

Sommer, Christoph

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The role of capital markets for small and medium-sized enterprise (SME) finance

Christoph Sommer (Heidelberg University and German Institute of Development and Sustainability (IDOS)): christoph.sommer@idos-research.de

SMEs play a crucial role for inclusive development, but their growth is often hampered by lacking access to finance. This paper explores whether capital markets can be harnessed to foster SME finance. Given the negligible usage of market-based financing by SMEs, it is analyzed to what extent capital market development indirectly alleviates SMEs' financing constraints by improving their access to loans. Thus, the study builds on the theoretical model by Song and Thakor (2010), which consolidated the view that markets and banks are complementary and co-evolve. Using a modification of the analysis framework by Rajan and Zingales (1998) for 68,712 firm-level observations from 50 mostly low- and middle-income countries for 2006-2019, it empirically investigates the central prediction of Song and Thakor (2010) that capital market development is associated with an increase in bank lending, in particular, towards smaller and riskier firms. I find a positive and significant effect; in support of Song and Thakor (2010), the effect runs through increased capital market usage by financial institutions and expanded loan availability. The findings underline that markets and banks co-evolve and that the most important contribution of capital markets to SME finance is their indirect effect on bank lending and loan availability.

Keywords: financial sector development; capital markets; banks; small and medium enterprises; access to finance

JEL classification: G10, G21, G30, O16

1. Introduction

Small and medium-sized enterprises (SMEs) are essential for inclusive economic development. The vast majority of firms in low- and middle-income countries classifies as SMEs. They provide at least 50 percent of the *formal* jobs and play an important role in employment creation (Ayyagari et al., 2014). Their true significance, however, is underrated by such figures as SMEs provide livelihoods for many more semi-formal and informal workers. In addition, SMEs advance the diversification and decentralization of economic activities as they operate in and move into diverse geographic areas and economic sectors (Disse & Sommer, 2020). Consequently, SMEs make development more inclusive and contribute to economic growth and poverty reduction (Beck et al., 2005). However, the growth and development of many SMEs is hampered by constrained access to finance, which particularly affects younger and smaller firms (Beck et al., 2008). In the World Bank's Enterprise Surveys, SME managers have ranked access to finance as the biggest obstacle to business operations, and reports by the World Bank estimate – depending on the methodology – that an additional 2.6 trillion USD (corresponding to 36% of outstanding SME loans) (Stein et al., 2013) to 5.2 trillion USD (140%) (Bruhn et al., 2017) would be needed to meet the financing needs of SMEs in low- and middle-income countries (LMICs). In the face of this large unmet demand for finance, it seems obvious to consider financing sources beyond the banking sector, which is still the most important provider of formal external finance for SMEs; for instance, harnessing capital markets (i.e. markets for publicly traded equity and privately traded equity as well as market-based debt instruments such as bonds), that move massive volumes of finance.

This paper attempts to assess the role of capital markets for SME finance. Acknowledging existing evidence that SMEs' direct access to external finance through capital markets is very limited or even negligible – especially in LMICs (see Section 2.2), I examine to what extent capital market development *indirectly* alleviates SMEs' financing constraints by improving

their access to loans. Thus, this paper empirically investigates a central prediction of the theoretical model by Song and Thakor (2010) on the complementarity and co-evolution of capital markets and the banking sector, namely that capital market development is associated with an increase in bank lending, in particular, towards smaller and riskier firms. An adaptation of the cross-industry cross-country model designed by Léon (2020) is employed using 68,712 firm-level observations from 50 mostly LMICs for the period 2006 to 2019. It is a modification of the seminal analysis framework by Rajan and Zingales (1998) that has been used widely to mitigate endogeneity issues. Intra-country variation resulting from differences in the external financial dependence across sectors (due to differences in technologies and associated capital intensities) allows to identify whether small firms in sectors that are more dependent on external finance are relatively less financially constrained (with regard to credit access) in countries with better developed capital markets. I find a positive and significant effect of capital market development on firms' financial situation indicating that smaller firms are more likely to have sufficient access to loans if they are located in countries with more developed capital markets. These results are robust to changes on various dimensions including instrumental variable (IV) approaches that account for potential endogeneity issues, in particular reverse causality concerns (due to interrelations between the banking sector and capital markets). Lastly, the analysis provides additional evidence that the indirect, positive effect of capital market development on firms' access to loans runs – in line with the theoretical literature on the complementarity and co-evolution of markets and banks (Song & Thakor, 2010) – through the increased usage of capital market instruments by financial institutions and expanded availability of bank loans.

This study contributes to various strands of literature. First, it adds to the literature on the role of capital markets for SMEs. Especially after the global financial crisis 2007-08 and the ensuing contraction of bank lending, capital market financing has received a lot of attention. Institutions with a development mandate such as the World Bank or OECD have explored the challenges

and potential of publicly traded equity for SMEs (e.g. Harwood & Konidaris, 2015; Nassr & Wehinger, 2016). Most studies on this topic are of descriptive nature, for instance on stock exchanges specifically dedicated to SMEs (e.g. Disse & Sommer, 2020; Schellhase & Woodsome, 2017). One notable exception being the work of Bongini et al. (2021) on European SMEs that – due to the very limited usage of market-based instruments by SMEs – analyzes SMEs’ potential fit for such financing options. Overview studies aspiring to paint a full picture of the SME financing landscape attest publicly traded equity only a very limited or even negligible role for SMEs, especially in LMICs (e.g. Ayyagari et al., 2017; Quartey et al., 2017). Privately traded shares such as private equity (PE) and venture capital (VC) are considered to be more suitable market-based financing instruments for SMEs despite the fact that they are still nascent and in its early stages (e.g. Ayyagari et al., 2017; Thompson et al., 2018). Even though studies on SMEs and market-based finance generally point out that the primary contribution of capital markets to SME finance are services to (SME-lending) financial institutions that enable them to improve their funding structure and risk management with subsequent positive effects on their lending activities and ability to serve riskier borrowers (e.g. Thompson et al., 2018; World Bank, 2020), this indirect channel has never been investigated empirically. This is the first study to explore to what extent SMEs benefit from positive effects of capital market development on banking activities and loan availability, and thus helps to improve our understanding of the role of capital markets for SME finance.

Furthermore, this paper contributes to the literature on the relationship between capital markets and the banking sector. Despite some (earlier) work on the competition between markets and banks, most scholars see markets and banks as complementary and co-evolving (see Section 2.3). Song and Thakor (2010) have articulated particularly well how the respective comparative advantages of banks (screening and monitoring) and markets (providing liquidity and cost-effective financing) are exploited in various financial instruments that create benefit flows from banks to markets (e.g. securitization) and from markets to banks (e.g. bank equity capital) and

thus foster complementarity and co-evolution. Empirical studies, indeed, find evidence for different roles of banks and markets (Levine & Zervos, 1998) and for their complementarity in LMICs in cross-country settings (Demirgüç-Kunt & Maksimovic, 1996) as well as respective country-specific evidence, for instance, for Malaysia (Toh et al., 2019), Nigeria (Arize et al., 2018) and the US (Chatterjee, 2015). My paper provides further evidence for the complementarity, on the one hand, explicitly by showing that Granger causality runs from capital market development to depth in the banking sector and vice versa, and, on the other hand, implicitly by linking capital market development to firms' improved access to bank loans in a cross-country analysis.

Closely related, I provide empirical evidence for a central prediction of the theoretical model by Song and Thakor (2010). Their work played a crucial role in the literature to consolidate the view that markets and banks are complementary and co-evolve. The propositions on respective comparative advantages of banks and markets, and on financial instruments with mutual benefit flows, which were introduced in the previous paragraph, form the theoretical underpinning of their model. They are the pivotal model features that improved upon the existing literature on the relationship between markets and banks and that give rise to the main finding on the complementarity and co-evolution of markets and banks. One of the central implications of their analysis is the prediction that capital market development is associated with an increase in bank lending, in particular, towards smaller and riskier firms. Song and Thakor (2010) themselves state that they 'are not aware of any existing empirical evidence on this prediction, but believe it is testable'. To the best of my knowledge, this prediction has not been tested since, such that this paper is the first to produce empirical evidence in support of their model prediction.

The rest of the paper is structured as follows. Section 2 reviews the literature focusing on the role of capital markets for corporate finance in general and for SMEs in particular as well as on

the indirect channel through which capital market development may improve firms' access to loans. Section 3 discusses the methodological approach and the regression model before Section 4 introduces the data. Section 5 presents the results along with robustness checks, while Section 6 takes a closer look at the indirect channel empirically. Section 7 summarizes and concludes.

2. Background

2.1. Capital market development and potential benefits for corporate finance

Capital market development has been shown to foster economic growth (e.g. Demirgüç-Kunt et al., 2013). At least two features are central therein. First, capital markets allow for tailored financial arrangements providing long-term finance to projects with diverse risk profiles, such that capital markets create liquidity and risk sharing opportunities (e.g. Demirgüç-Kunt et al., 2013; Disse & Sommer, 2020). Second, they exhibit significantly less cyclicalities than bank financing. Thus, economies with deeper capital markets are less affected by business cycles, i.e. contract less in the face of economic downturns and financial crises and bounce back faster (Gambacorta et al., 2014; Langfield & Pagano, 2016).

De la Torre et al. (2007) identified three fundamentals in the literature that affect the development of capital markets: country income levels (deeper markets in richer countries), quality of laws and the legal system (protection of (minority) investors' rights), as well as macroeconomic stability. Over the last two decades, domestic capital markets have gained importance in many LMICs. Earlier studies observed that issuance in international markets used to exceed domestic activities in LMICs in the period from 1975 to 2004 (De la Torre et al., 2007). Yet the depth of domestic stock markets in LMICs captured by the ratio of market capitalization to GDP increased from 39 percent in 2004 to 79 percent in 2020 (in high-income countries from 98% to 169%) according to World Bank's Global Financial Development

Database (GFDD).¹ So most of the capital is now raised in domestic markets: In East Asia with particularly strong capital market development, 97 percent of the capital was raised in domestic markets between 2008 and 2016, while the respective figure for emerging countries in other regions amounts to 94 percent (Abraham et al., 2019).

Firms can benefit in various ways from capital market financing as depicted by Disse and Sommer (2020). Most importantly, they can acquire long-term finance without repayment obligations by selling a defined share of ownership (i.e. stocks), which, in addition, allows them to transfer entrepreneurial risk to investors. Innovative firms, start-ups, firms with high growth potential and other enterprises with new, unproven business models and/or limited collateral and financial track record may struggle to borrow from banks and thus depend on risk financing through markets. Moreover, capital market finance may be more cost-effective for certain firms; lastly, it increases firms' visibility and (financial) transparency with positive effects on creditworthiness and debt financing options.

2.2. SMEs' direct access to capital market financing

SMEs' direct access to market-based financing can take the form of equity financing, which is mainly done through publicly traded shares in stock exchanges or privately traded shares such as private equity (PE) or venture capital (VC),² or market-based debt financing through bond issuance³. In general, SMEs are more dependent on bank loans. Their financing sources are less

¹ Even though there is great heterogeneity across regions (East Asia and Pacific exhibiting by far the fastest growth), domestic capital markets in LMICs exhibit similar positive trends in all regions.

² More recently, alternative equity financing options such as equity crowdfunding have been launched. However, the raised amounts are still very small.

³ There are other market-based debt instruments (e.g. instruments leveraging receivables or loans), but their contributions are still very small.

diversified since asymmetric information, agency risks, and limited collateral and financial track records constrain their access to the full menu of financing instruments (e.g. Bongini et al., 2021). Direct costs (e.g. fees, advisory expenses, brokers' commissions) and indirect costs (e.g. meeting pre-listing and reporting requirements) render market-based finance less cost-effective for raising smaller amounts. Furthermore, several SMEs object the dilution of ownership associated with equity finance or do not have the 'adequate level of institutionalisation to cope with the reporting and corporate governance requirements' (Disse & Sommer, 2020). All of these factors stifle the number of listed firms and the value of issued shares and bonds, especially among SMEs. Yet challenges also extend to the demand side, as investors are restrained by more pronounced problems of imperfect information (as SMEs are more opaque) and poor liquidity in the market that undermines exit options and thus makes purchases of SME shares less attractive (Disse & Sommer, 2020).

Consequently, SMEs rarely use market-based financing. For the first decade in the 2000s, Didier et al. (2014) find for a sample of 51 countries that 'only a few of the largest firms issue securities in the median country' and that this holds for the vast majority of countries. In the second decade of the 21st century, the average size of issuing firms has even increased in emerging economies and high-income countries outside East Asia (Abraham et al., 2019). SMEs' lack of market-based financing has been documented across economies of different income levels, e.g. for West African (Quartey et al., 2017) and European countries (Bongini et al., 2021). This situation has persisted despite the launch of dedicated SME stock exchanges with lighter pre-listing and admission requirements as most SME exchanges are characterized by restricted market capitalization and liquidity (Bongini et al., 2021; Disse & Sommer, 2020). Relative figures on the market capitalization of listed SMEs (and on SME loans) for country-year couples from the sample used in this paper are presented in Figure 1 (due to data availability only 19-41 out of 86 country-year couples are included). They buttress the above stylized facts: SMEs are much more dependent on bank loans (yellow boxplot), while SMEs'

publicly traded stocks account for negligible shares of SME finance (blue boxplot) or external finance (red boxplot) in most countries (with the median country at 0%, and the country at the 75 percentile (well) below 5%).⁴

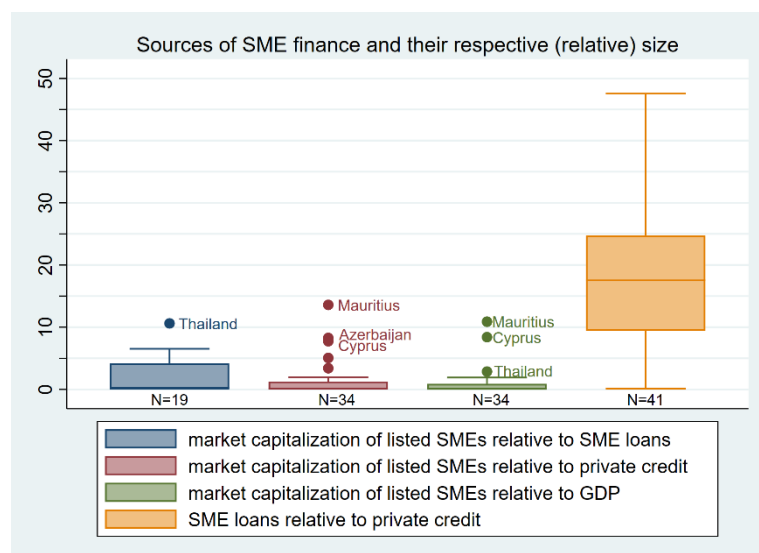


Figure 1. Relative size of different sources of SME finance.

Source: Author's visualization and calculation based on data from the World Federation of Exchanges (SME' market capitalization), IMF's Financial Access Survey (SME loans) and World Bank's World Development Indicators (private credit and GDP).

Market-based debt instruments such as bonds are even less suited for SMEs. Bond-issuing firms are even larger than those using equity finance (Didier et al., 2014) and bond markets, in general, are found to be underdeveloped in LMICs (Didier et al., 2021).

Privately traded equity such as PE and VC capital has often been described as one of the most promising market-based financing instruments for SMEs (e.g. Ayyagari et al., 2017; Thompson et al., 2018). Its contribution to SME finance, however, is still very limited in most countries (see Figure A1 in the Appendix for VC availability across the world). Even in countries with vibrant risk-financing markets such as the USA, hypothetical back-of-the-envelope calculations suggest that until 2013 only 0.2 percent of the *newly founded* firms would have received such finance if it had been targeted solely at these new firms (Kaplan & Lerner, 2016). To account

⁴ Notable exceptions are Thailand and Mauritius with double-digit figures and Cyprus (slightly below 10 percent). Azerbaijan only comes close to 10% in the red boxplot since private credit figures (used as denominator) are small.

for more recent developments, Figure 2 presents PE and VC data from 2010 to 2020 for four countries with publicly available data (figures comprise PE and VC of all firms, not just SMEs). In countries with vibrant and fast-growing capital markets such as China and South Korea, PE and VC increased substantially. Despite this growth, however, assets under management amounted to a modest 6 percent relative to GDP or 5 to 6 percent relative to stock market capitalization in 2020, which underscores the marginal role of privately traded equity. In other LMICs, the situation is even bleaker as PE and VC stagnated at around 1 percent relative to GDP in spite of reasonable (Mexico) or good (India) stock market performance during that period.

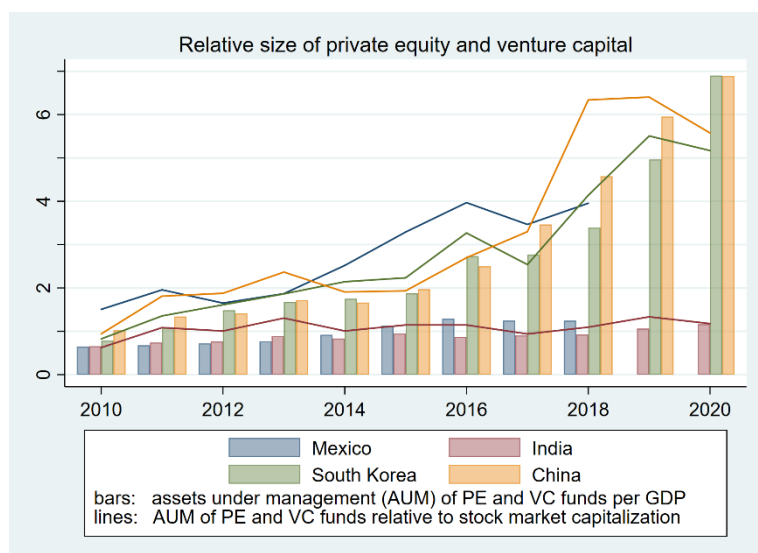


Figure 2. Relative size of PE and VC (captured by assets under management of PE and VC funds).

Source: Author's visualization and calculation based on data from Preqin (PE and VC figures from publicly available country reports) as well as World Bank's World Development Indicators (GDP) and Global Financial Development Database (stock market capitalization).

2.3. SMEs' indirect access to capital market funding: capital markets and banks

Even though SMEs hardly acquire external finance through capital markets *directly*, capital market development may *indirectly* improve SMEs' access to finance by increasing the availability of bank loans. This indirect channel builds on the assumption that capital markets and the banking sector complement each other and co-evolve. There is an extensive literature

that jointly looks at capital markets and the banking sector. The larger strand of this literature focuses on financial system development and its effect on economic growth. Financial development is found to foster growth irrespective of the structure of the financial system (bank-based versus market-based) (e.g. Arestis et al., 2001; Beck & Levine, 2002; Levine, 2002). More recent literature argues that the relationship is more complex and that capital markets become more important with the economy's level of development (e.g. Demirgüç-Kunt et al., 2013).

A smaller strand of this literature directly explores the relationship between capital markets and the banking sector. Even though more recent theoretical and empirical work solidified the view that markets and banks complement each other and co-evolve, a few scholars have argued that markets and banks compete (an overview of this view is provided in the Appendix). Given the thin and (partially) contradictory empirical evidence on the competition between markets and banks, this paper adopts the more common notion of complementarity and co-evolution.

The notion of co-evolution builds on the idea of different, complementing roles of capital markets and banks. Banks are described as having comparative advantages with regard to screening, monitoring and other information-related activities; whereas markets are relatively better at providing liquidity and access to a broad base of investors, which allows for cost-effective financing since some investors may value the project surplus similarly to the firm seeking finance (Song & Thakor, 2010). Song and Thakor (2010) emphasize that several financial instruments feature the respective comparative advantages and create interactions between banks and markets associated with benefit flows from banks to markets (e.g. securitization) and from markets to banks (e.g. bank equity capital), which results in complementarity and co-evolution. Well-functioning capital markets provide relatively inexpensive equity finance for banks (bank equity capital), which enables banks to improve their funding structures and to expand lending activities towards previously unserved firms and

households (Song & Thakor, 2010); this includes riskier borrowers such as SMEs as banks can meet higher capital requirements. Securitization also leverages banks' and markets' respective strengths: Banks assess creditworthiness, grant and monitor credits (i.e. engage in information-related activities) and, in a second step, sell them off in the market (i.e. markets provide liquidity) (Song & Thakor, 2010). Hence, banks can use asset-backed securities instead of deposits to fund such lending activities and thus further expand lending. There are other interactions between banks and markets as well. Capital markets provide information on listed firms applying for loans and thus facilitate banks' screening and monitoring (Disse & Sommer, 2020). Liquid capital markets further increase demand for and supply of banks' off-balance-sheet credit commitments through which banks guarantee liquidity on demand; firms may use such financial products as backup if issuance in the market created insufficient funds (Toh et al., 2019). The complementarity of banks and markets is underscored by a broad base of empirical evidence. It ranges from stylized facts on joint growth of capital markets and banking sectors in the US, the United Kingdom, Germany and Japan between 1960 and 2003 (Song & Thakor, 2010) over cross-country evidence on different roles of banks and markets (Levine & Zervos, 1998) and their complementarity in LMICs (Demirgüç-Kunt & Maksimovic, 1996) to country-specific evidence, for instance, for Malaysia (Toh et al., 2019), Nigeria (Arize et al., 2018) and the US (Chatterjee, 2015).

3. Empirical approach

I adapt Léon's (2020) extension of the influential cross-industry cross-country model of Rajan and Zingales (1998) to firm-level data, to explore whether capital markets alleviate SMEs' financing constraints. This question is not trivial since SMEs' direct access to external finance through capital markets is negligible as depicted in Section 2; nevertheless, SMEs may benefit indirectly as (SME) lenders use capital markets to improve their funding structure and expand their financing activities, which in turn may increase SMEs' access to loans. Before introducing

the adaptation of Léon's model, I take a closer look at this indirect channel, its implicit assumptions and potential reverse causality issues.

3.1. Underlying channel: Co-evolution of markets and banks

Two conditions have to be met such that capital market development can alleviate firms' financing constraints (in the absence of direct access to external finance through capital markets). First, markets and banks co-evolve such that capital market development goes hand in hand with increases in banking activities and lending. Second, the expansion of the loan portfolio results in firms' improved access to loans.

To examine the validity of the first condition, I use panel vector autoregression (VAR) analyses for varying numbers of lags of stock market capitalization and private credit and subsequently run Granger causality tests. Since the Im-Pesaran-Shin test signals non-stationarity, growth rates of the two variables are employed to mitigate unit root issues (Abrigo & Love, 2016). Both the hypothesis that stock market capitalization does *not* Granger cause private credit and the hypothesis for *no* Granger causality in the other direction are strongly rejected for the countries in my sample.⁵ The results are not sensitive to the number of included lags (1-8 lags have been used) nor to outliers, and constitute additional evidence for the complementarity and co-evolution of capital markets and banks.

It has to be noted that the complementarity and co-evolution of markets and banks could create some reverse causality issues. Even though this paper is interested in the effects of capital market development on credit (or rather subsequent effects on firms' financing constraints), the

⁵ Due to data availability, I can only include between 38 (for 8 lags) and 48 countries (for 1 lag) of the 50 countries from the main analysis. For those countries, panel VAR and Granger causality tests are undertaken for the period 1998-2020 so that even for the maximum number of lags (8), all the years from my sample (2006-2019) are included.

co-evolution theoretically implies an entanglement of capital and credit markets such that effects should run in both directions, i.e. also from credit market development to capital markets. However, as depicted in Figure A2 in the Appendix, financial instruments that create benefit flows from markets to banks (e.g. bank equity capital) are much more important in my sample with mostly LMICs, whereas instruments that create benefit flows from banks to markets (e.g. securitization) play a very limited role. This is further buttressed by regression outcomes: Disentangling capital market usage by financial institutions (employed in the analysis in the second half of Section 5.1) into ‘securities’ (securitization proxy) and ‘shares and other equity’ (equity proxy), results in significant effects for the equity proxy and insignificant effects for the securitization proxy. Hence, effects should mainly run from capital markets to credit activities in my sample with mostly LMICs and not the other way round,⁶ which supports the validity of the line of investigation in this paper and mitigates reverse causality concerns. Despite this promising evidence, I have additionally employed instrumental variables as robustness check (see Section 5.2).

The second condition that deeper credit markets result in firms’ improved access to loans is assessed by using private credit instead of market capitalization as key explanatory variable in the model introduced below. Results presented in Table A1 in the Appendix indicate that larger credit portfolios significantly alleviate financing constraints of (smaller) firms. Taken together, these findings – in line with the theoretical work by Song and Thakor (2010) – support the notion that capital market development improves firms’ financing situation indirectly through positive spillovers on the banking sector and banks’ lending activities.

⁶ This is further supported by evidence from panel VAR and subsequent Granger causality tests: In my sample, capital market usage by financial institutions Granger causes private credit, but private credit does not Granger cause capital market usage by financial institutions.

3.2. Regression model

To assess the central prediction of the model by Song and Thakor (2010) that capital markets indirectly alleviate SMEs' financing constraints by improving SMEs' access to bank loans, I employ firm-level data with pooled (repeated) cross sections from the World Bank Enterprise Surveys in a cross-industry cross-country model that is an adaptation of the seminal model by Rajan and Zingales (1998). The paper uses an extension of this model to firm-level data that has been put forth by Léon (2020) who built on the approach by Fafchamps and Schündeln (2013) and applied it to a multi-country context. The underlying seminal analysis framework by Rajan and Zingales (1998) has been used widely in the field of economics to causally link financial development to economic growth. It does so by assuming that the effect of financial development on economic growth runs through firms' improved access to external finance, which allows firms to take advantage of growth opportunities and subsequently fosters economic growth. This paper does not need such an assumption as it is interested in the impact on this intermediate variable, i.e. whether capital market development improves SMEs' access to external finance.

In the spirit of Rajan and Zingales (1998), the model addresses potential endogeneity issues, for instance because of omitted variables, by controlling for time-invariant sector and country characteristics. Sector and country fixed effects can be included since the approach exploits intra-country variation between firms from different sectors (in the same country) that exhibit different credit needs since economic sectors vary in capital intensity and thus in dependence on external finance. Hence, the framework of Rajan and Zingales (1998) is used to analyze whether SMEs in sectors that are more dependent on external finance are relatively less financially constrained in countries with better developed capital markets. The econometric specification follows Léon (2020) who tailored the country-level model of Rajan and Zingales (1998) to be applicable to firm-level data:

$$y_{isc} = \beta(D_{sc} \cdot F_c) + \eta(D_{sc} \cdot Z_c) + \Gamma X_{isc} + \delta D_{sc} + \alpha_s + \alpha_c + \varepsilon_{isc}$$

The dependent variable y_{isc} is a dummy variable that is one if firm i in sector s and country c is financially unconstrained and zero otherwise.⁷ It is consciously constructed around the concept of sufficient access to bank loans (see Section 4 for details) to only capture the indirect effect of capital market development from increases in bank lending. Main interest lies in β , the net effect of capital market development. As in Rajan and Zingales (1998), it is the coefficient of the interaction between the dependence on external finance (D_{sc}) and financial development (F_c). In my analysis, the financial development variable F_c captures capital market development in country c and is measured by the ratio of stock market capitalization to GDP.⁸ The index for dependence on external finance D_{sc} is the key element in the framework of Rajan and Zingales (1998). The interaction effect ($D_{sc} \cdot F_c$) reflects their central idea that well-developed capital markets should have a greater effect (on firms' financial constraints) for firms that are more dependent on external finance.

As in Rajan and Zingales (1998), D is an index for dependence on external finance. Yet in contrast to their simplification of using the values from the US sectors as benchmarks, I follow Fafchamps and Schündeln (2013) and Léon (2020) to compute (sector-country-specific) D_{sc}

⁷ A linear model is employed since non-linear specifications such as the probit model may suffer from incidental parameter issues due to the inclusion of many dummies. Nevertheless, it was confirmed that all findings are robust to using probit specifications.

⁸ Rajan and Zingales (1998) captured financial development F_c by the sum of domestic credit per GDP and stock market capitalization per GDP. I cannot include credit per GDP since the effect of interest, i.e. the indirect effect of capital market development, is hypothesized to run through the credit variable. (Recall that the dependent variable in this paper measures whether firms are financially unconstrained with regard to access to bank loans, whereas Rajan and Zingales (1998) looked at growth in value added.)

based on large firms.⁹ This assumes that large firms are less likely to be financially constrained such that their usage of external finance reflects well the financing needs of firms in sector s and country c . Computation of specific measures D_{sc} for each sector-country(-year) couple has been introduced by Léon (2020) to account for the multi-country setting: The same sectors in economically and geographically diverse countries are likely to differ in their usage/need of external finance (e.g. due to different production technologies and capital intensities), which necessitates specific measures D_{sc} for the same sector in different countries (and thus improves upon the original approach by Rajan and Zingales (1998)).

The specification includes fixed effects for sector (α_s) and country (α_c) to control for time-invariant unobserved effects on these levels. Since the identification strategy relies on intra-country variation on the sector level, sector-country fixed effects cannot be used in this model. In line with Léon (2020), the country-sector specific index D_{sc} is inserted instead. The logic being that unobserved shocks in sector s and country c will affect the usage of external finance

⁹ Note that Léon (2020) and Fafchamps and Schündeln (2013) capture growth opportunity in their index (which is thus labelled G and not D). This takes into account the critique by Fisman and Love (2007) that financial development plays a broader role in promoting growth (e.g. through overcoming informational problems, playing a risk-sharing role, monitoring role, corporate governance role; i.e. roles beyond merely addressing firms' external financial dependence). They subsequently argue that access to finance allows firms in all sectors with good growth opportunities (not just those in sectors with fixed technological financial dependence) to grow and thus modify the analysis framework of Rajan and Zingales (1998) by using growth opportunity instead of external financial dependence. This aligns well with the main interest of these authors to identify firms' growth performance resulting from financial development. (But Léon (2020) nevertheless uses external financial dependence in his robustness check). This paper, however, is concerned with firms' financial constraints (and not the finance-growth-nexus) such that the critique by Fisman and Love (2007) does not apply and the original specification by Rajan and Zingales (1998) (where D captures the external financial dependence, i.e. focuses on the financial dimension) is better suited and thus adopted.

(i.e. D_{sc}) such that D_{sc} will adequately capture such sector-country-level shocks as long as large firms are equally affected.

A vector of firm characteristics (X_{isc}) accounts for observable firm-level heterogeneity. I employ the controls commonly used in literature on firms' access to finance (e.g. Beck et al., 2008; Love & Martínez Pería, 2014; Sommer, 2022).¹⁰ In order to ensure that the interaction between external financial dependence and capital market development ($D_{sc} \cdot F_c$; and thus our coefficient of interest β) does not pick up effects from potentially confounding (time-variant) country-level variables (Z_c), the model adds the interactions ($D_{sc} \cdot Z_c$). This encompasses four potential confounders, namely competition in the banking sector, country income levels, inflation and quality of the legal system, all of which affect capital market development and additionally may directly influence the dependent variable (firms' financial constraints). For the first potential confounder, I follow Beck and Cull (2014) and jointly use the three measures of bank concentration, bank overhead costs and net interest margin to capture competition in banking. This may influence the level of capital market development and in particular SMEs' access to finance and their financial constraints (see e.g. Ryan et al., 2014). Note that the depth of the banking sector (private credit ratio to GDP) cannot be included as a control variable since the main effect of capital market development is hypothesized to run through this channel (see Section 2). Second, the analysis accounts for the income level (GDP per capita) since it directly affects capital market development (De la Torre et al., 2007) and the income level may further be correlated with other macroeconomic indicators such as institutional quality or corruption that affect capital market development and firms' access to finance. Third, inflation directly

¹⁰ León (2020) uses a slightly different set of firm-level controls. I deviate from his approach since his firm characteristics exhibit more missing values, which reduces the sample size. Hence, I resort to the firm-level controls well established in the existing literature on firms' access to finance. Yet results are unchanged when employing the controls of León (2020).

hampers capital market development and may additionally capture adverse effects due to its correlation with macroeconomic instability (De la Torre et al., 2007). Lastly, I include rule of law to account for effects of the legal system on capital market development (De la Torre et al., 2007) as well as on firms' access to finance.

As in the underlying model by Léon (2020), standard errors are clustered at the survey level (i.e. country-year level).

4. Data

This analysis uses data with pooled (repeated) cross sections that mainly stems from World Bank databases, most importantly the Enterprise Surveys (ES), the GFDD and the World Development Indicators (WDI). Firm-level data from the ES dataset is employed because of its unmatched coverage both of firms of all sizes, in particular SMEs, and of countries worldwide, in particular LMICs. Country-level variables are taken from various datasets; details of the sources and variable definitions are given in Table A2 in the Appendix, while summary statistics are provided in Table 1.

The *dependent variable* is a dummy capturing whether firms are financially unconstrained with regard to access to loans. I apply the definition that is frequently used in the literature on firms' access to finance (for details, see Popov & Udell, 2012): A firm is considered to be financially constrained either if none of its loan applications was successful in the last fiscal year, i.e. the number of rejections (variable k19 in the ES dataset) is equal to the number of applications (k18);¹¹ or if the firm is 'discouraged' from applying for loans because of unfavorable conditions (k17) such as complex application procedures, unfavorable interest rates, collateral

¹¹ For the few cases with missing values for k18 and/or k19, I instead used the dummy variable whether the most recent loan application was rejected (k20a).

requirements, loan sizes and maturities or pessimistic attitudes about approval chances. Firms are financially unconstrained if they suffer from neither of these issues and have a loan (k8) or report to not need a loan (k17).

Main interest lies with the *explanatory variable* capital market development, which is measured by the ratio of stock market capitalization of listed domestic firms to GDP taken from the GFDD.¹² It is the standard variable in the literature for stock market development (e.g. Abraham et al., 2019; Arestis et al., 2001; Arize et al., 2018; Demirgüç-Kunt et al., 2020) and captures the size and depth of the market. As depicted in Table 1, it amounts to 27 percent in the median country with ample variation across the sample. As robustness check, an alternative measure of capital market development is employed, the value of traded stocks, which primarily reflects the liquidity of the market.

Table 1. Summary statistics

	Obs.	Mean	Std. Dev.	Min	p25	Median	p75	Max
<i><u>Firm-level variables</u></i>								
Unconstrained	44,816	.65	0.48	0	0	1	1	1
Size (employees)	44,816	17.4	11.53	1	8	14	25	49
Age	44,816	18.1	12.73	1	9	15	23	100
Exporter	44,816	.13	0.34	0	0	0	0	1
Foreign-owned	44,816	.04	0.20	0	0	0	0	1
Government-owned	44,816	0	0.05	0	0	0	0	1
Financial statements	44,816	.42	0.49	0	0	0	1	1
<i><u>Country-level variables</u></i>								
Stock market capitalization	86	32.35	26.02	1.67	14.83	27.29	38.30	135.78
Net interest margin	78	4.53	2.42	1.30	3.01	3.75	5.27	14.28
Overhead costs	78	3.72	2.96	.67	2.03	2.90	4.40	18.20
Concentration	78	59.95	16.87	27.99	46.25	56.87	70.78	98.82
GDP per capita	78	8,559.85	6,564.62	830.43	3,562.93	7,837.45	11,192.18	33,995.43
Inflation	78	7.31	6.83	-.63	3.05	5.41	9.09	41.12
Rule of law	78	-.10	0.63	-1.42	-.59	-.24	.37	1.30

Since issues of data availability render the approach by Rajan and Zingales (1998) to measure *external financial dependence* through firms' financial structure infeasible, I follow León (2020) who also relies on ES data to compute this index. He captures the dependence on external

¹² For five countries with missing values in the GFDD, data was taken from the World Federation of Exchanges (WFE) instead.

finance through the share of large firms that have loans or lines of credit. As outlined in the methodology section, it is calculated for every sector-country(-year) couple separately to account for technological differences that translate into different needs of external finance. Large firms are chosen as reference group as they are assumed to face relatively few financial constraints such that their usage of external finance should adequately reflect the need of external finance in a specific sector-country(-year) couple.

In line with León (2020), the classification into small and large firms deviates from the definition used in the ES dataset where employees with 100 and more employees are regarded as large and those below that threshold as SMEs. Such a differentiation would not allow for reference groups of sufficient size to reliably calculate sector-country specific dependence scores as the ES dataset already has relatively few large firms at the country level (as depicted in Table A3 in the Appendix) and, correspondingly, even fewer at the sector-country level. Hence, as in León (2020), firms with 50 and more employees are already categorized as large and used as reference group, while the threshold of 100 employees is employed in the robustness check.

Relevant *firm characteristics* are included to account for observable heterogeneity across firms. The choice has been guided by previous studies on firms' access to finance (e.g. Beck et al., 2008; Love & Martínez Pería, 2014),¹⁰ and encompasses the size and age of firms in logarithmic form along with dummy variables indicating whether firms are exporters, foreign-owned, government-owned and whether firms have audited financial statements.¹³ As for the other variables, detailed definitions are provided in Table A2 and summary statistics in Table 1. On average, the small firms included in the main analysis have 17 employees and 18 years of age;

¹³ Note that, in contrast to the above-cited literature, no dummy for firms in the manufacturing sector is included since our model controls for that by employing sector fixed effects.

13 percent of them qualify as exporters, 42 percent have audited financial statements and the vast majority is privately domestically owned.

Lastly, I control for *country-level variables* of the macroeconomic and institutional environment as these factors may affect both firms' access to finance as well as capital market development. I include three measures (net interest margin, overhead costs, concentration) to jointly capture competition in the banking sector (as e.g. Beck & Cull, 2014) in addition to national income levels (per capita GDP), inflation and the quality of the legal system (rule of law).

The analysis only includes country-year couples from the ES dataset for which there is capital market data. Observations with missing values for firm-level or country-level variables had to be dropped. I further exclude observations that have been used as reference group to compute the external financial dependence D_{sc} . The final sample comprises 68,712 firm-level observations¹⁴ from 50 mostly LMICs (86 country-year couples as several countries appear more than once; for details see Table A3) for the period 2006 to 2019. The sample is dominated by observations from upper-middle-income (43% of observations) and lower-middle-income countries (36%), followed by high-income (17%) and low-income countries (4%).

5. Results

5.1. Baseline results

The main results for the indirect effect of capital market development on firms' financing constraints via the channel of increased credit availability are presented in Table 2. The five columns correspond to different specifications of the model with increasing numbers of control

¹⁴ In the baseline, between 22,700 and 24,000 observations have been used as reference group to compute D_{sc} and are thus not included in the regressions.

variables from left to right. The first column does not encompass any controls, while the second adds firm characteristics. The third column applies the same approach to the reduced sample for which there is data on the country-level controls. Column 4 additionally includes interactions of external financial dependence (D_{sc}) and the three indicators that jointly measure competition in the banking sector, and column 5 interactions of D_{sc} and control variables for the macroeconomic and institutional environment (i.e. income level, inflation and quality of the legal system). All specifications include sector and country fixed effects.

Main interest lies in β , the coefficient of the interaction ($D_{sc} \cdot F_c$). A positive sign would indicate that smaller firms in sectors that are more heavily dependent on external finance are more likely to have sufficient access to loans if they are located in countries with more developed capital markets. As depicted in Table 2, results strongly buttress that capital market development alleviates firms' financing constraints by improving access to credit. The effect is positive and statistically significant. It is significant at the 5-percent level for the preferred specification in column 4, which strikes a good balance between including relevant controls such as firm characteristics and features of the banking sector (competition measures) while – in the presence of sector and country fixed effects (as well as D_{sc} for the sector-country level) – forgoing supplementary country-level controls. When only including sector-country couples that have three or more large firms in their reference group to more robustly compute D_{sc} , the effect is significant at the 1-percent level for all specifications as depicted in the robustness checks (see Table A4). The effect is also economically significant: If a country without a capital market (e.g. Burundi) were to establish a median-sized stock market, this would increase the share of financially unconstrained (small) firms by 6.8 percentage points. The effect size is substantial considering that only 38 percent of small firms in Burundi are unconstrained.¹⁵

¹⁵ The computation is based on the median stock market capitalization (27.29) as well as the average external financial dependence for Burundi (0.83) and the β coefficient from the robustness check (only including sector-country couples with at least three large firms in the reference group: $\beta=0.0030$). Multiplying these values gives

Table 2. Baseline results

	(1)	(2)	(3)	(4)	(5)
D*F	0.00112 (0.000716)	0.00114 (0.000709)	0.00140* (0.000749)	0.00150** (0.000740)	0.00135* (0.000768)
D	0.0123 (0.0303)	0.00804 (0.0301)	-0.00957 (0.0304)	-0.0199 (0.0934)	0.141 (0.287)
Log firm size		0.0445*** (0.00584)	0.0435*** (0.00610)	0.0435*** (0.00610)	0.0435*** (0.00611)
Log firm age		0.0127*** (0.00468)	0.0139*** (0.00483)	0.0139*** (0.00483)	0.0139*** (0.00484)
Exporter		0.0137 (0.00864)	0.0121 (0.00902)	0.0121 (0.00901)	0.0121 (0.00904)
Foreign-owned		0.00614 (0.0126)	0.00734 (0.0131)	0.00730 (0.0131)	0.00727 (0.0131)
Government-owned		0.0312 (0.0382)	0.0317 (0.0383)	0.0318 (0.0382)	0.0319 (0.0382)
Financial statements		0.0307* (0.0177)	0.0294 (0.0187)	0.0294 (0.0187)	0.0293 (0.0187)
D*net interest margin				0.00390 (0.00917)	0.000411 (0.0111)
D*overhead				-0.000344 (0.00257)	0.0000845 (0.00285)
D*concentration				-0.000136 (0.00146)	-0.0000789 (0.00177)
D* log GDP pc					-0.0165 (0.0262)
D*inflation					-0.0000433 (0.00240)
D*rule of law					0.00205 (0.0449)
Dummies					
Sector	Yes	Yes	Yes	Yes	Yes
Countries	Yes	Yes	Yes	Yes	Yes
Obs.	44,816	44,816	42,398	42,398	42,398
R ²	0.124	0.130	0.129	0.129	0.129

The dependent variable is a dummy variable capturing whether firms are unconstrained with regard to access to loans. As in the underlying model by Léon (2020), the regression includes fixed effects for country(-year) and sector(-year) and standard errors are clustered at the survey-level. Details on variable definitions and sources are given in Table A2.

Standard errors are in parentheses.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

0.068. If we take the coefficient from the baseline (0.0015), we obtain 0.034, which would still amount to a relative increase of 9 percent in the case of Burundi.

The control variables mostly exhibit the expected signs. The coefficients on firm size and age are positive and highly significant, suggesting that larger and older firms face fewer financial constraints. Firms with audited financial statements also enjoy better access to loans (significant at 10-15%) as do exporters (but the coefficient is only significant once at 15%). Foreign-owned and government-owned firms are less financially constrained, but effects are insignificant, which may be an artefact of the small number of firms with such ownership structures. The signs on the competition measures are partially positive and negative. Theory suggests that they should be predominantly negative as higher overhead costs, net interest margins and concentration levels point towards less competition in the banking sector, which is associated with less lending to smaller firms. As expected, the effect of inflation is negative and the effect of the legal system positive. The sign of per capita GDP, surprisingly, is negative, but insignificant – just like the effects of the other country-level control variables.

The baseline findings show that capital market development alleviates firms' financing constraints. Taking into consideration that the dummy variable for being financially unconstrained is constructed around the concept of having sufficient access to bank loans, this suggests that the effect of capital market development runs through the indirect channel of increasing banking activities and availability of loans. In the following, I provide further evidence thereof, building on the theoretical foundation of Song and Thakor (2010) that describes how capital markets and the banking sector interact such that this indirect channel can materialize. The two scholars highlight that the complementarity of capital markets and the banking sector arises from instruments that generate benefit flows from banks to markets and vice versa (e.g. bank equity capital, securitization). Hence, the indirect effect of capital market development on firms' access to bank loans should only materialize if banks actually use such instruments that take advantage of a well-developed capital market, i.e. if they acquire relatively cheap equity finance and/or funding through securitization or issuance of other securities. A proxy for the usage of capital markets by financial institutions can be extracted from IMF's

Monetary and Financial Statistics (MFS). It captures the ratio of securities, shares and other equity of financial institutions (excluding central banks) to GDP.¹⁶ Using this as key explanatory variable instead of market capitalization leads to similar results as depicted in Table 3: The coefficient of interest shows even higher significance and the controls similar patterns as before.¹⁷

Table 3. Usage of capital markets by financial institutions as key explanatory variable

	(1)	(2)	(3)	(4)	(5)
D*capital market usage	0.00259** (0.00110)	0.00276** (0.00108)	0.00296** (0.00113)	0.00307** (0.00117)	0.00296** (0.00141)
D	0.00121 (0.0348)	-0.00282 (0.0344)	-0.00989 (0.0345)	-0.00843 (0.107)	0.762** (0.366)
Log firm size		0.0452*** (0.00687)	0.0443*** (0.00710)	0.0443*** (0.00711)	0.0442*** (0.00712)
Log firm age		0.0112* (0.00603)	0.0124* (0.00619)	0.0124** (0.00619)	0.0123* (0.00619)
Exporter		0.0172+ (0.0109)	0.0159 (0.0113)	0.0161 (0.0113)	0.0161 (0.0113)
Foreign-owned		-0.00358 (0.0139)	-0.00312 (0.0144)	-0.00316 (0.0144)	-0.00341 (0.0145)
Government-owned		0.0705 (0.0534)	0.0711 (0.0534)	0.0715 (0.0533)	0.0722 (0.0534)
Financial statements		0.0433*** (0.0101)	0.0425*** (0.0104)	0.0426*** (0.0104)	0.0425*** (0.0104)
D*net interest margin				0.0230+ (0.0145)	0.0205 (0.0142)
D*overhead				-0.0272 (0.0214)	-0.0394** (0.0193)
D*concentration				-0.000297 (0.00205)	-0.000415 (0.00222)

¹⁶ IMF provides absolute figures, and these are set into relation to GDP taken from the WDI.

¹⁷ Note that due to data availability, the sample is smaller when using the variable for capital market usage by financial institutions. However, the above statement is equally valid when employing the baseline approach in this smaller sample.

D* log GDP pc					-0.0789** (0.0340)
D*inflation					-0.00188 (0.00306)
D*rule of law					0.0310 (0.0532)
Dummies					
Sector	Yes	Yes	Yes	Yes	Yes
Countries	Yes	Yes	Yes	Yes	Yes
Obs.	33,166	33,166	31,668	31,668	31,668
R ²	0.127	0.135	0.133	0.133	0.133

The dependent variable is a dummy variable capturing whether firms are unconstrained with regard to access to loans. As in the underlying model by Léon (2020), the regression includes fixed effects for country(-year) and sector(-year) and standard errors are clustered at the survey-level. Details on variable definitions and sources are given in Table A2. Standard errors are in parentheses.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

In a second step, the variable *capital market usage by financial institutions* is added to the baseline regression framework. The results in Table 4 indicate – in line with the indirect channel – that it is the usage of capital markets instruments by financial institutions (and subsequent increases in lending and loan availability) rather than capital market development in itself that matters: The effect of stock market capitalization is no longer significant except for column 4, where the p-value of 0.150 indicates that even at the 15-percent level it is only marginally significant. The effect of capital market usage by financial institutions, in contrast, is significant at the 15-percent level for almost all specifications.¹⁸

¹⁸ One potential concern is multicollinearity, which may compromise the ability to properly disentangle the effects of stock market capitalization and capital market usage by financial institutions. However, the two variables are only moderately correlated ($r=0.45$), which gives reason for optimism. Even though the results should be interpreted with some caution (e.g. not taking effect sizes at face value), they can still give a good indication of the sign and significance of respective coefficients.

Table 4. Indirect channel: Usage of capital markets by financial institutions

	(1)	(2)	(3)	(4)	(5)
D*F	0.00102 (0.000905)	0.000980 (0.000888)	0.00126 (0.000912)	0.00144+ (0.000989)	0.000646 (0.00100)
D*capital market usage	0.00183 (0.00137)	0.00203+ (0.00134)	0.00208+ (0.00137)	0.00223+ (0.00152)	0.00261+ (0.00166)
D	-0.0161 (0.0392)	-0.0194 (0.0392)	-0.0321 (0.0403)	-0.0596 (0.117)	0.694* (0.400)
Log firm size		0.0452*** (0.00686)	0.0444*** (0.00710)	0.0444*** (0.00710)	0.0443*** (0.00711)
Log firm age		0.0112* (0.00603)	0.0124* (0.00619)	0.0124* (0.00619)	0.0123* (0.00619)
Exporter		0.0172+ (0.0109)	0.0159 (0.0113)	0.0161 (0.0113)	0.0161 (0.0113)
Foreign-owned		-0.00358 (0.0139)	-0.00311 (0.0144)	-0.00319 (0.0144)	-0.00340 (0.0144)
Government-owned		0.0707 (0.0534)	0.0713 (0.0535)	0.0719 (0.0534)	0.0723 (0.0534)
Financial statements		0.0432*** (0.0101)	0.0425*** (0.0104)	0.0425*** (0.0104)	0.0424*** (0.0104)
D*net interest margin				0.0246* (0.0144)	0.0212 (0.0147)
D*overhead				-0.0264 (0.0205)	-0.0382** (0.0189)
D*concentration				-0.0000878 (0.00207)	-0.000325 (0.00225)
D*log GDP pc					-0.0743** (0.0361)
D*inflation					-0.00154 (0.00294)
D*rule of law					0.0307 (0.0535)
Dummies					
Sector	Yes	Yes	Yes	Yes	Yes
Countries	Yes	Yes	Yes	Yes	Yes
Obs.	33,166	33,166	31,668	31,668	31,668
R^2	0.127	0.135	0.133	0.133	0.133

The dependent variable is a dummy variable capturing whether firms are unconstrained with regard to access to loans. As in the underlying model by Léon (2020), the regression includes fixed effects for country(-year) and sector(-year) and standard errors are clustered at the survey-level. Details on variable definitions and sources are given in Table A2.

Standard errors are in parentheses.

+ $p < 0.15$, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

These findings expand the evidence from the baseline regression that capital market development alleviates firms' financing constraints. Most importantly, it provides additional evidence for the indirect channel through which capital markets foster access to finance for small firms. As suggested by Song and Thakor (2010) in their theoretical model, capital markets and the banking sector are complementary and co-evolve such that capital market development primarily improves the financing situation of small firms indirectly through positive effects on banks' funding options and lending activities, which subsequently enhances firms' access to loans. This indirect channel is particularly important since the direct access to external finance through capital market is negligible for smaller firms as outlined in Section 2.

5.2. Robustness checks

The robustness checks underscore that the findings are not sensitive to choices concerning the sample of the reference group to compute D_{sc} , the threshold to define large firms or to choices concerning the key explanatory variable or the dependent variable.¹⁹ The results are given in Tables A4-A9 in the Appendix.

¹⁹ Despite being unreported (available upon request), it has been confirmed that findings remain unchanged when clustering standard errors at the sector-country-year level (as in the robustness check in Léon (2020)), giving each country-year couple the same weight (since number of observations differ across country-year couples) or removing high-income countries from the sample (recall that some scholars found differing importance of capital markets dependent on the economic development (e.g. Demirgüç-Kunt et al., 2013)). Results become very similar to the baseline when using the more robust computation of external financial dependence, i.e. removing country-sector couples with less than three large firms.

Through a jackknife-type of approach (unreported, but available upon request) – i.e. resampling 86 times, each time removing one country-year couple – it was confirmed that results are not driven by individual country-year couples. The resulting bias-corrected jackknife estimate for the preferred specification is 0.00196 (compared to the baseline estimate of 0.00150 from column 4 in Table 2).

First, I address a potential weakness of the analytical approach by Léon (2020) by employing a *more robust computation of external financial dependence* D_{sc} . The index of external financial dependence D_{sc} plays a central role in the chosen model. However, the reference group of large firms to compute the sector-country specific D_{sc} may be very small since the ES dataset entails relatively few large firms. Index scores D_{sc} may not adequately capture the true sector-country specific dependence on external finance if it is based on very few observations, which may distort the estimation. Therefore, Table A4 reports results when only sector-country couples are included that have at least three large firms in their respective reference group. The coefficient of interest β becomes highly significant. Similar results (unreported) emerge for increasing the threshold further to five or more large firms.

Results are not sensitive to changing the *definition of large firms*. Following Léon (2020), I move the threshold for classifying firms as large from 50 to 100 employees in the robustness check. As depicted in Table A5, the results remain unchanged.

In the baseline model, I use lagged values of stock market capitalization as *key explanatory variable*. Even though market capitalization exhibits relatively little volatility from year to year, I employ an alternative approach as robustness check by using the average value of stock market capitalization over the three years prior to ES survey year.²⁰ The sample is reduced from 50 countries (86 country-year couples) to 46 countries (79 country-year couples), but the findings

Furthermore, results (unreported, but available upon request) are robust to using panel data techniques exploiting the repeated cross sections of the Enterprise Surveys as for example in Love and Martínez Pería (2014) (recall that this paper pools the repeated cross sections). Such an approach reduces the sample to countries that are surveyed for at least two periods (27 instead of 50 countries).

²⁰ To minimize missing values, I included all country-year couples with at least two non-missing values for the first, second and third lag of stock market capitalization (i.e. one missing value was considered to be tolerable).

from the main analysis are confirmed and significance levels are even slightly higher (see Table A6).

Moreover, the robustness check considers a different key explanatory variable, the value of traded domestic and foreign stocks (from World Bank's GFDD), that rather captures the liquidity of capital market than its depth. It is used less frequently than market capitalization, but it is the second common measure in the literature for capital market development (e.g. Demirgüç-Kunt et al., 2013). Since volatility is higher for this variable, I take the average over the first three lags (but similar results emerge for simply using the first lag).²¹ Regression outcomes are presented in Table A7 and underline that the findings are not sensitive to choices regarding the key explanatory variable.

I employ two *alternative dependent variables* to capture firms' ease to access external finance through the banking sector. Instead of a dummy measuring whether firms are financially unconstrained, I use, first, a dummy that indicates whether firms currently have a loan or line of credit (as e.g. in Beck & Cull, 2014) and, second, a dummy for whether firms used loans in the last fiscal year to finance working capital or fixed assets (as e.g. in Sommer, 2022). As shown in Tables A8 and A9, results are very similar and significance levels even slightly higher.

Even though the evidence presented in Section 3.1 mitigates reverse causality concerns, *IV approaches* are used in addition to address potential endogeneity issues. After all, interrelations between the banking sector and capital markets may not only lead to the hypothesized indirect effect from capital market development to banks' increased lending activities (with positive effects on SMEs' access to credit): Banking sector development may also affect capital markets (see Section 3.1 for more details), which may lead to reverse causality issues and other situations where effects from credit markets are wrongly assigned to capital market

²¹ As for the average over the first three lags of market capitalization, one missing value is considered tolerable.

development.²² To account for this concern, IV estimation is employed. In the first IV approach, the potentially endogenous variable (stock market capitalization) is instrumented by the index for the strength of investor protection from World Bank's Doing Business dataset in a two-stage least squares (2SLS) estimation.²³ Legislation and regulations with regard to investor protection are central to building trust among (potential) investors and thus to developing capital markets, while they should be inconsequential for banks' lending activities. Indeed, test statistics underscore that the chosen instruments are relevant and valid, i.e. that they are sufficiently correlated with the potentially endogenous stock market capitalization, but uncorrelated with the error term.²⁴ As depicted in Table A10 in the Appendix, results are in

²² One potential concern beyond reverse causality, for example, may be that the key explanatory variable (stock market capitalization) picks up the effect of credit market development due to the correlation of the two variables. Especially the second IV approach accounts for this concern. Additionally in a back-of-the-envelope analysis (unreported), I employed the inverse of the net interest margin and the overhead costs to improve the linear fit and correlation with the ratio of private credit to GDP. The banking competition measures jointly account for the vast majority of the variation in private credit – almost twice as much as stock market capitalization when regressing private credit on stock market capitalization and the three banking competition measures (using standardized coefficients). This indicates that the banking competition variables adequately control for the national private credit environment such that stock market capitalization is unlikely to merely pick up the effect of credit market development. Results are very similar when using the transformations (i.e. inverse) for net interest margin and overheads.

²³ I use the first and second lag of strength of investor protection as instruments in order to be able to test the overidentifying restrictions (which requires having more instruments than (potentially) endogenous variables). However, results carry through when just using the first lag as single instrument.

Since two countries (Jordan and the Philippines) are outliers that weaken the correlation between strength of investor protection and stock market capitalization and thus undermine the strength and validity of my instrument, I exclude observations from these countries in this first IV approach.

²⁴ For the preferred specification (column 4 in the regression output table), for instance, test statistics on the first stage of the 2SLS estimation find a high joint significance of the instruments with $p=0.000$, $F=10.18$ (i.e. larger

support of the previous findings. In an alternative second approach, the first, second and third lags are used as instruments for stock market capitalization. As shown in Table A11, the results from this IV approach further strengthen confidence in the findings of the baseline analysis.²⁵ Test statistics underline the relevance and non-weakness of the instruments.²⁶

6. Conclusion

This paper examines whether capital market development has indirect, positive effects on SMEs' access to loans. Both scholarly, theoretical work (Song & Thakor, 2010) supported by empirical evidence (Arize et al., 2018; Chatterjee, 2015; Toh et al., 2019) as well as international institutions promoting economic development such as the World Bank and OECD (Thompson et al., 2018; World Bank, 2020) regard the complementarity and co-evolution of capital markets and the banking sector as most promising contribution of markets to improve SMEs' access to finance: Well-developed markets enable banks to acquire affordable equity capital, sell off loans (securitization) and use other market-based instruments to improve their funding structure and risk management, which in turn allows banks to expand their lending activities and extend loans to smaller and riskier firms. This indirect channel is paramount since

than the critical of 10 suggested in the literature) and a partial R^2 of 0.19. Testing the overidentifying restrictions using the chi-square test by Sargan or Basman yields $p=0.71$. Jointly this indicates that the instruments qualify as relevant and valid.

²⁵ Note that effect sizes are very similar whereas significance is slightly lower. For the preferred specification (column 4 in the regression output table), for instance, the effect is significant at 10% compared to 5% in the baseline. However, significance at the 5%-level materializes for all specifications (columns 1-5) in the second IV approach when using the more robust computation of external financial dependence D_{sc} (unreported).

²⁶ Again, I present test statistics exemplarily for the preferred specification (column 4): $p=0.000$ with $F=109.56$ and partial $R^2=0.84$ on the first stage; and $p=0.83$ for the overidentifying restrictions.

in most countries and especially in LMICs, SMEs cannot access external finance through capital market directly due to internal and external constraints. To explore the indirect effect of capital market development on firms' access to loans – and thus empirically investigate one of the central predictions of the theoretical model by Song and Thakor (2010) that capital market development is associated with an increase in bank lending, in particular, towards smaller and riskier firms – I employ a modification of the cross-industry cross-country model by Léon (2020) using firm-level data from World Bank's Enterprise Surveys. The model employs the analysis framework of Rajan and Zingales (1998) to limit endogeneity issues.

The analysis shows that capital market development positively and significantly affects smaller firms' access to finance indicating that smaller firms in sectors that are more heavily dependent on external finance are more likely to have sufficient access to loans if they are located in countries with more developed capital markets. The results are robust to changes on various dimensions including alternative specifications for the dependence on external finance, the definition of small firms, choices concerning the dependent and key explanatory variables, as well as the use of IV approaches to account for potential reverse causality and endogeneity issues. The paper presents further evidence in support of the hypothesized indirect channel: The findings suggest that the effect of capital market development on smaller firms' improved access to finance runs through increased usage of capital markets by financial institutions and subsequent increases in their lending activities. This is in line with the predictions of the theoretical model by Song and Thakor (2010) that consolidated the view that markets and banks are complementary and co-evolve.

For policymaking, the findings indicate that fostering the development of the main capital markets has positive spillover effects on SME finance as long as regulatory authorities allow financial institutions to engage with the capital market. Of course, the global financial crisis 2007-08 induced by irresponsible securitization practices should serve as a reminder that

appropriate regulation is crucial. It needs to strike the delicate balance of fueling financial development through mutually reinforcing interactions between banks and markets while safeguarding the soundness and stability of banks as well as the overall financial system. Yet the good news is that capital market development is beneficial for SMEs' access to finance even if the development should be limited to the main market and not include advancements in the secondary markets such as dedicated SME exchanges or in PE and VC markets. This does not necessarily imply that governments should direct their primary efforts of promoting SME finance to advancing capital markets. Depending on the current level of development, it may take strenuous institutional and structural reforms over a prolonged period of time to create an environment, that is characterized by a strong legal system, quality laws as well as macroeconomic and political stability, i.e. an environment that is truly conducive to thriving capital markets. Consequently, it may make more sense for various governments to prioritize more direct ways to foster SME finance by improving SMEs' access to bank loans. This could, for instance, comprise measures to reduce problems of information asymmetry by establishing functioning credit-information sharing systems (credit bureaus and registries), to reduce collateral issues by installing moveable asset registries, and to facilitate digitalization in the financial sector in order to make progress with regard to financial inclusion, the ease and costs of using financial services and with regard to competition in the financial sector.

For researchers, the results in this paper can serve as a starting point to investigate interactions between capital markets and the banking sector in more detail. This study provides first empirical evidence for the prediction of the theoretical model by Song and Thakor (2010) that capital market development expands banks' lending activities and thus extends loans to previously unserved smaller and riskier firms. Even though additional evidence is presented that this effect runs through capital market usage by financial institutions and increases in their loan portfolios, I examine this channel on the macro level using aggregate figures of the private credit ratio to GDP and capital market usage by financial institutions at the national level. Future

research could focus on the meso or micro level by using bank-level data to shed more light on the relationship between financial institutions and capital markets: elaborate, for instance, on the financial instruments that link markets and banks, the extent to which such instruments are being used by financial institutions and which internal and external factors influence their usage. The channels delineated by the theoretical work of Song and Thakor (2010) on the complementarity and co-evolution of markets and banks can guide such empirical investigations.

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