We analyze whether future tense marking influences risk-taking behavior of banks. We perform four regressions to consider several sets of control variables so that we can test the sensitivity of the results and the results are reported in Table 1.3. In column (1), we only include the variable *Strong-FTR*. In columns (2) to (4), we respectively add bank-level control variables, country-level control variables, and all control variables.

Our main finding is the negative and significant coefficient for *Strong-FTR* in all estimations. It means that a strong future time reference is associated with lower values for Z-score. Thus, banks from countries with strong future time reference take more risk than those located in countries with weak future time reference. This conclusion is in line with our hypothesis that to view the future as more distant leads to enhance the risk-taking behavior of banks.

The estimated effect of strong-FTR language is sizeable. Moving from a weak-FTR to a strong-FTR language leads to a reduction of Z-score of -0.289 in the specification with all control variables. This effect is substantial, considering that the average Z-score for weak-FTR language banks is 3.829. In other words, the average strong-FTR language bank has a Z-score of about 7.55% (=-0.289/3.829) lower than the average weak-FTR language bank, controlling for bank and country characteristics in the dataset.

With respect to the bank-level control variables, we observe a negative and significant sign for *Bank Size*, supporting the view that a large bank size is associated with higher risk. This result is consistent with the "too-big-to-fail effect" argument that larger banks have more incentives to undertake risky investments. We also observe a significantly positive coefficient for *Loans to Assets* and negative coefficient for *Deposits to Assets*, meaning that higher share of loans and lower share of deposits in total assets contribute to reduce bank risk.

When considering the country-level control variables, inflation tends to strengthen risk, as seen with its negative and significant coefficient. It accords with what Houston et al. (2010)

have found. Income per capita is associated with lower risk, which corroborates the finding from Laeven and Levine (2009) and Houston et al. (2010). Finally, *Legal Rights* and *Herfindahl Index* are not significant.

1.4.2. Additional culture measures

Our analysis is focused on the impact of language on bank risk. However, language is one characteristic of the culture but not the only one. Culture can be defined as "those customary beliefs and values that ethnic, religious, and social groups transmit fairly unchanged from generation to generation" (Guiso, Sapienza and Zingales, 2006). As such it includes language but also religion and trust among many other values. We can then question whether our finding that banks from countries with strong future time reference take more risk is not influenced by another indicator of the culture of a country. We thus aim to rule out this possibility by performing additional estimations in which we control for alternative culture measures. We present these results in Table 1.4.

1.4.2.1. Hofstede Dimensions

A seminal research in the analysis of culture has been the work from Hofstede (1980, 2001). He has used systematically collected data about a large number of cultures to develop a terminology to characterize cultures through six dimensions. Hofstede classification has been widely adopted to assess the influence of cultural dimensions, e.g., on financial systems (Kwok and Tadesse, 2006), on risk-taking in the insurance industry (Gaganis et al., 2018), and corporate risk-taking (Li et al., 2013).

We focus on two dimensions of national culture identified by Hofstede (1980): *Uncertainty Avoidance* measuring the tolerance of a society for uncertainty and ambiguity, *Long Term Orientation* which indicates the persistence of a society towards achieving future rewards. Both cultural dimensions are the most closely related to the potential influence of future time reference. Chen et al. (2017) similarly consider both these Hofstede dimensions to check the robustness of their findings for the relation between future time reference and corporate cash holdings. Both these indicators come from Hofstede's website.

We add both cultural dimensions in the regression in column (1). We observe that the coefficient of *Strong-FTR* remains significantly negative. Hence the impact of future time reference on bank risk is still observed when Hofstede's cultural dimensions are taken into account. In addition, we find that *Uncertainty Avoidance* and *Long Term Orientation* are not significant, suggesting no relation between these dimensions and bank risk.

1.4.2.2. Religion

Religion is a major component of the culture which shapes the norms of societies (Iyer, 2016). A large set of papers have shown how religion can influence financial behavior of economic agents (Hilary and Hui, 2009; Kumar, Page, and Spalt, 2011; Adhikari and Agrawal, 2016; Klein, Turk-Ariss, and Weill, 2017). Thus the differences in bank risk we observe across countries can be driven by religion rather than language features.

We control for religion by adding a set of religion indicators at the country level: *Catholic*, *Protestant*, *Muslim*, and *Buddhist*. These variables are all dummy variables equal to one if more than 50% of the inhabitants in a country are respectively Catholics, Protestants, Muslims, and Buddhists. Data come from the CIA World Factbook.

The results in column (2) show that religion does not drive our results. We still find a negative and significant coefficient for *Strong-FTR*. Interestingly, we observe that banks in Catholic countries and in Buddhist countries take less risk while the coefficients for *Muslim* and *Protestant* are not significant. The finding about Catholic countries accords with the finding that Catholics are more risk-averse (Halek and Eisenhauer, 2001).

1.4.2.3. Trust

Trust has been shown to influence economic outcomes (Zak and Knack, 2001). In the context of financing decisions, there is evidence that trust plays a key role in the performance of large organizations (La Porta et al., 1997b) and stock market participation (Guiso, Sapienza and Zingales, 2008).

We include trust in our estimations. *Trust* is measured with the trust index provided by La Porta et al. (1997b). This variable measures the level of trust in a country and is based on

the percentage of respondents in each country answering *yes* to the question in the World Values Survey (1990-1993): "*Generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with people?*" We display the results in column (3).

We still observe a significantly negative coefficient for *Strong-FTR*, supporting the robustness of this finding. Further, we find that higher trust is associated with lower bank risk, in line with the expectation.

1.4.2.4. Corruption

The role of corruption in influencing bank behavior, notably bank loan decisions (Fungacova, Kochanova and Weill, 2015), loan characteristics (Bae and Goyal, 2009), and bank risk-taking (Chen et al. 2015), has been documented in the literature.

We take into account corruption in the estimations with the Corruption Perception Index from Transparency International. *Corruption* indicates the prevailing level of corruption in a country and is calculated as the average of surveys from a different number of sources capturing the assessment of country experts and business people's perceptions of corruption levels in the public sector.[12] This variable is based on a scale of 0 (highest level of perceived corruption) to 100 (lowest level of perceived corruption).

The results are reported in column (4). We find again that the coefficient of *Strong-FTR* is significantly negative, meaning that the key finding is not affected by the inclusion of corruption.

1.4.3. Controlling for banking regulations

A set of regulations have been implemented across countries to preserve financial stability. A concern for our model is that the estimated effect of language FTR could be driven by the cross-country differences in banking regulations. To control for this, we take into

[12] For example, the 2017 Corruption Perception Index is constructed using 13 different data sources from 12 institutions, such as African Development Bank, Work Bank, World Economic Forum, and among others.

account regulations that have been stressed by the Basel committee and regulations that influence banks' forward-looking behavior.

First, a large set of studies suggest that bank loan loss provisioning behaviour is procyclical with fluctuating economic conditions (Laeven and Majnoni, 2003; Bouvatier and Lepetit, 2008). For this reason, some regulators have adopted the so-called counter cyclical or dynamic provisioning to mitigate this behaviour. This forward-looking loan loss provision mechanism is aimed at compelling banks to report higher loan loss provisions during good economic times i.e., when non-performing loans are low, and report lower loan loss provisions during bad economic times, so that banks will use the surplus loan loss reserves to cover the realized losses during economic downturns. If this regulation is correlated to language FTR, the estimated effect of language on bank risk could be biased. We therefore include *Dynamic Provisioning*, a dummy variable which equals to one if a bank is located in a country that has introduced dynamic loan loss provisioning and zero otherwise. Data come from Wezel, Chan Lau and Columba (2012).

Second, we include two dimensions on capital regulations with data from Barth, Caprio and Levine (2013). We use capital stringency and capital requirements. The *Capital Stringency* index measures "whether the capital requirement reflects certain risk elements and deducts certain market value losses from capital before minimum capital adequacy is determined" (Barth, Caprio and Levine, 2004). Next, we consider *Capital requirements* which is defined as the minimum capital requirement in a country. Capital regulations moderate bank behaviour by ensuring that banks have enough *capital* to cover their unexpected *losses.*

The estimation results are reported in Table 1.5. We include *Dynamic Provisioning* in the estimations in column (1). In column (2), we include both capital regulation variables: *Capital Requirements* and *Capital Stringency*. In column (3), we include all three regulation variables.

In all the estimations, we find that the coefficient of *Strong-FTR* is still significantly negative, suggesting that differences in regulatory environment across countries do not drive our results.

1.5. Robustness Checks

This section presents a battery of robustness tests. We first use alternative measures for bank risk. We continue with results including alternative measures for future time reference and complete with additional robustness checks. We finally check whether future time reference exerts an impact on the occurrence of banking crises.

1.5.1. Alternative measures of bank risk

First, we use alternative measures for bank risk. We have used Z-score to measure bank risk in our main estimations. Since literature also provides additional indicators for bank risk, we want to check whether our results stand when using these indicators.

To this end, we redo our estimations by using alternatively four measures of bank risk. First, we use the ratio of loan loss reserves to gross loans (*LLR*) as our main indicator for credit risk. Second, we utilize the ratio of non-performing loans to gross loans (*NPL*) as another risk measure. Third, we include the ratio of loan loss provisions to gross loans (*LLP*). The NPL and LLP are backward looking credit risk indicators i.e., they capture the historical performance of the quality of bank loans granted. Finally, we compute the standard deviation of average return on assets ($\delta(ROA)$) on the whole period of the study as an alternative risk measure. It has to be stressed that higher values represent greater risk for all four alternative bank risk measures. The results are reported in Table 1.6.

We find that the coefficient of *Strong-FTR* is significantly positive in estimations explaining *LLR* and $\delta(ROA)$ and positive but not significant in estimations explaining *NPL* and *LLP*. The positive but insignificant coefficients for NPL and LLP should be interpreted with some caution. Indeed, as pointed out by Foos, Norden, and Weber (2010), loan losses and a decrease in banks' solvency materialize about three years after rapid credit growth. This means that to capture the effect of language on these credit risk indicators, all variables would have to be measured with a lag of three years in relation to the current values of NPL and LLP. We are however unable to do this due to the limited time frame of our sample, and therefore some caution should be used in interpreting this finding.

The results using the alternative measures of bank risk suggest that our finding that banks located in countries with strong-FTR languages have higher risk-taking is confirmed. Our key finding is thus robust to the use of alternative measures of bank risk.

1.5.2. Alternative measures for future time reference

We utilize alternative measures of language future time reference. Chen (2013) has developed two indicators based on word-frequency analysis of text from the web. The *Verb Ratio* measures the number of verbs which are grammatically future marked, divided by the total number of future-referring verbs in a country's online weather forecast. The *Sentence Ratio* measures the share of sentences regarding the future which contain a grammatical future marker in a country's online weather forecast. The verb and sentence ratios are highly correlated with the strong-FTR language measure. They are available for a smaller number of observations (7,349 observations vs. 8,414 observations for strong-FTR language measure).

We test the influence of both indicators in Table 1.7. With each indicator, we first perform regressions without control variables, then with control variables. We find that both *Verb Ratio* and *Sentence Ratio* have significantly negative coefficients in all estimations. The results with verb ratio and sentence ratio thus align with our main estimations and provide additional support for our finding that strong future time reference increases bank risk.

1.5.3. Additional robustness checks

Table 1.8 reports several robustness checks.

First, we use an alternative way to measure Z-score. We change the denominator of the Z-score by computing the standard deviation of ROA on a three-year rolling window rather than on the whole period of the study. We report the results in column (1). We observe a negative but insignificant coefficient for *Strong-FTR*.

Second, we exclude U.S. from the sample. Chen et al. (2017) point out that this country has a specific status as a "melting pot" with large variation in cultures and languages. As such, we can check if the results stand without this country. The regression is displayed in column (2). We find again a significant and negative coefficient for *Strong-FTR*.

Third, we exclude the largest strong-FTR and weak-FTR countries in terms of number of banks from the sample. Both these countries represent a substantial share of the sample and can drive our results. We therefore drop both the largest strong-FTR country (U.S. with 375 banks) and the largest weak-FTR country (China with 116 banks). We report the results in column (3). We still find that the coefficient for *Strong-FTR* is negative and significant.

Fourth, we exclude Switzerland. This country is the only one in our sample combining strong-FTR (French, Italian) and weak-FTR (German) languages. We consider Switzerland in our sample since we were able to carefully check the location of the headquarters of each bank. We can nonetheless check the influence of the exclusion of this country from the sample. The results are reported in column (4). The effect of strong-FTR language on bank risk remains significantly negative.

Fifth, we control for the number of subsidiaries in English-speaking countries. The increasing importance of English language as a means of communication in the global community and in a vast majority of global financial transactions could influence our results. Thus, English language may be a common language and of importance to the activities of banks which have subsidiaries in other countries where English is the official language. To control for this, we include the number of subsidiaries a bank has in English speaking countries (*Subsidiaries*). The results are presented in column (5). We still observe that the coefficient of *Strong-FTR* is significantly negative.

1.5.4. The influence on banking crises

We have shown that future tense marking influences risk-taking behavior of banks. Strong-FTR languages contribute to make banks take higher risk. A natural extension of our work is to check whether future tense marking also affects the occurrence of banking crises. Namely the major detrimental effect of high bank risk is to launch a banking crisis. So the support of our hypothesis should be found whether we obtain evidence that countries with strong-FTR languages have higher occurrence of banking crises.

To investigate this question, we perform estimations at the country level explaining the occurrence of banking crises with the language variables. We use information on banking crises from Laeven and Valencia (2018) who provide a dataset of systemic banking crises globally

from 1970 till 2017. The dependent variable is a dummy variable that takes the value one if a banking crisis is observed in a particular year and zero otherwise (*Banking crisis*). A banking crisis is identified in a country for a particular year when two conditions are met: (1) the banking system experiences a significant financial distress i.e., when there are severe losses in the banking sector (high share of non-performing loans to total loans or relevant fiscal restructuring costs), and (2) significant policy interventions are employed in order to mitigate the real consequences of the losses in the banking system.

When combining information on classification of languages and on banking crises, we obtain a sample of 75 countries. It includes 60 countries with the strong-FTR language form and 15 countries with the weak-FTR language form. Since we now perform estimations at the country level, we must classify each of the two groups of countries in our sample with one language form. We classify Switzerland as having a weak-FTR language form because the most widely spoken language in Switzerland is German. In the case of Canada, we do not have any issue with the FTR language form since both of its official languages are of the strong-FTR language category. However, with regards to the verb and sentence ratio, we use the widely spoken language, which is English.

We consider two country control variables used in the bank-level estimations, *Log(GDP/Capita)* and *Inflation*, in line with previous works on the determinants of banking crises (Demirgüc-Kunt and Detragiache, 2000; Klomp, 2009). We do not include variables *Legal Rights* and *Herfindahl Index* which were adopted in the bank-level estimations because of data limitations. Namely, the focus on banking crises benefits from the use of long time series starting from 1970 until 2017. However, information on *Legal Rights* and *Herfindahl Index* is not available for such a long period for a large number of countries. Therefore, we control for legal environment with variables for legal origin: we include dummy variables for French legal origin, German legal origin, and English legal origin, with the omitted dummy variable being Scandinavian legal origin.

In order to examine whether language FTR affects the occurrence of banking crises across countries, we perform logit estimations and use the following model:

$$Y_{kt} = \alpha + \beta\, Strong\text{-}FTR_{kt} + \delta\, Country\ Controls_{\ kt} + \varepsilon_{kt} \qquad (3)$$

where Y_{kt} is the occurrence of banking crises in country *k* for year *t*; *Strong-FTR* is a dummy variable equal to one if a country's dominant language is classified as strong-FTR and zero otherwise; *Country Controls* is the set of country-specific control variables *(log(GDP/capita), Inflation, French Legal Origin, German Legal Origin, English legal origin*), and ε is a random error term.

We display seven estimations in Table 1.9 to provide a broad view of the influence of language FTR on the occurrence of banking crises. We first investigate the influence of *Strong-FTR* by considering only two country control variables (*Log GDP/capita* and *Inflation*) in column (1) before adding the three legal origin variables in column (2). In the following estimations, we always use this set of five control variables. We then analyze the impact of *Verb Ratio* in column (3) and of *Sentence Ratio* in column (4). Finally, in the three last columns, we study again the influence of *Strong-FTR* by considering the additional culture measures with respectively Hofstede dimensions, religion, and trust and corruption in columns (5) to (7). In all estimations, we report the marginal effects to measure not only statistical significance but also economic significance.

We find that *Strong-FTR* is significantly positive in all estimations, except in column (7). This result is observed with all sets of control variables. From the marginal effects, we observe that for a country that speaks a strong-FTR language, the likelihood to observe a banking crisis will increase by 0.8 percentage points when considering the specification in column (2). The economic impact is not insignificant, given the fact that the mean value for the banking crisis variable for the weak-FTR language countries is 2.34 percent. Our finding suggests that the average strong FTR language country has 34.19% (=0.008/0.0234) more chances to observe a banking crisis than the average weak-FTR language country, controlling for country-level characteristics in our dataset. Further, in columns (3)-(4), we also observe that the coefficients for *Verb Ratio* and *Sentence Ratio* are significantly positive, supporting the robustness of our finding. Thus, we conclude that strong future time reference is associated with an increase in the occurrence of banking crises.

This finding corroborates our major conclusion on the detrimental impact of strong future time reference on bank risk-taking. It has positive implications of prime importance since it suggests that occurrence of banking crises can be related to linguistic factors.

1.6. Conclusion

In this paper, we analyze the impact of language on risk-taking behavior of banks. While a large set of determinants of bank risk have been investigated, the influence of language has been ignored until now. Our hypothesis is that strong-FTR languages influence banks to take more risk. It accords with the view that a strong-FTR language makes the future feel more distant than the present and as such, reduces the perception of potential losses associated with risky activities.

Our main finding is that language affects bank risk. Our baseline estimations show a positive relation between strong-FTR language and bank risk. This conclusion stands when we take into account different culture indicators. It is confirmed in a battery of robustness tests considering various measures of bank risk, of future time reference and different samples of countries. We additionally observe that strong-FTR language is associated with greater occurrence of banking crises. This evidence is consistent with our hypothesis and supports the view from Chen (2013) that language exerts an impact on economic behavior for the risk-taking behavior of banks.

The take-away lesson is that language can explain part of the cross-country differences in bank risk. The implications of our conclusion are numerous. At the country level, it suggests that countries with strong-FTR languages should have lower financial stability due to higher risk-taking from banks. Language may therefore contribute to explain the differences in the frequency of banking crises across countries. At the bank level, we should observe a change in risk-taking behavior for a bank when bank managers with a strong-FTR language replace others with a weak-FTR language and reversely. The influence of CEO changes on bank risk should thus be considered through the angle of the CEO language. These implications open avenues for further research.

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Table 1.1.
Cross-country summary statistics

This table provides the number of banks and the average Z-score for each country in the sample.

Country	Number of Banks	Average Z-score	Country	Number of Banks	Average Z-score
Panel A: *Strong-FTR language countries*					
Albania	2	3.812	Portugal	8	2.443
Australia	19	4.33	Qatar	6	3.581
Azerbaijan	9	2.604	Republic of Korea	5	3.931
Bahamas	6	3.347	Republic of Moldova	2	3.997
Bahrain	4	4.207	Romania	8	2.296
Bangladesh	27	3.338	Russian Federation	59	2.717
Belarus	4	3.094	Saudi Arabia	8	4.709
Belize	2	2.596	Slovakia	4	4.269
Botswana	5	2.7	Slovenia	3	2.541
Bulgaria	11	2.958	Spain	22	3.588
Canada	37	3.816	Thailand	9	3.719
Chile	10	3.763	Trinidad and Tobago	2	3.952
Colombia	7	3.284	Tunisia	11	3.264
Costa Rica	5	3.989	Turkey	18	3.422
Croatia	5	3.343	Ukraine	11	3.069
Czech Republic	8	3.681	United Arab Emirates	14	3.537
Dominican Republic	2	4.081	United Kingdom	26	3.021
Ecuador	9	3.739	USA	375	3.598
Egypt	4	3.642	Uruguay	3	3.137
France	26	3.986	Vietnam	22	3.626
Gambia	2	3.511	Yemen	2	2.729
Georgia	7	3.716	Zambia	4	3.069
Ghana	8	2.38	Mean		3.54
Greece	5	2.057	Standard Deviation		0.899
Honduras	2	3.979	*Panel B: Weak-FTR language countries*		
Hungary	12	2.399	Austria	14	3.452
Iraq	2	4.248	Brazil	67	3.417
Italy	19	2.988	China	116	3.907
Jamaica	3	3.025	Denmark	12	2.95
Jordan	12	4.293	Finland	9	3.921
Kuwait	4	3.689	Germany	4	3.785
Latvia	9	2.636	Hong Kong	18	3.949
Lebanon	20	4.358	Iceland	2	3.142
Lithuania	3	2.779	Indonesia	16	3.394
Macedonia	2	3.093	Japan	76	4.306
Mexico	18	3.591	Netherlands	15	3.289
Morocco	8	4.232	Norway	8	3.774
Mozambique	2	3.995	Suriname	3	2.793
Namibia	4	3.764	Sweden	8	3.81
New Zealand	6	4.0003	Mean		3.829
Nicaragua	4	3.175	Standard Deviation		0.881
Nigeria	9	2.873			
Panama	22	4.33	Switzerland	10	3.681
Poland	16	3.841			

Table 1.2.
Descriptive statistics

This table provides descriptive statistics for the variables used in the estimations. Definitions of variables are reported in the Appendix.

Variable	N	Mean	Std. Dev.	Min	Max
Strong-FTR	8,414	0.746	0.435	0	1
Z- score	8,414	3.613	0.904	-1.153	7.58
Bank Size	8,414	15.855	1.929	9.203	22.111
Loans to Assets	8,414	58.216	17.652	6.047	89.873
Deposits to Assets	8,414	70.043	18.075	4.476	93.084
Log (GDP/capita)	8,414	10.041	1.045	5.946	11.543
Inflation	8,414	0.026	0.03	-0.038	0.441
Legal Rights	8,414	7.041	3.53	0	12
Herfindahl Index	8,414	48.642	16.206	25.884	100
NPL	7,862	4.329	6.835	0	49.143
LLR	8,158	3.187	3.967	0.034	32.888
LLP	8,011	0.921	1.428	-0.816	11.238
δ(ROA)	8,414	0.426	0.398	0.007	3.123
Verb Ratio	7,349	0.605	0.31	0	1
Sentence Ratio	7,349	0.671	0.334	0	1

Table 1.3.
Main estimations

This table presents the results of random effects regressions examining the relation between strong-FTR language and bank risk. The dependent variable is Z-score. Definitions of variables are provided in the Appendix. Robust standard errors controlling for heteroscedasticity are reported within parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	(1)	(2)	(3)	(4)
Strong-FTR	-0.319***	-0.369***	-0.265***	-0.289***
	(0.054)	(0.069)	(0.066)	(0.07)
Bank Size		-0.136***		-0.158***
		(0.017)		(0.019)
Loans to Assets		0.004***		0.003***
		(0.001)		(0.001)
Deposits to Assets		-0.003***		-0.004***
		(0.001)		(0.001)
Log (GDP/capita)			-0.008	0.097***
			(0.029)	(0.03)
Inflation			-0.751***	-0.858***
			(0.174)	(0.162)
Legal Rights			-0.006	-0.004
			(0.005)	(0.004)
Herfindahl Index			0.000	0.000
			(0.001)	(0.001)
Constant	3.741***	5.519***	3.536***	4.994***
	(0.048)	(0.269)	(0.287)	(0.313)
Observations	8,414	8,414	8,414	8,414
R Squared	0.019	0.035	0.106	0.039
Year FE	Yes	Yes	Yes	Yes
Continent FE	No	Yes	Yes	Yes

Table 1.4.
Alternative measures of country culture

This table presents the results of random effects regressions examining the relation between strong-FTR language and bank risk. The dependent variable is Z-score. Definitions of variables are provided in the Appendix. Robust standard errors controlling for heteroscedasticity are reported within parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	(1)	(2)	(3)	(4)
Strong-FTR	-0.293***	-0.262***	-0.171*	-0.282***
	(0.101)	(0.081)	(0.102)	(0.0693)
Uncertainty Avoidance	0.001			
	(0.002)			
Long term Orientation	-0.002			
	(0.002)			
Catholic		0.557***		
		(0.10)		
Muslim		-0.093		
		(0.113)		
Protestant		-0.159		
		(0.197)		
Buddhist		0.289**		
		(0.123)		
Trust			1.123***	
			(0.335)	
Corruption				0.001
				(0.001)
Constant	5.078***	4.495***	4.902***	5.103***
	(0.354)	(0.335)	(0.367)	(0.339)
Observations	7,759	8,414	7,460	8,404
R Squared	0.052	0.06	0.041	0.04
Bank Controls	Yes	Yes	Yes	Yes
Country Controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Continent FE	Yes	Yes	Yes	Yes

Table 1.5.
Controlling for banking regulations

This table presents the results of random effects regressions examining the relation between strong-FTR language and bank risk. The dependent variable is Z-score. Definitions of variables are provided in the Appendix. Robust standard errors controlling for heteroscedasticity are reported within parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	(1)	(2)	(3)
Strong-FTR	-0.386***	-0.170**	-0.279***
	(0.075)	(0.077)	(0.084)
Dynamic Provisioning	0.628***		0.577***
	(0.152)		(0.162)
Capital Requirements		-0.013	0.019
		(0.025)	(0.028)
Capital Stringency		0.006	0.004
		(0.023)	(0.023)
Constant	4.947***	4.806***	4.464***
	(0.310)	(0.471)	(0.476)
Observations	8,414	7,172	7,172
R Squared	0.044	0.034	0.04
Bank Controls	Yes	Yes	Yes
Country Controls	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Continent FE	Yes	Yes	Yes

Table 1.6.
Alternative measures of bank risk

This table presents the results of random effects regressions examining the relation between strong-FTR language and bank risk. The dependent variable is the risk measure at the top of the column. Definitions of variables are provided in the Appendix. Robust standard errors controlling for heteroscedasticity are reported within parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	(1)	(2)	(3)	(4)
	NPL	LLR	LLP	δ(ROA)
Strong-FTR	0.785	1.128***	0.092	0.057**
	(0.552)	(0.284)	(0.098)	(0.022)
Bank Size	-0.632***	-0.348***	-0.022	-0.045***
	(0.107)	(0.071)	(0.022)	(0.005)
Loans to Assets	-0.056***	-0.045***	-0.004*	-0.001**
	(0.01)	(0.007)	(0.002)	(0.001)
Deposits to Assets	-0.004	0.001	-0.006***	-0.002***
	(0.01)	(0.006)	(0.002)	(0.001)
Log (GDP/capita)	-2.004***	-1.388***	-0.369***	-0.054***
	(0.284)	(0.169)	(0.051)	(0.013)
Inflation	-6.568	1.116	5.884***	0.726***
	(5.648)	(2.289)	(1.279)	(0.258)
Legal Rights	0.189**	0.119**	0.028	0.009**
	(0.077)	(0.051)	(0.017)	(0.005)
Herfindahl Index	-0.02*	0.01*	-0.004*	0.001
	(0.01)	(0.005)	(0.002)	(0.001)
Constant	39.79***	23.21***	7.101***	1.784***
	(3.624)	(1.812)	(0.624)	(0.144)
Observations	7,862	8,158	8,011	8,414
R Squared	0.248	0.318	0.219	0.142
Year FE	Yes	Yes	Yes	Yes
Continent FE	Yes	Yes	Yes	Yes

Table 1.7.
Alternative measures for future time reference

This table presents the results of random effects regressions examining the relation between measures for future time reference and bank risk. The dependent variable is Z-score. Definitions of variables are provided in the Appendix. Robust standard errors controlling for heteroscedasticity are reported within parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	(1)	(2)	(3)	(4)
Verb Ratio	-0.546***	-0.498***		
	(0.111)	(0.121)		
Sentence Ratio			-0.542***	-0.494***
			(0.105)	(0.114)
Constant	3.604***	5.212***	3.608***	5.219***
	(0.078)	(0.338)	(0.078)	(0.337)
Observations	7,349	7,349	7,349	7,349
R Squared	0.118	0.051	0.120	0.052
Bank controls	No	Yes	No	Yes
Country controls	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes
Continent FE	Yes	Yes	Yes	Yes

Table 1.8.
Robustness checks

This table presents the results of random effects regressions examining the relation between strong-FTR language and bank risk. The dependent variable is Z-score. Definitions of variables are provided in the Appendix. Robust standard errors controlling for heteroscedasticity are reported within parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)
	3-year rolling window	Excluding U.S.	Excluding largest weak-FTR and strong-FTR countries	Excluding Switzerland	Subsidiaries in English speaking countries
Strong-FTR	-0.028	-0.284***	-0.168*	-0.286***	-0.321***
	(0.068)	(0.074)	(0.0858)	(0.070)	(0.075)
Subsidiaries					0.002***
					(0.000)
Constant	0.483***	5.058***	4.784***	4.998***	5.284***
	(0.381)	(0.391)	(0.408)	(0.313)	(0.359)
Observations	5,945	5,602	5,008	8,359	7,656
R Squared	0.143	0.050	0.050	0.039	0.044
Bank controls	Yes	Yes	Yes	Yes	Yes
Country controls	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Continent FE	Yes	Yes	Yes	Yes	Yes

Table 1.9.
Language and banking crises

This table presents the results of logit estimations (marginal effects) examining the relation between strong-FTR language and the occurrence of banking crises. The dependent variable is the occurrence of banking crisis. Definitions of variables are provided in the Appendix. Robust standard errors clustered at the country level are reported within parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Strong-FTR	0.006***	0.008***			0.008***	0.008***	0.003
	(0.002)	(0.002)			(0.002)	(0.002)	(0.003)
Verb Ratio			0.007*				
			(0.004)				
Sentence Ratio				0.008**			
				(0.004)			
Log (GDP/capita)	0.001	0.001	0.002	0.002	0.001	0.001	0.005***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)
Inflation	0.015***	0.015***	0.016***	0.016***	0.014***	0.015***	0.013***
	(0.003)	(0.003)	(0.002)	(0.002)	(0.005)	(0.003)	(0.003)
English Legal Origin		-0.009**	-0.008*	-0.008**	-0.006	-0.009**	-0.003
		(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
French Legal Origin		-0.007	-0.002	-0.002	-0.006	-0.008	-0.004
		(0.005)	(0.004)	(0.004)	(0.004)	(0.005)	(0.004)
German Legal Origin		-0.005*	-0.001	-0.001	-0.003	-0.005*	-0.004
		(0.003)	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)
Uncertainty Avoidance					-0.000		
					(0.000)		
Long-term Orientation					0.000		
					(0.000)		
Catholic						0.002	
						(0.003)	
Muslim						0.006	
						(0.006)	
Protestant						0.003	

						(0.005)	
Buddhist						0.018*	
						(0.01)	
Corruption							-0.000**
							(0.000)
Trust							0.015
							(0.01)
Observations	2,816	2,816	2,504	2,504	2,201	2,816	1,922
Pseudo R-squared	0.035	0.036	0.042	0.043	0.033	0.052	0.047
Log-Likelihood	-333.833	-333.444	-288.769	-288.675	-273.006	-327.89	-237.891
Continent FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Appendix 1.1.
Definitions and sources of variables

Variable	Definition and source
Dependent Variables	
Z-score	Measure of bank risk-taking: $Z\text{-}score = (ROA+CAR)/\delta(ROA)$, where ROA is the return on assets, CAR is the ratio of equity to total assets, and $\delta(ROA)$, is the standard deviation of the return on assets computed over the whole period of the study. Source: Orbis bank database.
NPL	Ratio of non-performing loans to gross loans. Source: Orbis bank database.
LLR	Ratio of loan loss reserves to gross loans. Source: Orbis bank database.
LLP	Ratio of loan loss provisions to gross loans. Source: Orbis bank database.
δ(ROA)	Standard deviation of the return on assets calculated over the whole period of the study. Source: Orbis bank database.
Banking crisis	Dummy variable equal to one if a country has observed a banking crisis in a particular year and zero otherwise. Source: Laeven and Valencia (2018).
Language Structure Measures	
Strong-FTR	Dummy variable equal to one if the dominant language of a region or country is classified as a strong-FTR ("Future Time Reference") language and zero otherwise. Source: Chen (2013).
Verb Ratio	The number of verbs which are grammatically future marked, divided by the total number of future-referring verbs in a country's online weather forecast. Source: Chen (2013).
Sentence Ratio	The share of sentences regarding the future which contain a grammatical future marker in a country's online weather forecast. Source: Chen (2013).
Bank Level Control Variables	
Bank Size	Logarithm of total assets. Source: Orbis bank database.
Loans to Assets	Ratio of loans to total assets. Source: Orbis bank database.
Deposits to Assets	Ratio of deposits to assets. Source: Orbis bank database.
Subsidiaries	Number of subsidiaries in English-speaking countries. Source: Orbis bank database.
Country Level Control Variables	
Log (GDP/capita)	Log of real Gross Domestic Product per capita. Source: World Development Indicators.

Inflation	Annual percentage change in consumer prices in a country. Source: World Development Indicators.
Legal Rights Index	Index to measure the extent to which the laws in a country protect borrowers and lenders. Source: World Governance Indicators.
Herfindahl Index	Index to measure bank concentration. Source: Global Financial Development (GFDD).
Catholic	Dummy variable equal to one if more than 50% of the inhabitants in a country are Catholics. Source: CIA World Factbook.
Protestant	Dummy variable equal to one if more than 50% of the inhabitants in a country are Protestants. Source: CIA World Factbook.
Muslim	Dummy variable equal to one if more than 50% of the inhabitants in a country are Muslims. Source: CIA World Factbook.
Buddhist	Dummy variable equal to one if more than 50% of the inhabitants in a country are Buddhists. Source: CIA World Factbook.
Uncertainty avoidance	Index to measure how a society feels threatened by uncertain situations. Source: Hofstede's Website.
Long-term orientation	Index to measure the long-term orientation of a society. Source: Hofstede's Website.
Trust	Index to measure trust. Source : La Porta et al (1997b).
Corruption	Corruption Perception Index indicating the perceived level of corruption in a country. Source: Transparency International.
English Legal Origin	Dummy variable equal to one if a bank is from a country with English legal origins. Source: La Porta et al. (2008).
French Legal Origin	Dummy variable equal to one if a bank is from a country with French legal origins. Source: La Porta et al. (2008).
German Legal Origin	Dummy variable equal to one if a bank is from a country with German legal origins. Source: La Porta et al. (2008).
Scandinavian Legal Origin	Dummy variable equal to one if a bank is from a country with Scandinavian legal origins. Source: La Porta et al. (2008).
Dynamic Provisioning	Dummy variable equal to one if a bank is located in a country that introduced dynamic loan loss provisioning. Source: Wezel, Chan Lau and Columba (2012).
Capital Requirements	Minimum capital requirements in a country. Source: Barth, Caprio and Levine (2013).
Capital Stringency	Index measuring whether the capital requirement reflects certain risk elements and deducts certain market value losses from capital before minimum capital adequacy is determined. Source: Barth, Caprio and Levine (2013).

Chapter 2[13]

Sex, Language, and Financial Inclusion

Abstract

Reference to gender in language can lead individuals to draw distinctions between genders and reinforce traditional views of gender roles. To test our hypothesis that language gender-marking exerts an influence on the gender gap in financial inclusion, we draw on data for 117 countries in the World Bank's Global Findex database and perform logit estimations at the individual level. We find the gender gap in the probability of owning a formal account, having access to a formal credit, as well as having savings in a formal financial institution is higher for countries with gendered languages than for countries with genderless languages. These findings are confirmed in robustness checks that control for alternative measures of culture and estimations at the country level.

JEL Codes: G21, Z13.
Keywords: financial inclusion, gender, language.

[13] This chapter refers to the article published in Economics of Transition and Institutional Change (2021) with Laurent Weill.

2.1. Introduction

In recent years, the promotion of financial inclusion, measured as the access to and the use of financial services, has taken a prominent place on the agendas of many governments and international organizations. The World Bank, for example, has set the aspirational objective of achieving universal access to a transaction account by 2020. These efforts have been motivated by the fact that financial inclusion is recognized as an important driver of economic development. It not only provides individuals a safe place to save for the future, launch a business or invest in education, but also helps society at large tackle the challenges of reducing poverty and improving health (Dupas and Robinson, 2013; Bruhn and Love, 2014).

A major issue in this debate is the gender gap – specifically, the fact that women continue to have poorer access to financial services than men. The latest wave of Global Findex data for 2017 shows, for example, that 72 percent of men and 65 percent of women had bank accounts – a seven-point gender gap that has not changed since the first wave of Global Findex data in 2011 (Demirgüc-Kunt et al., 2018). The gender gap in financial inclusion is an obstacle for women empowerment as it diminishes the economic role of women and their ability to contribute to family support (Hashemi, Schuler and Riley, 1996; Pitt, Khandker and Cartwright, 2006; Swamy, 2014). Thus, understanding the gender gap in financial inclusion is crucial in promoting gender equality.

Despite wide documentation of the gender gap in financial inclusion, the underlying reasons for this gap remain scarcely investigated. Demirgüç-Kunt, Klapper, and Singer (2013) argue that legal discrimination against women (e.g., restrictions in the ability to work or head a household) and gender norms may explain the gender gap. Beck, Behr, and Madestam (2018) provide a behavioral reason, showing that male loan officers charge higher interest rates and grant lower loan amounts to female borrowers, and impliedly that women have lower access to credit in countries with higher shares of male loan officers. Ghosh and Vinod (2017) show the influence of political-, wage-, and education-related determinants for India.

This paper provides a novel explanation for the gender gap in financial inclusion: gender-marking in language. We investigate how language gender-marking influences gender inequalities in the access and use of financial services. Our hypothesis is that languages that

require reference to gender lead individuals to draw subtle distinctions between genders. This aspect of language reinforces traditional views of gender roles in the minds of speakers, thereby affecting women's financial inclusion. This hypothesis has its roots in recent research showing that grammatical gender shapes the way people think along gender lines (Boroditsky, 2009).

Languages differ in the use of gender-specific nouns and pronouns. They can utilize a noun assignment based on gender with the masculine or feminine categorization of nouns as in French ("le/la"), which does not exist in English. They can use gender-specific pronouns like "he/she" for the third person pronoun in English. Other languages (e.g., Finnish, Swahili, Mandarin) do not systematically mark gender distinctions. There is no noun assignment or pronoun distinctions based on gender. This linguistic feature can influence inequalities in gender outcomes, namely languages that constantly call attention to gender distinctions by discriminating between feminine and masculine nouns and pronouns can influence the perception of distinctions between women and men, thereby influencing societal inequalities.

A few studies have found evidence for this view in economics with the findings that women in countries with a gendered language have lower participation rates in the labor market (Mavisakalyan, 2015), or lower participation on boards of directors and in senior management (Santacreu-Vasut, Shenkar, and Shoham, 2014). Drori et al. (2018) consider whether language gender-marking shapes microfinance outreach to women. They find that gender-marking in language reduces the ratio of female to male borrowers in microfinance organizations.

We test the hypothesis that grammatical gender shapes women's financial inclusion on a sample of roughly 350,000 individuals from 117 countries. Combining individual-level survey data from the Global Findex database for financial inclusion with measures for gender intensity of languages from the World Atlas of Language Structures, we examine whether the gender gap in financial inclusion is greater in countries with highly gendered languages. Three financial inclusion indicators are considered:

- formal ownership of a bank account,
- formal access to bank credit,
- formal saving on a bank account.

We also investigate whether the influence of gender-marking in language affects all types of motives for loans and access to alternative sources of borrowing. This helps in identifying whether language gender-marking constitutes a major obstacle for access to credit.

Our results indicate that language gender-marking affects women's financial inclusion. The gender gap in the probability for having a formal account, access to formal credit, and formal saving is significantly higher in countries with gendered language than in countries with genderless languages. We further find that language gender-marking enhances the gender gap in access to credit for all loan motives and for all sources of borrowing (formal and informal). Our key conclusion is that gendered languages help foster the gender gap in financial inclusion.

Our paper contributes to the literature in two ways. First, we extend the literature on the gender gap in financial inclusion by investigating the influence of language gender-marking. Recent works demonstrate the cultural determinants of gender inequality in economics. Alesina, Giuliano, and Nunn (2013) show that gender norms are influenced by traditional agricultural practices, specifically plough cultivation. In a related vein, Hansen et al. (2015) argue that higher gender inequality and lower female labor participation are caused by high patriarchal values and beliefs regarding the proper role of women in societies with long agrarian histories. Our paper augments the literature by emphasizing the role of language gender-marking, separate from other measures of national culture, as a determinant of the gender gap in financial inclusion.

Second, we add to the discussion on the impact of linguistic structures on economic behavior. This line of research tests the "Sapir-Whorf hypothesis," which states that actions are influenced by language, in economics. This hypothesis of economic behavior influence has been bolstered by evidence from future-tense-marking (Chen, 2013; Mavisakalyan, Tarverdi, and Weber, 2018) and language gender-marking (Santacreu-Vasut, Shenkar, and Shoham, 2014; Mavisakalyan, 2015). To our best knowledge, the influence of language on the gender gap in financial inclusion has never been studied. While Drori et al. (2018) present results for the ability of women to obtain loans in microfinance institutions, we extend the analysis to all dimensions of financial inclusion, including the ownership of a bank account and consider access and use of services in formal financial institutions.

The rest of this paper is organized as follows. Section 2.2 presents the background of the research question. Section 2.3 outlines the data and methodology. Section 2.4 provides estimations results. Section 2.5 reports the robustness checks. Section 2.6 concludes.

2.2. Background

The Sapir-Whorf hypothesis, or *Linguistic Relativity Hypothesis*, states that the language we speak influences our world view (Whorf, 1956). Language, beyond being an important tool for communication, indirectly influences behavior at the subconscious level. While the strong version of this hypothesis, which assumes that language determines thought and controls cognitive processes, has been widely panned, its weak version, which says language constrains cognition, is widely supported (Boroditsky, 2001; Slobin, 2003).

Gender features are encoded into many of the world's nearly 7,000 living languages (Boroditsky, 2011). Linguistic gender differs from biological sex distinctions in that "genders are classes of nouns reflected in the behavior of associated words" (Hockett, 1958, p. 231). Grammatical gender is merely a way of categorizing nouns. For example, the Spanish word for book with definite article, *el libro* (the book), has a masculine grammatical gender without any linkage to the male sex.

The large differences in how languages differ in the way they encode gender can be illustrated by the fact that languages such as Finnish make no distinction as to grammatical gender, while other languages such as Arabic express gender even in the first- or second-person pronoun. English takes the middle ground; nouns have no grammatical gender but it distinguishes between pronouns in the third-person singular: *he* (masculine) and *she* (feminine).

In gendered languages, the need to constantly consider and mark gender has been found to influence speakers' cognition and how they view objects as having male and female traits. Boroditsky (2009) asked German and Spanish speakers to describe two objects which have opposite gender assignments in the two languages: a *key* which is masculine in German and feminine in Spanish, and a *bridge* which is feminine in German and masculine in Spanish.

German speakers described the key using words such as *heavy, hard, metal, serrated,* and *jagged,* whereas Spanish speakers were more likely to say *tiny, intricate, golden, little, lovely,* and *shiny.* In describing the bridge, German speakers used words like *pretty, elegant, peaceful,* and *fragile*, while Spanish speakers said *long, strong, sturdy*, and *big.* This work builds on considerable experimental data. For example, Boroditsky, Schmidt, and Phillips (2003) and Phillips and Boroditsky (2003) tend to show that "even small flukes of grammar, like the seemingly arbitrary assignment of gender to a noun, can have an effect on people's ideas of concrete objects in the world" (Boroditsky, 2009).

In line with this view, scholars and feminists have long argued that gendered languages enforce sex distinctions on its speakers and contribute to sexist outcomes (Stahlberg et al., 2007; Wasserman and Weseley, 2009). The feminist Dale Spender (1985) notes that "there is sexism in language, it does enhance the position of males, and males have had control over the production of cultural forms."

One widespread form of asymmetry is the use of masculine generics, meaning the use of supposedly gender-neutral masculine pronouns and nouns like "*his*" and "*he*" in statements, even when the referent is not necessarily of a male gender. In this way, maleness is equated to humanness and portrayed as the norm. Using masculine generics has been shown to evoke perceptions and mental representations of men rather than women, and in consequence, put women at a disadvantage (Hamilton et al., 1992; Stahlberg et al., 2001).

A growing body of research in economics confirms the feminist language critique and reveals that gendered languages may highlight the salience of gender distinctions in the minds of speakers, leading to more pronounced inequalities in gender outcomes. Mavisakalyan (2013) examines whether sex-based grammatical gender in languages affect women's labor outcomes in over 100 countries. They find that in countries with a gender-intensive language, women have lower labor force participation. Similarly, Santacreu-Vasut, Shenkar, and Shoham (2013) show that countries with gendered languages are more likely to have political gender quotas and less microfinance support to women (Drori et al., 2018). Van der Velde, Tyrowicz, and Siwinska (2015) find that countries with gender-intensive languages tend to have higher estimates of gender wage gap. At the individual level, Davis and Reynolds (2018) observe that women speaking gendered languages have lower educational attainment and secondary school completion rate relative to men, while Hicks, Santacreu-Vasut and Shoham (2015) show that

households with individuals whose native language marks grammatical gender are more likely to allocate household tasks on the basis of sex. These findings support the view that grammatical gender in languages make a difference in how speakers organize their beliefs about gender and possibly play a role in affecting women's outcomes.

Following this line of reasoning, we question whether the pervasiveness of gender in language influences the ability of men and women to access and use financial services. In line with the view that language influences actions, we argue that individuals speaking a highly gendered language are more likely to accept prevailing cultural norms and traditional gender roles. Indeed, for individuals speaking a gendered language, sex-based distinctions are salient in every thought and speech. As explained by Johansson (2005), the origins of gender distinctions in languages are based on evolutionary pressures relating to reproduction, the division of labor, and specialization.[14] Thus, grammatical gender systems may have become embedded in language, and therefore the use of sex-based distinctions in language today may be reflecting historically determined gender-related cultural roles and values.[15] Roland (2004) notes that culture is a slow-moving institution which tends to change gradually, and that the presence of gender in the grammatical structure of language may act as a marker for ancestral gender roles. Language gender-marking therefore serves as a mechanism which effects the strength of salient facets of our past cultural reality.

Further, the direct impact of grammatical gender on cognition (Boroditsky et al., 2003) may reinforce the formation of beliefs and preferences along gender lines, and thereby influence the behavior of speakers. This may lead women speaking gendered languages to engage less in roles traditionally considered the purview of men such as labor force participation (Mavisakalyan, 2013) and financial responsibilities.

Within the household, as shown by Hicks, Santacreu-Vasut, and Shoham (2015), grammatical gender-marking in language is a strong predictor of the tasks that are engaged in by women and men. We therefore expect that women whose language marks grammatical gender would have a lower probability of owning a formal account, having access to formal

[14] Linguistic features, e.g., grammatical gender marking, have *remained stable* for a very long time (Wichmann and Holman, 2009), and therefore expected to be exogenous to economic outcomes (Tabellini, 2008).

[15] Alesina, Giuliano, and Nunn (2013) investigate the historical origins of current differences in gender roles in pre-industrial agricultural societies. They conclude that ancestral gender norms still matter today.

credit, and saving in a formal financial institution. This hypothesis accords with the role of language gender-marking in influencing perceptions of gender roles and contributing to gender inequalities.

Guided by our theoretical framework, we propose our testable hypothesis: Female-male distinctions in language increase the gap in financial inclusion between men and women.

2.3. Data and methodology

2.3.1. Measuring financial inclusion

We use data on financial inclusion from the World Bank's Global Findex database.[16] This database is obtained from nationally representative surveys of individuals in several countries by the Gallup Inc., in association with its annual Gallup World Poll. Targeting the entire civilian, non-institutionalized population aged 15 and above, the survey randomly selects roughly 1,000 respondents in each economy. Questions are provided in over 140 languages. Some countries have more than 1,000 respondents in a particular poll. The Global Findex contains three waves of data (2011, 2014 and 2017). By employing all three waves, we obtain a fairly broad sample size.[17]

In line with previous studies (Hannig and Jansen, 2010; Demirgüç-Kunt and Klapper, 2013; Fungacova and Weill, 2015), we focus on the access and use of financial services, including owning an account, borrowing from a financial institution, and saving at a financial institution.[18] We measure financial inclusion by examining three main variables.

Formal account: Does the individual have an account either at a financial institution or through a mobile money provider? Having a *formal account* is the most basic form of financial inclusion as it sets the tone for the use of a diverse range of financial services.

[16] The database is available at the World Bank website: https://datatopics.worldbank.org/financialinclusion.

[17] It is highly unlikely for one individual to participate in more than one of the three surveys, since the data from each wave are processed independently.

[18] While we focus on the access and use of financial services by individuals, Hainz and Nabokin (2019) provide an analysis of access to credit and its determinants for firms.

Formal credit: Has the individual borrowed from a financial institution at any time during the past 12 months? The ability to access formal credit is an essential element of financial inclusion especially for households and small businesses who often lack the capital to expand their business activities.

Formal saving: Has the individual saved money in an account with a financial institution at any time during the past 12 months?

In addition to these variables, we also consider several barriers to financial inclusion, the borrower's motivation for taking a loan, and alternative sources of credit. We examine some perceived barriers preventing individuals from having formal accounts. Respondents are asked to answer the question: "*Please tell me whether each of the following is a reason why you, personally, do not have an account at a bank or another type of formal financial institution."* The survey includes several responses and allows multiple answers. We focus on the barrier: "*because family member already has one*" and assign a dummy equal to one if the respondent answers "yes" to this question, and zero otherwise.

Next, we analyze the borrower's motivations for taking a loan. Individuals are asked the following question: "*In the past 12 months, have you, by yourself or together with someone else borrowed money for any of the following reasons*?" The responses to this question are: *for education or school fees*, *for medical purposes*, and *for farm or business*. This question relates to either formal or informal credit. To capture motivations for taking only formal credit, the following question is asked: *"Do you, by yourself or together with someone else, currently have a loan you took out from a bank or another type of formal financial institution to purchase a home, an apartment, or land?"*

In addition to the use of formal credit, we delve deeper to explore information on the alternative sources of borrowing. Respondents are asked the question: "*In the past 12 months, have you, by yourself or together with someone else, borrowed any money from any of the following sources?"* We focus on the following responses: *borrowed money from a store*, *borrowed money from family or friends*, and *borrowed money from another private lender*. We then compute the variable *Informal Credit* to measure if a respondent has borrowed any money from any of these three sources in the past 12 months.

2.3.2. Measuring gender marking in languages

Data on the measures of gender intensity in language come from the World Atlas of Language Structures (WALS: Dryer and Haspelmath, 2013).[19] Following Santacreu-Vasut, Shenkar and Shoham (2014), we employ the four grammatical structure variables related to gender in this database to measure gender intensity of a country's dominant language.[20,21] Each variable captures a different aspect of gender intensity in a language.

The first variable *Sex-Based Index* takes into account whether a gender system is linked to biological sex through a female-male distinction. A language gender system may be classified as sex-based (feminine-masculine distinctions) or non-sex-based (Corbett 2013b). Non-sex-based gender systems apply to languages where gender is not based on natural gender, but rather some notion of animacy. For example, in the Fula language, a member of the Niger-Congo language family, nouns referring to human females and human males are merged into a common gender. Thus, the gender system in this language is based on the distinction between human and nonhuman. Other non-sex-based gender languages like Swedish and Zulu make distinctions based on animate and inanimate objects. We code the dummy variable *Sex-Based Index* equal to one if a language has a sex-based gender system (for instance English, Spanish) and zero otherwise (for example Swedish, Danish).

The second variable *Number of Genders Index* considers the number of genders a language has. Some languages have multiple genders (Nigerian Fula has around twenty genders), while others like Mandarin or Cantonese have no genders (Corbett, 2013a). Normally, languages that have just two genders, for instance Arabic and French, possess a

[19] The recent dataset from Jakiela and Ozier (2019) covers a larger dataset of gendered grammar in the world's languages than the WALS dataset. Nevertheless, we prefer the WALS dataset for two reasons. First, the WALS dataset has a key advantage for our investigation: it contains refined linguistic information that enables us to measure four different aspects of gendered grammar in languages. Second, it is not an issue that the WALS dataset only covers a fraction of the world's languages. We only consider here the dominant language of each country (not all spoken languages of the world) because the Global Findex database only provides information on the country of the respondent. The information on the 117 countries available in the Global Findex database provides a vastly-more-than-adequate sample of respondents for our individual-level estimations.

[20] The language with the highest number of speakers in a country is defined as the dominant language following Encyclopedia Britannica, (2010).

[21] We have done a robustness check, in which we only keep countries where the dominant language is spoken by at least 80% of the population. We obtain similar findings, showing that our results are not influenced by countries in which multiple languages are spoken. These estimations are available upon request.

"masculine" and "feminine." Languages with three genders, for example German and English, include a neuter gender (feminine, masculine, and neuter), and there is no biological sex-related distinction in languages with several genders. We code the dummy variable *Number of Genders Index* equal to one if a language has exactly two genders (for instance French and Arabic), and zero otherwise (for instance English and Mandarin).

The third variable, *Gender Pronoun Index*, captures whether a language distinguishes gender in pronouns. Some languages distinguish pronouns along gender lines, meaning they use female/male pronouns when referring to the feminine or masculine, respectively. These distinctions can be made for the third-person pronouns, as well as for the first- and second-person pronouns. For example, English distinguishes between genders only in third-person pronouns (he/she/it), whereas Finnish has no gender distinction in pronouns. In general, languages that have gender distinctions in the first-person pronouns have gender distinctions in the second- or third-person pronouns, or both (Greenberg, 1963). Hence, we compute this variable as a dummy variable which equals one for languages which distinguish gender in the third-person pronouns and also in the first- and/or second-person pronouns (for example Spanish and Arabic), and zero otherwise (for instance English and Finnish).

The fourth variable *Gender Assignment Index* considers how gender is assigned to nouns. In languages, the assignment of genders may depend on the meaning (semantic) of the noun or on its form. In the semantic assignment system, "the meaning of a noun is sufficient to determine its gender, for all or almost all nouns" Corbett (2013c). For example, in Kannada, a language spoken predominantly by people in southern India, nouns that refer to male humans are assigned to the masculine gender, those that refer to female humans are assigned feminine, whereas all other remaining nouns are neuter. This is the case in English, which assigns gender only based on the meaning of the noun, hence a word like "chair" is assigned the neuter gender. On the other hand, some languages assign gender based on both semantic and formal rules. In this assignment system, nouns which are not sex-differentiable may not necessarily be assigned to the neuter gender. Such nouns may be assigned to genders based on morphological and/or phonological (for instance in Spanish, nouns ending in "*a*" are usually feminine) formal assignment rules. We thus introduce this dummy variable equal to one if a language assigns gender on both semantic and formal grounds (for example French and Russian), and zero otherwise (for instance English and Cantonese).

Finally, we consider the overall intensity of gender in a language by constructing the *Aggregate Gender Intensity* as the sum of all the four grammatical gender dummies described above. *Aggregate Gender Intensity* captures the pervasiveness of gender distinctions in a language with a value of 4 representing highly gendered languages and 0 for gender neutral languages. For instance, French has a value of 3, since grammatical gender depends on sex-based distinctions (*Sex-Based Index* = 1), has two genders (*Number of Genders Index* = 1), distinguishes gender in the third-person pronouns only (*Gender Pronoun Index* = 0), and assigns gender to nouns on both semantic and formal grounds (*Gender Assignment Index* = 1).

We use *Aggregate Gender Intensity* to create the dummy variable *AGIV* so that we can classify languages in two groups. *AGIV* is equal to one if *Aggregate Gender Intensity* has a value of 3 or 4, corresponding to highly gendered languages. *AGIV* is equal to zero if *Aggregate Gender Intensity* has a value of 0, 1, or 2, corresponding to mildly gendered languages. For example, English is a mildly gendered language with a value of 1, while French, with a value of 3, is a highly gendered language.

2.3.3. Methodology

We start by testing the outlined hypothesis with logit regressions using the following model specification:

$$X_{ik} = \alpha + \beta * \text{Female}_{ik} + \delta * \text{Individual Controls}_i + \rho * \text{Country Controls}_k + \varepsilon_{ik} \qquad (1)$$

where *X* represents the financial inclusion variable, *i* the individual, and *k* the country. *Female* is a dummy variable equal to one if the individual is a woman, and zero otherwise.

We perform estimations by splitting the countries into two groups based on the intensity of grammatical gender marking for each language gender index. We refer to these two groups as "genderless" (labeled as 0 at the top of the column in the tables of estimations) and "gendered" (labeled as 1 at the top of the column in the tables of estimations). This enables us to identify whether the gender gap in financial inclusion is influenced by the gender intensity of the language by testing if the coefficient for *Female* is significantly lower in gendered countries than in genderless countries.

We include individual-level control variables in line with former literature on the determinants of financial inclusion (Demirgüc-Kunt and Klapper, 2013; Fungacova and Weill, 2015). These variables are provided in the Global Findex database for each respondent. *Age* is the number of years of the individual. We also compute the square of the respondent's age (Age^2) to control for the possibility of any non-linear relation between age and financial inclusion. The respondent's income level is also considered. We introduce four dummies to capture if the respondent is in the first income quintile (*poorest 20%*), second income quintile (*second 20%*), middle income quintile (*third 20%*), fourth income quintile (*fourth 20%*), and consider the richest income quintile dummy as the omitted variable.

We consider three country-specific control variables in the estimations. We take into account the quality of institutions with the indicator *Rule of Law*, capturing the perceptions of the extent to which people have confidence in and abide by the rules of society. Since access to financial services might depend on the level of economic development, we include the logarithm of GDP per capita (*Log(GDP/capita)*). Finally, we control for population size with the logarithm of the total population who are 15 years or older (*log(population)*) because it accounts for market size affecting the supply of financial services. Data on country-specific control variables are taken from the World Development and World Governance Indicators.

The sample used for the estimations consists of 351,319 observations from 117 countries across the world. Table 2.1 displays the descriptive statistics for all variables we employ in our study.[22]

2.4. Results

In this section, we present the results for the main financial inclusion indicators, and give our findings for the determinants of barriers to financial inclusion. We complete the

[22] The indicators of financial inclusion have different numbers of observations due to missing information on the answers provided by the respondents in the database. Some questions on loan-taking motives and alternative sources of credit were also not asked in the three waves of the database.

analysis with the factors influencing loan-taking motives and the alternative sources of borrowing.

2.4.1. Determinants of main financial inclusion indicators

We investigate how language gender marking can influence women's financial inclusion. In all estimations, we present the marginal effects to measure both statistical significance and economic significance. We also report the chi-square test for the difference between coefficients to indicate whether the coefficient for females speaking gendered languages is significantly different from the coefficient for females speaking genderless languages. The estimations for each of the three main financial inclusion variables are reported respectively in Tables 2.2, 2.3, and 2.4, for *formal account, formal credit,* and *formal saving.* We report for each financial inclusion variable the estimations performed with each of the five grammatical gender indices.

Formal account: We observe that *Female* is significantly negative in all estimations. Being a woman significantly reduces the possibility of having a formal account no matter the language, genderless or gendered. However, the chi-test shows that the coefficient of *Female* is significantly lower with gendered languages than with genderless languages for all the five language gender indices. In other words, the gender gap in financial inclusion is higher in countries with gendered languages than in countries with genderless languages. Thus, grammatical gender-marking enhances the gender gap in account ownership.

We can measure the economic significance of the influence of language gender-marking with the marginal effects. If we consider the aggregate index, we observe that the gender gap is 11.1 percentage points higher in a highly gendered language than in a mildly gendered language.

The estimated coefficients of the control variables are as expected. *Age* and Age^2 have significant effects on formal account, with positive and negative signs, respectively. They show a nonlinear relation between age and formal account suggesting that even though old people are more likely to own an account, this relation diminishes at a certain age. This finding is in line with the result of Fungacova and Weill (2015), who explain this nonlinear relation from

the point of a "generational effect," whereby old people have a diminished interest in using financial services or financial institutions are not motivated to seek them out as customers. In accordance with Demirgüç-Kunt and Klapper (2013), we observe that a higher level of income increases the possibility of owning a formal bank account. All four income dummies are significantly negative, with the results showing that moving from a lower income quintile to a higher income quintile is associated with a greater probability of account ownership. Regarding the country-level variables, we point out that *Log(GDP/capita)* is positive and significant, indicating that higher levels of economic development is associated with a higher ownership of bank accounts. *Rule of law* has a positive and significant coefficient, in line with the view that better quality of institutions favors financial inclusion. Finally, higher population size increases the likelihood of owning a bank account.

Formal credit: We also find a significantly negative coefficient for *Female* in all estimations. This suggests that women have a lower access to credit in all countries, whether or not the language marks grammatical gender. Again, the chi-test shows that the coefficient of *Female* is lower with highly gendered languages than with mildly gendered languages with all five language gender indices. In terms of economic significance, the gender gap in formal credit is 1.5 percentage points higher in a highly gendered language than in a mildly gendered language, when considering the aggregate index. Again, it is economically significant even if the gender gap driven by the language gender marking is lower than for formal account. Note that the percentage of individuals in the sample is much lower with a formal credit (12.5 percent) than with a formal account (60.1 percent). Thus, we show that access to credit is lower for women speaking gendered languages than women speaking genderless languages.

Formal saving: We observe the same findings than for the other financial inclusion indicators. The coefficient of *Female* is significantly negative in all estimations, showing a lower access to formal saving for women in all types of countries. However, the chi-test confirms that this coefficient is lower in countries with gendered languages than in countries with genderless languages. In terms of economic significance, the gender gap in formal saving is 5.1 percentage points higher in a highly gendered language than in a mildly gendered language.

In summary, our results strongly support the view that language gender-marking affects women's financial inclusion. The gender gap in the probability of having a formal account,

access to formal credit, and formal saving is significantly higher in countries with gendered languages than in countries with genderless languages. Thus, the hypothesis that sex-based gender systems in languages reinforce traditional gender roles in the minds of speakers, resulting in lower use of financial services for women, is supported by our investigation.

2.4.2. Additional estimations

Global Findex database provides additional information which allows us to explore in greater depth the impact of language gender marking on the gender gap in financial inclusion.

2.4.2.1. Barriers to financial inclusion

First, we examine the reasons why women might not have a bank account. The dataset provides information on the barriers to financial inclusion. Each respondent can answer whether one of the proposed barriers contributes to restrict her/his access to account ownership. Respondents are asked: "*Please tell me whether each of the following is a reason why you, personally, do not have an account at a bank or another type of formal financial institution."* The survey includes the following responses (multiple answers allowed): "*too far away", "lack of documentation", "too expensive", "lack trust", "lack money", "religious reasons", "because family member already has one", "cannot get one",* and *"no need for financial services".*

We focus on the barrier "*because family member already has one*" since this answer may indicate something about the influence of language gender-marking on cultural norms restricting financial inclusion for women. It enables us to understand the deeper causes that influence the barriers hampering women's financial inclusion. The feminist view about the effect of gender systems in language is the prediction that it positions women to feel inferior to men. For instance, Spender (1985) argues that the view that females should be listed after males because "the male gender was the *worthier* gender" tends to enhance male power and supremacy. If this claim is true, we should expect that the fact that a family member already owns an account serves as a greater barrier to account ownership for women speaking gendered languages.

We perform estimations explaining the dummy variable equal to one if the respondent answers yes to the response "*because family member already has one*", and zero otherwise. The results are reported in Table 2.5.

We observe that *Female* is significantly positive in all estimations. Hence, women are more likely to mention the fact that a family member already has an account as an obstacle to not to having one. Women speaking gendered languages are more likely to cite this barrier. The coefficient for *Female* is always higher for women speaking gendered languages. The chi-test shows that the coefficient is significantly higher in gendered languages for all language gender indices. We conclude that women speaking a gender-intensive language are more likely to mention they do not have a bank account because a family member already has one, supporting the view that language can act to exclude women financially through this channel.

This finding shows that women's financial exclusion is voluntary and confirms the feminist claim about the effect of gendered languages on women's outcomes. This result tends to support the view that cultural norms and the view of the prominent role of men in the financial behavior of countries with gendered languages account for the gender gaps in financial inclusion.

2.4.2.2. Understanding credit behavior

Financial inclusion is essential because it helps the poor and vulnerable individuals finance their education, improve their homes and become entrepreneurs. In this respect, access to credit is a particularly important aspect of financial inclusion.

First, we can question whether language gender marking affects in a similar way the access to loans whatever the motive. The Global Findex database provides information about loan-taking motives. Four potential motives are proposed: "for education", "for medical purposes", "for farm or business", and "to purchase a home or land". We can therefore study whether language gender-marking affects all loan-taking motives similarly.

We redo the estimations by using each of the four loan-taking motivations as the dependent variable. We only perform regressions using *AGIV* as the gender index variable so

that we can compare highly gendered and mildly gendered languages. The results are reported in Table 2.6.

The coefficient for *Female* is significantly negative with highly gendered languages, but not with mildly gendered languages when considering loan-taking motives for education and for medical purposes. It means that women are less likely to obtain a loan than men for both these motives when they speak highly gendered languages, while there is no significant gender gap when they speak mildly gendered languages.

Female is significantly negative for both forms of languages for the loan-taking motives "for farm or business" and "to purchase a home or land". The chi-test, however, shows that the coefficient of *Female* is significantly lower with highly gendered languages than with genderless languages. Our finding suggests that for all four loan-taking motives, the gender gap in the probability of obtaining a loan is higher in countries with highly gendered languages than countries with mildly gendered languages. Thus, language gender-marking affects women's access to credit for all loan-taking motives.

Second, a natural question emerges as to whether the same findings on the influence of language gender-marking on the gender gap in financial inclusion stand when we consider informal borrowing. Up to this point, we have only considered formal borrowing, meaning loans acquired through formal banking institutions. If our hypothesis is correct, the influence of language should persist no matter the source of borrowing. All forms of access to credit, formal or informal, should be influenced the same way by language gender-marking.

We can investigate this question since we have information on alternative sources of borrowing other than formal credit. We know that if respondents to Global Findex surveys have obtained a loan from "another private lender", "a store", or "family and friends". We then perform estimations by considering each of these alternative sources of borrowing as the dependent variable, and also by considering them all together with the variable "informal credit". We consider only *AGIV* as the gender index variable to focus on the comparison between highly gendered and mildly gendered languages. The estimations are displayed in Table 2.7.

The results support the view that language gender marking affects all sources of borrowing. For *informal credit* and for loans obtained *from store* and from *family and friends*, the coefficient for *Female* is significantly negative in all estimations. However, the Chi-test shows that the coefficient for *Female* is significantly lower for women speaking highly gendered languages. For loans obtained from *another private lender*, the coefficient for *Female* is significantly negative only for women speaking highly gendered languages.

Our results suggest that women speaking a highly gendered language have a lower probability of obtaining an informal loan than women speaking mildly gendered languages. This finding supports our main conclusion: language gender-marking enhances the gender gap in access to credit. This conclusion stands for formal and informal credit.

2.5. Robustness checks

This section presents a battery of robustness tests, wherein we include additional measures for culture, and perform estimations at the country level. We end with additional robustness checks.

2.5.1. Additional measures for culture

Language is only one aspect of culture. Culture can be broadly defined as "those customary beliefs and values that ethnic, religious, and social groups transmit fairly unchanged from generation to generation" (Guiso, Sapienza and Zingales, 2006). Therefore, culture also includes religion, trust, and many other values. If linguistic structures influence economic outcomes, then other cultural dimensions may have similar impact. It is consequently possible that the gender gap in financial inclusion is driven by the estimated effect of language gender systems capturing other cultural aspects. We thus seek to rule out this possibility by performing additional estimations in which we control for alternative culture measures. These additional estimations are reported in Tables 2.8–2.10 with alternatively *Formal Account, Formal Credit,* and *Formal Saving* as the dependent variable. In all estimations, we only consider the aggregate gender index with *AGIV* to measure gender intensity. In columns (1) – (8), we report OLS estimates and interact gender with the culture variables to assess whether the estimated effect

of language gender marking on women's financial inclusion is not driven by other measures of culture.[23]

Religion: Religion has been identified as a key component of culture that shapes the norms of societies (Iyer, 2016). Several studies have shown that religion can influence financial inclusion, notably through the religious prescriptions of Islam for finance (Mohieldin et al., 2011; Demirgüc-Kunt, Klapper and Randall, 2013). We control for religion by including two religion measures at the country level: *Catholic* and *Muslim*. Both these variables are dummy variables equal to one if more than 50 percent of the inhabitants in a country are respectively Catholics, and Muslims. Data come from the CIA World Factbook. The religion variables are added in the estimations in the first and second columns of each table. We still observe that the coefficient for *Female* is significantly lower when women speak highly gendered languages than when they speak mildly gendered languages. Thus, religion does not drive our results. Interestingly, we observe that both religion variables are significantly negative in most estimations, supporting the view that Catholic and Muslim countries are associated with lower financial inclusion, corroborating the finding for Muslim countries from Demirgüc-Kunt, Klapper and Randall (2013).

Hofstede culture dimensions: The six-dimension terminology of Hofstede (1980, 2001) to characterize culture has been widely adopted to assess the influence of cultural dimensions. We focus on three of these: *Power distance*, which measures the extent to which individuals accept inequality; *Individualism*, which measures the degree of interdependence a society maintains among its members; and *Masculinity*, which measures the extent to which social gender roles in a society are distinct. In the third and fourth columns of each table, we add the three Hofstede culture variables in our estimations.

We again obtain that the coefficient for *Female* is significantly lower when women speak highly gendered languages than when they speak mildly gendered languages when explaining *Formal Account* and *Formal Saving*, while the difference is not significant whe explaining *Formal Credit*.

[23] Even though our dependent variable is a binary variable, Ai and Norton (2003) show that in non-linear models (e.g., probit or logit models), the results cannot be directly inferred by scrutinizing the coefficients of the interaction term. Further, as noted by Angrist and Pischke (2008), the estimated marginal effects that are obtained from nonlinear models for limited dependent variables are mostly similar to the coefficients obtained from OLS regressions. This explains why we perform OLS estimations instead of a logit model.

Trust and corruption: These two variables have been shown to influence a wide set of economic outcomes including financial development (De Koker and Jentzsch, 2013; Farooq et al., 2013). We therefore take into account trust and corruption in the estimations. *Trust* is assessed with the trust index proposed by La Porta et al. (1997). *Corruption* is measured with Transparency International's corruption perception index, in which higher values indicate less corruption. We add trust and corruption in the estimations performed in the fifth and sixth columns of each table. We again find that the coefficient for *Female* is significantly lower for women speaking highly gendered languages than women speaking mildly gendered languages when explaining *Formal Account*, while the difference is not significant when explaining *Formal Credit* and *Formal Saving*.

Historical use of the plough: Alesina, Giuliano, and Nunn (2013) investigate the historical origins of current differences in gender roles. They argue that the evolution and persistence of gender norms have been influenced by traditional agricultural practices, particularly plough cultivation. Plough cultivation requires significant body and grip strength needed to either pull the plough or control the animal that pulls it, and hence, men tend to have an advantage in farming relative to women. Consistent to this argument, they find evidence that societies that traditionally practiced plough agriculture have lower rates of female labor force participation and a higher prevalence of attitudes favoring gender inequality today.

We can therefore question whether our conclusion for language gender-marking is driven by traditional agricultural practices. To investigate this question, we perform estimations in which we include the plough measure constructed by Alesina, Giuliano and Nunn (*Plough use*). It is the proportion of citizens with ancestors who traditionally used the plough in pre-industrial agriculture. This variable is added in the seventh and eighth columns of all tables. Our key result is preserved: the coefficient for *Female* is significantly lower for women speaking highly gendered languages when explaining *Formal Account*. It is also significantly lower when explaining Formal *Saving* but not significant when explaining *Formal Credit*. It means that the effect of language gender-marking on the gender gap in financial inclusion still remains after we control for economic specialization in the distant past.

Arabic speakers excluded: Arabic is a highly gendered language with an Aggregate Gender Intensity of 4. It represents a substantial share of the languages spoken in our sample

(12.84 percent), and thus could drive our results. The MENA region, which includes a large share of Arabic-speaking individuals, is one of the regions in the world with the largest gender gaps in financial inclusion (Demirgüc-Kunt, Klapper and Singer, 2013). We perform estimations in the ninth and tenth columns of all tables by excluding Arabic speakers. We still find that the coefficient for *Female* is significantly lower for women speaking highly gendered languages than women speaking mildly gendered languages.

In summary, we find that the influence of language gender-marking on women's financial inclusion is still observed, even when we take into account alternative culture measures. Thus, we observe that gender-marking in language, separate from other measures of national culture, exerts an impact on the gender gap in the access and use of financial services.

2.5.2. Country-level estimations

Up to this point, we have performed estimations at the individual level as we link the gender of the individual with her/his level of financial inclusion. We then compare the observed results for women speaking highly gendered languages and women speaking mildly gendered languages.

We can nonetheless check whether our results stand when we perform country-level estimations. A large set of studies on financial inclusion have considered this level for the estimations (among others Demirgüc-Kunt and Klapper, 2013) by explaining the share of adults financially included. To this end, we redo our estimations at the country level.

The dependent variables are the percentage share of women (men) reported having a formal account, a formal credit, and a formal saving. This information is directly provided in the Global Findex database. We test alternatively the influence of each of the five gender indices on the aggregate financial inclusion measures. We include the three country-specific control variables formerly used in the individual-level estimations: *Log(GDP/capita), Rule of Law, Log(Population).*

The hypothesis of a gender gap in financial inclusion driven by language gender-marking would be supported if we find that the coefficient of the gender index is more negative when

explaining the percentage share of women financially included than when explaining the percentage share of men financially included. It would mean that the gender gap in financial inclusion is higher in countries with gendered languages.

The estimations are reported in Table 2.11. Our results support our hypothesis. We find that the coefficient of the gender index is significantly negative in all estimations when explaining the percentage shares of women and men financially included, with two exceptions with non-significant coefficients for the percentage share of men financially included. Furthermore, the chi-test shows that the coefficient of the gender index is lower for the percentage share of women financially included than for the percentage share of men financially included in all estimations with an exception with no significant difference. Thus, the country-level estimations corroborate our major conclusion that gendered languages enhance the gender gap in financial inclusion.

2.5.3. Additional robustness checks

We complete the estimations with yet another round of robustness checks.

First, we test the influence of country fixed effects. Country fixed effects are not included in the main estimations since our focus is on the impact of a country-level time-invariant variable, namely grammatical gender in language. Country differences have been taken into account through three country-level time-varying variables capturing the quality of institutions, the level of economic development, and population size. It is nonetheless of interest to test the influence of country fixed effects in the estimations, since this inclusion allows partially addressing the omitted variable bias.

To this end, we redo the regressions with country fixed effects. These estimations are displayed in Table 2.12 with alternatively *Formal Account, Formal Credit,* and *Formal Saving* as the dependent variable. In all estimations, we only consider the aggregate gender index with AGIV to measure gender intensity.

Our key findings are preserved. We still observe that the coefficient of *Female* is significantly lower with highly gendered languages than with mildly gendered languages. Thus, we still find that grammatical gender-marking contributes to enhance the gender gap in

women's financial inclusion after including country fixed effects, supporting the robustness of our conclusions.

Second, we test an alternative definition of the dummy variable AGIV. Up to this point, AGIV is a dummy variable equal to one if the aggregate index *Aggregate Gender Intensity* has a value of 3 or 4, and to zero if *Aggregate Gender Intensity* has a value of 0, 1, or 2. As a consequence, it compares highly gendered and mildly gendered languages. We now redefine AGIV by assigning a value of one to any language with *Aggregate Gender Intensity* greater than zero. This way we oppose genderless languages to all other gendered languages. We perform the estimations with alternatively *Formal Account, Formal Credit,* and *Formal Saving* as the dependent variable. The results are reported in Table 2.13. In all estimations, we still observe that women speaking highly gendered languages are less likely to be financially included than women speaking genderless languages. Thus, our results hold when we take into account a different definition of the AGIV dummy, supporting the robustness of our findings.

2.6. Conclusion

In this paper, we tested the hypothesis that language gender-marking influences the gender gap in financial inclusion. To this end, we investigated how language gender-marking influences the probability of a woman obtaining a bank account, having a savings account, and accessing credit. We use data from Global Findex database on a large sample of individuals from 117 countries.

Our key finding is that language gender marking affects women's financial inclusion. The gender gap in the probability of having a formal account, formal credit, and formal saving is greater in countries with gendered languages than in countries with genderless languages. Therefore, our results support the hypothesis that sex-based gender systems in languages reinforce traditional gender roles in the minds of speakers, resulting in lower use of financial services for women. This conclusion is robust to the inclusion of alternative culture indicators and to estimations performed at the country level. We also observe that language gender-marking enhances the gender gap in access to credit for all loan motives and all sources of

borrowing, formal or informal. This strengthens our finding that language gender-marking generates obstacles to women's access to credit.

This work provides a fresh view of the gender gap in financial inclusion by showing it has cultural roots anchored in language. Two policy implications with different time horizons arise with respect to reducing the gender gap in financial inclusion. Over the short-term, policy reforms that foster women's financial inclusion should focus on countries with gender-intensive languages. Over the long-term, our study supports calls for reforms that make language more gender-neutral.

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Table 2.1. Descriptive statistics

This table presents the descriptive statistics of the variables used in the estimations.

	Observations	Mean	Std. Dev.
Main indicators of financial inclusion			
Formal Account	351,319	0.601	0.49
Formal Credit	348,948	0.125	0.331
Formal Saving	277,357	0.31	0.462
Barrier to financial inclusion			
Family member has an account	144,401	0.189	0.391
Loan-taking motivations			
For education	190,923	0.063	0.242
For medical purposes	311,786	0.101	0.301
For farm or business	235,750	0.059	0.235
To purchase a home or land	349,057	0.131	0.338
Alternative sources of credit			
Another private lender	227,658	0.036	0.187
Family and friends	348,788	0.214	0.41
A store	226,774	0.097	0.296
Informal Credit	349,474	0.259	0.438
Language Gender Variables			
Sex-Based Index	351,319	0.672	0.47
Number of Genders Index	351,319	0.446	0.497
Gender Pronoun Index	333,496	0.327	0.469
Gender Assignment Index	255,074	0.677	0.468
Aggregate Gender Index (AGI)	243,189	2.36	1.68
Individual Characteristics			
Female	351,319	0.544	0.498
Age	351,319	42.644	17.780
Income-Poorest 20%	351,319	0.168	0.374
Income -Second 20%	351,319	0.18	0.384
Income -Third 20%	351,319	0.195	0.396
Income -Fourth 20%	351,319	0.211	0.408
Income -Richest 20%	351,319	0.246	0.431
Country Variables			
Log (GDP/capita)	351,319	8.921	1.353
Rule of law	351,319	0.057	1.0
Log (Population)	351,319	16.501	1.686

Table 2.2. Formal Account

This table presents the results of logit estimations examining the relation between language gender systems and women's financial inclusion. The dependent variable is "Formal Account". Definitions of variables are provided in the Appendix. χ^2 (chi-squared test) compares the coefficients for Female speaking a genderless language and a gendered language. Under the null hypothesis, the difference between the two coefficients is zero. Estimated marginal effects are reported and standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	Sex-Based Index		Number of Genders Index		Gender Pronoun Index		Gender Assignment Index		AGIV	
	0	1	0	1	0	1	0	1	Mildly gendered	Highly gendered
Female	-0.049***	-0.086***	-0.029***	-0.13***	-0.038***	-0.135***	-0.039***	-0.114***	-0.03***	-0.141***
	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Age	0.015***	0.023***	0.016***	0.023***	0.017***	0.023***	0.011***	0.022***	0.013***	0.023***
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)
Age^2	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Income-Poorest 20%	-0.301***	-0.300***	-0.26***	-0.31***	-0.257***	-0.298***	-0.272***	-0.299***	-0.272***	-0.29***
	(0.006)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.007)	(0.004)	(0.006)	(0.004)
Income-Second 20%	-0.24***	-0.243***	-0.199***	-0.264***	-0.2***	-0.257***	-0.219***	-0.252***	-0.218***	-0.247***
	(0.006)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.007)	(0.004)	(0.006)	(0.004)
Income-Third 20%	-0.186***	-0.185***	-0.146***	-0.209***	-0.146***	-0.204***	-0.159***	-0.202***	-0.159***	-0.199***
	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.006)	(0.004)	(0.005)	(0.004)
Income-Fourth 20%	-0.113***	-0.114***	-0.087***	-0.132***	-0.091***	-0.125***	-0.096***	-0.128***	-0.099***	-0.126***
	(0.005)	(0.004)	(0.004)	(0.004)	(0.003)	(0.005)	(0.006)	(0.004)	(0.005)	(0.004)
Log (GDP/capita)	0.1***	0.15***	0.105***	0.157***	0.109***	0.184***	0.188***	0.142***	0.136***	0.156***
	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)	(0.004)	(0.002)	(0.002)	(0.002)
Rule of Law	0.268***	0.155***	0.17***	0.175***	0.172***	0.072***	0.054***	0.167***	0.132***	0.138***
	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.005)	(0.002)	(0.003)	(0.003)
Log (Population)	0.027***	0.017***	0.012***	0.03***	0.013***	-0.014***	0.002	0.03***	0.01***	0.037***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
Observations	115,372	235,947	194,548	156,771	224,556	108,940	82,366	172,708	116,213	126,976
Pseudo R^2	0.295	0.269	0.313	0.233	0.314	0.182	0.34	0.219	0.32	0.181
Log Likelihood	-55661.31	-114542.45	-85126.04	-83208.49	-98173.59	-61571.31	-34946.15	-93419.3	-50557.78	-71926.41
χ^2	106.92***		443.18***		342.85***		120.98***		399.86***	

Table 2.3. Formal Credit

This table presents the results of logit estimations examining the relation between language gender systems and women's financial inclusion. The dependent variable is "Formal Credit". Definitions of variables are provided in the Appendix. χ^2 (chi-squared test) compares the coefficients for Female speaking a genderless language and a gendered language. Under the null hypothesis, the difference between the two coefficients is zero. Estimated marginal effects are reported and standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	Sex-Based Index		Number of Genders Index		Gender Pronoun Index		Gender Assignment Index		AGIV	
	0	1	0	1	0	1	0	1	Mildly gendered	Highly gendered
Female	-0.016***	-0.02***	-0.015***	-0.024***	-0.015***	-0.024***	-0.014***	-0.02***	-0.009***	-0.024***
	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)
Age	0.016***	0.014***	0.016***	0.012***	0.015***	0.012***	0.018***	0.011***	0.016***	0.011***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Age^2	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Income-Poorest 20%	-0.029***	-0.042***	-0.032***	-0.044***	-0.03***	-0.049***	-0.034***	-0.041***	-0.033***	-0.043***
	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)
Income-Second 20%	-0.019***	-0.03***	-0.02***	-0.034***	-0.019***	-0.04***	-0.026***	-0.034***	-0.026***	-0.034***
	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)
Income-Third 20%	-0.014***	-0.021***	-0.014***	-0.023***	-0.013***	-0.028***	-0.017***	-0.025***	-0.017***	-0.024***
	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)
Income-Fourth 20%	-0.006**	-0.013***	-0.008***	-0.013***	-0.007***	-0.016***	-0.011***	-0.014***	-0.013***	-0.013***
	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)
Log (GDP/capita)	0.005***	0.021***	0.004***	0.017***	0.008***	0.019***	0.012***	0.016***	-0.001	0.014***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.003)	(0.001)	(0.001)	(0.001)
Rule of Law	0.014***	0.012***	0.019***	0.014***	0.018***	0.014***	0.007**	0.01***	0.029***	0.02***
	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.003)	(0.001)	(0.002)	(0.001)
Log (Population)	-0.009***	-0.005***	-0.004***	-0.007***	-0.007***	-0.018***	-0.014***	-0.006***	-0.006***	-0.012
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)
Observations	114,629	234,319	193,174	155,774	222,872	108,324	81,942	171,607	115,505	126,185
Pseudo R^2	0.043	0.057	0.045	0.059	0.048	0.063	0.048	0.054	0.048	0.061
Log Likelihood	-42383.83	-82355.73	-73347.89	-51316.09	-83318.69	-35887.56	-33429.37	-54643.37	-44150.1	-40789.03
χ^2	6.83***		44.58***		30.00***		25.52***		64.21***	

Table 2.4. Formal Saving

This table presents the results of logit estimations examining the relation between language gender systems and women's financial inclusion. The dependent variable is "Formal Saving". Definitions of variables are provided in the Appendix. χ^2 (chi-squared test) compares the coefficients for Female speaking a genderless language and a gendered language. Under the null hypothesis, the difference between the two coefficients is zero. Estimated marginal effects are reported and standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	Sex-Based Index		Number of Genders Index		Gender Pronoun Index		Gender Assignment Index		AGIV	
	0	1	0	1	0	1	0	1	Mildly gendered	Highly gendered
Female	-0.016***	-0.048***	-0.015***	-0.061***	-0.022***	-0.059***	-0.013***	-0.054***	-0.014***	-0.065***
	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.004)	(0.002)	(0.003)	(0.003)
Age	0.012***	0.012***	0.013***	0.011***	0.014***	0.01***	0.011***	0.01***	0.012***	0.011***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)
Age^2	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Income-Poorest 20%	-0.196***	-0.201***	-0.219***	-0.179***	-0.218***	-0.155***	-0.257***	-0.162***	-0.224***	-0.16***
	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.004)	(0.002)	(0.003)	(0.002)
Income-Second 20%	-0.159***	-0.173***	-0.18***	-0.154***	-0.181***	-0.134***	-0.209***	-0.143***	-0.19***	-0.137***
	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.003)	(0.005)	(0.002)	(0.004)	(0.002)
Income-Third 20%	-0.114***	-0.132***	-0.129***	-0.12***	-0.129***	-0.108***	-0.141***	-0.113***	-0.134***	-0.108***
	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.005)	(0.002)	(0.004)	(0.003)
Income-Fourth 20%	-0.07***	-0.089***	-0.079***	-0.084***	-0.083***	-0.074***	-0.084***	-0.076***	-0.082***	-0.075***
	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.005)	(0.003)	(0.004)	(0.003)
Log (GDP/capita)	0.044***	0.073***	0.054***	0.058***	0.064***	0.067***	0.098***	0.051***	0.048***	0.056***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.005)	(0.001)	(0.003)	(0.002)
Rule of Law	0.16***	0.12***	0.163***	0.098***	0.159***	0.026***	0.124***	0.085***	0.168***	0.056***
	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)	(0.007)	(0.002)	(0.004)	(0.002)
Log (Population)	0.044***	0.012***	0.04***	0.006***	0.031***	-0.005***	0.041***	0.009***	0.044***	0.012***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Observations	92,434	184,923	156,040	121,317	179,590	83,387	67,212	134,324	94,538	97,396
Pseudo R^2	0.23	0.171	0.207	0.15	0.208	0.103	0.232	0.138	0.226	0.107
Log Likelihood	-43510.6	-95397.31	-80208.72	-58814.42	-92262.33	-38676.43	-34263.15	-63941.83	-47375.76	-45952.36
χ^2	54.57***		223.49***		187.68***		136.86***		232.43***	

Table 2.5. Barrier to Financial Inclusion

This table presents the results of logit estimations examining the relation between language gender systems and a perceived barrier to women's account ownership. The dependent variable is "Family member already has an account". All controls represent the full set of individual and country level control variables used in Table 2. Definitions of variables are provided in the Appendix. χ^2 (chi-squared test) compares the coefficients for Female speaking a genderless language and a gendered language. Under the null hypothesis, the difference between the two coefficients is zero. Estimated marginal effects are reported and standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	Sex-Based Index		Number of Genders Index		Gender Pronoun Index		Gender Assignment Index		AGIV	
	0	1	0	1	0	1	0	1	Mildly gendered	Highly gendered
Female	0.028***	0.043***	0.026***	0.046***	0.033***	0.045***	0.024***	0.04***	0.019***	0.049***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.002)	(0.003)	(0.003)
All Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	52,917	91,484	67,835	76,566	77,749	59,516	29,518	86,846	43,371	67,887
Pseudo R^2	0.091	0.06	0.084	0.061	0.092	0.079	0.097	0.067	0.093	0.064
Log Likelihood	-21095.89	-43711.98	-29191.69	-35715.88	-35163.16	-25685.72	-13107.1	-38146.18	-18233.88	-30955.57
χ^2	2.91*		15.73***		14.81***		10.88***		32.99***	

Table 2.6. Loan-Taking Motives

This table presents the results of logit estimations examining the relation between language gender systems and loan taking motivations for women. The loan taking motivations are: "For education", "For medical purposes", "For farm or business", "To purchase a home or land". Each motivation for accessing loan is a dependent variable and is presented at the top of each column. All controls represent the full set of individual and country level control variables used in Table 3. Definitions of variables are provided in the Appendix. χ^2 (chi-squared test) compares the coefficients for Female speaking a mildly gendered language and a highly gendered language. Under the null hypothesis, the difference between the two coefficients is zero. Estimated marginal effects are reported and standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	For education		For medical purposes		For farm or business		To purchase a home or land	
	AGIV		AGIV		AGIV		AGIV	
	Mildly gendered	Highly gendered	Mildly gendered	Highly gendered	Mildly gendered	Highly gendered	Mildly gendered	Highly gendered
Female	0.000	-0.009***	-0.002	-0.013***	-0.016***	-0.03***	-0.008***	-0.025***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)
All Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	62,646	72,883	102,821	117,250	79,471	84,150	115,517	126,224
Pseudo R^2	0.035	0.017	0.055	0.027	0.068	0.035	0.162	0.111
Log Likelihood	-14421.17	-18978.05	-32312.47	-41440.73	-18265.97	-20230.44	-39760.68	-35252.74
χ^2	10.64***		14.22***		25.34***		124.31***	

Table 2.7. Alternative sources of borrowing

This table presents the results of logit estimations examining the relation between language gender systems and alternatives sources of borrowing available to women. The alternative borrowing sources are: "Another private lender", "From store", "Family and friends", "Informal credit". Each alternative source of borrowing is a dependent variable and is presented at the top of each column. All controls represent the full set of individual and country level control variables used in Table 3. Definitions of variables are provided in the Appendix. χ^2 (chi-squared test) compares the coefficients for Female speaking a mildly gendered language and a highly gendered language. Under the null hypothesis, the difference between the two coefficients is zero. Estimated marginal effects are reported and standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	Another private lender		From store		Family and friends		Informal credit	
	AGIV		AGIV		AGIV		AGIV	
	Mildly gendered	Highly gendered	Mildly gendered	Highly gendered	Mildly gendered	Highly gendered	Mildly gendered	Highly gendered
Female	-0.001	-0.019***	-0.008***	-0.023***	-0.017***	-0.051***	-0.02***	-0.057***
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)
All Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	75,300	81,555	75,303	80,703	115,525	126,020	115,679	126,345
Pseudo R^2	0.059	0.02	0.028	0.016	0.067	0.031	-64697.77	0.022
Log Likelihood	-10322.6	-16824.63	-22928.96	-25025.21	-57760.93	-64387.86	0.044	-71358.89
χ^2	45.14***		25.81***		99.03***		107.82***	

Table 2.8. Formal Account

This table presents the results of OLS estimations examining the relation between language gender systems and women's financial inclusion. The dependent variable is "Formal Saving". All controls represent the full set of individual and country level control variables used in Table 3. Definitions of variables are provided in the Appendix. χ^2 (chi-squared test) compares the coefficients for Female speaking a mildly gendered language and a highly gendered language. Under the null hypothesis, the difference between the two coefficients is zero. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	AGIV		AGIV		AGIV		AGIV		AGIV (Excluding Arabic speaking countries)	
	Mildly gendered	Highly gendered	Mildly gendered	Highly gendered	Mildly gendered	Highly gendered	Mildly gendered	Highly gendered	Mildly gendered	Highly gendered
Female	-0.022***	-0.075***	-0.073***	0.006	-0.043***	-0.166***	0.009	-0.117***	-0.03***	-0.09***
	(0.003)	(0.007)	(0.02)	(0.017)	(0.009)	(0.015)	(0.007)	(0.006)	(0.003)	(0.004)
Female × Catholic	0.036***	0.018**								
	(0.006)	(0.008)								
Female × Muslim	-0.059***	-0.102***								
	(0.007)	(0.008)								
Female × Power distance			0.000*	-0.002***						
			(0.000)	(0.000)						
Female × Individualism			0.001***	0.001***						
			(0.000)	(0.000)						
Female × Masculinity			-0.000**	-0.000						
			(0.000)	(0.000)						
Female × Trust					-0.088***	0.009				
					(0.018)	(0.037)				
Female × Corruption					0.001***	0.001***				
					(0.000)	(0.000)				
Female × Plough use							-0.04***	0.033***		
							(0.008)	(0.008)		
Catholic	-0.098***	-0.272***								
	(0.004)	(0.006)								
Muslim	-0.003	-0.20***								
	(0.006)	(0.006)								

Power distance			-0.004***	0.001***						
			(0.000)	(0.000)						
Individualism			-0.002***	0.005***						
			(0.000)	(0.000)						
Masculinity			-0.001***	-0.002***						
			(0.000)	(0.000)						
Trust					0.285***	0.315***				
					(0.015)	(0.035)				
Corruption					-0.001***	-0.005***				
					(0.000)	(0.000)				
Plough use							-0.009	0.038***		
							(0.007)	(0.006)		
All Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	113,593	126,976	78,148	93,888	74,282	67,068	76,279	62,924	116,213	81,853
R^2	0.36	0.248	0.274	0.224	0.27	0.24	0.275	0.253	0.33	0.172
χ^2	57.26***		9.34***		49.13***		184.99***		78.77***	

Table 2.9. Formal Credit

This table presents the results of OLS estimations examining the relation between language gender systems and women's financial inclusion. The dependent variable is "Formal Saving". All controls represent the full set of individual and country level control variables used in Table 3. Definitions of variables are provided in the Appendix. χ^2 (chi-squared test) compares the coefficients for Female speaking a mildly gendered language and a highly gendered language. Under the null hypothesis, the difference between the two coefficients is zero. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	AGIV		AGIV		AGIV		AGIV		AGIV (Excluding Arabic speaking countries)	
	Mildly gendered	Highly gendered	Mildly gendered	Highly gendered	Mildly gendered	Highly gendered	Mildly gendered	Highly gendered	Mildly gendered	Highly gendered
Female	-0.007***	-0.035***	-0.059***	-0.022*	0.003	0.005	-0.007	-0.018***	-0.009***	-0.018***
	(0.003)	(0.005)	(0.02)	(0.012)	(0.009)	(0.01)	(0.007)	(0.004)	(0.002)	(0.002)
Female × Catholic	-0.002	0.014***								
	(0.005)	(0.005)								
Female × Muslim	-0.014**	-0.008								
	(0.006)	(0.005)								
Female × Power distance			0.000***	-0.000						
			(0.000)	(0.000)						
Female × Individualism			0.000	-0.000						
			(0.000)	(0.000)						
Female × Masculinity			0.000	0.000*						
			(0.000)	(0.000)						
Female × Trust					-0.036**	-0.082***				
					(0.017)	(0.025)				
Female × Corruption					-0.000	-0.000**				
					(0.000)	(0.000)				
Female × Plough use							-0.01	-0.013**		
							(0.007)	(0.006)		
Catholic	-0.028***	-0.04***								
	(0.004)	(0.004)								
Muslim	-0.007	-0.066***								
	(0.005)	(0.004)								
Power distance			-0.001***	-0.001***						

			(0.000)	(0.000)						
Individualism			0.001***	0.000						
			(0.000)	(0.000)						
Masculinity			-0.003***	0.002***						
			(0.000)	(0.000)						
Trust					0.082***	0.184***				
					(0.014)	(0.024)				
Corruption					-0.000	-0.000***				
					(0.000)	(0.000)				
Plough use							-0.006	-0.000		
							(0.006)	(0.004)		
All Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	112,887	126,185	77,626	93,287	73,837	66,668	75,797	62,924	115,505	81,303
R^2	0.037	0.045	0.047	0.042	0.04	0.049	0.037	0.216	0.048	0.055
χ^2	24.26***		2.37		0.04		1.95		16.04***	

Table 2.10. Formal Saving

This table presents the results of OLS estimations examining the relation between language gender systems and women's financial inclusion. The dependent variable is "Formal Saving". All controls represent the full set of individual and country level control variables used in Table 3. Definitions of variables are provided in the Appendix. χ^2 (chi-squared test) compares the coefficients for Female speaking a mildly gendered language and a highly gendered language. Under the null hypothesis, the difference between the two coefficients is zero. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	AGIV		AGIV		AGIV		AGIV		AGIV (Excluding Arabic speaking countries)	
	Mildly gendered	Highly gendered	Mildly gendered	Highly gendered	Mildly gendered	Highly gendered	Mildly gendered	Highly gendered	Mildly gendered	Highly gendered
Female	-0.012***	-0.069***	0.048*	-0.015	-0.01	-0.039***	0.013	-0.049***	-0.014***	-0.056***
	(0.003)	(0.007)	(0.028)	(0.017)	(0.012)	(0.015)	(0.009)	(0.006)	(0.003)	(0.003)
Female × Catholic	0.004	0.021***								
	(0.006)	(0.008)								
Female × Muslim	-0.012	-0.015*								
	(0.009)	(0.008)								
Female × Power distance			-0.000	-0.000**						
			(0.000)	(0.000)						
Female × Individualism			0.000	-0.000**						
			(0.000)	(0.000)						
Female × Masculinity			-0.001***	-0.001						
			(0.000)	(0.000)						
Female × Trust					-0.014	-0.106***				
					(0.023)	(0.038)				
Female × Corruption					0.000	-0.000				
					(0.000)	(0.000)				
Female × Plough use							-0.028***	-0.008		
							(0.01)	(0.008)		
Catholic	0.01**	-0.118***								
	(0.005)	(0.006)								
Muslim	-0.023	-0.108***								
	(0.007)	(0.006)								

Power distance			-0.002***	0.000						
			(0.000)	(0.000)						
Individualism			-0.001***	0.003***						
			(0.000)	(0.000)						
Masculinity			-0.000	0.001***						
			(0.000)	(0.000)						
Trust					0.236***	0.456***				
					(0.019)	(0.035)				
Corruption					-0.001***	-0.001***				
					(0.000)	(0.000)				
Plough use							-0.128***	0.078***		
							(0.008)	(0.006)		
All Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	91,919	97,396	64,565	72,098	63,249	52,572	62,304	47,246	94,538	62,469
R^2	0.262	0.117	0.199	0.115	0.244	0.15	0.25	0.168	0.048	0.055
χ^2	46.33***		3.55*		2.33		40.88***		116.10***	

Table 2.11. Country-level estimations

This table presents the results of OLS regressions examining the relation between language gender systems and women's financial inclusion. The dependent variables in Panels A, B, and C are respectively "Formal Account", "Formal Credit" and "Formal Saving". Definitions of variables are provided in the Appendix. χ^2 (chi-squared test) compares the coefficients of the Gender Index for the financial inclusion of female and male. Under the null hypothesis, the difference between the two coefficients is zero. Standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	Female Share	Male Share	Female Share	Male Share	Female Share	Male Share	Female Share	Male Share	Female Share	Male Share
	Sex-Based Index		Number of Genders Index		Gender Pronoun Index		Gender Assignment Index		AGIV	
Panel A:	*Formal Account*									
Gender Index	-0.072***	-0.04**	-0.126***	-0.07***	-0.164***	-0.096***	-0.102***	-0.054**	-0.047***	-0.03***
	(0.02)	(0.019)	(0.017)	(0.017)	(0.019)	(0.019)	(0.024)	(0.023)	(0.006)	(0.006)
Observations	328	328	328	328	321	321	235	235	223	223
R^2	0.760	0.752	0.786	0.761	0.787	0.758	0.749	0.744	0.766	0.751
χ^2	10.75***		36.79***		39.64***		14.68***		18.84***	
Panel B:	*Formal Credit*									
Gender Index	-0.025***	-0.027***	-0.028***	-0.015*	-0.023***	-0.007	-0.06***	-0.047***	-0.013***	-0.009***
	(0.008)	(0.008)	(0.007)	(0.008)	(0.008)	(0.009)	(0.009)	(0.01)	(0.003)	(0.003)
Observations	328	328	328	328	321	321	235	235	223	223
R^2	0.193	0.280	0.204	0.264	0.212	0.279	0.304	0.346	0.277	0.329
χ^2	0.12		13.81***		16.18***		7.56**		10.78***	
Panel C:	*Formal Saving*									
Gender Index	-0.057***	-0.032**	-0.052***	-0.018	-0.058***	-0.026**	-0.067***	-0.037**	-0.022***	-0.013***
	(0.012)	(0.013)	(0.012)	(0.012)	(0.013)	(0.013)	(0.014)	(0.015)	(0.004)	(0.004)
Observations	328	328	328	328	321	321	235	235	223	223
R^2	0.741	0.739	0.740	0.736	0.738	0.736	0.735	0.726	0.732	0.720
χ^2	25.08***		47.13***		36.43***		23.53***		36.44***	

Table 2.12. Robustness check with country fixed effects

This table presents the results of logit estimations examining the relation between language gender marking and women's financial inclusion. The dependent variable is presented at the top of each column. All controls represent the full set of individual and country level control variables used in Table 2. Definitions of variables are provided in the Appendix. χ^2 (chi-squared test) compares the coefficients for Female speaking a mildly gendered language and a highly gendered language. Under the null hypothesis, the difference between the two coefficients is zero. Estimated marginal effects are reported and standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	Formal Account		Formal Credit		Formal Saving	
	AGIV		AGIV		AGIV	
	Mildly gendered	Highly gendered	Mildly gendered	Highly gendered	Mildly gendered	Highly gendered
Female	-0.024***	-0.107***	-0.014***	-0.03***	-0.01***	-0.056***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)
All Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	116,213	126,976	115,505	126,185	94,538	97,396
Pseudo R^2	0.381	0.25	0.097	0.093	0.265	0.165
Log Likelihood	-46658.58	-65873.13	-41886.2	-39384.7	-44950.55	-42991.76
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
χ^2	401.93***		70.77***		237.55***	

Table 2.13. Robustness check with alternative definition of AGIV

This table presents the results of logit estimations examining the relation between language gender marking and women's financial inclusion. The dependent variable is presented at the top of each column. All controls represent the full set of individual and country level control variables used in Table 2. Definitions of variables are provided in the Appendix. We use in this table an alternative definition of AGIV equal to one if Aggregate Gender Intensity is greater than zero (gendered languages) and to zero otherwise (genderless languages). χ^2 (chi-squared test) compares the coefficients for Female speaking a genderless language and female speaking a gendered language. Under the null hypothesis, the difference between the two coefficients is zero. Estimated marginal effects are reported and standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	Formal Account		Formal Credit		Formal Saving	
	AGIV		AGIV		AGIV	
	Genderless languages	Gendered languages	Genderless languages	Gendered languages	Genderless languages	Gendered languages
Female	-0.066***	-0.103***	-0.012***	-0.019***	-0.017***	-0.051***
	(0.005)	(0.003)	(0.003)	(0.001)	(0.004)	(0.002)
All Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	57,901	185,288	57,575	184,115	45,894	146,040
Pseudo R^2	0.243	0.26	0.051	0.063	0.2001	0.177
Log Likelihood	-30057.28	-94200.61	-22133.24	-62475.23	-21520.36	-72147.99
χ^2	46.47***		12.06***		41.53***	

Appendix 2.1.

Variable	Definition and source
Dependent variables	
Formal Account	Dummy variable equal to one if an individual has an account either at a financial institution or through a mobile money provider and zero otherwise. Source: Global Findex Database.
Formal Credit	Dummy variable equal to one if an individual has borrowed from a financial institution in the past 12 months and zero otherwise. Source: Global Findex Database.
Formal Saving	Dummy variable equal to one if an individual saved using an account at a financial institution in the past 12 months and zero otherwise. Source: Global Findex Database.
Family member has an account	Dummy variable equal to one if a respondent does not have an account at a bank or another type of formal financial institution because a family member already has one and zero otherwise if a respondent does not have an account for different reasons. Source: Global Findex Database.
For education	Dummy variable equal to one if a respondent or together with someone else borrowed money for education or school fees and zero otherwise. Source: Global Findex Database.
For medical purposes	Dummy variable equal to one if a respondent or together with someone else borrowed money for medical purposes and zero otherwise. Source: Global Findex Database.
For farm or business	Dummy variable equal to one if a respondent or together with someone else borrowed money for farm or business and zero otherwise. Source: Global Findex Database.
To purchase a home or land	Dummy variable equal to one if a respondent took out a loan from a bank or another type of formal financial institution to purchase a home, an apartment, or land and zero otherwise. Source: Global Findex Database.
Another private lender	Dummy variable equal to one if a respondent or together with someone else, borrowed any money from another private lender and zero otherwise. Source: Global Findex Database.
Family and friends	Dummy variable equal to one if a respondent or together with someone else, borrowed any money from family and friends and zero otherwise. Source: Global Findex Database.
A store	Dummy variable equal to one if a respondent or together with someone else, borrowed any money from a store and zero otherwise. Source: Global Findex Database.
Informal Credit	Dummy variable equal to one if a respondent or together with someone else, borrowed any money from either another private lender, family and friends, or a store and zero otherwise. Source: Global Findex Database.
Independent Variables	
Sex-Based Index	Dummy variable equal to one if the language has a sex-based gender system and zero otherwise. Source: World Atlas of Language Structures.
Number of Genders Index	Dummy variable equal to one if the language has exactly two genders and zero otherwise. Source: World Atlas of Language Structures.
Gender Pronoun Index	Dummy variable equal to one if a language distinguishes gender in the third, first and/or second person pronouns and zero otherwise. Source: World Atlas of Languages Structures.
Gender Assignment Index	Dummy variable equal to one if a language assigns gender on both semantic and formal grounds and zero otherwise. Source: World Atlas of Languages Structures.
Aggregate Gender Index	The sum of sex-based index, number of genders index, gender pronoun index and gender assignment index.

Female	Dummy variable equal to one if the individual is a woman and zero otherwise. Source: Global Findex Database.
Control Variables	
Age	The number of years of the individual. Source: Global Findex Database.
Income-Poorest 20%	Dummy variable equal to one if the individual has an income in the first income quintile, zero otherwise. Source: Global Findex Database.
Income-Second 20%	Dummy variable equal to one if the individual has an income in the second income quintile, zero otherwise. Source: Global Findex Database.
Income-Third 20%	Dummy variable equal to one if the individual has an income in the third income quintile, zero otherwise. Source: Global Findex Database.
Income-Fourth 20%	Dummy variable equal to one if the individual has an income in the fourth income quintile, zero otherwise. Source: Global Findex Database.
Income-Richest 20%	Dummy variable equal to one if the individual has an income in the fifth income quintile, zero otherwise. Source: Global Findex Database.
Log (GDP/capita)	Log of real Gross Domestic Product per capita. Source: World Development Indicators.
Rule of law	Measures the perceptions of the extent to which people have confidence in and abide by the rules of society. Source: World Governance Indicators.
Log (Population)	Log of the total population who are 15 years and above. Source: World Development Indicators.
Catholic	Dummy variable equal to one if more than 50% of the inhabitants in a country are Catholics and zero otherwise. Source: The World Factbook.
Muslim	Dummy variable equal to one if more than 50% of the inhabitants in a country are Muslims and zero otherwise. Source: The World Factbook.
Power distance	The extent to which individuals accept inequality. Source: Hofstede's website.
Individualism	Measures the degree of interdependence a society maintains among its members. Source: Hofstede's website.
Masculinity	Measures extent to which social gender roles in a society are distinct. Source: Hofstede's website.
Corruption	Corruption perception index. Source: Transparency International.
Trust	Index to measure trust. Source: La Porta et al (1997).
Plough use	Measures the proportion of citizens with ancestors who traditionally used the plough in pre-industrial agriculture. Source: Alesina, Giuliano and Nunn (2013).

Chapter 3[24]

Does Access to Credit Come with Access to Voting? Democracy and Firm Financing Constraints

Abstract

Access to credit is one of the main obstacles for the growth of firms. We test the hypothesis that democracy exerts an impact on access to credit. Democratic development is expected to alleviate credit constraints for firms by favouring inclusive institutions and by strengthening the institutional framework. We perform regressions at the firm-level on a large dataset of 46,000 firms in 108 countries. We find evidence of a negative relationship between democratic development and credit constraints for firms. We further establish that democratic development contributes to reduce borrower discouragement and leads to more bank loan approval decisions. Our key finding is therefore that democracy favors access to credit. Our work contributes to the debate on the impact of democracy on economic development by considering one firm-level channel of transmission.

JEL Codes: G21, P16.

Keywords: democracy, access to credit, financing constraints.

[24] This chapter refers to the article cowritten with Laurent Weill.

3.1. Introduction

Following the fall of the Berlin wall, the world has witnessed an impressive rise in the number of countries transitioning from authoritarian regimes to democratic rule. According to Democracy Project, the number of democracies in the world has nearly doubled, rising from 51 in 1989 to 99 in 2018.[25] The recent years have however suggested a potential reversal trend with the gradual move to authoritarian regimes in several countries such as Turkey or Russia. These changes in political regimes generate questions regarding which type of political regime brings about the greatest economic benefits.

Economists and political scientists have devoted a great deal of attention to this debate, with recent studies supporting the beneficial impact of democracy on economic development, at least in the long run (e.g., Rodrik and Wacziarg, 2005; Papaionannou and Siourounis, 2008; Acemoglu et al., 2019). In their recent paper, Acemoglu et al. (2019) find that democratization increases GDP per capita by about 20 percent in the next 25 years.

The beneficial impact of democracy on economic development can occur through its influence on financial development, since financial development has been shown to favour economic development (Levine, 2005; Popov, 2018). At the macroeconomic level, Huang (2010) has shown that democratization is associated with higher financial development in a cross-country study. It is however of importance to identify the channels through which this impact takes place at the microeconomic level. Delis, Hasan and Ongena (2020) provide the first evidence on this issue by showing that democratization reduces the cost of credit in an investigation performed on a cross-country sample of syndicated loans, which are large loans granted to large companies.

Another channel through which democracy can exert its influence on financial development is through access to credit for firms, which has been shown to be a major force through which financial development can boost economic growth. Indeed, evidence has shown that the lack of access to credit is one of the main obstacles for the growth of firms, in particular for small and medium-sized firms (Beck and Demirgüc-Kunt, 2006: Nkurunziza, 2010). Credit-constrained firms cannot realize worthwhile projects and cannot consequently exploit

[25] See the "*V-Dem Annual Democracy Report 2019*" by Varieties of Democracy Project (V-Dem).

all investment opportunities. As a consequence, greater access to credit favours the expansion of the private sector. Lack of access to credit also contributes to hamper productivity of firms (Gatti and Love, 2008; Butler and Cornaggia, 2011) and then slows down the level of productivity of countries. Thus, the inability of firms to access credit is a major brake on economic growth, which explains the numerous efforts from international organizations to enhance access to credit for firms in developed and developing countries.

In this paper, we examine how democracy influences access to credit. We perform this analysis with firm-level data on access to credit by focusing on SMEs in a cross-country study. We are then able to establish the relation at the microeconomic level without restricting our conclusions to one country. In comparison with the analysis of Delis, Hasan and Ongena (2020) concentrating on large companies, our work is of broader interest for the microeconomic channels of the impact of democracy since SMEs have fewer financing options than large companies and are thus more dependent on bank credit for external finance. As a consequence, enhanced access to credit is expected to play a larger role in financial development than reduced cost of credit for large companies which can rely on other financing sources.

From a theoretical perspective, democratic development is expected to alleviate credit constraints for SMEs for three reasons. First, democracy is associated with inclusive institutions which favour financial inclusion of small firms. Acemoglu and Robinson (2012) explain that inclusive political institutions are associated with a functioning democratic and pluralistic state. Democracy is associated with the presence of checks and balances and enhances the equal political participation of all citizens which contribute to establish electoral pressures and control on leaders. Inclusive political institutions contribute to the emergence of inclusive economic institutions allowing economic agents incentives and opportunities to use their skills at best. Inclusive economic institutions include free entry on markets, mass education and equal access to economic opportunities. Access to credit also represents one inclusive economic institution by allowing economic agents to exploit at best their talents.

Second, democracy is associated with better institutional framework which favours access to credit for firms. As noted by Olson (1993), Clague et al. (1996) and Rodrik (2000), democracies facilitate the protection of property rights, have better legal systems for contract enforcement, reduce expropriation risk, and are associated with greater political stability. All these institutional factors have a beneficial impact on bank lending by increasing incentives for

banks to grant credit (Djankov, McLiesh and Shleifer, 2007; Qian and Strahan, 2007). It accords with the empirical finding from Beck et al. (2006) that better institutional development, measured as an aggregate indicator of World Bank Governance indicators including notably regulatory enforcement and rule of law, reduces financing obstacles for firms.

Thirdly, democracy is a political system characterized by free flow of information and protection of civil liberties, which could enhance access to credit by reducing asymmetry information. Unlike autocracies, information flows more freely in democracies since for example, political agents permit the publication of information on economic data such as inflation and unemployment rates by credible sources like international organizations (Rosendorff and Vreeland, 2006; Hollyer, Rosendorff and Vreeland, 2011). Furthermore, more democracy favours access to information through access to IT services, to the benefit of both businesses and banks. While businesses can use remote devices and have all the well-known advantages of information and communication technologies, banks can process information in a quicker, automated and more efficient way. These factors contribute to reduce information costs and make it less difficult for banks to gather information about firms' credit worthiness. The presence of information asymmetries between banks and borrowers contributes to reduce credit availability (Stiglitz and Weiss, 1981), in particular for SMEs because of the paucity of information about these firms (Petersen and Rajan, 1994). Thus, the increased flow of information in democracies might alleviate credit constraints for small firms.

We face one key challenge in the investigation of the link between democratic development and access to credit: the identification of credit-constrained firms. A first set of works uses a perception-based approach to measure credit constraints by focusing on whether firms perceive access to finance as an obstacle to their operations (Beck and Demirguc-Kunt, 2006; Clarke, Cull and Peria, 2006; Asiedu et al., 2013). Perception-based measures can be problematic since they are subject to perception bias and then may imperfectly inform on credit-constrained firms. A second set of studies defines credit-constrained firms as those not using formal credit (Muravyev, Talavera and Schäfer, 2009; Aterido, Beck and Iacovone, 2013; Love and Martínez Pería, 2014). The concern then is that some firms do not apply for credit because they do not need it, and then cannot be considered as credit-constrained. Thus, we adopt a third approach following Popov and Udell (2012) and Léon (2015). Using data on access to credit from the World Bank Enterprise Survey, we define credit-constrained firms as either firms that applied for credit and were denied or did not apply for credit because they

were discouraged. This identification strategy enables us to disentangle the demand and supply effects so that we can truly examine the effect of democratic development on firms' access to credit. We combine this information on access to credit and a large set of firm-level control variables with democracy indicators from the Polity IV project and additional country-level variables. We then consider a sample of about 46,000 firms in 108 countries. We are then able to examine how democratic development could influence access to credit for firms and further identify potential channels through which this effect is transmitted.

Our primary finding is that democracy favours access to credit. Firms in democratic countries have lower credit constraints than firms in nondemocratic countries. This effect is more pronounced for small and medium-sized firms which tend to suffer the most from credit constraints. Further, on the supply and demand channels, we establish that in democratic countries, firms are less discouraged to apply for credit and banks are more likely to accept credit applications, consistent with our prediction that democratic development transmits positive signals to banks and firms.

We further demonstrate the role of the individual constitutional dimensions of democracy as well as the impact of civil liberties on firms' credit access. While all four constitutional components of democracy (i.e., competitiveness of executive recruitment, openness of executive recruitment, constraints on executive, and competitiveness of participation) are important in alleviating firms' credit constraints, the openness of executive recruitment, which reflects the existence of institutions and procedures through which citizens can participate in the political process, matters the most in fostering firms' ability to access credit. The civil liberties also play an important role: rule of law, property rights, and press freedom all have significant impact in determining the negative effect of democracy on credit constraints. Overall, we show that democratization enhances firms' ability to access credit.

Our contribution to the literature is twofold. First, we contribute to the debate on the relationship between democracy and economic growth (e.g. Papaioannou and Siourounis, 2008; Acemoglu et al., 2019) by investigating a microeconomic channel through which democracy can be beneficial for economic development. Our work provides the first evidence on the impact of democracy on access to credit, which has been shown to be a fundamental driver of firm growth (Beck and Demirgüc-Kunt, 2006). Second, we extend the strand of literature that examines the determinants of access to credit for firms. Existing studies have

identified bank competition (Chong, Lu and Ongena, 2013; Léon, 2015), foreign bank participation (Clarke, Cull and Peria, 2006), institutional development (Beck et al., 2006), gender (Asiedu et al., 2013; Aterido, Beck and Iacovone, 2013), among others. We augment the literature by emphasizing the importance of democratic development on access to credit. To the best of our knowledge, this study is the first to explore the effect of democratic development on firms access to credit.

The paper is structured as follows. In Section 3.2, we describe the data and econometric methodology used in the study. Section 3.3 discusses the results, while Section 3.4 shows the robustness checks. Section 3.5 concludes the paper.

3.2. Data and Methodology

We employ firm-level data from the World Bank Enterprise Survey (WBES). We match these data with democracy indicators from the Polity IV project, Freedom House, and Acemoglu et al. (2019). Data on macroeconomic variables are collected from World Development Indicators and governance variables come from World Governance Indicators database.

We apply some filtering to the firm-level data extracted from World Bank Enterprise Surveys. For responses that the interviewer does not believe to be reliable, we drop those observations from the sample (question a16). We drop firms with missing information on credit market experience. Finally, we exclude firms with more than 1,000 employees since they are not SMEs and may have access to equity markets. The final sample includes 46,653 firms from 108 countries (176 surveys from 2006 to 2018). The sample of countries and survey years is reported in the Appendix 3.1.

3.2.1 Measuring credit constraints

We use data on access to credit from the World Bank Enterprise Survey[26]. This is a firm-level survey conducted since the 1990s and covers a broad range of business environment

[26] The World Bank Enterprise Survey data is available on the website http://www.enterprisesurveys.org/data.

topics including access to finance, gender, corruption, infrastructure, innovation, competition, informality, and performance measures. Since 2006, the survey questionnaires were standardized across waves and countries with common methodology, thereby enhancing comparability in cross-country studies. The survey targets formal (registered) firms with 5 or more employees and survey questions are answered by business owners and top managers. Using a stratified random sampling procedure with the size of the economy (GDP), sector, and location as strata, the survey data ensures that the samples are representative in each country.

In line with former studies on access to finance (Popov and Udell, 2012; Léon, 2015), we focus on several questions regarding firms' credit experience in the past year. We first make a distinction between firms that have a need for credit and firms which do not need bank credit. Then we identify the credit constrained firms among those firms with a need for bank credit. In the WBES survey, firms were asked the following question: "*Question K16: In the last year, did this establishment apply for loans or lines of credit*?" Firms who answered "*No*" to this question were asked a subsequent question: "*Question K17: What was the main reason the establishment did not apply for any line of credit or loan in the past year*?" This question enables us to distinguish firms who did not apply for credit because they did not need loans from those who were discouraged from applying. Firms who responded "*No need for a loan - establishment had sufficient capital*" to this question are classified as non-borrowers whereas firms who provide a different reason are classified as discouraged borrowers. Therefore, we classify a firm as discouraged only when the firm had a need for external financing but refused to make a formal demand because they were discouraged to apply, and not because the firm did not have a need for credit. Among the firms that answered "Yes" to Question K16, a firm is classified as Approved if at least one credit request was not turned down.

Following Popov and Udell (2012), we measure credit constrained firms (*Constrained*) as those firms that applied for credit and were denied or did not apply for credit because they were discouraged. This approach enables us to separate firms who did not apply for credit because they did not need it from firms who were discouraged from applying. Also, unlike other measures which are based on firms' use of formal credit, grouping both discouraged borrowers and firms that were turned down upon application allows us to observe firms who made a formal application for credit that was not fulfilled by supply or discouraged from applying due to imperfections in the credit market like high interest rates, complex application procedures or high collateral requirements.

3.2.2. Measuring democracy

Our primary measure of democracy is the Polity IV index from the Polity project which has been commonly used in recent works on the economic impact of democracy (e.g., Delis, Hasan and Ongena, 2020). This variable considers the presence of institutions through which citizens can take part in the political process and is widely used in the literature to measure democratic institutions.

It is based on three interdependent elements: (i) the existence of institutions and procedures through which citizens can participate in the political process; (ii) the presence of institutional checks and balances on the power exercised by the executive; and (iii) the protection and assurance of civil liberties and political participation of all citizens. Our democracy variable *Democracy*[27] ranges from 0 to 10, where 0 indicates no institutional democracy and 10 indicates maximum level of institutional democracy.

We use alternative democracy measures from the Freedom House and from Acemoglu et al. (2019) in the robustness checks.

3.2.3. Methodology

In this paper, we examine how democratic development affects firms' access to credit. Given the binary nature of the dependent variable, we estimate probit regressions with the following model specification:

$$\Pr(\text{Constrained}_{ik}=1) = \Phi(\alpha + \beta\ \text{Democracy}_k + \Omega F_i + \tau C_k + \varepsilon_{ik}) \quad (1)$$

where *Constrained* is a dummy variable equal to one if a firm *i* in country *k* is credit constrained. *Democracy* captures the level of development of democratic institutions in the year prior to the survey year. F represents firm-level control variables; C represents country-level control variables; Φ is the standard normal cumulative density function; and ε is the error term.

[27] This variable is referred to as DEMOC in the Polity IV project.

To control for observable firm-level heterogeneity, we include six firm-level control variables (F_i) in line with previous studies on the determinants of firms' access to credit (Asiedu et al., 2013; Popov and Udell, 2012). We control for firm size with two dummy variables. Following the WBES classification, a firm is classified as small if it has between 5 and 19 employees (*small firm*), medium if the number of employees is between 20 and 99 (*medium firm*), and consider large firms with employees of 100 or more as the omitted variable. We introduce three dummy variables to capture the legal status of the firm: *sole proprietorship, publicly traded and private or non-traded*. We take into account ownership structure with a dummy variable *foreign owned* equal to one if at least 10 percent of a firm's ownership is held by foreigners. *Exporter* is a dummy variable which equals to one if at least 10 percent of a firm's annual sales is derived from direct exports. We introduce a dummy variable *audited* to capture if a firm's financial statements were checked and certified by an external auditor. *Subsidiary* is a dummy variable equal to one if a firm is part of a larger group and zero otherwise.

We consider four country-level control variables (C_k) that may affect credit access. Since access to credit might depend on the level of income and growth, we include the logarithm of GDP per capita (*Log(GDP/capita)*) and GDP growth rate (*GDP growth*). We take into account the level of financial development measured by the domestic banking credit to the private sector as a share of GDP (*Credit/GDP*). We consider macroeconomic stability measured by the inflation rate (*inflation*). All country control variables are measured with a lag of one year to be consistent with the firm-level variables. Descriptive statistics for all variables employed in our study are reported in Table 3.2.

An important issue concerns the identification of the impact of democratic development on firms' access to credit. Our empirical setting includes relevant firm-level and country-level control variables that address issues of possible bias due to omitted variables. Also, reverse causation is highly unlikely since it is very improbable to observe a change in democracy due to a change in access to credit for firms.

We still go further to address any potential unobserved characteristics in several ways. First, we include year fixed effects, and industry fixed effects based on 2-digit SIC codes. The inclusion of the year fixed effects controls for time-specific global shocks that are common to all firms in our sample. The industry fixed effects based on 2-digit SIC codes control for

unobserved industry-specific heterogeneity. These sets of fixed effects capture the effect of several unobserved characteristics affecting access to credit.

Second, we employ an instrumental variable approach to deal with any potential endogeneity concerns. Following the strategy of Acemoglu et al. (2019), we use an established instrument that relies on the fact that regime changes have often occurred in regional waves. This approach is used in recent works on the economic impact of democracy (e.g., Madsen, Raschky and Skali, 2015; Gründler and Krieger, 2016; Acemoglu et al., 2019), and takes advantage of Huntington's observation that historically, transitions from autocracy to democracy (or vice versa) often occur through regional waves (Huntington, 1991). As noted by Starr (1991), democratization generally occurs via diffusion in the international systems, thus the likelihood of political transitions often depends on the level of democracy in regional neighbouring countries. To capture the effect of this democratic wave, we build *Regional democratization*, which uses the average democracy level of regional neighbours (leaving out the country's own democracy), as an instrument for the domestic level of democracy. Following the World Bank Classification, we classify countries into seven geographic regions: Africa, East Asia and the Pacific, Eastern Europe and Central Asia, Western Europe and other developed countries, Latin America and the Caribbean, the Middle East and the North of Africa, and South Asia.

More formally, we construct our instrument as follows:

$$Z_{k,t}^{p} = \frac{1}{|P|} \sum_{j \in P} d_{j,t}^{(p_j)} \quad \text{with } P = \{j : j \neq k,\ p_j = p_k\} \tag{2}$$

where p_k denotes the geographic region in which country k is located; d denotes the domestic level of democratization; and Z is the jack-knifed regional level of democracy (*Regional democratization*).

3.3. Results

3.3.1 Main Estimations

Table 3.3 reports the results of the main estimations. We consider five different specifications based on the inclusion of fixed effects and control variables to test the sensitivity of our results. We add year fixed effects in column (1), and industry fixed effects in column (2). We continue by adding either firm-level control variables in column (3) or country-level control variables in column (4). Finally, the specification in column (5) includes all control variables. In all estimations, we report the marginal effects, calculated as the discrete change in the expected value of the dependent variable as the dummy variable changes from 0 to 1.

Our main finding is the negative and significant coefficient for *Democracy* in all estimations. The overarching message from the regressions is that firms in democratic countries have less constraints in accessing credit than firms in autocracies. Thus, the quality of democratic institutions contributes to alleviate credit concerns for firms.

From the marginal effects, the estimated effect of the coefficient on *Democracy* is meaningful. When considering the specification with all control variables and fixed effects in column (5), we observe that for a one-point increase in democracy, firms' credit constraints would reduce by 1 percentage point. This finding is consistent with our expectation that democratic institutions tend to transmit positive signals to banks and firms and thereby increasing credit access to firms. For example, in our sample, 24.5 % of firms from Turkey were financially constrained in 2007 when Turkey had a democracy score of 8. In 2012, when Turkey's democracy score increased to 9, 21.3% of firms on average were credit constrained. Conversely, in Madagascar, the proportion of firms that were credit constrained increased from 63.4% in 2008 when the country had a democracy score of 7 to 78.4% in 2012 when the democracy score dropped to 4.

We turn our attention to the firm-level control variables. We observe that smaller firms have a high probability to be financially constrained than larger firms with the significantly positive coefficients for *Small firm* and for *Medium firm*. The positive and significant coefficient for *Foreign owned* shows that foreign-owned firms are more likely to be credit

constrained than domestically owned firms. We explain this finding by the fact that banks can have better information on domestically-owned firms than on foreign-owned firms, which contributes to the ability of these firms to have higher probability to access credit, given the key role of information asymmetries in SME financing. We also observe that *Sole Proprietorship* firms are more likely to be credit constrained whereas *Private or nontraded* and *Publicly traded* firms have a higher likelihood to access credit. Further, the significantly negative coefficients for *Exporter*, *Subsidiary*, and *Audited* show that exporting firms, firms belonging to a larger group, and firms whose financial statements were certified by an external auditor are less likely to have credit constraints. For the country-level control variables, we find that *Log(GDP/capita)* and *GDP Growth* are negative and significant, indicating that greater economic development is associated with less credit constraints. *Inflation* has a significantly positive coefficient, showing that firms in countries with high inflation are more likely to be financially constrained. Finally, we find that firms in financially developed countries have high probability to access credit with the significantly negative coefficient for *Credit/GDP*.

To further strengthen our analysis, we use instrumental variable (IV) probit approach to deal with any endogeneity concerns. We replicate the estimations from Table 3.3 using *Regional democratization* as instrument and report the results in Table 3.4. We also report the F-value of the first stage and the Wald test. In all IV specifications, the F-values of the first stage are far beyond the conventional critical values thus dispelling the weak instrument eventuality, while the Wald test suggests that it is appropriate to use an instrumental variable model. We still observe that democracy has a negative and significant impact on access to credit. Hence the results using the IV estimations confirm our key findings obtained with the probit regressions. Following Delis, Hasan and Ongena (2020), we use the simple probit regressions in the rest of our specifications in the paper since the IV results converge to the results with probit regressions.

In summary, our results provide evidence that democratic development affects firms' access to credit. Firms in democracies are less likely to be financially constrained compared to firms in nondemocracies. Therefore, our finding supports the hypothesis that democratic development has a positive impact on access to credit for firms.

3.3.2. Estimations by firm size

Our main estimations show that democratic development contributes to facilitate firms' ability to access credit. We can question whether this impact varies by firm size. This question is of particular interest, since credit constraints are more pronounced for small firms (e.g., Beck and Demirgüc-Kunt, 2006). These firms are indeed more vulnerable to information asymmetry problems on the credit market. Therefore, it is important to examine whether all types of firms benefit similarly from the effects of democracy, a political regime associated with better flow of information and more favourable institutional environment.

We perform separate estimations for the three size groups of firms i.e., small, medium, and large firms. The results are presented in Table 3.5. We find that the coefficient of *Democracy* is significantly negative for small and medium firms whereas we observe negative but insignificant coefficient for large firms. This finding shows that democratic development favours access to credit particularly for small and medium-sized firms.

The implications of this finding are important. Since small and medium firms suffer the most from credit constraints, this finding stresses the beneficial effects of democratization for access to credit of firms.

3.3.3. How does democratic development affect access to credit?

Our main estimations have shown that democratization alleviates firms' credit constraints. We explore this evidence in greater depth by examining the channels through which democratic development can facilitate access to credit for firms.

We want to investigate whether the transmission channel goes through credit demand channel by encouraging firms to apply for loans and/or through the supply channel by enhancing the number of approved credit applications.

A large strand of the literature has stressed that borrower discouragement explains more the low use of bank credit than bank rejection decisions. For instance, Brown et al. (2011) attribute the low use of credit to the fact that a higher percentage of firms in need of loans are

discouraged from applying. This is also observed in our sample as 56.5% of firms who needed loans refused to apply because they were discouraged, even though 88.4% of the firms who applied were approved the credit.

We therefore examine how democratic development could influence firms' decision to apply for a loan (the demand channel), and banks rejection/approval decisions (the supply channel).

3.3.3.1. Impact of democratic development on a firm's decision to apply for credit

A set of factors contribute to discourage firms with a need for external finance from applying for credit. Brown et al. (2011) suggest that high interest rates, collateral requirements, and complex application procedures are factors that discourage potential borrowers from applying for credit. Therefore, the degree of democratic development in a country can play a role in affecting firms' loan application decisions by influencing these different factors. Democratic development can influence firms' decision to apply for loans through its effect on cost of credit (Delis, Hasan, and Ongena, 2020) and creating the environment favourable for loan access. If firms perceive that, for example, there is low asymmetry information, cost of credit is low, and property rights are protected, they will be less reluctant to demand for credit. We expect therefore that these factors would reduce borrower discouragement and thus that democracy would be associated with more likelihood to apply for credit.

To test this demand channel, we investigate whether democratic development contributes to influence firms' decision to apply for credit. The dependent variable is *Apply*, a dummy variable equal to one if a firm needed an external credit and applied, and zero otherwise. The results are displayed in columns (1)-(2) of Table 3.6, in which we include all fixed effects but alternatively perform the estimation without and with all control variables. Our results show that democratic development has a significantly positive coefficient, suggesting that democratization is associated with less borrower discouragement. Thus, firms with a need for external finance are less reluctant to apply for credit in democracies.

To provide additional insights, we examine whether this effect is observed for all size groups of firms. In columns (3)-(5) of Table 3.6, we re-estimate the model by considering separately the three different size groups of firms. In all estimations, we find significantly

positive coefficients for *Democracy*. Thus, we observe that democratic development contributes to reduce the reluctance of firms whatever their size to demand credit.

This finding is important for policy considerations, given the severity of borrower discouragement in SME financing, as observed in our sample. It suggests that governments should focus on building and strengthening democratic institutions since they have the potential of influencing a firm's probability of applying for a loan.

3.3.3.2. Impact of democratic development on a bank's credit approval decision

Institutions have been shown to influence bank lending behaviour. Recent studies have shown that improvements in legal environment make banks increase their credit supply (Haselmann, Pistor and Vig, 2009), and lend proportionally more to SMEs (Haselmann and Wachtel, 2010). As explained before, better institutions through effective legal systems and contract enforcement, lower asymmetric information, better property rights protection, and political stability are established ideals inherent in democratic regimes. We contend that there is a positive link between these constitutional characteristics of democracy and a bank's likelihood to accept credit demands. Thus, in democratic regimes, we expect banks to reject less credit applications from firms.

To test this supply channel, we examine how democratic development affects banks' credit approval behaviour. The dependent variable *Approved* is a dummy variable equal to one if a firm applied for external finance and received at least one line of credit and zero otherwise. The results of the estimations are reported in columns (1)-(2) of Table 3.7, in which we include all fixed effects but alternatively perform the estimations without and with all control variables. We find that banks approve more credit applications in democratic countries than in autocracies.

In columns (3)-(5) of Table 3.7, we further perform estimations by firm size. We consider separately the three size groups of firms. We find that *Democracy* is significantly positive for small and medium firms. However, *Democracy* is not significant for large firms. This indicates that democratic development facilitates more bank loan approval decisions for small and medium firms. In other words, democracy favours more loan supply for small and medium

firms, which are the most affected firms by credit constraints because of information asymmetry problems.

This finding confirms what we know from the literature: banks can easily turn down credit applications when the environment for financial intermediation is not favourable. However, in a democratic environment, where contracts are well enforced through effective legal systems, property rights are better protected, political cycles are well-defined securing stability, and information flows easily, banks have incentives to efficiently intermediate funds thereby leading to less severe loan rejection decisions.

3.3.4. Components of Democracy and civil liberty channels

We have shown that democratic development favours access to credit. We take now one step further to identify the constitutional dimensions of democracy and civil liberty channels that could affect the ability of firms to access credit. We therefore proceed to assess the characteristics of democracy by considering the components of Democracy (Polity IV Project).

First, we consider the four components of democracy (Polity IV). As they are defined in Polity IV database, *Competitiveness of executive recruitment* refers to the extent that prevailing modes of advancement give subordinates equal opportunities to become superordinates; *Openness of executive recruitment* measures whether recruitment of the chief executive is "open" to the extent that all the politically active population has an opportunity, in principle, to attain the position through a regularized process; *Constraints on executive* refers to the extent of institutionalized constraints on the decision making powers of chief executives, whether individuals or collectivities; and *Competitiveness of participation* which refers to the extent to which alternative preferences for policy and leadership can be pursued in the political arena.

Table 3.8 presents the results on the effects of the constituents of democracy on firm's access to credit. We obtain two findings. First, we find that all four components are significantly negative. This means that all constituents of democracy contribute to favour access to credit for firms.

Second, we observe that among the four components, the constituent of democracy with the greatest impact on access to credit is *Openness of executive recruitment*. In other words, what matters the most for access to credit is the existence of institutions and procedures through which citizens can participate in the political process. This constituent of democracy is fundamental to ensuring inclusive and equal political participation.

It accords with Acemoglu and Robinson (2012)'s view that inclusive institutions contribute to favour growth. These inclusive institutions are associated with a functioning democratic and pluralistic state and contribute to give economic agents incentives and opportunities. These opportunities notably favour better access to credit.

Secondly, we consider the role of the civil liberty channels in influencing firms' ability to access external financing. Due to the fact that the potent channels are numerous, our choice of variables to measure civil liberties is motivated by the availability of data and the minimization of the effect of endogenous perceptions. We take into account three variables in accordance with the three channels through which democracy can affect access to credit: rule of law (a proxy for inclusive institutions) with data from World Governance Indicators, property rights (a proxy for the protection of property rights) with data from Fraser Institute, and press freedom (a proxy for freedom of the press) with data from Freedom House. The results are reported in Table 3.9.

The first channel is the rule of law which proxies for inclusive institutions. We find a significantly negative coefficient, suggesting that inclusive institutions – an important characteristic of a well-functioning and effective democratic regime – fosters economic activity and thereby contribute to enhance better credit access for firms. In column (2), we observe that better protection of property rights, which captures the degree to which laws of a country protect private property rights and the degree to which the government enforces those laws, play an important role in firms' ability to access credit. In the last column, we find that better flow of information in democracies, proxied by the freedom of the press, is significantly related to the access to credit for firms.

3.4. Robustness tests

In this section, we examine the robustness of our findings in several ways. In all robustness tests, we consider the specification with all control variables and all fixed effects unless otherwise indicated.

Alternative measures of democracy. We consider four different indicators. We start by using two alternative indicators from the Polity IV database, based on different ways to measure what our main democracy measure assesses. On the one hand, we use the alternative democracy measure from Polity IV. This variable *Polity* is the combined Polity score ranging from -10 to 10, where -10 indicates high autocracy and 10 indicates high democracy. On the other hand, we transform the *Polity* variable as the dummy variable *Polity Dummy* which is equal to one if *Polity* is positive and zero otherwise.

We then utilize two measures from other sources. We consider the democracy measure from Freedom House. This variable captures perception-based assessment of how civil and political rights are protected in a country. Therefore, this variable considers democracy on a different basis than democracy indices from the Polity IV database which is based on institutionalized democracy and not on perception. We name this variable *Democracy (Freedom House)* and it takes a value of one if Freedom House regards a country as "Free" or "Partially Free" and zero otherwise.

We finally use the democracy measure of Acemoglu et al. (2019) which combines data from the Polity IV and Freedom House. This variable *Democracy (Acemoglu et al.)* is coded as one (democratic) if Freedom House categorizes a country as "Free" or "Partially Free" and Polity IV gives it a positive score (Polity IV scale of -10 to 10). Conversely, if a country is regarded as "Not Free" in Freedom House and receives a negative score in Polity IV, it is coded as zero (autocratic).

The estimations are reported in Table 3.10. We observe that the coefficient for the democracy variable is significantly negative whatever the chosen democracy indicator. Therefore, our key finding that firms in democracies are less credit constrained than in autocracies is robust to the use of alternative measures of democracy.

Alternative measures of credit constraints. We test the sensitivity of our results to the use of alternative credit constraint measures. We measure financial constraints as whether a firm uses formal credit or not (e.g., Aterido, Beck and Iacovone, 2013). Specifically, we use two dummy variables: *Constrained (Loan Use)* coded as one if a firm does not have an overdraft facility, a credit line and/or a formal bank loan and zero otherwise; and *Constrained (Working Capital)* which is coded as one if a firm does not finance part of its working capital with bank credit and zero otherwise.

In comparison with our main indicator of credit constraints, these variables do not consider whether a firm needed external finance or not. Therefore, they do not provide the same information on the presence of credit constraints at the firm level. We however employ them to test the robustness of our findings.

Table 3.11 reports the results. For each alternative credit constraint measure, we test two specifications alternatively with all control variables but no fixed effects, and with all control variables and fixed effects. The dependent variable in columns (1)-(2) is *Constrained (Loan use)* and columns (3)-(4) is *Constrained (Working Capital)*. In all estimations, we still observe that the coefficient for *Democracy* is significantly negative, corroborating our finding that democratic development alleviates firms' credit constraints.

Additional control variables. A potential concern for our model is the omission of some important variables. To rule out this possibility, we test the stability of our results when we include additional controls. Estimation results are reported in Table 3.12. First, we add *Sales growth*, computed as the average growth in a firm's sales over three years, which captures the recent performance of a firm. This variable is not included in the main estimations because it is not available for about one quarter of the firms of our sample. . The results are reported in column (1). Our main finding is preserved: democracy enhances firms' ability to access credit.

Second, we include an indicator of creditor rights since it has been shown to influence firms' access to bank financing (Safavian and Sharma, 2007). As argued by Delis, Hasan and Ongena (2020), creditor rights are important for the banking industry and could have an impact on access to credit independent of democracy. We consider *Creditor rights* based on the creditor rights index from Djankov, McLiesh and Shleifer (2007). We include this variable in

column (2). We still find the negative relationship between democracy and firms' financing constraints.

Third, we test whether the estimated effect of democracy is driven by differences in financial regulatory environment. The ability of firms to access finance may be hindered by stricter regulations on banking activities. For example, in countries with more stringent restrictions on banking activities, banks may not be able to design suitable products and services specific for SME financing. To control for this, we include the index of regulatory restrictions on the activities of banks from Barth, Caprio and Levine (2013), as the variable *Restrict*. The results are presented in column (3). Our results show that democracy enters negative and significant, confirming that our result is not driven by differences in regulatory environment.

Fourth, we take into account the level of government interference in banking activities and financial development. This sensitivity check enables us to examine the effect of cross-country differences in financial freedom. We include the variable *Financial Freedom* from Heritage Foundation. The estimation is reported in column (4). We still find a significantly negative coefficient for democracy. Thus, our result is not affected by the inclusion of differences in financial freedom.

Fifth, we control for institutional development. One concern regarding our estimations is that our results could be influenced by the differences in the perceptions of institutional development across countries. Our measure for democracy is an objective measure based on the presence of democratic institutions. However, access to credit may be influenced by the perception of institutional development rather than by the level of democracy. To disentangle the effect of democracy on access to credit from the perception of institutional development, we include in our model the variable *Institutional Development*, measured as the average of six governance indicators: voice and accountability, political stability, effectiveness of government, regulatory quality, rule of law, control of corruption, with data from the World Governance Indicators. The estimation is displayed in column (5). The negative effect of *Democracy* is still observed with a statistically significant negative coefficient.

Sample Construction. We check the sensitivity of our results to the construction of the sample. First, we exclude all countries with less than 100 observations from our sample. These

countries can suffer from a lack of representativeness given the small number of observations. The estimation is displayed in column (1) in Table 3.13. We still observe that the estimated coefficient of democracy is negative and significant.

Second, we check whether our results are driven by developed countries. It has been argued that democracy requires a certain level of economic development to be able to thrive and that autocracy is the optimal political regime for very poor countries (e.g., Posner, 2010). To rule out the possibility that our findings are driven by developed countries, we redo our estimation only for the subsample of "low-income" and "lower middle-income" countries based on the World Bank classification. It is reported in column (2) in Table 3.13. We again point out a negative and significant coefficient for democracy. This confirms that our finding is not restricted to developed countries: democracy is beneficial for access to credit, regardless of the level of economic development of the country.

Third, we restrict the sample to countries that have more than one survey. Some countries in our sample period have either two or three surveys (66 countries). As a robustness check, we perform estimations by considering only these countries. This robustness check allows us to take advantage of the changes in democracy and observe its impact on access to credit. Estimation results are reported in column (3) in Table 3.13. The results confirm our main findings that democracy favours better access to credit.

Econometric concerns: We tackle potential econometric issues. First, our results may be subject to selection bias. Our sample is restricted to firms who have a need for bank credit since a credit-constrained firm is only observable if the firm expresses a need for bank financing. However, the selection into the group of firms with a need for credit may not be random and could therefore bias our estimates. To overcome this potential selection issue, we apply a probit model with sample selection proposed by Van de Ven and Van Praag (1981). The probit model with sample selection takes into account two binary equations (selection and outcome equation) and requires relevant exclusion variables which have to influence the selection equation (need for credit) but uncorrelated to the outcome equation (credit access) for a robust identification. Following former studies (Popov and Udell, 2012; Léon, 2015), we employ two exclusion variables: *Working capital* which captures the share of goods and services paid for after delivery, and *Competition* capturing a firm's perceived degree of competition from the informal sector. The results are reported in column (4) of Table 3.13. We find that the coefficient of

Democracy remains significantly negative despite the change in model specification. This further provides additional support for the robustness of our finding.

Second, we include country fixed effects. Our baseline model includes relevant country-level control variables that take into account differences in the macroeconomic environment. Sector and year fixed effects are also included to capture sector-specific country shocks and time specific global shocks common to all firms. As a robustness check, we estimate the model by including country fixed effects to take into account unobserved country-level heterogeneity. Results in column (5) in Table 3.13 confirm our main finding that democratic development contributes to alleviate firms' financing constraints.

3.5. Conclusion

This paper examines the impact of democracy on access to credit. We use data on a large cross-country sample of firms to investigate whether democratic development affects credit availability at the firm level.

Our main finding is that democracy favors access to credit. We find evidence of a negative effect of democratic development on credit constraints for firms. This effect is particularly observed for small and medium-sized firms which tend to suffer the most from financing constraints. We further establish that democratic development contributes to reduce borrower discouragement and leads to more bank loan approval decisions.

We interpret these findings by the fact that democratic development alleviates credit constraints for SMEs by favoring inclusive institutions, including financial inclusion of small firms, by strengthening the institutional framework increasing incentives for banks to lend, and by reducing information asymmetries.

Our paper therefore contributes to provide microeconomic foundations to the finding that democracy contributes to economic development as observed by Acemoglu et al. (2019). Access to credit is one of the key obstacles for firm growth. Thus, democracy benefits firm growth through access to credit.

Complementing the finding from Delis, Hasan and Ongena (2020) that democracy reduces cost of credit for large firms, our works altogether show that democracy contributes to facilitate firm credit. A natural extension is to investigate whether democratic development exerts an influence on the type of credit, for instance by favoring more credit to innovative firms and thus contribute through this channel to innovation and consequently growth. This question opens avenues for further research.

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Table 3.1.
Definitions of variables

Variable	Definition and source
	Dependent variables
Constrained	Dummy variable equal to one if a firm that needed external funds applied for credit and was denied or refused to apply and zero otherwise. Source: WBES
Apply	Dummy variable equal to one if a firm needed external funds and applied for credit and zero if the firm did not apply. Source: WBES
Approved	Dummy variable equal to one if a firm applied for loans and received at least one line of credit and zero otherwise. Source: WBES
Constrained (Loan Use)	Dummy variable equal to one if a firm does not have an overdraft facility, a credit line and/or a formal bank loan and zero otherwise. Source: WBES
Constrained (Working Capital)	Dummy variable equal to one if a firm does not finance part of its working capital with bank credit and zero otherwise. Source: WBES
	Independent Variables
Democracy Measures	
Democracy	Democracy measure which ranges from 0 (no institutional democracy) to 10 (maximum level of institutional democracy). Source: Polity IV project.
Polity	Combined Polity score. Computed by subtracting the autocracy score from the democracy score, and ranges from -10 (strongly autocratic) to 10 (strongly democratic). Source: Polity IV project.
Democracy (Freedom House)	Dummy variable equal to one if Freedom House regards a country as "Free" or "Partially Free" and zero otherwise. Source: Freedom House.
Democracy (Acemoglu et al.)	Dummy variable equal to one if Freedom House categorizes a country as "Free" or "Partially Free" and Polity IV gives it a positive score and zero otherwise. Source: Acemoglu et al. (2019).
Competitiveness of Executive recruitment	The extent that prevailing modes of advancements give subordinates equal opportunities to become superordinates. Source: Polity IV project.
Openness of executive recruitment	Recruitment of the chief executive is "open" to the extent that all the politically active population has an opportunity, in principle, to attain the position through a regularized process. Source: Polity IV project.
Constraints on executive	The extent of institutionalized constraints on the decision-making powers of chief executives, whether individuals or collectivises. Source: Polity IV project.
Competitiveness of participation	The extent to which alternative preferences for policy and leadership can be pursued in the political arena. Source: Polity IV project.
Firm Level variables	
Small firm	Dummy variable equal to one if a firm has between 5 and 19 employees. Source: WBES.
Medium firm	Dummy variable equal to one if a firm has between 20 and 99 employees and zero otherwise. Source: WBES.

Large firm	Dummy variable equal to one if a firm has 100 or more employees and zero otherwise. Source: WBES.
Sole Proprietorship	Dummy variable equal to one if a firm is a sole proprietorship and zero otherwise. Source: WBES.
Private or non-traded	Dummy variable equal to one if shares of a firm are privately traded or non-traded and zero otherwise. Source: WBES.
Publicly traded	Dummy variable equal to one if a firm is a publicly traded company and zero otherwise. Source: WBES.
Foreign owned	Dummy variable equal to one if at least 10 percent of a firm's ownership is held by foreigners and zero otherwise. Source: WBES.
Exporter	Dummy variable equal to one if at least 10 percent of a firm's annual sales is derived from direct exports and zero otherwise. Source: WBES.
Subsidiary	Dummy variable equal to one if a firm is part of a larger group and zero otherwise. Source: WBES.
Audited	Dummy variable equal to one if a firm's financial statements were checked and certified by an external auditor and zero otherwise. Source: WBES.
Sales growth	Average growth in a firm's sales over three years. Source: WBES.
Working capital	Measures the proportion of goods and services paid for after delivery. Source: WBES.
Competition	Captures a firm's perceived degree of competition in the informal sector. Source: WBES.
Country level Variables	
Log(GDP/capita)	Logarithm of Gross domestic product (GDP) per capita. Source: WDI.
GDP Growth	Growth rate in GDP. Source: WDI.
Inflation	Rate of inflation. Source: WDI.
Credit/GDP	Domestic banking credit to the private sector as a share of GDP. Source: WDI.
Restrict	Index of regulatory restrictions on the activities of banks. Source: Barth, Caprio and Levine (2013).
Financial Freedom	The Index scores an economy's financial freedom by looking into the following five broad areas: (i) the extent of government regulation of financial services; (ii) the degree of state intervention in banks and other financial firms through direct and indirect ownership; (iii) the extent of financial and capital market development; (iv) government influence on the allocation of credit, and (v) openness to foreign competition. These five areas are considered to assess an economy's overall level of financial freedom that ensures easy and effective access to financing opportunities for people and businesses in the economy. An overall score on a scale of 0 to 100 is given to an economy's financial freedom through deductions from the ideal score of 100. Source: Heritage Foundation.
Institutional Development	Average value of six governance indicators: voice and accountability, political stability, effectiveness of government, regulatory quality, rule of law, control of corruption. Source: World Governance Indicators.

Rule of law	Index to measure perceptions of the extent to which people have confidence in and abide by the rules of society. Source: World Governance Indicators.
Property Rights	This index measures the extent to which the laws of a country protect private property rights and the degree to which its government enforces those laws. It also captures the probability that private property will be expropriated. Source: Heritage Foundation.
Press Freedom	A measure of the press freedom of a country. Source: Freedom House.
Creditor Rights	This index aggregates creditor rights by following La Porta et al. (1998). The index ranges from 0 (poor creditor rights) to 4 (strong creditor rights). Source: Djankov, McLiesh and Shleifer (2007).
Instrumental Variable	
Regional Democratization	Average regional level of democracy.

Table 3.2.
Summary Statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
Constrained	46,653	0.616	0.486	0	1
Apply	46,653	0.435	0.496	0	1
Approved	20,277	0.884	0.32	0	1
Constrained (Loan Use)	46,653	0.412	0.492	0	1
Democracy	46,653	6.208	3.138	0	10
Polity	46,653	5.137	4.936	-9	10
Competitiveness of executive recruitment	46,653	2.329	0.908	0	3
Openness of executive recruitment	46,653	3.72	0.9997	0	4
Executive constraints	46,653	5.433	1.589	2	7
Competitiveness of participation	46,653	3.357	1.179	0	5
Democracy (Acemoglu et al.)	46,653	0.745	0.436	0	1
Democracy (Freedom House)	46,653	0.781	0.414	0	1
Small firm	46,653	0.472	0.499	0	1
Medium firm	46,653	0.352	0.478	0	1
Large firm	46,653	0.176	0.381	0	1
Sole Proprietorship	46,653	0.361	0.48	0	1
Private or nontraded	46,653	0.403	0.491	0	1
Publicly traded	46,653	0.04	0.197	0	1
Foreign owned	46,653	0.078	0.268	0	1
Exporter	46,653	0.138	0.345	0	1
Subsidiary	46,653	0.144	0.351	0	1
Audited	46,653	0.492	0.5	0	1
Log (GDP/capita)	46,653	8.016	1.087	5.022	11.008
Inflation	46,653	0.077	0.057	-0.009	0.465
GDP Growth	46,653	5.128	2.955	-25.907	15.029
Credit/GDP	46,653	40.768	28.828	1.344	241.311
Financial Freedom	45,118	48.092	14.667	10	80
Institutional Development	46,653	-0.358	0.522	-1.542	1.74

Table 3.3.
Main Estimations

This table presents the results of probit estimations examining the relation between democratic development and firms' access to credit. The dependent variable is "constrained". Definitions of variables are provided in Table 1. Estimated marginal effects are reported and robust standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)
Democracy	-0.025***	-0.025***	-0.017***	-0.014***	-0.01***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Small firm			0.205***		0.199***
			(0.006)		(0.006)
Medium firm			0.088***		0.084***
			(0.006)		(0.006)
Sole Proprietorship			0.043***		0.03***
			(0.006)		(0.006)
Private or nontraded			-0.087***		-0.064***
			(0.006)		(0.006)
Publicly traded			-0.065***		-0.059***
			(0.011)		(0.011)
Foreign owned			0.056***		0.033***
			(0.008)		(0.008)
Exporter			-0.079***		-0.063***
			(0.006)		(0.006)
Subsidiary			-0.026***		-0.017***
			(0.006)		(0.006)
Audited			-0.099***		-0.10***
			(0.004)		(0.004)
Log (GDP/capita)				-0.069***	-0.051***
				(0.003)	(0.003)
Inflation				0.371***	0.478***
				(0.04)	(0.039)
GDP Growth				-0.004***	-0.004***
				(0.001)	(0.001)
Credit/GDP				-0.001***	-0.001***
				(0.000)	(0.000)
Observations	46,653	46,637	46,637	46,637	46,637
Pseudo R^2	0.092	0.1	0.173	0.129	0.189
Year FE	Yes	Yes	Yes	Yes	Yes
Industry FE	No	Yes	Yes	Yes	Yes

Table 3.4.
IV Probit

This table presents the results of instrumental variable (IV) probit estimations examining the relation between democratic development and firms' access to credit. The dependent variable is "constrained". The instrumental variable is "Regional Democratization". Definitions of variables are provided in Table 1. The Wald Test compares the instrumented model and non-instrumented model. Under the null hypothesis, both models provide similar results. Estimated marginal effects are reported and robust standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)
Democracy	-0.021***	-0.021*	-0.016***	-0.014***	-0.01**
	(0.001)	(0.012)	(0.003)	(0.004)	(0.004)
Small firm			0.240***		0.245***
			(0.008)		(0.008)
Medium firm			0.105***		0.106***
			(0.007)		(0.008)
Sole Proprietorship			0.053***		0.041***
			(0.007)		(0.008)
Private or nontraded			-0.081***		-0.067***
			(0.009)		(0.009)
Publicly traded			-0.062***		-0.063***
			(0.014)		(0.014)
Foreign owned			0.054***		0.0376**
			(0.009)		(0.01)
Exporter			-0.101***		-0.086***
			(0.008)		(0.008)
Subsidiary			-0.045***		-0.034***
			(0.008)		(0.008)
Audited			-0.129***		-0.133***
			(0.006)		(0.007)
Log (GDP/capita)				-0.071***	-0.056***
				(0.006)	(0.006)
Inflation				0.411***	0.576***
				(0.061)	(0.067)
GDP Growth				-0.006***	-0.006***
				(0.001)	(0.001)
Credit/GDP				-0.002***	-0.001***
				(0.000)	(0.001)
Observations	46,653	46,637	46,637	46,637	46,637
Year FE	Yes	Yes	Yes	Yes	Yes
Industry FE	No	Yes	Yes	Yes	Yes
F-1st (excl. IV)	5411.15	5167.45	3648.73	2245.84	1980.10
Wald Test	730.64***	707.76***	511.55***	294.12***	262.01***

Table 3.5.
Estimations by Firm Size

This table presents the results of probit estimations examining the relation between democratic development and firms' access to credit. The dependent variable is "constrained". Definitions of variables are provided in Table 1. Firm controls represent the full set of firm-level control variables used in Table 3 and country controls represent the full set of country-level control variables used in Table 3. Estimated marginal effects are reported and robust standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	Small firms	Medium firms	Large firms
	(1)	(2)	(3)
Democracy	-0.014***	-0.011***	-0.002
	(0.001)	(0.001)	(0.002)
Observations	21,983	16,396	8,231
Pseudo R^2	0.138	0.156	0.172
Firm Controls	Yes	Yes	Yes
Country Controls	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes

Table 3.6.
Firms' Credit Application Decisions

This table presents the results of probit estimations examining the relation between democratic development and firms' access to credit. The dependent variable is "Apply". Definitions of variables are provided in Table 1. Firm controls represent the full set of firm-level control variables used in Table 3 and country controls represent the full set of country-level control variables used in Table 3. Estimated marginal effects are reported and robust standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	Full Sample		Small firms	Medium firms	Large firms
	(1)	(2)	(3)	(4)	(5)
Democracy	0.027***	0.011***	0.016***	0.01***	0.004**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Observations	46,641	46,641	21,985	16,394	8,231
Pseudo R^2	0.108	0.19	0.133	0.169	0.209
Firm Controls	No	Yes	Yes	Yes	Yes
Country Controls	No	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes

Table 3.7.
Banks' Credit Approval Decisions

This table presents the results of probit estimations examining the relation between democratic development and firms' access to credit. The dependent variable is "Approved". Definitions of variables are provided in Table 1. Firm controls represent the full set of firm-level control variables used in Table 3 and country controls represent the full set of country-level control variables used in Table 3. Estimated marginal effects are reported and robust standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	Full Sample		Small firms	Medium firms	Large firms
	(1)	(2)	(3)	(4)	(5)
Democracy	0.005***	0.004***	0.008***	0.004***	-0.001
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)
Observations	20,265	20,265	7,037	7,970	5,160
Pseudo R^2	0.045	0.088	0.073	0.066	0.105
Firm Controls	No	Yes	Yes	Yes	Yes
Country Controls	No	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes

Table 3.8.
Components of Democracy

This table presents the results of probit estimations examining the relation between democratic development and firms' access to credit. The dependent variable is "constrained". Definitions of variables are provided in Table 1. Firm controls represent the full set of firm-level control variables used in Table 3 and country controls represent the full set of country-level control variables used in Table 3. Estimated marginal effects are reported and robust standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	Competitiveness of Executive Recruitment	Openness of Executive Recruitment	Constraints on Executive	Competitiveness of Political Participation
	(1)	(2)	(3)	(4)
Democracy Channel	-0.027***	-0.029***	-0.025***	-0.018***
	(0.003)	(0.002)	(0.002)	(0.002)
Observations	46,637	46,637	46,637	46,637
Pseudo R^2	0.187	0.188	0.19	0.187
Firm Controls	Yes	Yes	Yes	Yes
Country Controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes

Table 3.9.
Civil Liberty Channels

This table presents the results of probit estimations examining the relation between democratic development and firms' access to credit. The dependent variable is "constrained". Definitions of variables are provided in Table 1. Firm controls represent the full set of firm-level control variables used in Table 3 and country controls represent the full set of country-level control variables used in Table 3. Estimated marginal effects are reported and robust standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	Rule of law	Property rights	Press freedom
	(1)	(2)	(3)
Civil liberty channel	-0.047***	-0.0004***	-0.001***
	(0.005)	(0.000)	(0.000)
Observations	46,637	45,105	46,566
Pseudo R^2	0.187	0.186	0.186
Firm Controls	Yes	Yes	Yes
Country controls	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes

Table 3.10.
Alternative Measures of Democracy

This table presents the results of probit estimations examining the relation between democratic development and firms' access to credit. The dependent variable is "constrained". Definitions of variables are provided in Table 1. Firm controls represent the full set of firm-level control variables used in Table 3 and country controls represent the full set of country-level control variables used in Table 3. Estimated marginal effects are reported and robust standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	(1)	(2)	(3)	(4)
Polity	-0.005***			
	(0.000)			
Polity Dummy		-0.045***		
		(0.006)		
Democracy (Freedom House)			-0.047***	
			(0.006)	
Democracy (Acemoglu et al.)				-0.058***
				(0.006)
Observations	46,637	46,637	46,637	46,637
Pseudo R^2	0.187	0.187	0.187	0.187
Firm Controls	Yes	Yes	Yes	Yes
Country Controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes

Table 3.11.
Alternative Measures of Credit Constraints

This table presents the results of probit estimations examining the relation between democratic development and firms' access to credit. The dependent variables are "constrained (loan use)" and "constrained (working capital)". Definitions of variables are provided in Table 1. Firm controls represent the full set of firm-level control variables used in Table 3 and country controls represent the full set of country-level control variables used in Table 3. Estimated marginal effects are reported and robust standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	Constrained (Loan Use)		Constrained (Working Capital)	
	(1)	(2)	(3)	(4)
Democracy	-0.025***	-0.023***	-0.021***	-0.018***
	(0.001)	(0.001)	(0.001)	(0.001)
Observations	46,653	46,644	40,306	40,295
Pseudo R^2	0.171	0.205	0.111	0.129
Firm Controls	Yes	Yes	Yes	Yes
Country Controls	Yes	Yes	Yes	Yes
Year FE	No	Yes	No	Yes
Industry FE	No	Yes	No	Yes

Table 3.12.
Additional Control Variables

This table presents the results of probit estimations examining the relation between democratic development and firms' access to credit. The dependent variable is "constrained". Definitions of variables are provided in Table 1. Firm controls represent the full set of firm-level control variables used in Table 3 and country controls represent the full set of country-level control variables used in Table 3. Estimated marginal effects are reported and robust standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)
Democracy	-0.01***	-0.012***	-0.016***	-0.009***	-0.006***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Sales growth	-0.026***				
	(0.004)				
Creditor Rights		0.019***			
		(0.002)			
Restrict			-0.006***		
			(0.002)		
Financial Freedom				-0.001***	
				(0.000)	
Institutional Development					-0.075***
					(0.006)
Observations	36,501	44,183	37,591	45,105	46,637
Pseudo R^2	0.201	0.191	0.206	0.189	0.191
Firm Controls	Yes	Yes	Yes	Yes	Yes
Country Controls	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes

Table 3.13.
Additional Sensitivity Tests

This table presents the results of probit estimations examining the relation between democratic development and firms' access to credit. The dependent variable is "constrained". Definitions of variables are provided in Table 1. Firm controls represent the full set of firm-level control variables used in Table 3 and country controls represent the full set of country-level control variables used in Table 3. Estimations in column (4) apply the probit with sample selection model. The Wald test compares the simple probit model with the probit model with sample selection. Under the null hypothesis, the probit with sample selection model is not different from the simple probit model. Estimated marginal effects are reported and robust standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	Excluding countries with <100 obs.	Evidence from low income and lower middle-income countries	Countries with more than one survey	Probit with Sample Selection	Country FE
	(1)	(2)	(3)	(4)	(5)
Democracy	-0.01***	-0.007***	-0.011***	-0.007***	-0.033***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.005)
Observations	45,757	24,538	32,230	44,677	46,200
Pseudo R^2	0.19	0.181	0.181	-	0.265
Wald Test	-	-	-	6.90***	-
Firm Controls	Yes	Yes	Yes	Yes	Yes
Country Controls	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes

Appendix 3.1.

Countries in our sample include (year of the survey):

Albania (2007, 2013), Angola (2006), Argentina (2006, 2017), Armenia (2009, 2013), Azerbaijan (2009, 2013), Bangladesh (2013), Belarus (2008, 2013), Benin (2009, 2016), Bhutan (2009), Bolivia (2006, 2017), Botswana (2006), Brazil (2009), Bulgaria (2007, 2009, 2013), Burkina Faso (2009), Burundi (2006, 2014), Cambodia (2016), Cameroon (2009, 2016), Cape Verde (2009), Central African Republic (2011), Chad (2009), Chile (2006), China (2012), Colombia (2006, 2017), Cote D'Ivoire (2016), Croatia (2007, 2013), Czech Republic (2009, 2013), Democratic Republic of Congo (2013), Djibouti (2013), Dominican Republic (2016), Ecuador (2006, 2017), Egypt (2016), El Salvador (2006, 2016), Eritrea (2009), Estonia (2009, 2013), Eswatini (2006, 2016), Fiji (2009), Gambia (2006, 2018), Georgia (2008, 2013), Ghana (2007, 2013), Greece (2018), Guatemala (2006, 2017), Guinea (2006, 2016), Guinea Bissau (2006), Honduras (2006, 2016), Hungary (2009, 2013), India (2014), Indonesia (2009, 2015), Iraq (2011), Israel (2013), Jordan (2013), Kazakhstan (2009, 2013), Kenya (2007, 2013, 2018), Kosovo (2009, 2013), Kyrgyz Republic (2009, 2013), Laos (2009, 2012), Latvia (2013), Lebanon (2013), Lesotho (2016), Liberia (2017), Lithuania (2009, 2013), Madagascar (2009, 2013), Malawi (2009, 2014), Malaysia (2015), Mali (2007, 2016), Mauritania (2006, 2014), Mauritius (2009), Mexico (2006), Moldova (2009, 2013), Mongolia (2009, 2013), Montenegro (2009, 2013), Morocco (2013), Mozambique (2007, 2018), Myanmar (2014), Namibia (2006, 2014), Nepal (2009, 2013), Nicaragua (2006, 2016), Niger (2009, 2017), Nigeria (2007, 2014), Pakistan (2007, 2013), Panama (2006), Paraguay (2006, 2017), Peru (2006, 2017), Philippines (2009, 2015), Poland (2009, 2013), Romania (2009, 2013), Russia (2009, 2012), Rwanda (2006, 2011), Senegal (2007, 2014), Serbia (2009, 2013), Sierra Leone (2017), Slovakia (2009, 2013), Slovenia (2009, 2013), South Africa (2007), Sri Lanka (2011), Suriname (2018), Sweden (2014), Tajikistan (2008, 2013), Tanzania (2006, 2013), Thailand (2016), Timor-Leste (2009, 2015), Togo (2009, 2016), Turkey (2008, 2013), Uganda (2006, 2013), Ukraine (2008, 2013), Uruguay (2006, 2017), Vietnam (2009, 2015), Yemen (2013), Zambia (2007, 2013).

Chapter 4

High Corruption, Less Bank Efficiency?

Abstract

This paper investigates the impact of corruption on bank efficiency. Using the stochastic frontier approach, we examine the link between corruption and cost efficiency on a broad sample of commercial banks in 126 countries over the period 2011-2018. The results show that corruption influences banking efficiency. We find evidence of a negative effect of increased corruption on bank cost efficiency. Additionally, the results show that the effect of corruption on bank efficiency does not vary with bank size and the level of a country's development. Overall, our findings suggest that anti-corruption policy measures are important for improving the efficiency in the banking system.

JEL Codes: D73, G21

Keywords: corruption, bank efficiency, stochastic frontier approach

4.1. Introduction

Corruption, commonly defined as "the abuse of public office for private gain" (Lambsdorff, 2007), is pervasive throughout the world. It involves the misuse of public office by engaging in practices involving bribery, embezzlement, tax evasion, collusion, cronyism, or other similar activities for private gains.

In recent years, the consequences of corruption on banking performance have received renewed attention in the literature. The first strand of literature argues in line with the "sand the wheel hypothesis" (see Shleifer and Vishny, 1993; Mauro, 1995; Aidt, 2009) that corruption may hamper banks' ability to efficiently allocate capital to the most productive users. Thus, corruption could constitute an impediment to bank performance and decrease efficiency. Park (2012), for instance, shows that greater corruption exacerbates the problem with non-performing loans in the banking sector while Chen et al. (2015) document that rampant corruption increases banks' risk-taking behavior. The second strand of literature suggests that corruption may be efficiency enhancing as it creates the incentives for banks to perform or helps to overcome complex regulations, in line with the "grease the wheels hypothesis". For example, Fungáčová, Kochanova and Weill (2015) find that high corruption can increase bank's debt ratio, providing evidence that bribing bank officials enhances firms' ability to access credit from banks. Similarly, Weill (2011) documents that corruption can improve bank lending particularly when banks are highly risk averse and reluctant to grant credit.

One key question in this discussion is whether corruption affects banks' costs. Indeed, a predominant theme that emerges from the evidence is that high levels of corruption in a country induce greater uncertainty regarding the costs of doing business. The objective of this paper is to fill this gap by examining the impact of corruption on banks' ability to minimise their costs. This question is particularly important given the significant role of banks' ability to operate at minimal costs in economic development. It enables banks to operate through lower loan rates and further enhances financial stability (Assaf et al., 2019; Shamshur and Weill, 2019).

From a theoretical perspective, the impact of corruption on bank costs is ambiguous. On the one hand, banks operating in corrupt countries are expected to have higher costs for two reasons. First, high levels of corruption in a country may increase the costs associated with bribery. In a corrupt environment, banks may incur extra costs in the form of bribery in order get things done.[28] For example, obtaining necessary licenses and permits in a corrupt country would require negotiating and paying bribes to public officials. As Glass and Wu (2002, p. 3) point out, corruption is usually related with "an extra fee or bribe paid to a government official by a private entrepreneur for obtaining an economic profit". Increased corruption may therefore act as an irregular tax that raises banks' costs.

Second, excessive corruption in an economy may lead to misallocation of bank funds from productive investment projects to less efficient and risky ones thereby increasing the amount of bank non-performing loans, which has been empirically confirmed by Goel and Hasan (2011) and Park (2012). Consequently, the deterioration in asset quality could induce banks to devote extra managerial efforts and further incur additional expenses on the collection of the problem loans (Berger and DeYoung, 1997). The escalation in operating costs due to the administration of the bad loans, in turn, may result in a decline in banks' ability to minimise costs.

On the other hand, corruption may not always be detrimental to banks' costs. In a second-best world, corruption may help to overcome distortions created by ill-functioning institutions (Leff, 1964; Huntington, 1968). It may serve as a helping hand to speed up decision-making process and enhance efficiency in resources allocation. Corruption may therefore decrease costs if bribes allow banks to avoid significant fees and time cost or finance the best projects. For example, Chen et al. (2013) find that bribery enhances banks' decisions to grant larger loans to the most productive firms. Corruption may thus be the needed grease to improve banks' costs.

In this paper, we shed light on this question by investigating whether corruption affects banks' costs. We adopt the efficiency approach to measure bank costs. The cost efficiency of

[28] A foreigner who wants to invest in a Russian company, for instance, "must bribe every agency involved in foreign investment, including the foreign investment office, the relevant industrial ministry, the finance ministry, the executive branch of the local government, the legislative branch, the central bank, the state property bureau, and so on" (Shleifer and Vishny, 1993, p. 615).

a bank measures the ability of a bank to produce a certain level of output whiles minimising costs. It therefore provides information about the bank performance to produce with the minimum costs by comparing a bank's costs to that of the best-practice bank. Unlike accounting ratios like the cost-to-income ratio, using the efficiency approach to measure how a bank minimises its costs offers the advantage of simultaneously taking into account all the inputs and outputs of a bank.

To examine if corruption influences bank cost efficiency, we perform a cross-country analysis using a broad sample of 2,257 commercial banks in 126 developed and developing countries for the 2011-2018 period. We employ the stochastic frontier approach (SFA) to estimate bank efficiency, a technique which has been widely adopted in the literature (Bonin, Hasan and Wachtel, 2005; Shamshur and Weill, 2019). We combine the estimated cost efficiency scores along with corruption measures from Transparency International and a set of bank-level and country-level control variables to investigate the impact of corruption on bank efficiency. We further assess whether the link between corruption and bank efficiency may vary according to bank size and a country's wealth.

Our results show that corruption influences banking efficiency. We find evidence of a negative effect of increased corruption on bank cost efficiency. We find that this negative effect is linear: too low or too high corruption levels have detrimental effects on bank efficiency. Additionally, the results show that the effect of corruption on bank efficiency does not vary with bank size and the level of a country's development. These results are confirmed in a battery of robustness tests. Overall, our findings suggest that corruption constitutes an impediment to banks' ability to efficiently minimise their costs.

Our paper contributes to the current literature in two areas. First, it contributes to the vast literature on the determinants of bank cost efficiency (Pasiouras, Tanna and Zopounidis, 2009; Chortareas, Girardone and Ventouri, 2013) by investigating the role of corruption, which has been ignored until now. The closest paper to ours is Lensink and Meesters (2014) who examine the impact of institutions on bank efficiency. They focus on institutional quality and measure it by applying principal component analysis on the six World Governance Indicators. Our contribution is different as we focus explicitly on the consequences of corruption and not on the quality of institutions in a country. Our study therefore constitutes the first attempt, as far as we know, to extensively examine the impact of corruption on the cost efficiency of banks.

Second, our work contributes to a better understanding of how corruption influences the banking sector. A growing number of studies have examined the consequences of corruption on various aspects of banking activities (Weill, 2011; Chen et al., 2015). We add to this discussion by investigating how corruption impacts bank cost efficiency and draw lessons for banking sector policy.

The structure of the remaining parts of the paper is as follows: In section 4.2, we discuss the data and empirical strategy. Section 4.3 presents results of the estimations. Robustness tests are discussed in section 4.4. Section 4.5 concludes the paper.

4.2. Data and Methodology

4.2.1. Data

To investigate how corruption influences bank efficiency, we employ a large sample of banks located in 126 developing and developed countries for the period 2011 to 2018. We extract data from a number of sources: (1) Bank Focus database for information on bank characteristics. We keep only commercial banks to have a homogenous sample in terms of activities and use only unconsolidated statements for each bank. (2) The measures of corruption are compiled from Transparency International and World Governance Indicators. (3) Information on macroeconomic and governance variables are collected from World Development Indicators and World Governance Indicators respectively.

We drop all observations with missing necessary accounting information and further eliminate countries with only one bank. After winsorizing extreme observations for all the accounting variables of interest (1% lowest and highest values), we have a final sample of 2,257 commercial banks which consists of 11,129 bank-year observations. Detailed definitions of the variables and sources of data are provided in Table 4.1.

4.2.2 Measuring corruption

Quantifying corruption levels in different countries is quite challenging. Variation exists (in some instances) as to what constitute a corrupt behaviour since a practice that is deemed morally acceptable in one country or time could also be viewed as corrupt in another

country or time. Further, people who engage in corruption often conceal the practice since they normally involve illegal activities like bribery and embezzlement, and hence, make it difficult to gather exact data on corruption.

Existing studies therefore employ subjective indices capturing the perceived degree of corruption to gauge corruption levels in a country. In this paper, our primary measure of corruption is the Corruption Perception Index from Transparency International which has been widely adopted in recent works (Aidt, 2009; Chen et al., 2015; Jetter, Agudelo and Hassan, 2015). As explained by Serra (2006), this index is a more reliable corruption measure and reduces measurement errors as it is constructed based on the average of surveys coming from several sources that capture the assessment of country experts and the perception of citizens regarding the degree of corruption in the public sector.[29]

Up till 2011, this index ranges from 0 to 10, where higher values reflect less corruption in a country. From 2012 onwards, Transparency International scores on a scale from 0 (highly corrupt) to 100 (not corrupt). To ensure consistency, we adopt a uniform corruption scale which ranges from 0 to10. To further facilitate interpretation, we rescale this index to make higher values indicate a higher level of perceived corruption by subtracting the corruption index from 10 (*Corruption-CPI*).

We employ an alternative corruption measure from the World Governance Indicators. We use the control of corruption variable (*Corruption-WB*). It captures the extent to which public power is exercised for private gain and also assesses how effective the policy measures in a country are to fight corruption. This index, which ranges from -2.5 to 2.5 (higher values represent better control of corruption), is commonly employed in the literature to measure corruption (e.g., Méon and Weill, 2010). To make this index comparable to our main corruption measure, we subtract the index from zero, so that higher values will reflect less control of corruption.

[29] According to Transparency International, the 2016 Corruption perception index, for example, is constructed using 13 different data sources from 12 institutions, such as the World Bank, African Development Bank, World Economic Forum, and among others.

4.2.3. Bank cost efficiency

Cost efficiency measures how close a banks' cost is to what the cost of a best-practice bank would be when producing identical bundle of output in similar conditions (Berger and Humphrey, 1997). To measure the optimal cost of each bank using frontier analysis, two main categories of techniques have been proposed in the literature: parametric and non-parametric approach. The non-parametric methods, such as the Data Envelopment Analysis, are characterized by computing efficiency scores using linear programming tools. The main drawback of these techniques is that they do not assume a random error, and hence, may lead to imprecise estimation of bank efficiency as any observed deviations from the efficient frontier are attributed to inefficiencies.

In this paper, we therefore adopt the parametric approach. In particular, we apply the stochastic frontier approach (SFA) to estimate bank efficiency, which is commonly used in the literature (Bonin, Hasan and Wachtel, 2005; Berger, Hasan and Zhou, 2009). This approach allows for random error by specifying a two-component error term. It covers both the random component capturing measurement errors and other uncontrollable factors, and an inefficiency component which represents the inefficiency aspects that can be controlled. To separate the inefficiency term from the random part of the error term, we assume a normal distribution for the random error (v) and a half-normal distribution for the inefficiency term (u) (Aigner, Lovell and Schmidt, 1977).

In line with previous studies (Edward Chang, Hassan and Hunter, 1998; Weill, 2003), we utilize the two-step SFA approach which first involves estimating a stochastic frontier to derive the cost efficiency scores for each bank. Then in the second stage, these estimated cost efficiency scores are regressed against the measures of corruption and other bank- and country-level control variables to examine the relation between corruption and bank efficiency.

To estimate the cost frontier, we follow the intermediation approach for the selection of inputs and outputs, which assumes that banks collect funds from lenders and then transform them into loans and other assets demanded by borrowers. We include two outputs in the cost function which are loans and investment assets. We also take into account three inputs: labour,

physical capital, and borrowed funds. The price of labour is calculated by dividing the ratio of personnel expenses by total assets. We define the price of physical capital as the ratio of other operating expenses to fixed assets, and the price of funds is the interest rate paid on borrowed funds. Total cost equals the sum of the costs incurred for labour, physical capital, and borrowed funds. Table 4.2 presents summary statistics for the output and input prices used in estimating the stochastic frontier approach.

To model the cost function of banks, we utilize the translog functional form as follows:

$$\ln\left(\frac{TC}{w_3}\right) = \beta_0 + \sum_m \alpha_m \ln y_m + \sum_n \beta_n \ln\left(\frac{w_n}{w_3}\right) + \frac{1}{2}\sum_m\sum_j \alpha_{mj} \ln y_m \ln y_j + \frac{1}{2}\sum_n\sum_k \beta_{nk} \ln\left(\frac{w_n}{w_3}\right)\ln\left(\frac{w_k}{w_3}\right) + \sum_n\sum_m \gamma_{nm} \ln\left(\frac{w_n}{w_3}\right)\ln y_m + \text{YEAR} + \text{COUNTRY} + u + v \quad (1)$$

where TC represents the total costs, y_m is the output of the mth bank (m=1, 2), w_n is the nth input price (n=1, 2), and w_3 captures the price of borrowed funds. For brevity, we drop the indices for each bank. We impose standard restrictions of linear homogeneity conditions by normalizing the total costs, price of labor, and price of physical capital, by the price of borrowed funds.

We include year and country dummies in the frontier to control, *inter alia*, for changes in technology over time and country-specific unobserved heterogeneity. By including country dummy variables, we are able to compare each bank to all other banks by taking into account the fact that they operate in different environments. The average cost efficiency scores are displayed for each country in the appendix 4.1.

4.2.4 Methodology

Using the efficiency scores as the dependent variable in the second stage, we examine how corruption influences bank efficiency by estimating the following model specification:

$$\text{Efficiency}_{ikt} = \alpha + \beta\ \text{Corruption}_{kt} + \rho\ \text{Bank Controls}_{ikt} + \tau\ \text{Country Controls}_{kt} + \varepsilon \quad (2)$$

where *Efficiency* is the measure of cost efficiency for bank *i* in country *k* for year *t*; *Corruption* indicates the level of corruption in a country; *Bank Controls* represent the set of bank-specific control variables; *Country Control*s represent the set of country-specific control variables; and ε is the random error term.

We include four bank variables to control for bank-specific characteristics. We take into account bank size measured as the natural logarithm of total assets (*Bank size*). We also control for financial leverage which is measured as the ratio of equity to total assets (*Equity to Assets*). Profitability is considered with the return on average assets (*ROAA*). Finally, we make use of the ratio of loans to investment assets to take into account the asset mix (*LOEA*). Macroeconomic indicators are also included to control for country-specific factors. We control for economic environment using the logarithm of GDP per capita (*GDP/capita*). Inflation accounts for macroeconomic stability (*Inflation*). Finally, we take into account financial development measured by domestic credit to the private sector by banks as a share of GDP (*Credit/GDP*).

Year fixed effects are included in the model to control for time specific shocks that are common to all banks. We further control for regional fixed effects using seven different regional dummy variables based on the World Bank region classification, as different countries within a geographic region may have similar perceived corruption levels.

Equation (2) is estimated using a Tobit regression. The cost efficiency estimates derived from the SFA approach are bounded between 0 and 1, and therefore make it a limited dependent variable. Prior related studies apply a number of regression techniques such as Tobit and Ordinary Least Squares regressions, with the Tobit model considered as the most appropriate estimator to handle the distribution of the efficiency measures (Coelli et al., 2005; Peng et al., 2017). We therefore employ a Tobit regression model in this study to investigate the relationship between corruption and bank efficiency.

Summary statistics for the main variables employed in the model are reported in Table 4.3. The mean value of bank cost efficiency is 72.2%. We also observe that the mean for the main Corruption index is 5.45, which suggests that corruption represents a major issue for majority of the countries. For example, we note in appendix 4.1 that the top three countries with the highest average corruption levels are Afghanistan, South Sudan, and Iraq.

4.3. Results

4.3.1 Main results

We examine the effect of corruption on bank efficiency. Table 4.4 presents the results derived from the estimations. We consider several specifications to test the sensitivity of our results. Column (1) presents the model which includes *Corruption-CPI* as the main explanatory variable with only bank-level control variables. In column (2), we include all control variables. We perform the same estimations respectively in columns (3)-(4), but this time using *Corruption-WB* as the main explanatory variable.

In all models tested, we find significantly negative coefficients at the 1% level of significance for corruption. This result is observed for both measures of corruption and suggests that greater corruption reduces bank cost efficiency. Thus, banks are less cost efficient in more corrupt economies. In terms of economic significance, the impact of corruption on cost efficiency is meaningful. Results in column (2) suggest that for a one standard deviation increase in corruption, cost efficiency will reduce by 1.02 percentage points (calculated as -0.005 x 2.036). This finding is in line with the idea that corruption contributes to explain the low cost efficiency of banks in more corrupt countries relative to those in less corrupt countries.

We therefore interpret this result as a justification for the hypothesis that high degree of corruption in a country is detrimental to banks' ability to efficiently minimise costs. This finding has important implications for the design of polices that seek to improve banking efficiency. Specifically, our results suggest that policy measures that curb corruption would have positive impacts on bank cost efficiency.

Turning to the control variables, we find that *Bank size* has a significantly negative coefficient, suggesting that large banks are less cost efficient. The coefficient of *Equity to Assets* is significantly positive which indicates that banks that are highly capitalized are more cost efficient. This finding may highlight the need to minimize costs by well-capitalized banks in order to achieve acceptable returns on the funds invested by shareholders. We also observe that profitable banks are more cost efficient, as shown by the positive and significant coefficient on *ROAA*. The impact of *LOEA* is negative, indicating that a high proportion of loans relative

to other earning assets would be detrimental to bank efficiency. Regarding the macroeconomic variables, we observe in line with Chortareas, Girardone and Ventouri (2012) that an increase in *GDP/Capita* seems to reduce banks' cost efficiency. It suggests that banks in developed markets may be less efficient in minimising their costs. Finally, we find that *Inflation* and *Credit/GDP* have insignificant effects on efficiency.

4.3.2. Is the corruption–bank efficiency nexus linear?

Our baseline estimations show that high degree of corruption reduces banks' efficiency in minimising costs. We can question whether this relation is linear. Namely, we want to investigate whether the negative effect of corruption on cost efficiency is observed for all levels of corruption. This question is of importance since recent studies tend to suggest a possible non-linear relation between corruption and bank performance. For example, Ali, Fhima and Nouira (2020) find a non-linear effect of corruption on banking stability. Therefore, we assess whether there is the potential existence of a nonlinear relationship between corruption and bank efficiency in our sample countries.

To examine this question, we include in the model corruption and its square term to allow for a potential non-linear effect of corruption. We perform estimations using both measures of corruption. The results are reported in Table 4.5.

Our conclusions remain the same: In column (1), we find that the coefficient of corruption is insignificant and corruption squared is significantly negative, whereas we observe significantly negative coefficients for corruption and corruption squared in column (2). These results provide evidence for the presence of a linear relationship between corruption and bank cost efficiency.

In other words, this finding suggests that corruption levels that is too low or too high has detrimental effects on banks' ability to efficiently minimise their costs.

4.3.3. Estimations by bank size

Our baseline estimations show that high degree of corruption reduces banks' efficiency in minimising costs. We investigate whether this effect is influenced by bank size.

The literature on the organizational structure of banks suggests that relative to small banks, large banks primarily have centralized and hierarchical structures which may preclude corruptive practices, and hence, are less likely to be impacted by excessive corruption. For instance, Skrastins and Vig (2019) document that organizations that have more hierarchical structures perform better in very corrupt environments due to the fact that they are able to restrain rent-seeking activities.

We therefore examine whether the negative impact of corruption on bank efficiency holds true for all size group of banks. We split the banks into two main size groups defined as large and small based on the median assets size. We perform estimations for each size group and the results are presented in columns (1)-(2) of Table 4.6.

We find that corruption remains significantly negative in all estimations. This finding suggests that the detrimental effect of corruption on banking efficiency is observed for both small and large banks. The implication of this finding is important. It means that the design of policies to curb corruption would improve the cost efficiency for all banks, large or small.

4.3.4. The effect of economic development

Our main estimations indicate that banks in more corrupt countries are less cost efficient. This effect may be influenced by the level of a country's development. Evidence shows that the issue of corruption is more rampant in developing economies compared to developed countries (Svensson, 2005). It is consequently possible that banks operating in developed economies may be less affected by the detrimental effect of corruption on cost efficiency.

We investigate whether the effect of corruption varies with the level of a country's income. Using the World Bank income classification, we divide our sample into two groups:

Developed countries consist of countries in the "high income" and "upper middle income" category, and *Developing countries* include "lower middle income" and "low income" countries. We re-estimate our model for the two groups and present the results in Table 4.7.

In all estimations, we find that the coefficient of corruption is significantly negative for both developing countries and developed countries. This finding shows that the detrimental effect of corruption is observed for both groups. We therefore conclude that in both developed and developing countries, corruption is detrimental for bank cost efficiency.

4.4. Robustness checks

In this section, we perform several tests to assess the robustness of our findings. We start with an instrumentation strategy, then we test sensitivity to the sample construction, and finally we include additional control variables.

4.4.1. Instrumental variable approach

A potential source of concern is the endogeneity of corruption. This issue may arise from measurement errors due to the subjective coding of the corruption measures. Simultaneity may also exist between corruption and bank efficiency. While a high degree of corruption may reduce bank cost efficiency on the one side, cost efficiency may increase corruption on the other side, for example, by increasing the level of bank non-performing loans (Berger and DeYoung, 1997) which could in turn lead defaulters to pay bribes in order to avoid penalties.

We therefore employ instrumental variable (IV) tobit approach to address possible endogeneity concerns. Following Mauro (1995), we use the ethno-linguistic fractionalization index as an instrument for corruption. This index captures the likelihood that two individuals who are randomly selected within a country do not belong to the same ethno-linguistic group. As argued by Mauro (1995), in a country with the presence of several ethnic groups, corruption may foster in that country as public officers and politicians may favour members of their own ethnic group. Thus, societies that are more ethnically diverse have a higher probability to adopt corrupt practices. This index has been widely employed in recent studies as an instrument to

measure the economic impact of corruption (Aidt, Dutta and Sena, 2008; Dreher and Schneider, 2010; Goel and Hasan, 2011).

To control for any potential endogeneity issues, we replicate the main estimations in Table 4.4 by applying instrumental variable tobit model using ethno-linguistic fractionalization index as an instrument. The F-values of the first stage and the Wald test are reported. Results of the estimations are reported in Table 4.8. We observe that in all IV models, the F-values of the first stage are far beyond the conventional critical values, thus suggesting that ethno-linguistic fractionalization is a well-specified instrument. The Wald test statistics also indicate that it is appropriate to use an instrumental variable model.

In all the estimations, we still find that the coefficient on corruption (as instrumented) is significantly negative, showing that increased corruption adversely affects bank cost efficiency. In sum, this result confirms our conclusion that high degree of corruption lowers banks' ability to efficiently minimise their costs.

4.4.2. Sample construction

We test whether the construction of our sample influences our results. First, we exclude Russia from our sample. Russia is the largest country in terms of the number of banks in our sample (14% of the total number of banks). It also has an average corruption score of 7.17, which is above the median. It is therefore consequently possible that our results could be driven by Russia since it represents a substantial share of the sample. As a robustness check, we estimate the model by excluding Russia from our sample. Dropping Russia leaves our sample consisting of 9,639 bank-year observations. We report the results in columns (1)-(2) of Table 4.9 using both measures of corruption.

Second, we check whether our results are not driven by countries with extreme corruption values. We exclude the top 10 countries with the most rampant corruption and the 10 least corrupt countries from our sample. After excluding these countries, we have 9,571 bank-year observations. Columns (3)-(4) of Table 4.9 show the results.

In both estimations, we still find that corruption is negatively associated to cost efficiency, suggesting that our findings are not driven by some influential outliers in the sample.

4.4.3. Additional control variables

We include in our model additional control variables to assess whether our results are not biased due to some omitted variables. We include four country-level controls. First, we take into account bank competition by including the share of assets that are held by the three largest banks in a country (*Concentration*) with data from Global Financial Development Database from the World Bank. Second, we consider banking regulations by taking into account the presence of deposit insurance in a country. Deposit insurance is a dummy variable that equals one if a country has explicit deposit insurance and zero otherwise. Data come from Demirgüç-Kunt, Kane and Laeven (2015). We include financial freedom to control for government's interference in the financial sector with data from the Heritage Foundation. Finally, we add a dummy variable to capture English legal origin, as a country's legal origin has been shown to affect financial development. Data is from La Porta et al. (1999).

To check the sensitivity of our results, we add the variables one by one in our model and then simultaneously. We present the results in Table 4.10. We observe that the coefficients for corruption remain negative and statistically significant in all models. These results confirm our main finding that greater corruption reduces bank efficiency. We further observe that English legal origin has a significantly negative coefficient. Additionally, we find that *financial freedom* is positively associated with efficiency suggesting that less government interference in the banking environment improves cost efficiency.

4.5. Concluding remarks

In this paper, we examine whether high degree of corruption influences bank efficiency. We employ a large cross-country sample of banks in 126 developing and developed countries

for the 2011 to 2018 period to analyse how corruption shapes banks' ability to efficiently minimise their costs.

Our key finding is that corruption reduces bank efficiency. We find evidence of a negative effect of corruption on the cost efficiency of banks. This result is robust across alternative measures of corruption, different sample groups, and treatment for endogeneity concerns. We interpret this finding by the fact that corruption increases the costs associated with bribery, and aggravates the problem of bad loans thereby increasing banks' costs to recover such loans. Additionally, our results indicate that whiles the negative effect of corruption is observed for banks of all sizes, corruption reduces cost efficiency in both developing and developed countries.

A central message of this paper is that corruption is detrimental to bank cost efficiency. Our work conveys some important policy implications. It offers a better understanding of how corruption impacts the banking sector in terms of cost advantages. We show that corruption has destructive effects for bank performance as it contributes to explain the low degree of bank efficiency. Given the primal role of bank efficiency for financial stability and economic development, our findings suggest that countries can improve banking efficiency by reducing corruption. Policy measures, like appropriate institutional reforms, that curb corruption would pay off in terms of improving bank efficiency.

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Table 4.1.

Definitions and sources of variables

This table presents the definitions and sources of data for the variables employed in the study.

Variable	Definition and source
Efficiency	Bank cost efficiency scores. Author's computation.
Corruption–CPI	Corruption perception index. Transformed so that higher values reflect more perceived corruption. Source: Transparency International.
Corruption–WB	Control of corruption index from World Bank. Transformed so that higher values indicate less control of corruption. Source: World Governance Indicators (World Bank).
Bank size	Natural logarithm of total assets. Source: Bank Focus database.
ROAA	Return on average assets. Source: Bank Focus database.
Equity to assets	Ratio of equity to total assets. Source: Bank Focus database.
LOEA	Ratio of loans to other investment assets. Source: Bank Focus database.
Log(GDPPC)	Natural logarithm of gross domestic product per capita. Source. World Development Indicators (World Bank).
Credit/GDP	Domestic credit to the private sector by banks as a share of GDP. Source: World Development Indicators (World Bank).
Inflation	Rate of inflation. Source: World Development Indicators (World Bank).
Concentration	Share of assets that are held by the three largest banks in a country. Source: Global Financial Development Database.
Deposit Insurance	Dummy = 1 if a country has explicit deposit insurance and 0 otherwise. Source: Demirgüç-Kunt, Kane and Laeven (2015).
Financial freedom	This index scores the financial freedom of a country. Source: Heritage Foundation.
English legal origin	Dummy = 1 if a bank is from a country with English legal origins. Source: La Porta et al. (1999).
Ethno-linguistic fractionalization	This index captures the likelihood that two individuals who are randomly selected within a country do not belong to the same ethno-linguistic group.

Table 4.2.

Bank inputs and outputs

This table presents the summary statistics for the inputs and outputs.

	Mean	Std. dev.	Median
Inputs			
Price of labor	0.019	0.018	0.014
Price of physical capital	8.722	28.852	1.499
Price of borrowed funds	0.04	0.059	0.026
Outputs			
Loans	2,158,618	9,466,839	249,849
Investment assets	1,401,662	6,316,859	127,631

Table 4.3.

Descriptive statistics

This table presents the summary statistics for variables employed in this study.

Variable	Mean	Std. dev.	Median	Obs.
Efficiency	0.722	0.114	0.745	11,129
Corruption–CPI	5.452	2.036	6.2	11,129
Corruption–WB	-0.033	1.067	0.346	11,129
Bank size	13.261	1.915	13.194	11,129
ROAA	0.919	1.144	0.81	11,129
Equity to Assets	0.152	0.116	0.119	11,129
LOEA	6.649	22.872	2.107	11,129
Log(GDPPC)	9.082	1.339	9.139	11,129
Credit/GDP	66.902	44.034	53.703	11,129
Inflation	0.039	0.048	0.028	11,129

Table 4.4.

Main estimations

This table presents results of tobit regressions examining the relation between corruption and bank efficiency. The dependent variable *Efficiency* is the estimated bank cost-efficiency scores. Definitions of variables are provided in Table 1. Robust standard errors are reported in parentheses. ***, ** and * denote statistical significance at the 1, 5 and 10% levels respectively.

	(1)	(2)	(3)	(4)
Corruption–CPI	-0.003***	-0.005***		
	(0.001)	(0.001)		
Corruption–WB			-0.005***	-0.009***
			(0.001)	(0.002)
Bank size	-0.003***	-0.002***	-0.003***	-0.002***
	(0.001)	(0.001)	(0.001)	(0.001)
Equity to Assets	0.004***	0.004***	0.004***	0.004***
	(0.001)	(0.001)	(0.001)	(0.001)
ROAA	0.052***	0.055***	0.052***	0.056***
	(0.014)	(0.014)	(0.014)	(0.014)
LOEA	-0.0003***	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
GDP/Capita		-0.005**		-0.005***
		(0.002)		(0.002)
Credit/GDP		-0.000		-0.000
		(0.000)		(0.000
Inflation		-0.014		-0.012
		(0.024)		(0.024)
Constant	0.772***	0.827***	0.757***	0.801***
	(0.015)	(0.023)	(0.014)	(0.019)
Observations	11,129	11,129	11,129	11,129
Log likelihood	8509.57	8514.74	8508.6	8514.2
Year FE	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes

Table 4.5.

Non-linear effect

This table presents results of tobit regressions examining the relation between corruption and bank efficiency. The dependent variable *Efficiency* is the estimated bank cost-efficiency scores. All controls refer to the full set of bank-level and country-level control variables used in Table 4. All controls refer to the full set of bank-level and country-level control variables used in Table 4. Definitions of variables are provided in Table 1. Robust standard errors are reported in parentheses. ***, ** and * denote statistical significance at the 1, 5 and 10% levels respectively.

	(1)	(2)
Corruption–CPI	0.002	
	(0.003)	
Corruption–CPI^2	-0.001**	
	(0.000)	
Corruption–WB		-0.012***
		(0.002)
Corruption–WB^2		-0.003**
		(0.001)
All controls	Yes	Yes
Observations	11,129	11,129
Log likelihood	8516.18	8517.44
Year FE	Yes	Yes
Region FE	Yes	Yes

Table 4.6.

Estimations by bank size

This table presents results of tobit regressions examining the relation between corruption and bank efficiency. The dependent variable *Efficiency* is the estimated bank cost-efficiency scores. All controls refer to the full set of bank-level and country-level control variables used in Table 4. Definitions of variables are provided in Table 1. Robust standard errors are reported in parentheses. ***, ** and * denote statistical significance at the 1, 5 and 10% levels respectively.

	Small banks		Large banks	
	(1)	(2)	(3)	(4)
Corruption–CPI	-0.006***		-0.003*	
	(0.002)		(0.002)	
Corruption–WB		-0.01***		-0.006**
		(0.003)		(0.001)
All controls	Yes	Yes	Yes	Yes
Observations	5,565	5,565	5,564	5,564
Log likelihood	4046.15	4045.56	4545.51	4545.93
Year FE	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes

Table 4.7.

Developing v Developed countries

This table presents results of tobit regressions examining the relation between corruption and bank efficiency. The dependent variable *Efficiency* is the estimated bank cost-efficiency scores. All controls refer to the full set of bank-level and country-level control variables used in Table 4. All controls refer to the full set of bank-level and country-level control variables used in Table 4. Definitions of variables are provided in Table 1. Robust standard errors are reported in parentheses. ***, ** and * denote statistical significance at the 1, 5 and 10% levels respectively.

	Developing		Developed	
	(1)	(2)	(3)	(4)
Corruption–CPI	-0.007***		-0.005***	
	(0.002)		(0.001)	
Corruption–WB		-0.012***		-0.011***
		(0.004)		(0.003)
All controls	Yes	Yes	Yes	Yes
Observations	3,180	3,180	7,949	7,949
Log likelihood	3427.64	3427.93	5414.89	5429.74
Year FE	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes

Table 4.8.

Instrumental variable approach

This table presents results of instrumental variable (IV) tobit regressions examining the relation between corruption and bank efficiency. The dependent variable *Efficiency* is the estimated bank cost-efficiency scores. The instrumental variable is "ethno-linguistic fractionalization". Bank controls and Country controls respectively refer to the full set of bank-level controls and country-level control variables used in Table 4. Definitions of variables are provided in Table 1. The Wald Test compares the instrumented model and the non-instrumented model. Under the null hypothesis, both models provide similar results. Robust standard errors are reported in parentheses. ***, ** and * denote statistical significance at the 1, 5 and 10% levels respectively.

	(1)	(2)	(3)	(4)
Corruption–CPI	-0.013***	-0.066**		
	(0.004)	(0.027)		
Corruption–WB			-0.024***	-0.134**
			(0.008)	(0.056)
Bank controls	Yes	Yes	Yes	Yes
Country controls	No	Yes	No	Yes
Observations	10,052	10,052	10,052	10,052
F-1st (excl. IV)	214.13	18.17	277.26	16.04
Wald Test	6.14**	6.34**	6.11**	6.31**
Year FE	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes

Table 4.9.

Sample construction

This table presents results of tobit regressions examining the relation between corruption and bank efficiency. The dependent variable *Efficiency* is the estimated bank cost-efficiency scores All controls refer to the full set of bank-level and country-level control variables used in Table 4. Definitions of variables are provided in Table 1. Robust standard errors are reported in parentheses. All controls refer to the full set of bank-level and country-level control variables used in Table 4. ***, ** and * denote statistical significance at the 1, 5 and 10% levels respectively.

	Excluding Russia		Excluding influential outliers	
	(1)	(2)	(3)	(4)
Corruption–CPI	-0.003***		-0.006***	
	(0.001)		(0.001)	
Corruption–WB		-0.007***		-0.011***
		(0.002)		(0.002)
All controls	Yes	Yes	Yes	Yes
Observations	9,629	9,629	9,571	9,571
Log likelihood	7715.59	7716.81	7568.56	7569.79
Year FE	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes

Table 4.10.

Additional control variables

This table presents results of tobit regressions examining the relation between corruption and bank efficiency. The dependent variable *Efficiency* is the estimated bank cost-efficiency scores. All controls refer to the full set of bank-level and country-level control variables used in Table 4. Definitions of variables are provided in Table 1. Robust standard errors are reported in parentheses. ***, ** and * denote statistical significance at the 1, 5 and 10% levels respectively.

	(1)	(2)	(3)	(4)	(5)
Panel A					
Corruption–CPI	-0.004***	-0.005***	-0.003**	-0.005***	-0.003**
	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
Concentration	-0.000				-0.000
	(0.000)				(0.000)
Deposit Insurance		-0.002			-0.002
		(0.003)			(0.004)
Financial freedom			0.0002**		0.0002**
			(0.000)		(0.000)
English legal Origin				-0.014***	-0.014***
				(0.004)	(0.004)
All controls	Yes	Yes	Yes	Yes	Yes
Observations	9518	11,129	11,018	11,129	9,416
Log likelihood	7434.32	8514.11	8465.9	8521.28	7387.40
Year FE	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes
Panel B					
Corruption–WB	-0.009***	-0.009***	-0.006**	-0.01***	-0.007**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)
Concentration	-0.000				-0.000
	(0.000)				(0.000)
Deposit Insurance		-0.002			-0.002
		(0.003)			(0.004)
Financial freedom			0.0002**		0.0002*
			(0.000)		(0.000)
English legal Origin				-0.014***	-0.014***
				(0.004)	(0.004)
All controls	Yes	Yes	Yes	Yes	Yes
Observations	9,518	11,018	11,018	11,129	9,416
Log likelihood	7435.62	8466.26	8466.88	8521.66	7388.38
Year FE	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes

Appendix 4.1

This table presents the means by country for the measures of corruption and bank efficiency.

Country	Corruption – CPI	Corruption – WB	Efficiency	Country	Corruption – CPI	Corruption – WB	Efficiency
Afghanistan	8.765	1.443	0.721	Finland	1.267	-2.229	0.74
Albania	6.469	0.523	0.75	France	2.978	-1.356	0.731
Algeria	6.597	0.591	0.726	Gabon	6.642	0.763	0.74
Angola	8.074	1.361	0.755	Georgia	4.584	-0.665	0.738
Armenia	6.511	0.519	0.738	Germany	1.999	-1.846	0.721
Austria	2.612	-1.525	0.722	Ghana	5.6	0.145	0.731
Azerbaijan	7.14	0.921	0.73	Guatemala	7.138	0.731	0.738
Bahamas	3.307	-1.191	0.72	Guinea	7.406	1.009	0.739
Bahrain	4.994	-0.279	0.745	Guyana	6.753	0.518	0.731
Bangladesh	7.375	0.861	0.724	Haiti	8.073	1.237	0.712
Belarus	6.305	0.299	0.731	Hong Kong	2.388	-1.64	0.669
Belgium	2.432	-1.579	0.714	Hungary	5.054	-0.139	0.716
Benin	6.318	0.626	0.747	India	6.192	0.357	0.718
Bhutan	3.435	-1.279	0.749	Indonesia	6.46	0.435	0.739
Bolivia	6.732	0.658	0.741	Iraq	8.289	1.314	0.709
Bosnia and Herzegovina	6.133	0.4	0.739	Ireland	2.686	-1.562	0.678
Botswana	3.771	-0.879	0.741	Italy	5.458	-0.098	0.726
Brazil	6.089	0.345	0.656	Jamaica	5.95	0.207	0.74
Bulgaria	5.845	0.21	0.741	Japan	2.499	-1.575	0.712
Burkina Faso	6.077	0.313	0.752	Kazakhstan	7.102	0.796	0.664
Burundi	8.019	1.311	0.743	Kenya	7.363	0.939	0.713
Cambodia	7.921	1.182	0.718	Kyrgyzstan	7.243	1.087	0.715
Cameroon	7.422	1.166	0.712	Lebanon	7.218	0.949	0.723
Cape Verde	4.308	-0.862	0.74	Lesotho	5.639	-0.045	0.7
Chad	8.005	1.378	0.737	Libya	8.28	1.422	0.6
Chile	3.058	-1.294	0.726	Luxembourg	1.803	-2.09	0.707
China	6.105	0.297	0.727	Madagascar	7.323	0.878	0.734
Colombia	6.336	0.34	0.748	Malaysia	5.102	-0.236	0.686
Costa Rica	4.495	-0.647	0.718	Mali	6.843	0.705	0.743
Cote d'Ivoire	6.903	0.599	0.751	Malta	4.394	-0.781	0.728
Croatia	5.238	-0.159	0.743	Mauritania	7.103	0.83	0.704
Cyprus	4.052	-0.912	0.702	Mauritius	4.747	-0.289	0.725
Czech Republic	4.635	-0.428	0.702	Mexico	6.917	0.738	0.706
D.R. Congo	7.842	1.317	0.707	Mongolia	6.238	0.471	0.719
Denmark	0.942	-2.281	0.742	Montenegro	5.652	0.109	0.752
Djibouti	6.726	0.619	0.711	Morocco	6.221	0.278	0.735
Dominican Rep.	6.939	0.791	0.658	Mozambique	7.225	0.731	0.752
Ecuador	6.755	0.643	0.719	Myanmar	7.558	0.771	0.732
Egypt	6.658	0.616	0.734	Nepal	7.071	0.701	0.718
El Salvador	6.397	0.481	0.741	Netherlands	1.623	-1.993	0.731
Eswatini	6.136	0.349	0.754	New Zealand	1.037	-2.251	0.707

Appendix 4.1 (Continued)

Country	Corruption – CPI	Corruption – WB	Efficiency
Niger	6.64	0.649	0.743
Nigeria	7.342	1.13	0.725
Macedonia	5.968	0.183	0.745
Norway	1.45	-2.196	0.726
Oman	5.338	-0.237	0.749
Pakistan	7.037	0.894	0.71
Panama	6.283	0.439	0.741
Paraguay	7.298	0.86	0.73
Peru	6.357	0.457	0.726
Philippines	6.481	0.475	0.733
Poland	3.91	-0.677	0.743
Portugal	3.698	-0.916	0.655
Moldova	6.725	0.806	0.743
Romania	5.43	0.086	0.747
Russia	7.169	0.911	0.716
Rwanda	4.627	-0.638	0.75
Senegal	5.799	0.079	0.746
Serbia	6.032	0.316	0.739
Seychelles	4.39	-0.577	0.737
Sierra Leone	6.995	0.84	0.717
Singapore	1.5	-2.114	0.734
Slovakia	5.172	-0.203	0.736
South Africa	5.673	0.009	0.726
South Sudan	8.575	1.434	0.607
Spain	4.173	-0.612	0.667
Sri Lanka	6.275	0.347	0.753
Sweden	1.312	-2.191	0.726
Switzerland	1.419	-2.101	0.727
Tajikistan	7.6	1.179	0.814
Thailand	6.363	0.401	0.716
Togo	6.965	0.836	0.755
Tunisia	5.928	0.079	0.711
Turkey	5.632	0.104	0.693
Uganda	7.429	1.051	0.735
Ukraine	7.211	0.941	0.709
United Arab Emirates	3.076	-1.165	0.733
United Kingdom	2.048	-1.806	0.72
Tanzania	6.695	0.607	0.751
United States	2.674	-1.353	0.667
Uruguay	2.816	-1.317	0.712
Venezuela	8.063	1.324	0.781
Vietnam	6.789	0.479	0.726
Zambia	6.285	0.416	0.746
Zimbabwe	7.867	1.338	0.728

Chapter 5[30]

Bank Efficiency and Access to Credit: International Evidence

Abstract

This paper examines the impact of bank efficiency on access to credit. We test the hypothesis that higher bank efficiency, meaning better ability of banks to operate at lower costs, favors access to credit for firms. To this end, we perform a cross-country analysis with firm-level data on access to credit and bank-level data to compute bank efficiency, using a sample of about 54,000 firms from 76 countries. We find that greater bank efficiency improves access to credit for firms. The beneficial impact of bank efficiency to alleviate credit constraints takes place through the demand channel by reducing borrower discouragement to apply for a loan. Whereas the positive impact of bank efficiency on credit access is observed for firms of all sizes, the effect tends to be more pronounced in countries with better economic and institutional framework. Our results therefore support policies favouring bank efficiency to enhance access to credit.

JEL Codes: G21, O16.

Keywords: bank efficiency, access to credit, borrower discouragement.

[30] This chapter refers to the article to be revised and resubmitted in Economic Systems with Laurent Weill.

5.1. Introduction

Access to credit is a key engine of economic growth. Credit constraints make firms unable to pursue attractive investment opportunities (Campello et al., 2010), limit their flexibility in resources allocation (Fafchamps, 1997), and hamper their productivity (Gatti and Love, 2008; Butler and Cornaggia, 2011). They consequently reduce firm growth, in particular for small and medium-sized firms (Beck and Demirgüc-Kunt, 2006: Nkurunziza, 2010).

A large strand of literature has therefore identified the determinants of financing constraints, including firm-level factors like size, and foreign ownership (Beck et al., 2006) and country-level factors such as the institutional framework (Qi and Ongena, 2019) and banking market characteristics. Among banking market characteristics, the influence of bank financial conditions (Popov and Udell, 2012) and bank competition (Léon, 2015) on access to credit has been put into evidence. The underlying hypothesis is that these banking market characteristics affect bank behavior in granting loans and through this mechanism exert an impact on access to credit.

It therefore appears surprising that the influence of bank efficiency on access to credit has never been investigated. Cost efficiency of banks measures the ability of a bank to operate at the minimal cost by comparing its cost structure to that of a best-practice bank. It therefore informs about the bank performance to produce with the lowest costs, and has been widely studied in banking literature over the last two decades (e.g., Bonin, Hasan and Wachtel, 2005; Berger, Hasan and Zhou, 2009). This omission from the literature is surprising since economic theory predicts that a greater ability of a bank to produce with the lowest costs should lead to lower banking prices, including lower loan rates. It should then reduce the financing obstacle generated by high loan rates and thus facilitates access to credit. Therefore, we can expect that higher bank efficiency should favor access to credit.

From a theoretical perspective, the rationale for our hypothesis is based on two mechanisms. First, bank efficiency should reduce cost of credit, which has been empirically confirmed by Shamshur and Weill (2019). Using a cross-country sample of firms from European countries, they provide evidence that greater bank efficiency diminishes cost of credit at the firm level. Second, firms should be constrained by high loan rates, which reduce their

ability to access credit. This fact has been confirmed by a set of works supporting the view that high interest rates are one of the major financing obstacles for firms (e.g., Beck et al., 2006; Coluzzi, Ferrando and Martinez-Carrascal, 2015).[31]

This paper aims to fill this loophole in the literature by examining how bank efficiency affects access to credit. To this end, we perform a cross-country analysis with firm-level data on access to credit and bank-level data to compute bank efficiency. We use firm-level data on access to credit from World Bank Enterprise Survey (WBES), which provides unique information at the firm level on access to credit for a large cross-country sample of countries and has been used similarly by Léon (2015). We utilize bank-level data from Bank Focus database to estimate bank efficiency with the stochastic frontier approach commonly adopted in the literature (Hasan, Koetter and Wedow, 2009; Shamshur and Weill, 2019). We thus consider a large sample of about 54,000 firms from 76 countries.

In our first estimations, we examine the impact of bank efficiency on access to credit. We are then able to answer the question to ascertain whether greater bank efficiency can contribute to facilitate access to credit. We further identify the channels through which bank efficiency affects access to credit. Higher bank efficiency can favor access to credit through two different mechanisms: the demand channel, and the supply channel. On the one hand, more efficient banks can charge lower loan rates because of their lowest costs. It would then lead to higher loan demand. This is the mechanism in line with economic theory according to which lower costs should favor lower prices and thus greater access to the products. On the other hand, more efficient banks can grant more loans for two reasons. First, their lower costs can reduce the cost of granting one loan and as such increase credit supply. Second, more efficient banks can be able to overcome the problems of moral hazard and adverse selection associated with the loan activity. As such, they would be able to have lower loan application denial rates resulting in higher loan supply.

We finally analyze whether the relationship between bank efficiency and access to credit is conditional to firm size and to the macroeconomic environment. Since access to credit is predominantly a concern for smaller firms, it is of importance to know whether smaller firms

[31] In the analysis of the determinants of financing obstacles based on a worldwide survey of firms proposed by Beck et al. (2006), "high interest rates" is the most often cited financing obstacle of all 12 proposed financing obstacles with more than half of the firms of the sample citing it as a major obstacle.

benefit the most of gains in bank efficiency. In addition, the macroeconomic environment can contribute to the magnitude of the impact of bank efficiency.

We face several challenges in our investigation. First, we must identify credit-constrained firms. This step is often challenging due to data limitations. Perception-based measures of credit access are problematic and may be subject to perception bias, whereas indirect indicators like the usage of credit do not take into account whether firms do not use credit because they actually do not need them. To address this issue, we follow Popov and Udell (2012) and Léon (2015) and measure credit-constrained firms as those firms that applied for credit and were denied or did not apply for credit because they were discouraged. In this way, we are able to account for firms that select themselves out of the loan application process.

Second, a credit-constrained firm can only be observed when the firm has a need for bank credit. This, however, raises potential sample selection issues which can affect the consistency of the estimates. To correct this potential bias, we employ a probit model with sample selection proposed by Van de Ven and Van Praag (1981) using two variables to control for the need of funds as selection variables. This approach aims to insulate our analysis from any potential bias and inconsistency.

Third, we must link measures on bank efficiency and on access to credit. Access to credit is computed at the firm level. Bank efficiency could be computed at the firm level if we were able to identify the name of the bank for each firm in the dataset. While such identification can be done with country datasets or for European countries thanks to Amadeus database (Shamshur and Weill, 2019), we cannot identify the partner bank for each firm in the WBES database which is a unique worldwide database to investigate financing constraints for a large sample of firms from developed and developing countries.

We thus choose to consider the mean bank efficiency score for each country as the indicator of bank efficiency for each firm. Léon (2015) adopts a similar choice in his analysis of the impact of bank competition on access to credit by utilizing the country-level degree of bank competition. We however make an improvement relative to Léon (2015) in the sense that we do not rely to a database on aggregate country measures but estimate bank efficiency scores for all banks from the countries of the study. Using these bank efficiency scores computed, we obtain the mean bank efficiency score and use it in our estimations to explain access to credit.

We find that bank efficiency exerts a beneficial impact on access to credit by alleviating firms' credit constraints. This effect takes place through the demand channel: when bank efficiency is higher, borrower discouragement is reduced with more firms applying for a loan. We do not observe any support for the supply channel according to which more efficient banks would increase their credit supply. We finally point out that the beneficial effect of bank efficiency on access to credit is observed for all firms whatever their size and tends to be more pronounced in countries with better institutional and economic framework.

Our work contributes to three different streams of literature. First, we contribute to the substantial body of work on the finance-growth nexus. This strand of literature has examined how financial markets can affect economic development (Levine, 2005; Popov, 2018). Our study investigates a new channel through which banks can affect economic growth by alleviating credit constraints for firms. Second, we add to the literature on the determinants of access to credit. Our work emphasizes the role of bank efficiency in facilitating access to credit, which has been ignored in the literature. Third, we augment the literature on the consequences of bank efficiency. While the determinants of bank efficiency have been thoroughly investigated, the effects of bank efficiency have received much less attention. A handful of papers has examined the consequences of bank efficiency, notably on financial stability (Assaf et al., 2019), economic growth (Hasan, Koetter and Wedow, 2009), and cost of credit (Shamshur and Weill, 2019). We complement this literature by providing evidence on how bank efficiency affects access to credit.

The remainder of the paper proceeds as follows. Section 5.2 describes the data and methodology. Section 5.3 reports the main estimations, while additional estimations are displayed in Section 5.4. Section 5.5 presents the robustness checks. Section 5.6 concludes.

5.2. Data and Methodology

5.2.1. Data Sources

To investigate the effect of bank efficiency on firms' access to credit in a cross-country setting, we employ firm-level data on access to credit from the World Bank Enterprise Survey. We combine this data with bank-level information from Bank Focus database to compute bank efficiency scores. We consider only commercial banks to have a homogenous sample in terms of activities and only use unconsolidated statements for each bank. Data on macroeconomic variables are collected from World Development Indicators and data on institutional factors are from World Governance Indicators database.

In constructing the dataset, we drop all bank-level observations with missing necessary accounting information and eliminate countries with only one bank. We winsorize all bank-level variables used to estimate bank efficiency scores at 5% (lowest and highest values) to eliminate the effect of outliers. Regarding the firm-level information collected from WBES, we drop responses that the interviewer does not believe to be reliable (question a16) and firms with missing information on credit market experience. In addition, we exclude firms with more than 1,000 employees since they are not SMEs and may have access to multiple sources of financing.

The final sample covers 54,086 firms from 76 countries (89 surveys from 2012 to 2019). Table 5.1 presents the number of firms in our sample by country and the year of survey. For our sample period, most of the countries had only one survey. Variation exists in the coverage of firms by country. Russia, for example, has 4,693 firms covered in two surveys, whereas Moldova has 353 firms covered in two surveys. Definitions of variables and data sources are provided in the Appendix 5.1.

5.2.2. Measuring bank efficiency

Cost efficiency is commonly measured in works analyzing bank efficiency, and can be defined as the ability for a bank to produce at the minimal cost. It measures the difference

between a bank's actual cost and its optimal cost for producing the same bundle of outputs.

To estimate cost efficiency, we must therefore have one approach to measure the optimal cost for each bank, given its bundle of outputs. Frontier efficiency techniques provide several approaches to reach this objective: they allow estimating the efficiency frontier on which the optimal cost is provided for each level of output. We adopt the stochastic frontier approach which is widely adopted in the literature (e.g., Hasan, Koetter and Wedow, 2009; Belke, Haskamp and Setzer, 2016; Shamshur and Weill, 2019). This approach decomposes the distance from the efficiency frontier into an inefficiency term and a random error, which represents random disturbances reflecting luck or measurement errors. We assume a normal distribution for the random error and a half-normal distribution for the inefficiency term.

To compute efficiency, we need to specify banking inputs and outputs. We adopt the intermediation approach, according to which the bank uses capital and labor to collect deposits and transform them into loans. Two outputs are then included in the cost frontier: loans, and investment assets. Three input prices are considered: the price of funds is the interest rate paid on borrowed funds, the price of labor is the ratio of personnel expenses to total assets, and the price of physical capital is defined as other operating expenses divided by fixed assets. Total cost is the sum of the costs incurred for borrowed funds, labor, and physical capital. The descriptive statistics for the inputs and outputs used in the stochastic frontier approach are presented in Table 5.2. We utilize the translog form to model the cost frontier, which is as follows:

$$\ln\left(\frac{TC}{w_3}\right) = \beta_0 + \sum_m \alpha_m \ln y_m + \sum_n \beta_n \ln\left(\frac{w_n}{w_3}\right) + \frac{1}{2}\sum_m \sum_j \alpha_{mj} \ln y_m \ln y_j + \frac{1}{2}\sum_n \sum_k \beta_{nk} \ln\left(\frac{w_n}{w_3}\right)\ln\left(\frac{w_k}{w_3}\right) + \sum_n \sum_m \gamma_{nm} \ln\left(\frac{w_n}{w_3}\right)\ln y_m + \text{YEAR} + \text{COUNTRY} + u + v \quad (1)$$

where TC is total cost, y_m is the m^{th} bank's output (m = 1, 2), w_n is the n^{th} input price (n = 1, 2), w_3 is the price of borrowed funds, u the inefficiency term, and v the random error. For simplicity

of presentation, the indices for each bank have been dropped. Homogeneity conditions are imposed by normalizing total costs, price of labor and price of physical capital, by the price of borrowed funds. We include year dummy variables in the cost frontier.

We add country dummy variables in the cost frontier since country differences can exert an influence on bank efficiency. As observed by Lozano-Vivas, Pastor and Pastor (2002), the omission of variables taking into account the country in the estimation of the frontier can lead to a misinterpretation of the cross-country differences in efficiency. Namely, the omission of country dummy variables would lead to the fact that each bank is compared to all other banks without taking into account the fact that they are located in different environments.

The objective of the paper is to investigate the impact of bank efficiency on access to credit. Since we cannot identify the lending bank for each firm, we consider the aggregate level of bank efficiency in each country in the estimations. This hypothesis accords with former papers considering the impact of bank competition on firm-level variables linked to financing constraints like Léon (2015) and Fungacova, Shamshur and Weill (2017) using the aggregate level of bank competition for a given country.

We therefore compute two measures of bank efficiency at the country level. The standard efficiency measure is the mean level of efficiency scores of all banks for each country. The hypothesis that bank efficiency for a given country is measured by the mean of efficiency scores of all banks is commonly adopted in former papers looking at the impact of country-level bank efficiency measures (Hasan, Koetter and Wedow, 2009; Belke, Haskamp and Setzer, 2016). However we can question whether the level of bank efficiency for a country would not be better measured with the asset-weighted mean of bank efficiency scores. Weighted efficiency scores have the key advantage of giving a higher weight to the largest banks, meaning those with greater market share and thus greater importance in the financing of firms, and can thus be a better indicator of the level of bank efficiency for each country.

The descriptive statistics for the two types of efficiency measures are displayed in Table 5.3. We observe that standard efficiency and weighted efficiency measures are of the same order of magnitude for the whole sample, with respectively means of 72.8% and 72.7%. However they can differ substantially for several countries: for instance for Uruguay the standard efficiency measure is 67.4% while the weighted efficiency measure is 51.7%. The

scores are displayed for each country in Table 5.4.

5.2.3. Measuring access to credit

We utilise data on access to credit from the World Bank Enterprise Surveys (WBES).[32] This is a cross-country survey of a large number of firms in several developed and developing economies around the world. The survey is based on a standard set of core questions and covers broad range of topics like access to finance, innovation, corruption, productivity, competition, and performance. In each country, the survey method guarantees that precise inferences can be made from the sample by employing stratified random sampling technique, using firm size, sector, and geographic region as strata. To ensure accurateness of the data, survey information is collected through face-to-face interviews with business owners and top managers of each of the enterprises as they have in-depth information about their firms.

Following Popov and Udell (2012) and Léon (2015), we use questions concerning the credit market experience of firms in the past year to measure access to credit. First, we distinguish between firms that have a need for credit and firms without a need for credit. Then among the firms that need credit, we identify the credit-constrained ones. Specifically, WBES asks firms the following question: "*Question K16: In the last year, did this establishment apply for loans or lines of credit?*" This question enables us to identify firms which expressed a formal demand for credit.

Firms which answered "No" to this question K16 were asked a subsequent question: "*Question K17: What was the main reason the establishment did not apply for any line of credit or loan in the past year?*" From this question, we are able to distinguish between firms which did not apply for credit because they did not need any loans from those firms who were discouraged from applying due to credit market imperfections such as high interest rates or high collateral requirements. For firms that answered "*No need for a loan - establishment had sufficient capital*" to this question, we classify them as non-borrowers whereas firms who give a different reason are classified as discouraged borrowers. Thus, a firm is classified as discouraged only when the firm needed bank loans but refused to apply because they are discouraged to do so, and not because the firm did not need a loan.

[32] The database is available at the website: http://www.enterprisesurveys.org/data.

We group the firms that answered yes to question K16 and received at least one loan as credit unconstrained. Thus, a firm is classified as Approved if the firm responded "Yes" to Question K16 and at least one credit request was not rejected. Following Léon (2015), we define a firm as credit-constrained (*Constrained*) if they applied for credit and were denied or did not apply for credit because they were discouraged.

Table 5.3 presents the descriptive statistics for the main variables. We find that among the firms in our sample, more than half had a need for bank credit (52.3%). This emphasizes why it is important to identify and eliminate firms which select themselves out of the application process because they do not have a need for loan. We also observe that only 38.6% of the firms which needed credit actually expressed a formal demand for loans, even though a large percentage (91.5%) of those firms which applied received at least one loan. Among the firms with a need for external financing, 64.7% were credit-constrained because they were discouraged to apply for loans or were formally rejected.

Table 5.4 reports the means by country for all variables related to access to credit. We observe large cross-country differences. It is of particular interest to observe that the share of credit-constrained firms ranges from 19.9% in Peru to 91.2% in India. Also, the share of firms which need credit varies between 23% in Malta and 78% in Zimbabwe.

5.2.4 Methodology

To examine the impact of bank efficiency on access to credit, we estimate a probit regression with the following model specification:

$$\Pr(\text{Constrained}_{ik}=1) = \Phi(\alpha_0 + \alpha_1 \text{ Bank efficiency}_k + \alpha_2 X_{ik} + \alpha_3 Y_k + \varepsilon_{ik}) \qquad (2)$$

where *Constrained* is a dummy variable which captures the credit access of firm *i* in country *k*; the variable *Bank efficiency* is the measure of bank efficiency; *X* is a set of firm-level control variables; *Y* is a set of country-level control variables; ε is the error term; and Φ is the cumulative density function of a normal distribution.

We incorporate several firm-level control variables that may influence firms' access to credit following previous studies (Popov and Udell, 2012; Asiedu et al., 2013; Léon, 2015). We control for *Firm size* measured as the natural logarithm of the number of permanent full-time employees. Firm ownership is taken into account by including dummy variables whether a firm is a *Sole Proprietorship*; a *Privately held* firm; a *Publicly listed* firm; and a *Foreign owned* firm if at least 50% of a firm's shares are held by foreigners. *Audited* captures whether a firm's financial statements were checked or certified by an external auditor. We also include *Exporter*, a dummy variable which equals one if at least 10 percent of a firm's annual sales is derived from direct exports. The dummy variable *Subsidiary* captures whether a firm is part of a larger group.

To control for country characteristics which can affect access to credit, we include four country-level control variables. We take into account the logarithm of GDP per capita to control for the level of economic development (*Log (GDP/capita)*). *Inflation* accounts for macroeconomic stability and *Rule of Law* captures the quality of institutions. We finally control for financial development measured by domestic credit to the private sector as a percentage of GDP (*Domestic Credit*). These variables come from World Development Indicators from the World Bank, with the exception of *Rule of law* extracted from World Governance Indicators. All country-level variables, including bank efficiency and country-level controls, are measured with a lag of one year to be consistent with the firm-level data from WBES.

The setting of the empirical investigation reduces endogeneity concerns since bank efficiency is computed at the bank level and then aggregated at the country level, while access to credit is firm-level information obtained from a different database. It is thus unlikely that access to credit can influence bank efficiency.[33]

Further, we include year dummies that control for any time-specific worldwide shocks that are common to all firms, and sector dummies accounting for sector-specific unobserved heterogeneity.

Finally, as previously discussed, we define credit-constrained firms as either firms that applied for credit and were rejected or did not apply for a loan because they were discouraged.

[33] We still address any potential endogeneity concerns in several ways in the robustness section.

Our estimation sample is therefore restricted to firms which have a need for bank credit. We can observe whether a firm is credit-constrained only if the firm has a need for external funds. This however raises a sample selection problem since we are not able to determine if firms which do not have a desire for a loan would have been credit-constrained or not should they have applied. The selection into the group of firms with a need for a loan might therefore not be random and may have some specific characteristics. Not taking into account the selection issue may represent a specification error which could bias our estimates.

To overcome the potential issue of selection bias, we apply a probit model with sample selection proposed by Van de Ven and Van Praag (1981). The probit model with sample selection, which assumes a bivariate normal and independent error distribution, takes into account two binary equations (selection and outcome equations), and thus estimates probit outcomes for both stages. For a robust identification, relevant exclusion variables should impact the selection equation (the need for credit) but do not directly influence the outcome equation (access to credit). Following Popov and Udell (2012) and Léon (2015), we use *Working Capital* and *Construction* as exclusion variables that are included in the selection equation but excluded from equation (2). *Working Capital* takes into account the proportion of the value of sales paid for after delivery by customers in the previous year. Intuitively, firms that have a greater need for working capital financing are more likely to desire external financing. *Construction* is a dummy variable equal to one if a firm submitted an application to obtain a construction permit in the previous two years, and zero otherwise.[34] These two variables are exogenous, and likely to signal the need for credit without directly influencing banks' decision to approve loan applications.

The first-stage (selection equation) of the probit model with sample selection is specified as follows:

$$\text{Need Credit}_{ik} = \alpha_0 + \beta_1 \text{ Working Capital}_{ik} + \beta_2 \text{ Construction}_{ik} + \tau X_{ik} + \lambda Y_k + \varepsilon_{ik} \qquad (3)$$

where *Need Credit* is a dummy variable which captures whether firm *i* in country *k* desires bank credit. *Working Capital* and *Construction* are the exclusion variables. We include the

[34] The variable *Construction* may, however, also reflect the recent investments of a firm. If banks had this information, the instrument could potentially be endogenous to the outcome equation. Whereas this variable appears to be statistically valid, we propose alternative instrumentation strategies in the Robustness Section since we cannot test the validity of the exclusion restriction.

same set of firm-level (X_{ik}) and country-level (Y_k) control variables, and sector and year fixed effects.

5.3. Results

This section first describes the determinants of the need for credit. We then conduct our baseline estimations for the relation between bank efficiency and access to credit. Finally, we explore the channels through which bank efficiency affects access to credit.

5.3.1 The determinants of need of credit

We begin with an investigation of the determinants of the need for credit before conducting our empirical models explaining access to credit. Table 5.5 reports the results of probit regressions.

We find that bank efficiency has a positive effect on the need for credit, which is only significant when we consider weighted efficiency. The need for credit decreases when firm size increases, which accords with the view that small firms have less internal financing for their financing needs. Ownership influences the need of credit: sole proprietorships have a lower need for loans whereas privately-held firms have more need of credit. Foreign-owned firms are less likely to need a loan, which can come from their access to alternative sources of funding. Subsidiaries have lower need for loan, in line with the view that they benefit from the internal capital markets of a group. Additionally, we find that exporters have a higher need for credit, which can result from the requirement to finance their expansion.

Regarding the country-level variables, we observe that firms located in countries with better quality of institutions and higher economic development have a lower desire for credit. Reversely the need for credit is higher for firms in countries with higher financial development and higher inflation.

Finally, we point out that both our exclusion variables, *Construction* and *Working Capital* have a significantly positive relation with the need for credit. This finding shows that

firms that have to finance their working capital and those that have invested in construction have a higher probability to need credit.

5.3.2. Baseline Estimations

We proceed to the estimations for the relation between bank efficiency and access to credit. Tables 5.6 and 5.7 report the results respectively for standard efficiency and weighted efficiency. In all estimations, we report marginal effects. In each table, five different specifications are adopted to test the sensitivity of the results. We only include bank efficiency with year fixed effects in column (1), while we add sector fixed effects in column (2). We continue by adding either firm-level controls in column (3) or country-level controls in column (4). Finally, the specification in column (5) includes all controls. We apply the probit model with sample selection to correct for the potential selection bias. The selection equation is estimated using equation (3).[35] We report the Wald test to compare the simple probit model with the probit with sample selection model. The Wald test in all estimations confirms the presence of a selection issue and shows that estimations obtained without the correction may be biased.

The key finding is the significantly negative coefficient for *Bank efficiency*. This result is observed for all specifications of the set of explaining variables and with both measures of bank efficiency. It therefore indicates that higher bank efficiency alleviates credit constraints for firms. The results are not only statistically significant, but also economically meaningful. We can illustrate the economic significance with the specification for standard efficiency measures with all controls from column (5): a one standard deviation increase in bank efficiency (0.038) is associated with a reduction in the probability of being credit-constrained by 1.84 percentage points (calculated as 0.038 × -0.484). Given that, on average, about 64% of firms which need loans are credit-constrained, the effect is moderate but economically significant. Therefore our results provide strong evidence that bank efficiency facilitates access

[35] For brevity, we do not report the results of selection variables for estimations in columns (1)-(4). The results of selection variables for estimations in columns (5) are respectively presented in Table 5.5. We drop the selection variables "Construction" and "Working Capital" for identification purposes.

to credit, in line with the hypothesis that more efficient banks can relax credit constraints for firms.

Regarding the control variables, we overall observe the expected results. In line with the findings from former literature on the determinants of access to credit, we find that larger, publicly listed, privately-held, and audited firms are less likely to be credit-constrained. We furthermore find that subsidiaries and exporting firms have higher access to credit. At the country level, better economic and institutional environment contribute to reduce financing constraints: access to credit is higher in presence of higher levels of quality of institutions, income per capita, and financial development. Reversely, higher inflation which proxies macroeconomic instability increases the probability to be credit-constrained.

5.3.3. Exploring the channels

Our baseline estimations indicate that bank efficiency favors access to credit. We now explore the mechanisms that drive this result. Specifically, we examine whether greater bank efficiency fosters access to credit through credit demand by reducing the reluctance of firms to apply for credit and/or through credit supply by lowering loan application denial rates.

WBES database provides information which enables us to investigate each channel. It gives information to know whether a firm needing credit expressed a formal demand and provides information on the reasons why a firm did not ask for a loan. We can therefore examine how bank efficiency can influence the decision at the firm-level to apply for a loan (the demand channel), and the probability at the bank-level to accept loan applications (the supply channel).

5.3.3.1 Testing the demand channel

We first examine the impact of bank efficiency on a firm's decision to apply for credit. A strand of literature has examined the discouraged borrowers, defined as firms with a need for credit deciding not to apply for a loan. From a theoretical perspective, the existence of discouraged borrowers can be explained by credit market imperfections including imperfect

screening by banks, and the scale of application costs (Kon and Storey, 2003). Empirically, Brown et al. (2011) document that high interest rates, collateral requirements, and complex application procedures contribute to discourage firms from applying for credit.

Higher bank efficiency can therefore influence the firm's decision to apply for a loan by reducing the interest rate charged for the loan thanks to lower bank costs. In addition to this straightforward mechanism, more efficient banks can also be perceived by firms as more likely to solve credit market imperfections thanks to their better managerial performance. We therefore expect that higher bank efficiency would reduce borrower discouragement.

To investigate the demand channel, we examine whether bank efficiency influences firm's decision to apply for a loan. We therefore perform estimations explaining *Apply*, a dummy variable which equals to one if a firm needed credit and applied for one, and zero otherwise. The risk of selection bias is controlled for using the probit with sample selection model.[36] We report the results in columns (1) and (2) of Table 5.8 respectively for standard efficiency and weighted efficiency measures.

We observe that the coefficient of *Bank efficiency* is significantly positive in both estimations, indicating that greater bank efficiency increases the probability for a firm needing a loan to apply for one. Thus, our finding supports the view that bank efficiency favors access to credit by reducing the discouragement of potential borrowers. The beneficial impact of bank efficiency on access to credit takes place through the demand channel.

This finding has important implications for the design of policies. Borrower discouragement has been identified as a key issue in SME financing. For instance, Brown et al. (2011) attribute the low usage of bank loans to borrower discouragement rather than bank loan application denial rates. Our data also reveals that over 60% of the firms with a need for bank credit refused to apply for loans because they were discouraged. Our results suggest that policy measures that foster bank efficiency would contribute to reduce borrower discouragement.

[36] Table 5.5 presents results of the selection equation.

5.3.3.2 Testing the supply channel

As a further test of the channels through which bank efficiency can influence credit access, we investigate the effect of bank efficiency on bank's loan approval decisions.

Bank efficiency may affect decisions of banks to grant loans in two ways. First, a higher degree of bank efficiency is associated with a better control of costs which could facilitate loan approval decisions since loans would be cheaper for the banks. Lower costs can be transferred to borrowers through lower loan rates. They can also contribute to reduce the cost of producing a loan for the bank and as such can lead to an increase in credit supply.

Second, a higher degree of bank efficiency is the signal of a better bank management in line with the view that efficiency is an indicator of managerial performance. As such, more efficient banks may be able to overcome the problems of moral hazard and adverse selection associated with the loan activity. They could therefore grant more loans thanks to their better ability to screen and monitor borrowers. This argument is based on the fact that information asymmetries contribute to reduce access to credit (Stiglitz and Weiss, 1981). As a consequence, banks which can reduce information asymmetries can grant more loans. We thus test the hypothesis that bank efficiency increases the probability of being accepted for loan applicants.

To test the supply channel, we investigate whether bank efficiency influences bank's credit approval decisions. The dependent variable is *Approved*, a dummy variable that is coded as one if a firm applied for bank credit and received at least one line of credit, and zero otherwise. Since loan approval/rejection is only observable for firms that express a formal demand for credit, we apply the probit model sample selection to control for the potential selection bias at the loan application stage.[37] We display the results in columns (3) and (4) of Table 5.8 respectively for standard efficiency and weighted efficiency measures.

We find that *Bank efficiency* is not significant in both estimations. In other words, bank efficiency does not exert an impact on the probability for a bank to accept a loan application. We therefore find no support for the supply channel in the sense that any change in bank efficiency does not affect credit supply.

[37] To save space, we do not report results of the selection equation in this and subsequent sections.

5.3.3.3 Reasons for discouragement

We have shown above that higher bank efficiency reduces the discouragement of borrowers to apply for a loan. We can take one step further to analyze this demand channel by scrutinizing the reasons given by discouraged borrowers as to why they refused to apply for loans.

Since bank efficiency reduces borrower discouragement, this could possibly be motivated by different channels such as lower loan prices, lower collateral requirements and/or a high perception of being financed. Specifically, WBES asked firms *"what was the main reason the establishment did not apply for any line of credit or loan in the past year?"* The survey provides the following responses: credit conditions (unfavorable interest rates, too high collateral requirements, and insufficient loan size and maturity), complex application procedures, did not think it would be approved, and other reasons. We focus on the responses associated to credit conditions: "high interest rates", and "too high collateral requirements".

In fact, since efficient banks grant loans at cheaper costs (Shamshur and Weill, 2019), potential borrowers may be less reluctant to apply for credit. Bank efficiency could also reduce borrower discouragement through its impact on collateral requirements. Manove and Padilla (1999) and Manove, Padilla, and Pagano (2001) argue that more collateral requirements could decrease banks' efforts to thoroughly screen borrowers.[38] Since there is a possible trade-off between the use of collateral and screening efforts, banks operating at lower marginal costs could have more incentives to conduct adequate screening of their potential borrowers.

We therefore expect that bank efficiency lowers the likelihood of firms citing "unfavorable interest rate" and "high collateral requirements" as the reasons why they refused to formally apply for loans. To investigate this question, we perform estimations by using *Interest rate* and *collateral requirements* as the dependent variables. *Interest rate* is a dummy variable equals to one if a firm mentions "Interest rates were not favorable" as the reason why they were discouraged, and zero otherwise; and *Collateral requirements* is a dummy variable that equal one if a firm cites "collateral requirements were too high" as the reason why they were discouraged, and zero otherwise. The results are reported in Table 5.9.

[38] Jiménez and Saurina (2004) show that collateralised loans have a higher probably of default.

We observe that *Bank efficiency* is negative when explaining *Interest rate*, but the coefficient is only significant when using standard efficiency measures. Similarly, *Bank efficiency* is only significantly negative in one specification, this time with the weighted efficiency measures, when explaining *Collateral requirements*. These results therefore provide some evidence that bank efficiency contributes to reduce discouragement of borrowers through its impact on the interest rate and on collateral requirements.

5.4. Additional estimations

In this section, we delve deeper by examining the factors that may influence the relationship between bank efficiency and access to credit. We first assess the impact of firm size, and then examine the influence of macroeconomic factors.

5.4.1. The impact of firm size

We have shown that greater bank efficiency increases the ability for firms to access credit. We can question whether this impact varies with firm size. Extant literature documents that small firms particularly suffer from a lack of access to credit (e.g., Beck and Demirguc-Kunt, 2006). It is therefore of utmost interest to check whether small firms benefit of better access to credit when bank efficiency increases.

To explore the link between bank efficiency and access to credit across the different size group of firms, we define three groups of firms using the classification employed by WBES for firm size: small firms (between 5 and 19 employees), medium firms (between 20 and 99 employees), and large firms (100 employees or more). We perform separate regressions for each group of firms. The results are presented in Table 5.10.

We obtain two key findings. First, we find that the negative effect of bank efficiency on credit constraints is not size-specific. The coefficient of *Bank efficiency* is negative and significant in all estimations, with the exception of a non-significant coefficient in the specification with weighted efficiency for small firms. Second, the effect is stronger for large

and medium firms than for small firms. When considering the standard efficiency indicators, we observe that the coefficient of *Bank efficiency* is respectively -0.213, -0.506, and -0.665 for small, medium, and large firms.

These findings have key implications. They suggest that greater bank efficiency has beneficial effects for firms of all sizes. The design of policies to improve bank efficiency would therefore enhance access to credit for all firms which are credit-constrained.

5.4.2. The impact of macroeconomic factors

Our finding that higher bank efficiency enhances access to credit can be influenced by the macroeconomic environment. Namely the mechanism through which greater bank efficiency alleviates financing constraints for firms can be affected by the environment since macroeconomic factors have been shown to exert a role on the bank behaviour in granting loans but also in the willingness of firms to apply for a loan (e.g., Qian and Strahan, 2007; Bae and Goyal, 2009).

It therefore appears of interest to check whether the macroeconomic environment affects the relation between bank efficiency and access to credit so that we have a better understanding of the beneficial effects of bank efficiency to reduce credit constraints.

We consider the four macroeconomic variables employed as control variables: *Log(GDP/capita)*, *Rule of law*, *Domestic credit*, and *Inflation*. As explained above, they assess the degree of economic development, of quality of institutions, of financial development, and of macroeconomic instability for a country. They consequently provide a comprehensive set of variables to consider the macroeconomic environment of one country. We redo the estimations by adding the interaction term between bank efficiency and each of these macroeconomic variables. We consider only the set of explaining variables with all controls. We can then assess whether the effect of bank efficiency on access to credit is influenced by macroeconomic factors. Table 5.11 displays the results of these estimations.

Our conclusion is that macroeconomic environment exerts an influence on the impact of bank efficiency on access to credit. We observe that the interaction term of *Bank efficiency*

is significantly negative with *Log(GDP/capita)*, *Domestic Credit*, and *Rule of Law* (only significant with weighted efficiency), while it is significantly positive with *Inflation*. In other words, the impact of bank efficiency to reduce credit constraints is stronger in countries more financially and economically developed, and with better quality of institutions. It is weaker in countries with higher inflation. In a nutshell, the beneficial effect of bank efficiency on access to credit is amplified when the country is more developed and more stable.

This finding emphasizes the fact that the role of bank efficiency to alleviate credit constraints is stronger in developed countries, benefiting from the more adequate macroeconomic environment to enjoy the benefits of bank efficiency for access to credit.

5.5. Robustness checks

To examine the robustness of our findings, we carry out a number of sensitivity tests. In all robustness checks, we perform regressions using the standard efficiency.

Alternative measures for credit constraints. We use two different proxies for financing constraints to check whether our results hold. First, following Asiedu et al. (2013) and Qi and Ongena (2019), we measure credit constraints based on responses to the WBES question "*To what degree is access to finance an obstacle to the current operations of this establishment?*" Five possible answers are provided: not an obstacle, minor obstacle, moderate obstacle, major obstacle, and very severe obstacle. We construct *Constrained (Perception)*, a dummy variable equals to one if a firm answered that access to credit was a moderate, major, or very severe obstacle, and zero otherwise.[39] Second, in line with Aterido, Beck and Iacovone (2013), we utilize firms' usage of credit as a proxy for financing constraints. *Constrained (Loan Use)* is a dummy variable coded as one if a firm does not have an overdraft facility, a credit line and/or a formal bank loan, and zero otherwise. Columns (1)-(2) of Table 5.12 present the simple probit estimation results.

[39] In unreported regressions, we assigned values of 0 (not an obstacle) to 4 (very severe obstacle) to the responses, where a high number shows that a firm is more financially constrained. We perform ordered probit regressions and obtain similar findings. Estimation results are available upon request.

In both estimations, we find negative and significant coefficients for *Bank efficiency*. This result confirms our main finding that bank efficiency is beneficial for access to credit.

Additional control variables. We include in our model a number of additional control variables to validate that our main findings are not biased due to the omission of some important variables. We first consider a set of three additional country-level control variables: depth of credit information with data from Doing Business (*Credit Info*), *Financial freedom* with data from the Heritage Foundation, and *Institutional Development*, measured as the average of six governance indicators: voice and accountability, political stability, effectiveness of government, regulatory quality, rule of law, control of corruption, with data from the World Governance Indicators. We include the variables one by one and then simultaneously to check the stability of our results. The results are presented in columns (3)-(6) of Table 5.12. We still observe that the coefficient of *Bank efficiency* is negative and significant in all estimations.

Second, we take into account bank competition since it has been shown to influence access to credit (Beck, Demirguc-Kunt, and Maksimovic, 2004; Léon, 2015). We measure bank competition with three alternative indicators: the share of assets that are held by the three largest banks (*Concentration*), the Herfindahl-Hirschman index for assets (*Herfindahl*), and the Boone index (*Boone index*) which measures bank competition through the elasticity of profits to marginal costs. While we compute the *Herfindahl* index, the two other indicators are extracted from the Global Financial Development Database from the World Bank. Table 5.13 reports the estimations. In all estimations, we find negative and significant coefficients for *Bank efficiency*. We furthermore observe that lower bank competition and higher bank concentration are associated with lower access to credit in line with former works (e.g., Léon, 2015). All in all, our main findings are robust to the inclusion of additional controls.

Measurement of bank efficiency. The bank efficiency variable employed in this study is estimated at the bank level and aggregated at the country level. We therefore utilize the mean bank efficiency for each country. It is consequently possible that depending on the variation of efficiency, the estimated mean bank efficiency could have different impact on access to financing. As a robustness check, we perform estimations in which we weight mean bank efficiency by the inverse of the standard deviation of bank efficiency. Love and Martinez-Peria (2015) adopt a similar approach in their investigation of the impact of bank competition on access to credit, by weighting the estimated measures of competition by the inverse of their

standard deviation. The results are reported in column (4) of Table 5.13. In line with our main finding, we still observe that bank efficiency reduces firms' credit constraints.

Alternative exclusion variables. The potential selection issue is addressed using a probit model with sample selection. Relevant exclusion variables, which are uncorrelated with the outcome equation (credit access), are included in the selection equation for a robust identification. We therefore employed *Working Capital* and *Construction* as exclusion variables in our regressions. As noted earlier, *Construction* could potentially be correlated to the outcome equation (credit access) since it could capture a firm's recent investments. Since we are unable to test for the validity of the exclusion restrictions, we follow two alternative strategies to examine the sensitivity of our results.

First, we re-estimate our model using *Working Capital* as the only exclusion variable. We do not include the variable *Construction* since it could potentially be endogenous to the outcome equation. Second, we include a firm's perceived degree of competition from the informal sector (*Perceived competition)* in addition to *Working Capital* as exclusion variables in line with previous studies (Léon and Weill, 2018; Popov and Udell, 2012). Firms operating in competitive environments may have a higher desire for bank credit since they may want to invest more in order to match their competitors, and should therefore serve as a good demand shifter without affecting credit access. We display the results in columns (1) and (2) of Table 5.14.

Notwithstanding this change in instrumentation strategy, we still note that the estimated coefficient of bank efficiency is negative and significant. From the marginal effects, we observe that *Bank efficiency* has coefficients of -0.476 and -0.482 in columns (1) and (2) respectively, which is similar in magnitude to our main finding of -0.484 (column (5) of Table 5.6). The Wald test statistic is also highly significant in both models. Overall, the consistent results confirm our earlier findings and show that our results are robust to the alternative instrumentation approach.

Sample Construction. We assess the sensitivity of our results to the construction of the sample. First, we perform regressions by excluding countries that have less than 100 firms in a survey. Due to the small number of observations of firms in such countries, they may suffer

from a lack of representativeness. Column (3) of Table 5.14 displays the estimations. We still observe that the estimated coefficient of *Bank efficiency* is negative and significant.

Second, we include firms which reported not having a need for credit. Until now, our estimation sample is only restricted to firms which have a desire for bank credit. We therefore excluded firms without a need for bank loans. It is consequently possible that we may not capture some important information since we do not utilize all firms in our sample. To test the stability of our results, we include these firms by examining the credit market experience of firms which do not have a desire for bank credit. We define a firm that has no need for bank credit as credit unconstrained if the firm has an overdraft facility, a credit line and/or a formal bank loan, or finances part of its working capital/fixed asset investment with bank loans. Due to the fact that these firms already use bank credit, it suggests that they may have the ability to access bank financing. We also classify a firm that has no need for external financing as credit-constrained if the firm finances all of its working capital and/or fixed assets with funds from moneylenders/friends/relatives. We present the results of simple probit regressions in column (4) of Table 5.14. Despite the extension of the sample size, we still observe that the coefficient on bank efficiency is negative and significant, supporting the robustness of our finding.

5.6. Conclusion

In this paper we investigate the impact of bank efficiency on access to credit. To this end we combine firm-level data on access to credit with bank-level data to estimate bank efficiency using the stochastic frontier approach. We then perform estimations on a large sample of about 54,000 firms from 76 countries.

Our main finding is that bank efficiency exerts a positive impact on access to credit. We consequently support the view that gains in bank efficiency result in alleviating credit constraints. We find that higher bank efficiency favors access to credit through the demand channel: a higher degree of bank efficiency increases the likelihood that firms with a need for credit apply for a loan. The beneficial impact of bank efficiency on access to credit is observed for all firms, irrespective of their size. Finally, we find that greater bank efficiency alleviates more credit constraints when the macroeconomic environment is more developed and stable.

This study has major implications. From a positive perspective, our results can contribute to explain why access to credit is lower in developing countries than in developed countries. Lower degree of bank efficiency in developing countries exerts a detrimental impact on access to credit for firms. From a normative perspective, the result that higher bank efficiency alleviates financing constraints provides additional support for policies aimed at improving bank efficiency. Given the importance of access to credit for economic development, policies favoring bank efficiency should be implemented to favor economic development. To design such policies, lessons can be taken from the wide literature identifying the determinants of bank efficiency including bank ownership.

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Table 5.1.

Number of firms by country and year of survey

This table presents the coverage of firms by country and the year of survey.

Country	Survey year									Number of surveys
	2012	2013	2014	2015	2016	2017	2018	2019	Total	
Afghanistan			256						256	1
Albania								335	335	1
Armenia		332							332	1
Belarus							521		521	1
Benin					127				127	1
Bolivia						301			301	1
Bosnia-Herzegovina		315						274	589	2
Bulgaria		256							256	1
Burundi			146						146	1
Cambodia		375			270				645	2
Cameroon					263				263	1
China	2,377								2,377	1
Colombia						912			912	1
Cote d'Ivoire					290				290	1
Croatia		317						395	712	2
Cyprus								218	218	1
Czech Republic		216							216	1
DRC		400							400	1
Dominican Republic					282				282	1
Ecuador						335			335	1
Egypt		1,523			1,543				3,066	2
El Salvador					657				657	1
Eswatini					104				104	1
Georgia								512	512	1
Ghana		645							645	1
Guatemala						314			314	1
Guinea					97				97	1
India			7,980						7,980	1
Indonesia				1165					1,165	1
Italy								682	682	1
Kenya		645							645	1
Kosovo		174							174	1
Kyrgyz Republic								328	328	1
Latvia								314	314	1
Lebanon		444							444	1
Lesotho					120				120	1
Liberia						135			135	1
Malaysia				728					728	1
Mali					119				119	1
Malta								227	227	1
Mauritania			127						127	1
Moldova		279						74	353	2
Mongolia								351	351	1

Montenegro		106						134	240	2
Morocco		312						507	819	2
Myanmar			484		543				1,027	2
Namibia			342						342	1
Nepal		447							447	1
Niger						111			111	1
Nigeria			1,823						1,823	1
Macedonia		334						327	661	2
Pakistan		786							786	1
Papua New Guinea				63					63	1
Paraguay						311			311	1
Peru						903			903	1
Philippines				841					841	1
Poland		416						905	1,321	2
Portugal								1,005	1,005	1
Russia	3,571							1,122	4,693	2
Senegal			450						450	1
Serbia		340						319	659	2
Sierra Leone						145			145	1
Slovakia		210							210	1
Slovenia								383	383	1
Tanzania		400							400	1
Thailand					670				670	1
Togo					138				138	1
Tunisia		557							557	1
Turkey		940						1,042	1,982	2
Uganda		502							502	1
Ukraine								1,156	1,156	1
Uruguay						296			296	1
Vietnam				896					896	1
Yemen		311							311	1
Zambia		608							608	1
Zimbabwe					530				530	1
Total	5,948	12,190	11,608	3,693	5,753	3,763	521	10,610	54,086	89

Table 5.2.

Bank inputs and outputs

This table presents the descriptive statistics for the inputs and outputs.

Variable	Obs.	Mean	Std. Dev.
Inputs:			
Price of labor	1,312	0.024	0.019
Price of physical capital	1,312	3.56	5.683
Price of borrowed funds	1,312	0.042	0.03
Outputs:			
Loans	1,312	1,054,177	4,287,410
Investment assets	1,312	578,383.2	2,437,082

Table 5.3.

Descriptive statistics

This table presents the descriptive statistics for the main variables used in the study.

Variable	Obs.	Mean	Std. Dev.
Need Credit	54,086	0.523	0.499
Constrained	28,309	0.647	0.478
Apply	28,309	0.386	0.487
Approved	10,915	0.915	0.278
Firm size	54,086	3.245	1.294
Sole proprietorship	54,086	0.354	0.478
Publicly listed	54,086	0.048	0.214
Privately held	54,086	0.353	0.478
Subsidiary	54,086	0.171	0.376
Audited	54,086	0.509	0.5
Exporter	54,086	0.15	0.357
Construction	54,086	0.107	0.309
Working Capital	54,086	40.29	36.341
Rule of law	54,086	-0.351	0.536
Domestic credit	54,086	50.346	30.511
Log(GDP/capita)	54,086	8.24	1.01
Inflation	54,086	6.454	3.992
Bank efficiency:			
Standard efficiency	54,086	0.728	0.038
Weighted efficiency	54,086	0.727	0.056

Table 5.4.

Means by country: Access to credit and bank efficiency

This table presents the means by country for access to credit and bank efficiency.

Country	Percentage of firms				Bank efficiency	
	Need Credit	Constrained	Apply	Approved	Standard efficiency	Weighted efficiency
Afghanistan	0.621	0.975	0.044	0.571	0.701	0.707
Albania	0.272	0.33	0.67	1.00	0.750	0.73
Armenia	0.551	0.372	0.65	0.966	0.771	0.774
Belarus	0.553	0.458	0.576	0.94	0.728	0.74
Benin	0.638	0.58	0.444	0.944	0.74	0.707
Bolivia	0.598	0.422	0.6	0.963	0.743	0.719
Bosnia-Herzegovina	0.45	0.381	0.664	0.932	0.735	0.755
Bulgaria	0.469	0.592	0.425	0.961	0.771	0.764
Burundi	0.733	0.477	0.561	0.933	0.767	0.76
Cambodia	0.349	0.578	0.44	0.96	0.68	0.69
Cameroon	0.608	0.763	0.275	0.864	0.72	0.681
China	0.566	0.602	0.422	0.942	0.737	0.764
Colombia	0.751	0.282	0.743	0.967	0.756	0.749
Cote d'Ivoire	0.659	0.754	0.309	0.797	0.752	0.762
Croatia	0.434	0.382	0.706	0.876	0.752	0.771
Cyprus	0.362	0.582	0.456	0.917	0.66	0.804
Czech Republic	0.315	0.176	0.882	0.933	0.694	0.758
DRC	0.62	0.798	0.234	0.862	0.723	0.67
Dominican Republic	0.376	0.179	0.83	0.989	0.704	0.662
Ecuador	0.651	0.33	0.692	0.967	0.698	0.632
Egypt	0.29	0.804	0.245	0.798	0.75	0.717
El Salvador	0.549	0.476	0.548	0.955	0.744	0.752
Eswatini	0.644	0.716	0.284	1.00	0.764	0.76
Georgia	0.404	0.29	0.783	0.907	0.751	0.768
Ghana	0.78	0.738	0.300	0.874	0.737	0.806
Guatemala	0.465	0.384	0.637	0.968	0.725	0.732
Guinea	0.515	0.92	0.08	1.00	0.739	0.712
India	0.57	0.912	0.104	0.844	0.742	0.737
Indonesia	0.641	0.819	0.185	0.978	0.74	0.744
Italy	0.425	0.817	0.193	0.946	0.7	0.752
Kenya	0.516	0.465	0.562	0.952	0.652	0.695
Kosovo	0.489	0.494	0.518	0.977	0.746	0.77
Kyrgyz Republic	0.387	0.543	0.504	0.906	0.726	0.756
Latvia	0.373	0.402	0.658	0.909	0.743	0.709
Lebanon	0.489	0.442	0.613	0.91	0.748	0.74
Lesotho	0.533	0.438	0.578	0.973	0.749	0.788
Liberia	0.659	0.753	0.27	0.917	0.763	0.752
Malaysia	0.622	0.587	0.417	0.989	0.657	0.656
Mali	0.723	0.593	0.465	0.875	0.752	0.738
Malta	0.233	0.189	0.868	0.935	0.708	0.736
Mauritania	0.661	0.607	0.429	0.917	0.718	0.722

Moldova	0.459	0.568	0.512	0.843	0.771	0.776
Mongolia	0.829	0.574	0.481	0.886	0.75	0.716
Montenegro	0.588	0.496	0.532	0.947	0.751	0.745
Morocco	0.482	0.744	0.296	0.863	0.756	0.75
Myanmar	0.389	0.783	0.233	0.935	0.726	0.647
Namibia	0.485	0.608	0.446	0.878	0.714	0.635
Nepal	0.609	0.684	0.338	0.935	0.671	0.559
Niger	0.595	0.667	0.348	0.957	0.754	0.772
Nigeria	0.577	0.971	0.05	0.566	0.768	0.778
Macedonia	0.43	0.479	0.546	0.955	0.745	0.76
Pakistan	0.452	0.837	0.203	0.806	0.726	0.676
Papua New Guinea	0.492	0.484	0.516	1.00	0.772	0.771
Paraguay	0.418	0.215	0.785	1.00	0.714	0.783
Peru	0.764	0.199	0.823	0.974	0.726	0.744
Philippines	0.276	0.384	0.634	0.973	0.723	0.701
Poland	0.283	0.449	0.583	0.945	0.758	0.62
Portugal	0.349	0.305	0.718	0.968	0.593	0.678
Russia	0.56	0.666	0.426	0.784	0.72	0.767
Senegal	0.651	0.788	0.218	0.969	0.739	0.728
Serbia	0.563	0.299	0.712	0.985	0.71	0.751
Sierra Leone	0.724	0.819	0.248	0.731	0.721	0.725
Slovakia	0.381	0.363	0.675	0.944	0.737	0.701
Slovenia	0.439	0.137	0.881	0.98	0.771	0.77
Tanzania	0.753	0.784	0.233	0.929	0.766	0.746
Thailand	0.54	0.887	0.119	0.953	0.579	0.546
Togo	0.688	0.495	0.547	0.923	0.749	0.742
Tunisia	0.618	0.366	0.674	0.94	0.689	0.738
Turkey	0.511	0.393	0.621	0.978	0.745	0.773
Uganda	0.572	0.875	0.132	0.947	0.737	0.718
Ukraine	0.633	0.81	0.223	0.853	0.706	0.695
Uruguay	0.53	0.299	0.732	0.957	0.674	0.517
Vietnam	0.552	0.244	0.788	0.959	0.728	0.668
Yemen	0.383	0.773	0.235	0.964	0.757	0.738
Zambia	0.546	0.84	0.199	0.803	0.719	0.615
Zimbabwe	0.783	0.892	0.173	0.625	0.721	0.733

Table 5.5.

Determinants of firms' need of credit

This table presents results of probit estimations examining the relation between bank efficiency and firms' credit access. The dependent variable is "Need Credit". Definitions of variables are provided in the Appendix. Estimated marginal effects are reported and standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	Standard efficiency	Weighted efficiency
	(1)	(2)
Bank efficiency	0.002	0.432***
	(0.066)	(0.044)
Firm size	-0.005**	-0.005**
	(0.002)	(0.002)
Sole proprietorship	-0.017***	-0.020***
	(0.006)	(0.006)
Publicly listed	0.004	0.001
	(0.011)	(0.011)
Privately held	0.013**	0.010*
	(0.006)	(0.006)
Audited	-0.006	-0.010**
	(0.005)	(0.005)
Foreign owned	-0.117***	-0.115***
	(0.010)	(0.010)
Subsidiary	-0.018***	-0.021***
	(0.006)	(0.006)
Exporter	0.018***	0.015**
	(0.006)	(0.006)
Construction	0.085***	0.084***
	(0.007)	(0.007)
Working Capital	0.001***	0.001***
	(0.000)	(0.000)
Rule of law	-0.028***	-0.028***
	(0.006)	(0.006)
Domestic credit	0.000***	0.001***
	(0.000)	(0.000)
Log (GDP/capita)	-0.053***	-0.055***
	(0.004)	(0.004)
Inflation	0.003***	0.004***
	(0.001)	(0.001)
Year FE	Yes	Yes
Sector FE	Yes	Yes
Observations	54,086	54,086
Log Likelihood	-36277.82	-36230.56
Pseudo R^2	0.031	0.032

Table 5.6.

Main estimations: standard efficiency

This table presents estimation results examining the relation between bank efficiency and firms' credit access. The dependent variable is "Constrained". Definitions of variables are provided in the Appendix. We apply the probit model with sample selection to control for the potential selection issue. The Wald test compares the simple probit model with the probit with sample selection model. Under the null hypothesis, the probit model with sample selection is not different from the simple probit model. Estimated marginal effects are reported and standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)
Bank efficiency	-0.261***	-0.232***	-0.333***	-0.538***	-0.484***
	(0.065)	(0.066)	(0.068)	(0.076)	(0.075)
Firm size			-0.051***		-0.051***
			(0.002)		(0.002)
Sole proprietorship			0.024***		0.006
			(0.007)		(0.007)
Publicly listed			-0.037***		-0.035***
			(0.012)		(0.012)
Privately held			-0.070***		-0.055***
			(0.007)		(0.007)
Audited			-0.081***		-0.082***
			(0.005)		(0.005)
Foreign owned			-0.001		-0.009
			(0.011)		(0.012)
Subsidiary			-0.014**		-0.013*
			(0.007)		(0.007)
Exporter			-0.075***		-0.058***
			(0.007)		(0.007)
Rule of law				-0.064***	-0.056***
				(0.007)	(0.007)
Domestic credit				-0.000**	0.000
				(0.000)	(0.000)
Log(GDP/capita)				-0.058***	-0.050***
				(0.005)	(0.004)
Inflation				0.006***	0.007***
				(0.001)	(0.001)
Year FE	Yes	Yes	Yes	Yes	Yes
Sector FE	No	Yes	Yes	Yes	Yes
Observations	28,309	28,309	28,309	28,309	28,309
Log Likelihood	-35876.56	-35549.12	-34307.47	-34987.5	-33931.84
Wald Test	708.80 ***	682.56***	349.45***	602.50***	302.33***

Table 5.7.

Main estimations: weighted efficiency

This table presents estimation results examining the relation between bank efficiency and firms' credit access. The dependent variable is "Constrained". Definitions of variables are provided in the Appendix. We apply the probit model with sample selection to control for the potential selection issue. The Wald test compares the simple probit model with the probit with sample selection model. Under the null hypothesis, the probit model with sample selection is not different from the simple probit model. Estimated marginal effects are reported and standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)
Bank efficiency	-0.239***	-0.277***	-0.212***	-0.256***	-0.151***
	(0.048)	(0.049)	(0.049)	(0.060)	(0.051)
Firm size			-0.052***		-0.052***
			(0.002)		(0.002)
Sole proprietorship			0.025***		0.006
			(0.007)		(0.007)
Publicly listed			-0.033***		-0.030**
			(0.012)		(0.012)
Privately held			-0.067***		-0.052***
			(0.007)		(0.007)
Audited			-0.081***		-0.084***
			(0.005)		(0.005)
Foreign owned			-0.000		-0.008
			(0.012)		(0.012)
Subsidiary			-0.012*		-0.012*
			(0.007)		(0.007)
Exporter			-0.074***		-0.058***
			(0.007)		(0.007)
Rule of law				-0.065***	-0.057***
				(0.011)	(0.007)
Domestic credit				-0.000	0.000***
				(0.000)	(0.000)
Log(GDP/capita)				-0.055***	-0.049***
				(0.008)	(0.004)
Inflation				0.006***	0.007***
				(0.001)	(0.001)
Year FE	Yes	Yes	Yes	Yes	Yes
Sector FE	No	Yes	Yes	Yes	Yes
Observations	28,309	28,309	28,309	28,309	28,309
Log likelihood	-35834.91	-35477.33	-34280.66	-34958.3	-33916.61
Wald test	683.25***	707.28***	335.01***	588.64***	291.26***

Table 5.8.

Firms' decision to apply for loans and Banks' credit approval/rejection decisions

This table presents estimation results examining the relation between bank efficiency and firms' credit access. The dependent variable in columns (1)-(2) is "Apply" and columns (3)-(4) is "Approved". All controls represent the full set of firm-level and country-level control variables used in Table 6. Definitions of variables are provided in the Appendix. We apply the probit model with sample selection to control for the potential selection issue. The Wald test compares the simple probit model with the probit with sample selection model. Under the null hypothesis, the probit model with sample selection is not different from the simple probit model. Estimated marginal effects are reported and standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	Apply		Approved	
	Standard efficiency	Weighted efficiency	Standard efficiency	Weighted efficiency
	(1)	(2)	(3)	(4)
Bank efficiency	0.493***	0.155***	-0.016	0.053
	(0.075)	(0.052)	(0.146)	(0.228)
All controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes
Observations	28,309	28,309	10,914	10,914
Log likelihood	-34531.72	-34517.07	-10853.06	-10853.87
Wald test	289.66***	279.84***	13.74***	13.13***

Table 5.9.

Reasons for discouragement

This table presents results of probit estimations examining the relation between bank efficiency and firms' credit access. The dependent variable in columns (1)-(2) is "Interest rate" and columns (3)-(4) is "Collateral requirements". All controls represent the full set of firm-level and country-level control variables used in Table 6. Definitions of variables are provided in the Appendix. Estimated marginal effects are reported and standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	Interest Rate		Collateral Requirements	
	Standard efficiency	Weighted efficiency	Standard efficiency	Weighted efficiency
	(1)	(2)	(3)	(4)
Bank efficiency	-0.653***	-0.035	0.072	-0.135***
	(0.13)	(0.083)	(0.11)	(0.067)
All controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes
Observations	17,395	17,395	17,335	17,335
Log likelihood	-10471.76	-10484.2	-7465.23	-7463.43
Pseudo R^2	0.068	0.067	0.031	0.031

Table 5.10.

Estimations by firm size

This table presents estimation results examining the relation between bank efficiency and firms' credit access. The dependent variable is "Constrained". All controls represent the full set of firm-level and country-level control variables used in Table 6. Definitions of variables are provided in the Appendix. We apply the probit model with sample selection to control for the potential selection issue. The Wald test compares the simple probit model with the probit with sample selection model. Under the null hypothesis, the probit model with sample selection is not different from the simple probit model. Estimated marginal effects are reported and standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	Small firms		Medium firms		Large firms	
	Standard efficiency	Weighted efficiency	Standard efficiency	Weighted efficiency	Standard efficiency	Weighted efficiency
	(1)	(2)	(3)	(4)	(5)	(6)
Bank efficiency	-0.213*	0.042	-0.506***	-0.213**	-0.665***	-0.362***
	(0.111)	(0.071)	(0.143)	(0.092)	(0.162)	(0.121)
All controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	12,598	12,598	10,251	10,251	5,460	5,460
Log likelihood	-14717.44	-14709.31	-12375.91	-12366.82	-6545.45	-6542.54
Wald test	156.91***	149.63***	141.84***	137.64***	75.78***	71.43***

Table 5.11.

Impact of macroeconomic factors

This table presents estimation results examining the relation between bank efficiency and firms' credit access. The dependent variable is "Constrained". All controls represent the full set of firm-level and country-level control variables used in Table 6. Definitions of variables are provided in the Appendix. We apply the probit model with sample selection to control for the potential selection issue. The Wald test compares the simple probit model with the probit with sample selection model. Under the null hypothesis, the probit model with sample selection is not different from the simple probit model. Estimated marginal effects are reported and standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	Standard efficiency	Weighted efficiency	Standard efficiency	Weighted efficiency	Standard efficiency	Weighted efficiency	Standard efficiency	Weighted efficiency
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Bank efficiency	5.036***	3.635***	-0.479***	-0.222***	1.132***	0.521***	-1.194***	-0.524***
	(0.614)	(0.394)	(0.075)	(0.053)	(0.153)	(0.082)	(0.105)	(0.087)
Bank efficiency x log(GDP/capita)	-0.631***	-0.451***						
	(0.07)	(0.047)						
Bank efficiency x Rule of law			-0.115	-0.504***				
			(0.101)	(0.097)				
Bank efficiency x Domestic credit					-0.021***	-0.012***		
					(0.002)	(0.001)		
Bank efficiency x Inflation							0.172***	0.071***
							(0.018)	(0.013)
All controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	28,309	28,309	28,309	28,309	28,309	28,309	28,309	28,309
Log likelihood	-33889.77	-33868.81	-33931.19	-33901.75	-33855.07	-33855.07	-33868.82	-33901.12
Wald test	282.60***	278.88***	298.45***	292.49***	277.35***	288.29***	286.82***	289.21***

Table 5.12.

Robustness checks -1

This table presents estimation results examining the relation between bank efficiency and firms' credit access. The dependent variable is presented at the top of each column. Columns (1) and (2) are estimated using a simple probit model. All controls represent the full set of firm-level and country-level control variables used in Table 6. Definitions of variables are provided in the Appendix. We apply the probit model with sample selection to control for the potential selection issue in columns (3)-(6). The Wald test compares the simple probit model with the probit with sample selection model. Under the null hypothesis, the probit model with sample selection is not different from the simple probit model. Estimated marginal effects are reported and standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	Constrained (Perception)	Constrained (Loan Use)	Constrained			
	(1)	(2)	(3)	(4)	(5)	(6)
Bank efficiency	-0.566***	-0.368***	-0.468***	-0.529***	-0.494***	-0.518***
	(0.065)	(0.061)	(0.077)	(0.076)	(0.075)	(0.079)
Financial freedom			-0.001***			-0.001***
			(0.000)			(0.000)
Credit Info				0.005***		0.002
				(0.001)		(0.001)
Institutional development					-0.014***	-0.012***
					(0.003)	(0.004)
All controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	54,086	53,998	27,133	28,309	27,976	27,133
Log likelihood	-35541.18	-32248.14	-32379.86	-33903.53	-33473.54	-32288.11
Pseudo R^2	0.034	0.131	-	-	-	-
Wald test	-	-	325.18***	317.63***	306.82***	337.56***

Table 5.13.

Robustness checks – 2

This table presents estimation results examining the relation between bank efficiency and firms' credit access. The dependent variable is "Constrained". All controls represent the full set of firm-level and country-level control variables used in Table 6. Definitions of variables are provided in the Appendix. Estimation in column (4) is weighted by the inverse of standard deviation of bank efficiency. We apply the probit model with sample selection to control for the potential selection issue. The Wald test compares the simple probit model with the probit with sample selection model. Under the null hypothesis, the probit model with sample selection is not different from the simple probit model. Estimated marginal effects are reported and standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	(1)	(2)	(3)	(4)
Bank efficiency	-0.491***	-0.517***	-0.272**	-0.019***
	(0.091)	(0.075)	(0.129)	(0.003)
Concentration	-0.002***			
	(0.000)			
Herfindahl Index		-0.064***		
		(0.016)		
Boone Index			-0.152**	
			(0.078)	
All controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes
Observations	23,136	28,309	17,522	28,309
Log likelihood	-26792.57	-33924.07	-20135.34	-33931.84
Wald test	213.43***	303.53***	142.59***	302.33***

Table 5.14.

Robustness checks – 3

This table presents estimation results examining the relation between bank efficiency and firms' credit access. The dependent variable is "Constrained". All controls represent the full set of firm-level and country-level control variables used in Table 6. Definitions of variables are provided in the Appendix. We apply the probit model with sample selection to control for the potential selection issue in columns (1)-(3). The Wald test compares the simple probit model with the probit with sample selection model. Under the null hypothesis, the probit model with sample selection model is not different from the simple probit model. We perform simple probit regression in column (4). Estimated marginal effects are reported and standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	Alternative exclusion variables		Sample construction	
	Using only "Working Capital"	Using "Working Capital" & "Perceived competition"	Excluding countries with <100 obs.	Alternative definition of "Constrained"
	(1)	(2)	(3)	(4)
Bank efficiency	-0.476***	-0.482***	-0.48***	-0.454***
	(0.075)	(0.113)	(0.075)	0.066
All controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes
Observations	28,309	27,041	8,187	49,964
Log likelihood	-34112.97	-32313.32	-33785.72	-30346.375
Wald test	186.80***	101.09***	304.79***	-
Pseudo R^2	-	-	-	0.079

Appendix 5.1

This table presents the definition and sources of the variables employed in the study.

Variable	Definition and source
Constrained	Dummy =1 if a firm that needed external funds applied for credit and was rejected or refused to apply because the firm was discouraged; 0 otherwise. Source: WBES.
Need credit	Dummy =1 if a firm desires bank credit; 0 otherwise. Source: WBES.
Apply	Dummy =1 if a firm needed external funds and applied for credit; 0 otherwise. Source: WBES
Approved	Dummy =1 if a firm applied for loans and received at least one line of credit; 0 otherwise. Source: WBES.
Constrained (perception)	Dummy =1 if a firm reported that access to credit was a moderate, major, or very severe obstacle; 0 otherwise. Source: WBES.
Constrained (loan use)	Dummy =1 if a firm does not have an overdraft facility, a credit line and/or a formal bank loan; 0 otherwise. Source: WBES.
Bank efficiency	Mean of bank cost efficiency scores by country (standard efficiency) or mean of asset-weighted bank cost efficiency scores by country (weighted efficiency). Source: own computation.
Firm size	Logarithm of the number of permanent full-time employees. Source: own computation.
Sole proprietorship	Dummy =1 if a firm is a sole proprietorship; 0 otherwise. Source: WBES
Privately held	Dummy =1 if shares of a firm are privately traded; 0 otherwise. Source: WBES.
Publicly traded	Dummy =1 if a firm is a publicly traded company, 0 otherwise. Source: WBES.
Audited	Dummy =1 if a firm's financial statements were checked or certified by an external auditor; 0 otherwise. Source: WBES.
Foreign owned	Dummy =1 if at least 50 percent of a firm's ownership is held by foreigners; 0 otherwise. Source: WBES.
Exporter	Dummy =1 if at least 10 percent of a firm's annual sales is derived from direct exports and zero otherwise. Source: WBES.
Subsidiary	Dummy =1 if a firm is part of a larger group; 0 otherwise. Source: WBES.
Construction	Dummy =1 if a firm submitted an application to obtain a construction-related permit over the last two years; 0 otherwise. Source: WBES.
Working capital	Captures the proportion of goods or services paid for after the delivery by customers. Source: WBES.
Perceived competition	A firm's perceived degree of competition from the informal sector. Source: WBES.
Log(GDP/capita)	Logarithm of Gross Domestic Product (GDP) per capita. Source: World Development Indicators.
Domestic credit	Domestic credit to the private sector as a percentage of GDP. World Development Indicators.
Rule of law	Measures the perceptions of the extent to which people have confidence in and abide by the rules of society. Source: World Governance Indicators.
Inflation	Rate of inflation. Source: World Development Indicators.

Credit info	Depth of credit information index measures the coverage, scope and accessibility of credit information available through either a public credit registry or a private credit bureau. Source: Doing Business.
Herfindahl Index	Sum of the squares of market shares of each bank. Source: own computation.
Concentration	Share of assets that are held by the three largest banks in each country. Source: Global Financial Development Database.
Boone Index	Measure of bank competition calculated at the elasticity of profit to marginal cost. Source: Global Financial Development Database.
Financial freedom	The Index scores an economy's financial freedom by looking into the following five broad areas: (i) the extent of government regulation of financial services; (ii) the degree of state intervention in banks and other financial firms through direct and indirect ownership; (iii) the extent of financial and capital market development; (iv) government influence on the allocation of credit, and (v) openness to foreign competition. These five areas are considered to assess an economy's overall level of financial freedom that ensures easy and effective access to financing opportunities for people and businesses in the economy. An overall score on a scale of 0 to 100 is given to an economy's financial freedom through deductions from the ideal score of 100. Source: Heritage Foundation.
Institutional development	Average value of six governance indicators: voice and accountability, political stability, effectiveness of government, regulatory quality, rule of law, control of corruption. Source: World Governance Indicators.

General Conclusion

Why does financial development still differ substantially across countries? A large body of research documents that the institutional framework of a country — consisting of formal and informal rules — is fundamental in determining the level of its financial development. This dissertation contributes to a better understanding of the mechanisms through which formal and informal institutions shape banking.

Chapter one shows how language influences bank risk taking behavior. We examine one linguistic feature: future-tense marking. Our results show that indeed language contributes to explain the cross-country differences in bank risk taking. We find that in countries where the language grammatically marks the future, banks take higher risk. Additionally, we find that future tense marking is associated with greater occurrence of banking crises.

Chapter two studies the impact of language on financial inclusion. Our study examines the presence of gender marking in a language. We show that this linguistic feature influences the formation of beliefs which affects women's financial inclusion. In particular, we find that gender marking in language exerts an impact on the gender gap in the probability of owning a formal account, having access to a formal credit, as well as having savings in a formal financial institution. Thus, language gender marking contributes to explain the gender gap in financial inclusion.

Chapter three evaluates the role of democratic development in alleviating firms' financing constraints. We show that democratic development, characterized by better institutions and protection of civil liberties, facilitates better credit access for firms. We further show that democratic development fosters credit access by contributing to reduce borrower discouragement and facilitating less severe bank loan rejection decisions.

Chapter four focuses on the consequences of corruption on bank efficiency. Our results show that in countries with rampant corruption, banks are less efficient in minimizing their costs. This negative effect of corruption on cost efficiency does not vary

with bank size and the level of a country's development. This finding highlights the detrimental effect of greater corruption on bank performance in terms of cost advantages.

Chapter 5 investigates the effect of banking efficiency on credit availability for firms. We show that greater ability of a bank to produce with the lowest costs improves access to credit for firms. We also find that the beneficial impact of bank efficiency to alleviate credit constraints takes place through the demand channel by reducing borrowers' discouragement.

Overall, the key message of this dissertation is that institutions play an important role for financial development. Formal and informal institutions influence financial development by shaping the beliefs that influence perception and behavior of economic agents, and by establishing the incentive structure. This study offers a better understanding of the mechanisms through which institutions influence financial development.

This dissertation offers some important policy implications. Given the primal role of institutions, policy measures that strengthen the institutional framework should be implemented to favor financial development. Additionally, we show that the prevalence of weak institutions in developing and emerging markets account for their low level of financial development. Policy measures that enhance institutional quality would pay off in terms of improving financial development. Further, since language influences the gender gap in financial inclusion, policy reforms that foster women's financial inclusion should focus on countries with gender-intensive languages.

There remain potential avenues for future research. This dissertation only focuses on finance and some aspects of institutions. Given the broad nature of institutions, additional research is required to pinpoint the specific mechanisms through which other institutional characteristics influence financial development. For example, the culture-finance nexus has received little attention and therefore special attention should be dedicated to identifying the channels through which culture impacts finance.

I also provide a roadmap for future works on research presented in the first three chapters of this dissertation. First, two linguistic features are examined in the first two chapters: future tense reference, and gender-marking. Future research should identify

other economic channels through which these linguistic features may affect decision making. Other linguistic features that may affect financial development also remain a plausible avenue for further research. Second, the chapter one documents that language contributes to explain bank risk taking behavior. More knowledge is required to understand the channels through which this effect takes place. For example, we could observe a change in bank risk-taking behavior when bank managers with a strong-FTR language replace others with a weak-FTR language and reversely. Future research may consider the influence of CEO changes on bank risk through the angle of the CEO language. Third, our study in chapter three shows that democratic development facilities firms' credit access. Does democratic development exert an influence on the type of credit, for instance by favoring more credit to innovative firms? A possible future work could focus on this line of research.

Résumé de la Thèse en Français

Il y a plus de 30 ans, Douglass North (1990) a mis en exergue le rôle des institutions en tant que déterminant clé de la performance économique. Il a soutenu que les institutions sont définies comme « les règles du jeu dans une société ou, en d'autres termes, les contraintes conçues par les humains eux-mêmes pour façonner leurs interactions », affectent les coûts de transaction en réduisant l'incertitude tout en créant une structure stable qui améliore les échanges humains. La définition des institutions de North énonce trois éléments importants : *(i)* les institutions sont les « règles du jeu » conçues pour limiter les choix de ses agents ; *(ii)* les institutions sont « conçues par l'homme », ce qui signifie qu'elles sont des règles créées par l'homme, contrairement à d'autres facteurs de développement comme la géographie ; et *(iii)* les institutions mettent en place la structure d'incitation aux échanges humains. Les institutions d'une société façonnent les interactions humaines en définissant ce que les individus sont contraints de faire et même, parfois, les conditions sous lesquelles des activités doivent se dérouler. A travers les effets sur les interactions sociales, les institutions influencent la performance économique d'un Etat.

Depuis les années 90, la prise en compte des institutions comme un élément crucial permettant de déterminer la performance économique a été largement soutenue par la littérature. Par exemple, Hall et Jones (1999) ont montré que les variations de la production par travailleur, de l'accumulation de capital et de la productivité d'un pays à l'autre sont principalement conduit par les différences institutionnelles. Acemoglu, Johnson et Robinson (2001) ont conclu que la qualité des institutions, mesurées par le taux de mortalité chez les premiers Européens arrivés dans une colonie, a un rapport marqué avec la performance économique. Dans le même ordre d'idées, Rodrik, Subramanian et Trebbi (2004) ont démontré que la qualité des institutions l'emporte sur d'autres facteurs de développement, comme l'emplacement géographique ou le commerce international, pour expliquer les différences de niveaux de revenu entre les pays. Dias et Tebaldi (2012) ont montré que des institutions améliorent le développement économique en favorisant l'accumulation de capital humain et en diminuant les inégalités de revenus, tandis que Tebaldi et Elmslie (2013) ont documenté un lien positif entre la qualité institutionnelle et la croissance par le biais du canal de l'innovation.

De bonnes institutions améliorent l'activité économique en structurant des incitations qui induisent un comportement productif de la part des agents économiques. Acemoglu (2003) décrit trois caractéristiques principales des bonnes institutions: *(i)* elles appliquent effectivement les droits de propriété, ce qui incite les individus à investir et à s'engager dans des activités productives dans une société; *(ii)* ils imposent des contraintes sur le comportement humain, en particulier les actions des élites, des politiciens et d'autres groupes puissants, en créant des freins et contrepoids afin de minimiser la concentration d'un pouvoir politique et économique illimité sur les élites; et *(iii)* ils créent un niveau de participation égale pour une grande partie de la société, afin de donner aux agents économiques la possibilité d'utiliser au mieux leurs compétences et leurs talents.

Les institutions peuvent être classées en deux catégories : formelles et informelles. D'un côté, les institutions formelles incluent les règles, lois, constitutions, contrats ainsi que les formes de gouvernement. Elles sont explicites et codifiées, et déterminent le système politique y compris la structure de gouvernance, le système économique tel que les règles qui régissent les droits de propriété, et le système d'application comme le système judiciaire. De l'autre côté, les institutions informelles sont perçues comme des traditions, coutumes, conventions et toute autres normes de comportements qui façonnent les interactions, et ainsi, font partie de l'héritage culturel d'une société. Les institutions informelles sont « généralement non- écrites, elles sont plutôt créées, communiquées et appliquées en dehors de canaux officiellement sanctionnés » (Helmke et Levitsky, 2004, p. 727). Selon North (1990, p. 36), les règles informelles sont les contraintes institutionnelles les plus influentes. Il écrit :

> « Dans nos interactions quotidiennes avec les autres, que ce soit au sein de la famille, dans les relations sociales extérieures ou dans les activités commerciales, la structure de gouvernance est largement définie par des codes de conduite, des normes de comportement et des conventions. À la base de ces contraintes informelles se trouvent des règles formelles, mais celles-ci sont rarement la source évidente et immédiate de nos choix dans nos interactions quotidiennes ».

Le rôle fondamental des institutions pour la croissance ayant été préalablement démontré, reste une question qui constitue le point focal de cette dissertation pouvant être

formulé de la manière suivante : **la finance est-elle un canal par lequel ces institutions formelles et informelles influencent le développement économique** ?

Les banques les plus performantes ont un impact significatif sur la croissance économique, en particulier au travers de leur rôle travers leur rôle de mobilisation d'épargne et de distribution de capital à des usages productifs (Popov, 2018). Au niveau macroéconomique et microéconomique, les preuves empiriques suggèrent largement que le niveau de développement financier a un effet positif à long terme sur la croissance économique (Beck et al, 2007, 2000 ; King et Levine, 1993).

La question visant à comprendre pourquoi une différence au niveau de développement financier traverse beaucoup de pays a été fortement liée aux différences dans les caractéristiques institutionnelles. En effet, les marchés financiers sous-développés sont caractérisés par un coût élevé de transaction et d'information, et les institutions sont importantes parce qu'elles permettent de surmonter ces effets de ces coûts en réduisant l'incertitude. Par exemple, les lois qui protègent les droits de propriété sont un aspect essentiel des transactions financières car elles réduisent les conséquences de l'asymétrie de l'information. La culture et d'autres institutions informelles déterminent également la participation aux marchés financiers en façonnant les croyances, les attitudes et la prise de décision des agents économiques.

La Porta et al. (1997 ; 1998) constatent que l'irrégularité du développement financier d'un pays à l'autre peut s'expliquer par les différences en termes de systèmes juridiques. Ils montrent que, contrairement au cas du droit civil français, la « common law » anglaise protège rigoureusement les droits des créanciers et fait respecter les contrats, et donc conduit à de meilleurs résultats financiers. Johnson, McMillan et Woodruff (2002) soulignent le rôle de la protection des droits de propriété dans le processus de développement financier. Ils montrent que dans les pays où les entrepreneurs se sentent plus sûrs de la protection des droits de propriété, ils sont plus susceptibles de réinvestir leurs bénéfices. Huang (2010) et Roe et Siegel (2011) plaident en faveur de l'impact des institutions politiques sur le développement financier. Lensink et Meesters (2014) montrent le rôle bénéfique des institutions bien développées pour le fonctionnement efficace des banques. De toute évidence, la littérature souligne le rôle central des institutions dans le développement financier

Alors que les institutions formelles ont été largement étudiées, peu d'études sont consacrées au lien entre les institutions informelles et le développement financier. L'article fondateur de Stulz et Williamson (2003) tente d'examiner pourquoi la protection des investisseurs, une forme d'institution formelle qui a été mis en avant comme déterminant clé du développement financier, diffère d'un pays à l'autre. Ils constatent que les croyances religieuses, une forme d'institution informelle, expliquent de manière significative les différences entre les pays dans le degré de protection des investisseurs. Plus précisément, ils suggèrent que les pays catholiques sont associés à une protection des droits des créanciers plus faible. Dès lors, les études sur le lien entre culture et finance ont commencé à susciter l'intérêt des universitaires. Par exemple, Guiso, Sapienza et Singales (2004) démontrent l'importance du rôle de la confiance sur le développement financier. De même, il a été démontré que le comportement de prise de risque des banques est influencé par la culture nationale, mesurée par l'individualisme et la confiance (Mourouzidou-Damtsa et al., 2019), et la religiosité locale (Adhikari et Agrawal, 2016). Drori et al. (2018) montrent que la langue, une institution informelle, importe dans la mesure où elle détermine la mesure dans laquelle les institutions de microfinance réussissent à atteindre les femmes et à soutenir leurs activités entrepreneuriales.

Dans l'ensemble, de plus en plus de d'études suggèrent que les institutions formelles et informelles sont importantes pour le développement financier. Les chercheurs se sont donc tournés vers l'identification des mécanismes spécifiques qui lient les institutions et la finance.

Dans cette thèse, je compte approfondir et contribuer à cette discussion en abordant une question clé : **comment les institutions influencent-elles le comportement des banques ?** En particulier, je me concentre sur les institutions formelles et informelles et j'étudie leur rôle dans l'élaboration du comportement des banques. Etant donné que les intermédiaires financiers qui fonctionnent bien renforcent l'efficacité de l'allocation des capitaux et contribuent à atténuer les contraintes de financement qui entravent l'expansion des entreprises et de l'industrie, j'apporte une contribution majeure à la littérature en mettant l'accent sur la finance comme l'un des principaux canaux par lequel les institutions affectent de manière significative la croissance. Je m'attarde notamment sur le cas des pays en développement et émergents en employant un échantillon mondial dans tous les

chapitres. Etant donné que ces pays sont généralement caractérisés par des institutions faibles, cette étude est importante pour formuler les recommandations politiques majeures. Ce travail est structuré autour de cinq chapitres.

Les deux premiers chapitres examinent l'impact de la langue, une institution informelle, sur le façonnement des attitudes des agents économiques et des banques à l'égard du risque et du secteur financier inclusif. Le premier chapitre[40] étudie comment la langue influence le comportement de prise de risque des banques. Des études récentes ont montré que les personnes qui parlent des langues différentes pensent et agissent différemment (Boroditsky, 2001). La langue, comme la culture, influence le comportement des agents économiques.

Une caractéristique linguistique a été particulièrement étudiée dans la littérature en économie : la présence d'un marquage au futur. Certaines langues comme l'anglais, appelées langues FTR (Strong Future Time Reference), obligent les locuteurs à faire une distinction grammaticale entre les événements futurs et présents. D'autres langues comme le chinois, appelées langues à faible FTR, permettent aux locuteurs d'utiliser naturellement le présent pour parler d'événements futurs comme si ces événements se produisaient maintenant. Cette caractéristique linguistique peut influencer le comportement économique : l'utilisation d'une langue à fort FTR diminue l'importance de l'avenir en dissociant le présent et l'avenir. Elle peut donc conduire à un comportement moins tourné vers l'avenir pour les agents économiques.

Cette hypothèse a été confirmée par de nombreux travaux récents sur les décisions individuelles et d'entreprise. Chen (2013) montre que les locuteurs de langues à fort FTR ont un comportement moins tourné vers l'avenir : ils épargnent moins, investissent moins dans leur santé et prennent leur retraite avec une pension moindre par rapport aux autres locuteurs de langues à faible FTR. Mavisakalyan, Tarverdi et Weber (2018) constatent que les locuteurs de langues à faible FTR sont plus disposés à résoudre les problèmes environnementaux que les locuteurs de langues à fort FTR, soutenant l'hypothèse selon laquelle ils se soucient davantage de l'avenir. Au niveau de l'entreprise, Liang et al. (2014) montrent que les entreprises ayant des langues à fort FTR obtiennent de moins bons

[40] Papier co-écrit avec Laurent Weill, publié dans Journal of Financial Services Research (2021).

résultats en matière de responsabilité sociale des entreprises, une activité orientée vers l'avenir, que celles dont les langues à FTR sont faibles, tandis que Chen et al. (2017) constatent que les entreprises linguistiques à FTR fort ont des épargnes de précaution plus faibles que les entreprises linguistiques à FTR faible, soutenant l'idée que les premières sont moins tournées vers l'avenir.

On peut se demander si cette distinction linguistique influence le comportement de prise de risque des banques. Le comportement à risque est influencé par la manière dont les directeurs de banque et les employés envisagent l'avenir. Voir l'avenir comme plus lointain devrait contribuer à accroître la prise de risque des banques car cela réduit la perception de pertes sur les activités risquées. L'objectif de cet article est de vérifier cette hypothèse : nous examinons si le marquage du temps futur des langues exerce un impact sur le comportement de prise de risque des banques. Nous étudions cette question sur un vaste ensemble de données de banques transnationales, car nous avons besoin de variations linguistiques suffisamment importantes d'une banque à l'autre. Nous utilisons un échantillon de 1401 banques basées dans 81 pays sur la période 2010-2017.

Nos résultats démontrent l'influence du marquage du futur sur le risque bancaire. Nous constatons que les langages FTR forts augmentent le risque bancaire. Ce résultat est observé lorsque nous contrôlons différents indicateurs de culture et lorsque nous testons des mesures alternatives du risque bancaire et de la référence temporelle future. Cette preuve est cohérente avec l'hypothèse selon laquelle les langages FTR forts incitent les banques à prendre des risques plus élevés.

Ce travail a des implications importantes. D'un point de vue positif, la constatation selon laquelle un langage FTR fort augmente le risque bancaire confirme l'idée selon laquelle un langage expliquerait les différences entre les pays en matière de risque bancaire et de fréquence des crises bancaires. D'un point de vue normatif, nos résultats suggèrent que les régulateurs devraient surveiller plus spécifiquement les banques situées dans des pays à fort langage FTR pour contrôler le potentiel de « prise de risque excessive ».

Ce chapitre contribue à deux volets de la littérature. Premièrement, nous enrichissons la vaste littérature sur les déterminants de la prise de risque bancaire. Deuxièmement, nous contribuons à la littérature sur l'impact de la langue sur le

comportement économique. Alors que cette ligne de recherche a jusqu'à présent examiné comment la langue façonne le comportement des individus et des entreprises, nous analysons comment le comportement des banques est affecté par la langue.

Le deuxième chapitre[41] étudie l'impact de la langue sur l'inclusion financière. La promotion de l'inclusion financière, mesurée comme l'accès aux services financiers et leur utilisation, a pris une place de choix dans les agendas de nombreux gouvernements et organisations internationales ces dernières années. La Banque mondiale, par exemple, a fixé l'objectif ambitieux de parvenir à l'accès universel à un compte courant d'ici 2020. Ces efforts ont été motivés par le fait que l'inclusion financière est reconnue comme un moteur important du développement économique. Il fournit non seulement aux individus un lieu sûr pour épargner pour l'avenir, lancer une entreprise ou investir dans l'éducation, mais aide également la société dans son ensemble à relever les défis de la réduction de la pauvreté et de l'amélioration de la santé (Dupas et Robinson, 2013).

L'un des problèmes majeurs de ce débat est l'écart entre les sexes - en particulier, le fait que les femmes continuent d'avoir moins accès aux services financiers que les hommes. La dernière vague de données Global Findex pour 2017 montre, par exemple, que 72% des hommes et 65% des femmes avaient des comptes bancaires - un écart de sept points entre les sexes qui n'a pas changé depuis la première vague de données Global Findex en 2011 (Demirgüc-Kunt et al., 2018). L'écart entre les sexes en matière d'inclusion financière est un obstacle à l'autonomisation des femmes car il diminue le rôle économique des femmes et leur capacité à contribuer au soutien familial. Ainsi, la compréhension de l'écart entre les sexes dans l'inclusion financière est cruciale pour promouvoir l'égalité des sexes.

Malgré une large documentation sur l'écart entre les sexes dans l'inclusion financière, les raisons sous-jacentes de cet écart restent à peine étudiées. Demirgüç-Kunt, Klapper et Singer (2013) soutiennent que la discrimination légale à l'égard des femmes (par exemple, les restrictions dans la capacité de travailler ou de diriger un ménage) et les normes de genre peuvent expliquer l'écart entre les sexes. Beck, Behr et Madestam (2018) fournissent une première explication relative au comportement, montrant que les agents de

[41] Papier co-écrit avec Laurent Weill, publié dans Economics of Transition and Institutional Change (2021).

crédit masculins facturent des taux d'intérêt plus élevés et accordent des montants de prêt moins élevés aux emprunteuses, et implicitement que les femmes ont moins accès au crédit dans les pays où la proportion d'agents de crédit masculins est plus élevée. Ghosh et Vinod (2017) montrent l'influence des déterminants politiques, salariaux et liés à l'éducation en Inde.

Nous fournissons une nouvelle explication de l'écart entre les sexes dans l'inclusion financière : le marquage du genre dans la langue. Nous étudions comment le marquage du genre dans la langue influence les inégalités entre les sexes dans l'accès et l'utilisation des services financiers. Notre hypothèse est que les langues qui nécessitent une référence au genre conduisent les individus à établir des distinctions subtiles entre les genres. Cet aspect de la langue renforce les vues traditionnelles des normes de genre dans l'esprit des locuteurs, affectant ainsi l'inclusion financière des femmes. Cette hypothèse trouve ses racines dans des recherches récentes montrant que le genre grammatical façonne la manière dont les gens pensent en fonction du genre (Boroditsky, 2009).

Nous testons l'hypothèse selon laquelle le genre grammatical façonne l'inclusion financière des femmes sur un échantillon d'environ 350 000 personnes de 117 pays. En combinant les données d'enquête au niveau individuel de la base de données Global Findex pour l'inclusion financière avec des mesures de l'intensité de genre des langues de l'Atlas mondial des structures linguistiques, nous examinons si l'écart entre les sexes en matière d'inclusion financière est plus grand dans les pays où les langues sont fortement genrées.

Nos résultats indiquent que le marquage du genre dans la langue affecte l'inclusion financière des femmes. L'écart entre les sexes dans la probabilité d'avoir un compte formel, d'accéder à un crédit ou une épargne formelle est significativement plus élevé dans les pays avec une langue sexuée que dans les pays avec des langues sans genre. Nous constatons en outre que le marquage linguistique du genre renforce l'écart entre les sexes en termes d'accès au crédit pour tous les motifs de prêt et pour toutes les sources d'emprunt (formelles et informelles). Notre principale conclusion est que les langues qui marquent grammaticalement le genre contribuent à favoriser l'écart entre les sexes dans l'inclusion financière.

Ce chapitre contribue à la littérature de deux manières. Premièrement, nous élargissons la littérature sur l'écart entre les sexes dans l'inclusion financière en examinant l'influence du marquage du genre dans la langue. Notre article enrichit la littérature en mettant l'accent sur le rôle du marquage du genre dans la langue en tant que déterminant de l'écart entre les sexes dans l'inclusion financière. Deuxièmement, nous contribuons à la discussion sur l'impact des structures linguistiques sur le comportement économique. Cette ligne de recherche teste économiquement « l'hypothèse Sapir-Whorf », qui affirme que les actions sont influencées par le langage. Cette hypothèse de l'influence du comportement économique a été renforcée par les preuves du marquage au futur (Chen, 2013 ; Mavisakalyan, Tarverdi et Weber, 2018) et du marquage du genre linguistique (Santacreu-Vasut, Shenkar et Shoham, 2014).

Les troisième et quatrième chapitres explorent le rôle des institutions formelles et la manière dont elles affectent la performance des banques en facilitant l'accès au crédit. Le troisième chapitre[42] évalue le rôle du développement démocratique dans l'atténuation des contraintes de financement des entreprises. Au cours des trois dernières décennies, le monde a été témoin d'une augmentation impressionnante du nombre de pays passant d'un régime autoritaire à un régime démocratique. Selon Democracy Project, le nombre de démocraties dans le monde a presque doublé, passant de 51 en 1989 à 99 en 2018. Les dernières années ont cependant vu émerger un potentiel de retournement de cette tendance avec le passage progressif à des régimes autoritaires dans plusieurs pays comme la Turquie ou Russie. Ces changements de régimes politiques suscitent des interrogations quant au type de régime politique qui apporte les plus grands avantages économiques.

Les économistes ont consacré beaucoup d'attention à ce débat, des études récentes soutenant l'impact bénéfique de la démocratie sur le développement économique, du moins à long terme (par exemple, Papaionannou et Siourounis, 2008 ; Acemoglu et al., 2019). Récemment, Acemoglu et al. (2019) ont démontré que la démocratisation devrait augmenter le PIB par habitant d'environ 20% au cours des 25 prochaines années.

L'impact bénéfique de la démocratie sur le développement économique peut s'exercer au travers de son influence sur le développement financier, car il a été démontré

[42] Papier co-écrit avec Laurent Weill.

que le développement financier favorise le développement économique (Levine, 2005 ; Popov, 2018). Au niveau macroéconomique, Huang (2010) a montré que la démocratisation est associée à un développement financier plus élevé dans une étude transnationale. Il est cependant important d'identifier les canaux par lesquels cet impact a lieu au niveau microéconomique. Delis, Hasan et Ongena (2020) fournissent les premiers éclairages sur cette question en montrant que la démocratisation réduit le coût du crédit dans une enquête menée sur un échantillon transnational de prêts syndiqués, qui sont des prêts importants accordés à de grandes entreprises.

Un autre moyen par lequel la démocratie peut exercer son influence sur le développement financier est l'accès au crédit pour les entreprises, qui s'est avéré être un levier majeur par laquelle le développement financier peut stimuler la croissance économique.

Nous étudions comment la démocratie influence l'accès au crédit en nous concentrant sur les PME dans une étude transnationale. Comparées aux autocraties, les démocraties sont des systèmes politiques permettant de favoriser l'accès au crédit pour les entreprises. En ce sens, le développement démocratique devrait alléger les contraintes de crédit pour trois raisons : *(i)* favoriser des institutions inclusives, y compris l'inclusion financière des petites entreprises ; *(ii)* renforcer le cadre institutionnel, stimulant ainsi l'offre de crédit émanant des ; et *(iii)* réduire les asymétries d'information.

Pour identifier les entreprises avec des contraintes de crédit, nous suivons l'approche de Léon (2015). En utilisant les données sur l'accès au crédit issues de l'Enquête de la Banque mondiale sur les entreprises, nous identifions les entreprises soumises à des contraintes de crédit comme étant les entreprises qui ont demandé un crédit et se sont vu refuser, ou celles qui n'ont pas demandé de crédit parce qu'elles étaient découragées. Cette stratégie d'identification nous permet de distinguer les effets de la demande et de l'offre afin de pouvoir véritablement examiner l'effet du développement démocratique sur l'accès au crédit des entreprises. Nous combinons ces informations sur l'accès au crédit et un ensemble consistant de variables de contrôle au niveau de l'entreprise avec des indicateurs de démocratie du projet Polity IV, ainsi que des variables supplémentaires au niveau des pays. Nous considérons un échantillon d'environ 46 000 entreprises dans 108 pays. Nous sommes alors en mesure d'examiner comment le développement démocratique pourrait

influencer l'accès au crédit pour les entreprises et d'identifier les canaux potentiels par lesquels cet effet est transmis.

Nos résultats démontrent que la démocratie favorise l'accès au crédit. Les petites et moyennes entreprises implantées dans les pays démocratiques ont des contraintes de crédit plus faibles que les entreprises issues des pays non démocratiques. Cet effet est plus prononcé pour les petites et moyennes entreprises qui ont tendance à souffrir le plus des contraintes de crédit. En outre, sur les canaux de l'offre et de la demande, nous notons également que dans les pays démocratiques, les entreprises sont moins découragées de demander un crédit et les banques sont plus susceptibles d'accepter les demandes de crédit, conformément à notre prédiction selon laquelle le développement démocratique transmet des signaux positifs aux banques et aux entreprises.

Nous démontrons également le rôle des dimensions constitutionnelles individuelles de la démocratie ainsi que l'impact des libertés civiles sur l'accès au crédit des entreprises. Les quatre composantes constitutionnelles de la démocratie (la compétitivité du recrutement des cadres, l'ouverture du recrutement des cadres, les contraintes sur les cadres et la compétitivité de la participation) sont importantes pour alléger les contraintes de crédit des entreprises. Néanmoins, l'ouverture du recrutement des cadres, qui reflète l'existence d'institutions et les procédures par lesquelles les citoyens peuvent participer au processus politique demeure la plus importante pour favoriser la capacité des entreprises à accéder au crédit. Les libertés civiles jouent également un rôle important : l'état de droit, les droits de propriété et la liberté de la presse ont tous un impact significatif sur la réduction des contraintes de crédit. Dans l'ensemble, nous montrons que la démocratisation améliore la faculté des entreprises à accéder au crédit.

Notre contribution à la littérature est double. Premièrement, nous contribuons au débat sur la relation entre démocratie et croissance économique en étudiant un canal microéconomique par lequel la démocratie peut être bénéfique pour le développement économique. Deuxièmement, nous élargissons le courant de la littérature qui examine les déterminants de l'accès au crédit pour les entreprises. Les études existantes ont identifié les effets concurrence bancaire, la participation des banques étrangères, le développement institutionnel, le genre, entre autres sur l'accès au crédit. Nous enrichissons la littérature en soulignant l'importance du développement démocratique ce dernier.

Le chapitre quatre se focalise sur les conséquences de la corruption sur l'efficacité des banques. La corruption, communément définie comme « l'abus d'une fonction publique à des fins privées » (Lambsdorff, 2007), est omniprésente dans le monde. Elle implique l'abus de fonctions publiques en se livrant à des pratiques impliquant les pots-de-vin, le détournement de fonds, l'évasion fiscale, la collusion, le copinage ou d'autres activités similaires à des fins d'intérêts privés.

Ces dernières années, les conséquences de la corruption sur les performances bancaires ont fait l'objet d'une attention renouvelée dans la littérature. Un premier volet de littérature soutient que la corruption peut entraver la propension des banques à allouer efficacement le capital aux utilisateurs les plus productifs. Ainsi, la corruption pourrait constituer un obstacle à la performance de la banque et diminuer son efficacité. Park (2012), par exemple, montre qu'une plus grande corruption exacerbe le problème des prêts improductifs dans le secteur bancaire tandis que Chen et al. (2015) indiquent que la corruption endémique augmente le comportement à risque des banques. Un second volet de littérature suggère que la corruption peut améliorer l'efficacité des banques car elle les incite à performer ou aide à contourner des réglementations complexes. Par exemple, Fungáčová, Kochanova et Weill (2015) constatent qu'une corruption élevée peut augmenter le taux d'endettement des banques, ce qui prouve que la corruption d'agents bancaires améliore la capacité des entreprises à accéder au crédit des banques. De même, Weill (2011) montre que la corruption peut améliorer le volume de prêts accordés, en particulier lorsque les banques sont averses au risque et réticentes à accorder des crédits.

Une question clé dans cette discussion est de savoir si la corruption affecte les coûts des banques. En effet, il a été empiriquement démontré que les niveaux élevés de corruption dans un pays rendent incertains les coûts d'exercices de l'activité pour les entreprises. L'objectif de ce document est de combler cette lacune en examinant l'impact de la corruption sur la capacité des banques à minimiser leurs coûts. Cette question est particulièrement importante étant donné le rôle important de la capacité des banques à opérer à des coûts minimes dans le développement économique. Il permet aux banques de subsister grâce à des taux d'intérêts sur les crédits plus bas et améliore encore la stabilité financière (Assaf et al., 2019 ; Shamshur et Weill, 2019).

D'un point de vue théorique, l'impact de la corruption sur les frais bancaires est ambigu. D'une part, les banques opérant dans des pays corrompus devraient avoir des coûts plus élevés pour deux raisons. Premièrement, des niveaux élevés de corruption dans un pays peuvent augmenter les coûts associés à la corruption. Dans un environnement corrompu, les banques peuvent encourir des coûts supplémentaires sous forme de pots-de-vin pour faire avancer les choses. Par exemple, pour obtenir les autorisations administratives nécessaires dans un pays corrompu, il faudrait négocier et verser des pots-de-vin aux agents publics. Une corruption accrue peut donc agir comme une taxe irrégulière qui augmente les coûts des banques.

Deuxièmement, une corruption excessive dans une économie peut conduire à une mauvaise affectation des fonds bancaires. En effet, des projets d'investissement productifs peuvent se retrouver évincés face à des projets moins efficaces et plus risqués dans un environnement corrompu, augmentant ainsi le montant des prêts bancaires improductifs (Goel et Hasan, 2011 ; Park, 2012). Par conséquent, la détérioration de la qualité des actifs pourrait inciter les banques à consacrer des efforts de gestion supplémentaires et à engager davantage de dépenses pour le recouvrement des prêts problématiques (Berger et DeYoung, 1997). L'augmentation des coûts d'exploitation due à l'administration des créances douteuses peut à son tour nuire à la capacité des banques à minimiser les coûts.

D'un autre côté, la corruption n'est pas toujours préjudiciable aux coûts des banques. La corruption peut aider à surmonter les distorsions créées par des institutions qui fonctionnent mal (Leff, 1964 ; Huntington, 1968). Il peut servir de coup de pouce pour accélérer le processus de prise de décision et améliorer l'efficacité de l'allocation des ressources. La corruption peut donc réduire les coûts si les pots-de-vin permettent aux banques d'éviter des frais et des coûts de temps importants, ou encore de financer les projets les plus productifs. Par exemple, Chen et al. (2013) constatent que la corruption renforce la propension des banques à accorder des prêts plus importants aux entreprises les plus productives. La corruption peut donc être une aide pour améliorer les coûts des banques.

Dans ce chapitre, nous apportons des éléments de réponse à cette question en examinant si la corruption affecte les coûts des banques. Nous adoptons l'approche de l'efficience pour mesurer les coûts bancaires. La rentabilité d'une banque mesure la capacité d'une banque à produire un certain niveau de rendement tout en minimisant les coûts. Elle

nous renseigne donc sur la performance de la banque en termes de minimisation des coûts par rapport à leurs homologues les plus efficaces au regard des coûts. Contrairement aux ratios comptables - à l'instar du ratio coût / revenu -l'utilisation de l'approche d'efficience pour mesurer la façon dont une banque minimise ses coûts offre l'avantage de prendre en compte simultanément tous les intrants et extrants d'une banque.

Pour examiner si la corruption influence la rentabilité des banques, nous effectuons une analyse transnationale en utilisant un large échantillon de 2257 banques commerciales dans 126 pays développés et en développement pour la période 2011-2018. Nous utilisons l'approche de la frontière stochastique (SFA) pour estimer l'efficacité des banques, une technique qui a été largement utilisée dans la littérature (Bonin, Hasan et Wachtel, 2005 ; Shamshur et Weill, 2019). Nous combinons les scores de rentabilité estimés avec les mesures de corruption de Transparency International, ainsi qu'un ensemble de variables de contrôle au niveau des banques et des pays pour étudier l'impact de la corruption sur l'efficacité des banques. En somme, nous évaluons si le lien entre la corruption et l'efficacité des banques peut varier en fonction de la taille de la banque et de la richesse d'un pays.

Nos résultats montrent que la corruption influence l'efficacité bancaire. Nous apportons des arguments soutenant un effet négatif d'une corruption accrue sur la rentabilité des banques. Nous constatons que cet effet négatif est linéaire : des niveaux de corruption trop faibles ou trop élevés ont des effets néfastes sur l'efficacité des banques. En somme, les résultats montrent que l'effet de la corruption sur l'efficacité des banques ne varie pas en fonction de la taille de la banque et du niveau de développement du pays en question. Dans l'ensemble, nos résultats suggèrent que la corruption constitue un obstacle à la faculté des banques à minimiser leurs coûts.

Ce chapitre contribue à la littérature actuelle dans deux domaines. Tout d'abord, elle contribue à la vaste littérature sur les déterminants de la rentabilité des banques en enquêtant sur le rôle de la corruption. Deuxièmement, nos travaux contribuent à une meilleure compréhension de la manière dont la corruption influence le secteur bancaire.

Les quatre premiers chapitres ont permis de construire une argumentation solide à propos des effets des institutions sur le système bancaire. A partir de ces premiers éléments,

j'ai choisi d'approfondir, dans le dernier chapitre, dans quelle mesure le développement financier facilite l'accès au crédit pour les entreprises, qui est un déterminant important de la croissance de celles-ci. Le dernier chapitre[43] examine donc l'effet de l'efficience bancaire sur la disponibilité du crédit pour les entreprises. L'accès au crédit est un facteur clé de la croissance économique. Les contraintes de crédit empêchent les entreprises de saisir des opportunités d'investissement attrayantes (Campello et al., 2010), limitent leur flexibilité dans l'allocation des ressources (Fafchamps, 1997) et entravent leur productivité. Ils réduisent par conséquent le développement des entreprises, en particulier pour les petites et moyennes entreprises (Beck et Demirgüc-Kunt, 2006).

Une grande partie de la littérature à ce propos a d'ores et déjà identifié les déterminants des contraintes de financement, incluant aussi bien des facteurs au niveau de l'entreprise comme la taille et la propriété étrangère que des facteurs au niveau des pays tels que le cadre institutionnel et les caractéristiques du marché bancaire. Parmi ces dernières, l'influence de la concurrence bancaire (Léon, 2015) sur l'accès au crédit a été mise en évidence. L'hypothèse sous-jacente est que ces caractéristiques du marché bancaire affectent le comportement des banques en termes d'octroi de prêts et par conséquent, exercent un impact sur l'accès au crédit.

Il paraît donc surprenant que l'influence de l'efficience des banques sur l'accès au crédit n'ait jamais été empiriquement considérée. La rentabilité des banques mesure la capacité d'une banque à opérer à un coût minimal en comparant sa structure de coûts à celle d'une banque observant les meilleures performances en termes de minimisation des coûts. Elle renseigne donc sur la faculté de la banque à produire avec les coûts les plus bas, et a été largement étudiée dans la littérature bancaire au cours des deux dernières décennies. Cette omission dans la littérature est surprenante car la théorie économique suggère qu'une plus grande capacité d'une banque à produire avec les coûts les plus bas devrait conduire à une baisse des prix bancaires, y compris des taux d'intérêts plus bas. Elle devrait alors réduire l'obstacle au financement engendré par des taux de crédit élevés et faciliter ainsi l'accès au crédit. On peut donc s'attendre à ce qu'une plus grande efficacité des banques favorise l'accès au crédit.

[43] Papier co-écrit avec Laurent Weill, en révision pour la revue Economic Systems.

Théoriquement, la justification de notre hypothèse repose sur deux mécanismes. Premièrement, l'efficacité des banques devrait réduire le coût du crédit, ce qui a été confirmé empiriquement par Shamshur et Weill (2019). En utilisant un échantillon transnational d'entreprises de pays européens, ils fournissent la preuve qu'une plus grande efficacité des banques diminue le coût du crédit au niveau de l'entreprise. Deuxièmement, les entreprises devraient être contraintes par des taux de prêt élevés, qui évincent une partie d'entre elles en termes d'accès au crédit. Ce fait a été confirmé par une série de travaux, soutenant l'idée que les taux d'intérêt élevés sont l'un des principaux obstacles au financement des entreprises (par exemple, Beck et al., 2006 ; Coluzzi, Ferrando et Martinez-Carrascal, 2015).

Ce chapitre vise à combler cette lacune de la littérature en examinant comment l'efficience des banques affecte l'accès au crédit. À cet effet, nous effectuons une analyse transnationale avec des données au niveau des entreprises sur l'accès au crédit et des données au niveau des banques pour calculer l'efficacité des banques. Nous utilisons des données au niveau de l'entreprise sur l'accès au crédit issues de l'Enquête auprès des entreprises de la Banque mondiale (WBES), qui fournit des informations uniques au niveau de l'entreprise sur l'accès au crédit pour un large échantillon transnational de pays et a été utilisée de manière similaire par Léon (2015). Nous utilisons les données bancaires provenant de la base de données Bank Focus pour estimer l'efficacité des banques avec l'approche de frontière stochastique couramment adoptée dans la littérature. Nous considérons donc un large échantillon d'environ 54 000 entreprises de 76 pays.

Dans nos premières estimations, nous examinons l'impact de l'efficience des banques sur l'accès au crédit. Nous sommes alors en mesure de répondre à la question clé de ce chapitre : une plus grande efficacité bancaire peut-elle contribuer à faciliter l'accès au crédit. En somme, nous identifions les canaux par lesquels l'efficacité des banques influe sur l'accès au crédit. Une plus grande efficacité bancaire peut favoriser l'accès au crédit à travers deux mécanismes différents : le canal de la demande et le canal de l'offre. D'une part, les banques plus efficaces peuvent appliquer des taux de crédit plus bas en raison de leurs coûts moins élevés. Cette situation soutient un niveau de demande de crédit plus élevée. Cette première hypothèse est conforme à la théorie économique selon lequel une baisse des coûts devrait favoriser une baisse des prix et donc un meilleur accès aux produits. D'autre part, les banques les plus efficaces peuvent accorder plus de prêts pour deux

raisons. Premièrement, leurs coûts moindres peuvent réduire le coût de l'octroi d'un prêt, augmentant ainsi l'offre de crédit. Deuxièmement, des banques plus efficaces peuvent être en mesure de surmonter les problèmes d'aléa moral et de sélection adverse associés à l'activité de prêt. En ce sens, les potentiels emprunteurs verraient leurs chances de refus amoindries, ce qui entraînerait une augmentation de l'offre de prêts.

Nous analysons enfin si la relation entre l'efficacité des banques et l'accès au crédit est conditionnelle à la taille de l'entreprise et à l'environnement macroéconomique. Étant donné que l'accès au crédit est principalement une préoccupation pour les petites entreprises, il est important de savoir si les petites entreprises bénéficient le plus des gains d'efficacité des banques. En outre, l'environnement macroéconomique peut affecter l'ampleur de l'impact de l'efficience des banques.

Nous constatons que l'efficacité des banques a un impact bénéfique sur l'accès au crédit en allégeant les contraintes de crédit des entreprises. Cet effet se produit par le biais du canal de la demande : lorsque l'efficience des banques est plus élevée, le découragement des emprunteurs est réduit et davantage d'entreprises demandent un prêt. Nous n'observons aucun effet significatif de l'efficacité des banques concernant leur offre de crédit. Signalons enfin que l'effet bénéfique de l'efficience des banques sur l'accès au crédit est observé pour toutes les entreprises quelle que soit leur taille et tend à être plus prononcé dans les pays disposant d'un meilleur cadre institutionnel et économique.

Ce chapitre contribue à trois courants différents de la littérature. Premièrement, nous contribuons au corps de littérature sur le lien finance-croissance. Ce courant de littérature a examiné comment les marchés financiers peuvent affecter le développement économique (Levine, 2005 ; Popov, 2018). Notre étude explore un nouveau canal par lequel les banques peuvent influer sur la croissance économique en allégeant les contraintes de crédit pour les entreprises. Deuxièmement, ce chapitre s'inscrit dans la littérature sur les déterminants de l'accès au crédit. Troisièmement, nous enrichissons la littérature sur les conséquences de l'efficience des banques. Une poignée d'articles seulement a examiné les conséquences de l'efficacité des banques, notamment sur la stabilité financière (Assaf et al., 2019), la croissance économique (Hasan, Koetter et Wedow, 2009) et le coût du crédit (Shamshur et Weill, 2019). Nous complétons cette littérature en fournissant des preuves sur la manière dont l'efficacité des banques affecte l'accès au crédit.

Pour conclure, cette thèse a permis d'élucider le rôle des institutions dans le domaine bancaire. Elle permet de mieux comprendre comment le cadre institutionnel d'un pays - composé de règles formelles et informelles - façonne le comportement des banques. Les différents chapitres de ce travail aident à expliquer les mécanismes spécifiques par lesquels des aspects des institutions formelles et informelles influencent le comportement des banques et le développement financier en général.

Tout d'abord, le premier chapitre montre comment la langue influence le comportement de prise de risque des banques. Nous concentrons notamment une caractéristique linguistique : le marquage du futur. Nos résultats montrent qu'en effet, la langue contribue à expliquer les différences entre les pays en termes de prise de risque bancaire. Nous constatons que, dans les pays où la langue marque grammaticalement l'avenir, les banques prennent plus de risques. De plus, nous constatons que le marquage du futur est associé à une plus grande occurrence de crises bancaires.

Le deuxième chapitre étudie l'impact de la langue sur l'inclusion financière. Notre étude examine la présence d'un marquage de genre dans une langue. Nous montrons que cette caractéristique linguistique influence la formation de croyances, affectant l'inclusion financière des femmes. En particulier, nous constatons que le marquage du genre dans la langue exerce un impact sur l'écart entre les sexes dans la probabilité de posséder un compte formel, d'avoir accès à un crédit formel, ainsi que d'avoir des économies dans une institution financière formelle. Ainsi, le marquage du genre dans la langue contribue à expliquer l'écart entre les sexes en matière d'inclusion financière.

Le troisième chapitre évalue le rôle du développement démocratique dans l'atténuation des contraintes de financement des entreprises. Nous montrons que le développement démocratique, caractérisé par des institutions plus efficaces et une protection accrue des libertés civiles, permet un accès au crédit plus important pour les entreprises. En outre, nous montrons que le développement démocratique favorise l'accès au crédit en contribuant à réduire le découragement des emprunteurs et les décisions de rejet de prêts bancaires.

Le chapitre quatre se focalise sur les conséquences de la corruption sur l'efficacité des banques. Nos résultats montrent que dans les pays où la corruption est endémique, les banques sont moins efficaces pour minimiser leurs coûts. Cet effet négatif de la corruption sur la rentabilité ne varie pas en fonction de la taille de la banque et du niveau de développement d'un pays. Ce constat met en évidence l'effet néfaste d'une plus grande corruption sur la performance des banques en termes d'avantages de coûts.

Le cinquième chapitre examine l'effet de l'efficience bancaire sur la disponibilité du crédit pour les entreprises. Nous montrons qu'une plus grande capacité d'une banque à produire avec les coûts les plus bas améliore l'accès au crédit pour les entreprises. Nous constatons également que l'effet bénéfique de l'efficacité des banques pour atténuer les contraintes de crédit se fait par le canal de la demande en réduisant le découragement des emprunteurs.

Dans l'ensemble, le message clé de cette thèse est que les institutions jouent un rôle important dans le développent financier. Les institutions formelles et informelles influencent le développement financier en façonnant les croyances qui influencent la perception et le comportement des agents économiques et en établissant la structure des incitations.

Cette thèse suggère des implications politiques importantes. Compte tenu du rôle primordial des institutions, des mesures politiques qui renforcent le cadre institutionnel devraient être mises en œuvre pour favoriser le développement financier. En outre, nous montrons que la prévalence des institutions faibles dans les marchés en développement et émergents explique leur faible niveau de développement financier. Des mesures politiques en faveur de la qualité institutionnelle seraient payantes en termes d'amélioration du développement financier. En outre, l'influence exercée par la langue sur l'écart entre les sexes en matière d'inclusion financière, les réformes politiques qui favorisent l'inclusion financière des femmes devraient se concentrer sur les pays où les langues sont sexospécifiques.

Il reste des pistes potentielles pour de futures recherches. Cette thèse se concentre uniquement sur la finance et certains aspects des institutions. Compte tenu de la définition étendue des institutions, des recherches supplémentaires sont nécessaires afin d'identifier

les mécanismes spécifiques par lesquels d'autres caractéristiques institutionnelles influencent le développement financier. Par exemple, le lien culture-finance a été peu étudié et, par conséquent, une attention particulière devrait être consacrée à l'identification des canaux par lesquels la culture a un impact sur le financement.

Je propose également une feuille de route pour les futurs travaux de recherche présentés dans les trois premiers chapitres de cette thèse. Premièrement, deux caractéristiques linguistiques sont examinées dans les deux premiers chapitres : la référence au futur et le marquage du genre. Les recherches futures devraient identifier d'autres canaux économiques par lesquels ces caractéristiques linguistiques peuvent influer sur la prise de décision. D'autres caractéristiques linguistiques susceptibles d'affecter le développement financier restent également une piste plausible pour des recherches ultérieures. Deuxièmement, le premier chapitre documente que le langage contribue à expliquer le comportement de prise de risque des banques. Davantage de connaissances sont nécessaires pour comprendre les canaux par lesquels cet effet se produit. Par exemple, nous pourrions observer un changement dans le comportement de prise de risque des banques lorsque les directeurs de banque avec un langage FTR fort en remplacent d'autres utilisant un langage FTR faible et inversement. Les recherches futures pourraient considérer l'influence des changements de PDG sur le risque bancaire sous l'angle du langage du PDG. Troisièmement, notre étude au chapitre trois montre que le développement démocratique facilite l’accès au crédit des entreprises. Le développement démocratique exerce-t-il une influence sur le type de crédit, par exemple en favorisant davantage de crédit aux entreprises innovantes ? Un éventuel travail futur pourrait se concentrer sur cette ligne de recherche.

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Essays on Banking and Institutions

Résumé

Cette thèse examine le lien entre les institutions et la banque. Elle contribue à une meilleure compréhension de la manière dont les institutions formelles et informelles façonnent le comportement des banques. Le premier chapitre étudie l'impact du marquage du futur du langage sur la prise de risque bancaire. Les langages qui marquent grammaticalement l'avenir conduisent les banques à prendre plus de risque. Le chapitre deux étudie comment le marquage du genre dans la langue affecte l'inclusion financière. La présence du marquage de genre dans la langue explique l'écart entre les sexes dans la probabilité de posséder un compte formel, d'avoir accès à un crédit formel, ainsi que d'avoir une épargne dans une institution financière formelle. Le chapitre trois explore l'influence du développement démocratique sur l'accès au crédit pour les entreprises. La démocratie contribue à alléger les contraintes de financement des entreprises. Le quatrième chapitre examine les conséquences de la corruption sur l'efficacité des banques. Les banques opérant dans des pays à forte corruption sont moins efficaces. Le chapitre cinq examine l'effet de l'efficacité des banques sur l'accès au crédit des entreprises. Une plus grande efficacité bancaire améliore l'accès au crédit pour les entreprises. Dans l'ensemble, cette thèse met en évidence le rôle important des institutions pour le développement financier.

Mots clés : Banques ; Contraintes de financement ; Efficience de coût ; Inclusion financière ; Institutions formelles ; Institutions informelles

Summary

This dissertation examines the link between institutions and banking. It contributes to a better understanding of how formal and informal institutions shape bank behavior. The first chapter studies the impact of language future tense marking on bank risk taking. Languages that grammatically mark the future lead banks to take higher risk. Chapter two studies how gender marking in language affects financial inclusion. The presence of gender marking in language explains the gender gap in the probability of owning a formal account, having access to a formal credit, as well as having savings in a formal financial institution. Chapter three explores the influence of democratic development on access to credit for firms. Democracy contributes to alleviate firms' financing constraints. The fourth chapter examines the consequences of corruption on bank efficiency. Banks operating in countries with high corruption are less efficient. Chapter five explores the effect of bank efficiency on firms' access to credit. Greater bank efficiency improves access to credit for firms. Overall, this dissertation highlights the important role of institutions for financial development.

Keywords: Banking; Financing constraints; Cost efficiency; Financial inclusion; Formal institutions; Informal institutions