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Bank competition and access to finance by firms in the common monetary area of Southern Africa

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ABSTRACT

This study determines the effect of bank competition on firms' access to finance in the Common Monetary Area of Southern Africa (CMA). The study uses a combination of firm, bank, and country-level data from various sources for the period 2014 to 2020. We use four different measures of access to finance, one subjective and three objective. Furthermore, we employ two non-structural measures of competition (the Lerner index and Boone indicator) and one structural measure (the Herfindahl-Hirschman index). Probit, ordered probit, and probit with sample selection estimations are utilized to obtain results. According to results, more bank competition in CMA enhances firms' access to finance. Our findings directly suggest that promoting bank competition can enhance firms' access to finance. Relevant authorities in the CMA should develop and implement policies that stimulate bank competition in order to promote firms' access to finance. Furthermore, the most important firm-specific factors that explain firms' access to finance appear to be the size of a firm, whether it is foreign-owned, audited, and privately held or not. On the other hand, the level of income, inflation rate, financial development, and institutional development are all important in explaining cross-country variation in firms' access to finance.

Contribution/ Originality: To the best of our knowledge, this is the only study that solely focuses on African countries and employs four distinct measures of access to finance: one subjective measure and three objective measures. The other studies use one or two measures of access to finance.

1. INTRODUCTION

Firms play an important role in job creation, poverty reduction, and innovation (see, for example, (Beck, 2013; Fowowe, 2017; Hallberg, 2001)). Therefore, in Sub-Saharan Africa and other less developed and developing countries, where unemployment rates and poverty levels are high and governments still remain the main drivers of the economies, the emergence and growth of firms is of paramount importance for job creation, poverty reduction, innovation, and overall economic growth. However, regardless of the importance of firms, access to finance by firms remains a challenge in less developed and developing regions of the world. This challenge is more pervasive in Sub-Saharan Africa (see Table 1), probably due to less developed financial markets. Access to finance is imperative in the overall business environment, and lack thereof potentially restricts market entry of firms, resilience, and growth (Beck & Demirguc-Kunt, 2006; Rahaman, 2011). Furthermore, access to and availability of finance for firms enables them to invest more and expand their operations, and it also promotes firm innovation (Beck, 2013).

According to Table 1, access to finance is a bigger obstacle in Sub-Saharan Africa than it is in the other regions of the world. The percentage of firms for whom access to finance is the biggest obstacle in Sub-Saharan Africa is just less than double the world's average of 14.6%.

Table 1. Biggest obstacles to the operations of firms by region.

Economy	Access to finance (% of firms)	Access to land (% of firms)	Business licensing and permits (% of firms)	Corruption (% of firms)	Courts (% of firms)	Crime, theft and disorder (% of firms)
All countries	14.6	3.2	2.7	6.5	0.9	2.8
East Asia and Pacific	12.9	5.6	3	7	0.7	3.2
Europe and Central Asia	9.4	1.7	2.7	3.8	1.2	1.7
Latin America and Caribbean	9	1.4	4.4	9.7	1	6.7
Middle East and North Africa	13.4	3.6	4.7	9.4	0.8	1.4
South Asia	16.4	6.1	2.7	8.4	0.3	1.9
Sub-Saharan Africa	24.5	4.4	1.4	7.4	0.6	3.2

Note: These indicators are computed using data from manufacturing firms only.
Source: World bank enterprise surveys averages for the period 2010-2020.

This problem could, therefore, severely hinder firms' emergence and growth in Sub-Saharan Africa, thereby making it difficult for the private sector to make a meaningful impact in overall economic growth and development.

In the literature, bank competition is perceived as one of the important determinants of access to finance (see, for example, (Claessens & Laeven, 2004; Leon, 2015; Love & Martínez Pería, 2015; Petersen & Rajan, 1995)). Since it can be hard for businesses to get the money they need in Sub-Saharan Africa and because bank competition affects this, the study's main goal is to find out how bank competition affects businesses' ability to get these loans in CMA in particular.[1] Ayalew and Xianzhi (2019) and Moyo and Sibindi (2022) are the only studies, that we are aware of, that empirically determine the effect of bank competition on firms' access using only African countries. The average proportion of firms' investments financed by banks is about 17% in CMA, while that of Sub-Saharan Africa is close to half of that, 9%, according to the data from World Bank (2023). CMA then becomes an interesting region for this study, as firms seem to be relying more on bank loans to finance investments than firms in the rest of Sub-Saharan Africa. Furthermore, Ayalew and Xianzhi (2019) and Moyo and Sibindi (2022) use two measures of access to finance and one measure of access to finance, respectively. Therefore, we also advance their work by using four different measures of access to finance: one subjective measure and three objective measures. Moyo and Sibindi (2022) also focus on informal firms, while this paper focuses only on formal firms. The results indicate that more bank competition improves access to finance for CMA firms. Hence, the results are in support of the market power hypothesis. We organize the rest of the paper as follows. Section 2 reviews the relevant literature. Section 3 describes the data and explains the methodologies used to address the objective of the study. Section 4 presents and discusses the results, while Section 5 provides the main conclusions.

2. LITERATURE REVIEW

There are two different strands of literature that link bank competition and access to finance: the market power hypothesis and the information hypothesis. However, the direction of the relationship between the two is ambiguous and remains the subject of debate. The market power hypothesis is of the view that in concentrated banking markets, credit is both less available and very costly (Carbó-Valverde, Rodriguez-Fernandez, & Udell, 2009), while strong competition results in more available credit and also at lesser costs (Leon, 2015; Love & Martínez Pería, 2015). The information hypothesis, on the other hand, postulates that banks that have more market power lend more because of the ability to acquire and process information on potential borrowers, which allows even the opaque firms to acquire

[1] CMA is made up of Eswatini, Lesotho, Namibia and South Africa.

financing (Love & Martínez Pería, 2015; Petersen & Rajan, 1995). Banks with market power afford and are willing to incur the costs of information acquisition because they can relatively better internalize the associated costs.

Different studies find conflicting results on the effect of bank competition on firms' access to finance. That is, some studies support the market power hypothesis while others support the information hypothesis. For example, for 74 developed and developing countries, Beck, Demirgüç-Kunt, and Maksimovic (2004) find that bank concentration increases financing obstacles, but only in countries with low levels of economic and institutional development. Using multi-year, firm-level surveys for 53 countries, the results for Love and Martínez Pería (2015) indicate that less bank competition is associated with lower access to finance. The findings of Leon (2015) and Rakshit and Bardhan (2023) also show that bank competition improves credit availability for firms in developing countries and India, respectively, showing a positive impact of bank competition on credit availability. Other studies whose results support the market power hypothesis include Liu and Mirzaei (2013) and Bernini and Montagnoli (2017).

Ayalew and Xianzhi (2019) using different measures of competition, find that bank competition worsens credit constraints for firms in 27 African countries, which supports the information hypothesis. The results for Tacneng (2014) in Philippines also show that bank concentration increases credit availability. Other studies with findings that support the information hypothesis include Petersen and Rajan (1995); Dinç (2000); Zarutskie (2003) and Hoxha (2013). Some studies find mixed results, depending on the measure of competition used. That is the effect of bank competition on access to finance varies based on the measure of bank competition (See, for example, (Carbó-Valverde et al., 2009; Moyo & Sibindi, 2022; Mudd, 2013)).

3. METHODOLOGY

3.1. Data Scope and Sources

The study uses a combination of firm, bank, and country-level data from various sources. For firm-level data, we utilize the latest World Bank enterprise surveys conducted in each of the 4 CMA countries over the years 2014–2020 (see Table 2).[2] Bank-level data from the BankScope database is used to compute bank competition measures. A sample of 30 banks operating in CMA- Eswatini (4), Lesotho (4), and Namibia (4) and South Africa (18) - is used. World Development Indicators and Global Financial Development databases are used for country-level data.

Table 2. Number of firms by country and year of survey.

Survey year				
	2014	**2016**	**2020**	**Total**
Eswatini		109		109
Lesotho		124		124
Namibia	432			432
South Africa			1027	1027
Total	432	233	1027	1692

Note: The table presents number of firms by country and year of survey.

3.2. Access to Finance and Bank Competition Variables and their Measurement

In this study we are interested in examining how bank competition affects access to finance. Thus, the primary variables are access to finance and bank competition. We follow approaches in line with Beck et al. (2004); Love and Martínez Pería (2015) and Popov and Udell (2012) to measure access to credit using one subjective measure and three objective measures. For the subjective measure of access to finance, we use the survey question (K.30): "To what degree is access to finance an obstacle to the current operations (or growth) of this establishment?" Answers vary between 0 (no obstacle), 1 (minor obstacle), 2 (moderate obstacle), 3 (major obstacle), and 4 (very severe obstacle).

[2] The total number of surveyed firms is 1977. The final sample of 1692 is arrived at after dropping firms that do not have information about finance access and at least one of the control variables.

Thus, we create a polychotomous variable that takes a value of 0 if financing is not an obstacle to a firm; a value of 1 if financing is a minor obstacle to a firm; a value of 2 if financing is a moderate obstacle to a firm; a value of 3 if financing is a major obstacle to a firm; and a value of 4 if financing is a very severe obstacle to a firm. Overall, more than half (56.79%) of the firms in the sample indicated that access to finance is an obstacle to their operations regardless of variation in the level of obstacle (See Table 3). Only 19.74% of firms reported access to finance as a major and severe obstacle to their operations, and 43.20% of firms reported access to finance as no obstacle to their operations.

Table 3. Financing obstacles.

Financing obstacle (% of firms)					
Country	**No obstacle**	**Minor obstacle**	**Moderate obstacle**	**Major obstacle**	**Very severe obstacle**
Eswatini	20.18	42.20	29.36	6.42	1.83
Lesotho	12.10	14.52	29.03	27.42	16.94
Namibia	19.44	17.13	22.45	23.61	17.36
South Africa	59.40	19.77	11.78	7.50	1.56
Total	43.20	20.15	16.90	13.00	6.74

Notes: The table presents the degree of financing obstacle faced by firms by country.

Following Popov and Udell (2012) and Leon (2015) we construct our first objective measure of access to finance, which is a binary variable that takes a value of 1 if a firm that needed external funding chose not to apply or was turned down and 0 if a firm that needed external funds had access to credit. In this approach, firms that were either discouraged from applying for a loan or were rejected upon application in the year prior to the survey are classified as credit constrained. Those that had at least one loan application approved are not classified as credit constrained. The classification of constrained and unconstrained firms is based on three survey questions. The first question (K.16) is: "In the last year, did this establishment apply for any lines of credit or loans?" This question helps us to establish or identify firms that applied for a loan or loans. The second question (K.17) asks, "What was the primary reason this establishment did not apply for any line of credit or loan?" This question helps us to separate firms that did not apply for credit because they did not need it from those that did not apply because they were discouraged. We classify firms as discouraged borrowers if they provide a different reason for not applying, such as not needing a loan.

To identify the outcomes of loan applications (for those firms that answered yes in question K.16), we refer to question K.20: "What happened with this most recent line of credit or loan application?" Close to 70% of firms with a need for credit are credit constrained (see Table 4), either because they chose not to apply or their credit application was rejected. That is, about seven out of ten firms in CMA are credit constrained. The other two objective measures of access to finance are based on whether firms have overdraft facilities in the year under consideration and whether they have a line of credit or loans from financial institutions. The variables, a dummy variable that has a value of 1 if the firm has a loan or credit line and 0 otherwise, and a dummy variable that has a value of 1 if the firm has an overdraft facility and 0 otherwise, are then created. According to the two definitions, 14.39% of firms in the sample have a loan or credit line, and 61.05% have an overdraft facility (see Table 4).

Table 4. Access to finance.

% of firms			
Country	**Credit constrained**	**Credit line**	**Overdraft**
Eswatini	73.91	34.91	31.19
Lesotho	47.89	26.61	42.74
Namibia	63.83	32.62	54.63
South Africa	85.03	5.76	69.13
Total	69.47	14.39	61.05

Notes: The table presents the percentage of firms that are credit constrained, that have a loan or credit line and that have an overdraft facility by country.

The Lerner index, Boone indicator, and Herfindahl Hirschman index (HHI) are used as measures of bank competition.[3] A detailed description of the methods and processes we use to calculate the three competition measures is available in Appendix A. Table 5 reports the values of these competition measures.[4]

Table 5. Values of competition measures by country and year.

Competition measures				
Country	**Year**	**HHI**	**Lerner index**	**Boone indicator**
Eswatini	2015	0.267	0.411	-1.441
Lesotho	2015	0.434	0.350	-2.591
Namibia	2013	0.270	0.307	-0.573
South Africa	2019	0.255	0.164	-2.650

Note: The table presents values of competition measures used in the analysis by country and year.

3.3. Models Specification and Estimation Techniques

The general baseline model is specified as follows:

$$Access\ to\ finance = f(bank\ competition, firm\ characteristics, country\ characteristics) \quad (1)$$

The corresponding econometric models estimated are:

$$Financing\ obstacle_{ij} = \phi(\propto + \Omega_1 Bankcompetition_j + \varphi Firm_{ij} + \lambda Country_j) \quad (2)$$

$$\Pr(Credit\ constrained_{ij} = 1) = \phi(\propto + \Omega_2 Bankcompetition_j + \varphi Firm_{ijt} + \lambda Country_j) \quad (3)$$

$$\Pr(Creditline_{ij} = 1) = \phi(\propto + \Omega_3 Bankcompetition_j + \varphi Firm_{ijt} + \lambda Country_j) \quad (4)$$

$$\Pr(Overdraft_{ij} = 1) = \phi(\propto + \Omega_4 Bankcompetition_j + \varphi Firm_{ijt} + \lambda Country_j) \quad (5)$$

$Financing\ obstacle$ is a polychotomous dependent variable with a natural order of 0 (no obstacle), 1 (minor obstacle), 2 (moderate obstacle), 3 (major obstacle), and 4 (very severe obstacle). $Credit\ constrained$ is a binary dependent variable that a firm is credit constrained, which takes the value 1 if a firm that needed external funding chose not to apply or was turned down and 0 if a firm that needed external funds had access to credit. $Creditline$ is a dummy variable which has a value of 1 if the firm has a loan or credit line and 0 otherwise. $Overdraft$ is a dummy variable which has a value of 1 if the firm has an overdraft facility and 0 otherwise. $Bankcompetition$ is the indicator of bank competition measured using both structural (HHI) and non-structural measures (Lerner index and Boone indicator).[5] $Firm$ and $Country$ are the vectors for firm-specific and country-level control variables, respectively. i and j denote firm and country, respectively. Error terms are assumed to be normally distributed in all the regressions.

The choice of the firm-level and country-level control variables is in line with the literature (e.g., (Asiedu, Kalonda-Kanyama, Ndikumana, & Nti-Addae, 2013; Beck et al., 2004; Carbó-Valverde et al., 2009; Leon, 2015; Love & Martínez Pería, 2015)).[6] [7]We also assume exogeneity of bank competition measures to firms' access to finance measures. Because our data are firm level, reverse causality from access to finance to competition is unlikely. That is, each individual firm is not large enough to affect measures of bank competition. Following Love and Martínez Pería

[3] Due to insufficient data, we were not able to compute (P-R) H-statistic for different years.

[4] Because we use one-year lagged values of the country-level variables in our regressions, we compute and report one-year lagged values of bank competition measures. For Namibia, the Boone indicator value reported and used is for 2014. This is because the actual value for 2013 is extraordinarily too big in absolute terms and can potentially distort the results.

[5] Following Leon (2015) we use the inverse of the Herfindahl Hirschman index, the Lerner index and the Boone indicator to facilitate the reading and interpretation of the results. Hence, an increase in the value of the indices implies an increase in the level of competition.

[6]Some firm-specific and country-level variables that are considered relevant by the literature in the relationship between bank competition and access to finance are omitted due to lack of data. These include the share of assets held by the largest owner, the gender of the largest owner, the gender of the top manager, geographic closeness between lenders and customers, and the asset share of foreign banks in a country.

[7] Variables descriptions and data sources are outlined in Appendix B.

(2015) and Leon (2015) to further mitigate any possible reverse causality concerns, one-year lagged values for both bank competition and the other country-level control variables are used.

Since *Financing obstacle* is a polychotomous dependent variable with a natural order, we use ordered probit estimation for Equation 2. Given the binary nature of the dependent variables in Equations 3, 4, and 5, probit regression is used. A simple probit regression is used for estimating Equations 4 and 5. For Equation 3, however, we use probit with sample selection (PSS) introduced by Van de Ven and Van Praag (1981). This is because the measure of credit access in that equation can only be observed for firms that need credit. For those firms that don't need credit, we cannot determine whether or not they would have been constrained if they had expressed a demand for credit (Leon, 2015). It's possible that a sample of firms that indicated a need for credit is characterized by certain specific attributes and not purely random. This sample selection issue would then lead to inconsistent simple probit regression estimates. PSS overcomes this problem and provides consistent estimates in samples that may be subject to selection bias.

The PSS figures out two probit equations: the selection equation and the outcome equation. The error terms in these equations have a bivariate normal distribution. In this case, the selection equation is the need for credit equation, in which the dependent variable can be completely observed. The outcome equation is the credit-constrained equation, in which the dependent variable can only be observed for firms that need credit. Since, for identification purposes, the selection equation should contain at least one variable that is not in the outcome equation, we include an exclusion restriction variable in the need for credit equation, which we omit in the credit-constrained equation. Following Leon (2015) we use a dummy variable equal to one if the firm submitted an application to obtain a construction permit in the two years prior to the survey, approximating the willingness to invest, to proxy the need for funds as an exclusion restriction variable.[8] A good exclusion variable should influence the need for credit without directly determining a firm's credit constraint status. Hence, our exclusion variable is relevant in that regard.

Following Love and Martínez Pería (2015) and Claessens, Tong, and Zuccardi (2015) we also weight our regressions by the inverse of the square root of the number of firms in each country-year, as a sensitivity check. This is because the number of firms is different across countries in our sample. Countries with a large number of observations will be overrepresented in the sample (Love & Martínez Pería, 2015) which may bias or tilt the results to the characteristics of such countries. By giving countries with a lot of observations less weight, this weighting gets rid of the possible problem and makes those countries less important in the estimates (Claessens et al., 2015; Love & Martínez Pería, 2015).

4. EMPIRICAL RESULTS

This section presents the empirical results on the effect of bank competition on access to finance by firms in CMA. First, we present the descriptive statistics and then provide estimation results.

4.1. Descriptive Statistics

The summary statistics for all the variables used in estimating Equations 2 to 5 are reported in Table 6. The average size of the firms is 67 employees, and the size varies from 1 to 7000 employees. Hence, according to OECD (2021) definition of enterprises by business size, most of the firms in the sample are small and medium-sized enterprises. Most of the firms have been operating for about 22 years at the date of the interview. Hence, most of the firms are relatively young. Firm age varies from one-year-old startups to 220-year-old-firms. The sample consists of 28.6% manufacturing firms (the rest are in other industries such as services, retail, or construction)[9], 9.3% exporting

[8] Other studies also use the proportion of goods or services paid for after the delivery to catch the need of funds for financing working capital (e.g, (Ayalew & Xianzhi, 2019; Leon, 2015)). In our case we don't have enough information to use it.

[9]To simplify, we classify all firms not in the manufacturing sector but in all other industries as part of the service industry.

firms, 3% foreign-owned firms, 1.2% publicly listed firms, and 58.7% privately held firms. The correlation analysis in Appendix C indicates that larger firms, firms whose top managers have more experience, manufacturing firms, and exporting firms face lower financing obstacles, are less credit constrained, and are more likely to have a loan or credit line and an overdraft facility. The correlations between logGDPpc and HHI, and inflation and HHI, are considerably high (above 0.8); hence, logGDPpc and inflation are dropped in regressions in which HHI is used as a measure of competition. The correlations between all other variables are low, and those variables can be used in all the regressions.

Table 6. Summary statistics (Firm and country-level variables).

Variables	Obs.	Mean	Std. dev.	Min.	Max.
Dependent variables					
Financing obstacle	1692	1.199	1.300	0	4
Need	1692	0.302	0.459	0	1
Credit constrained	475	0.695	0.461	0	1
Credit line	1536	0.144	0.351	0	1
Overdraft	1692	0.611	0.488	0	1
Independent variables					
Firm-level variables					
Firm size	1692	67.574	286.931	1	7000
Age	1692	21.904	19.950	1	220
Experience	1692	15.042	10.121	1	60
Manufacturing	1692	0.286	0.452	0	1
Exporter	1692	0.093	0.291	0	1
Foreign-owned	1692	0.030	0.169	0	1
Audited	1692	0.540	0.499	0	1
Subsidiary	1692	0.191	0.394	0	1
Publicly listed	1692	0.012	0.111	0	1
Privately held	1692	0.587	0.493	0	1
Construction	1692	0.171	0.377	0	1
Country-level variables					
HHI	1692	0.273	0.046	0.255	0.434
Lerner	1692	0.230	0.086	0.164	0.411
Boone	1692	-2.037	0.906	-2.650	-0.573
GDPpc	1692	6359.788	1633.818	1363.930	7345.960
Inflation	1692	4.394	1.272	3.760	8.670
Financial dev.	1692	99.505	50.248	17.210	139.290
Institutional dev.	1692	0.138	0.246	-0.608	0.373

Note: The table presents summary statistics of variables used in estimations.

4.2. Bank Competition and Financing Obstacles

This section presents the results of the empirical test of the link between bank competition and financing obstacles. The results are reported in Table 7.[10, 11] Three different proxies for bank competition (HHI, Lerner index and Boone indicator) are included sequentially.[12] The coefficients of the Lerner index and the Boone indicator are

[10] All the regressions in this study use robust standard errors. Standard errors are not adjusted for clustering at the country level because there are few clusters (i.e., countries). With a small number of clusters, the cluster-robust variance estimator is not valid and can be downwards biased, leading to imprecise estimates (Cameron & Miller, 2015).

[11] Dummies for time effects, country fixed effects, and Covid-19, as well as the accessibility and quality of the credit information index, are dropped in all the regressions in this study owing to collinearity problems.

[12] The second column of each specification presents weighted results. This applies to all estimation results going forward. Since the number of firms varies for each country, we weight the regressions by the inverse of the square root of the number of firms in each country-year. This makes observations from countries overrepresented in the sample have relatively less weight and, hence, less influence in the estimations. However, we only interpret the coefficients of unweighted regressions in all the results.

negative and significant at 1% level of significance. Hence, the results indicate that in CMA, higher levels of bank competition are associated with lower financing obstacles faced by firms. From Table 6, the standard deviations of Lerner index and Boone indicator are 0.086 and 0.906, respectively. The corresponding coefficients from Table 7 are -0.007 and -0.016. Therefore, one standard deviation change in the Lerner index and Boone indicator results in decreases of approximately 0.06 and 1.47 percentage points in the probability of a firm being severely credit constrained. The results, therefore, support the market power hypothesis and are consistent with the findings of Beck et al. (2004) but are in contrast to the findings of Ayalew and Xianzhi (2019). This could be because, one, competition lowers interest rates, which stimulates the demand for cheaper loans; second, competition lowers profit margins for banks, which forces them to look for a large set of customers as they seek increased volumes to increase profit levels. The results for most of the control variables have the predicted signs and are consistent with expectations.

Table 7. Bank competition and financing obstacles (Ordinal probit estimation results).

Measures of competition						
Variables	**HHI**	**HHI**	**Lerner index**	**Lerner index**	**Boone indicator**	**Boone indicator**
Log firm size	-0.002***	-0.001**	-0.003***	-0.001**	-0.003***	-0.001**
	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)
Log age	-0.006***	-0.002***	-0.007***	-0.003***	-0.006***	-0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Log experience	0.001	0.000	0.001	0.001	0.001	0.001
	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Manufacturing	0.004**	0.002**	0.003*	0.001*	0.005***	0.003***
	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)
Exporter	-0.007***	-0.003**	-0.006***	-0.002**	-0.006**	-0.002*
	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)
Foreign-owned	-0.005**	-0.003**	-0.004*	-0.003**	-0.006**	-0.003**
	(0.003)	(0.001)	(0.003)	(0.001)	(0.003)	(0.001)
Audited	-0.006***	-0.001	-0.006***	-0.001	-0.006***	-0.001
	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)
Subsidiary	-0.009***	-0.003***	-0.009***	-0.003***	-0.009***	-0.003***
	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)
Publicly listed	-0.002	-0.003	0.001	-0.002	-0.002	-0.003
	(0.005)	(0.002)	(0.005)	(0.002)	(0.005)	(0.002)
Privately held	-0.005***	-0.002**	-0.002	-0.002	-0.003	-0.002*
	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)
Competition	0.001	0.001	-0.007***	-0.002***	-0.016***	-0.007***
	(0.002)	(0.001)	(0.001)	(0.001)	(0.003)	(0.002)
Log GDPpc			-0.032***	-0.015***	-0.038***	-0.017***
			(0.007)	(0.005)	(0.007)	(0.005)
Inflation			-0.008***	-0.004***	-0.006***	-0.003***
			(0.002)	(0.001)	(0.001)	(0.001)
Financial dev.	-0.000***	-0.000***	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Institutional dev.	0.005**	0.002**	-0.006*	-0.001	-0.003	-0.002
	(0.003)	(0.001)	(0.003)	(0.001)	(0.003)	(0.001)
Observations	1,690	1,690	1,690	1,690	1,690	1,690
Pseudo R^2	0.063	0.057	0.068	0.065	0.069	0.067

Note: The table presents estimated marginal effects and standard errors (in parentheses). *, **, *** denote statistical significance at 10%, 5% and 1% level, respectively. The second column of each specification presents weighted results.

4.3. Bank Competition and Credit Constraints

This section presents the results of the empirical test of the link between bank competition and credit constraints. We first investigate the determinants of the firms' need for credit before estimating the credit constraints model. Table 8a reports the credit requirements. The results indicate a negative relationship between bank competition and firms' need for credit. Thus, firms are less likely to need credit in more competitive banking systems, which is surprising. This contradicts the findings of Rakshit and Bardhan (2023) which suggest that firms require more bank

loans in more competitive banking markets. Banks that compete hard lower their lending rates, which may then lower the rates of other lending financial institutions as well, which is good for the credit market as a whole (Ayalew & Xianzhi, 2019). Firms would expect lower lending rates to attract borrowing. The exclusion restriction variable, construction, enters all model specifications positively and significantly as expected. That is, firms that wish to undertake some construction activities are more likely to need credit.

Table 8a. The determinants of need for credit (Probit estimation results).

Measures of competition						
Variables	**HHI**	**HHI**	**Lerner index**	**Lerner index**	**Boone indicator**	**Boone indicator**
Log firm size	-0.026***	-0.023***	-0.027***	-0.023***	-0.027***	-0.023***
	(0.007)	(0.008)	(0.007)	(0.008)	(0.007)	(0.008)
Log age	-0.025**	-0.022*	-0.020*	-0.019	-0.019*	-0.015
	(0.010)	(0.012)	(0.010)	(0.012)	(0.010)	(0.012)
Log experience	0.019*	0.023*	0.013	0.014	0.014	0.017
	(0.010)	(0.012)	(0.010)	(0.012)	(0.010)	(0.012)
Manufacturing	0.093***	0.099***	0.070***	0.063***	0.096***	0.104***
	(0.018)	(0.020)	(0.018)	(0.020)	(0.017)	(0.020)
Exporter	-0.036	-0.055*	-0.037	-0.056*	-0.039	-0.061*
	(0.028)	(0.033)	(0.027)	(0.032)	(0.027)	(0.033)
Foreign-owned	-0.062**	-0.067**	-0.045*	-0.049*	-0.065**	-0.070**
	(0.027)	(0.030)	(0.026)	(0.029)	(0.027)	(0.030)
Audited	-0.031*	-0.024	-0.050***	-0.052***	-0.037**	-0.029
	(0.017)	(0.012)	(0.017)	(0.019)	(0.017)	(0.019)
Subsidiary	-0.061***	-0.042**	-0.081***	-0.073***	-0.066***	-0.049**
	(0.018)	(0.021)	(0.018)	(0.021)	(0.018)	(0.021)
Publicly listed	-0.124*	-0.212***	-0.066	-0.135*	-0.121*	-0.212***
	(0.064)	(0.070)	(0.064)	(0.071)	(0.065)	(0.071)
Privately held	-0.115***	-0.139***	-0.045**	-0.044**	-0.096***	-0.124***
	(0.018)	(0.019)	(0.019)	(0.021)	(0.019)	(0.021)
Construction	0.437***	0.408***	0.409***	0.387***	0.416***	0.393***
	(0.026)	(0.029)	(0.025)	(0.029)	(0.027)	(0.030)
Competition	-0.138***	-0.102***	-0.114***	-0.124***	-0.070***	-0.048
	(0.021)	(0.022)	(0.014)	(0.015)	(0.027)	(0.029)
Log GDPpc			0.001	0.014	0.151*	0.141
			(0.085)	(0.087)	(0.091)	(0.091)
Inflation			0.014	0.016	0.068***	0.056***
			(0.017)	(0.017)	(0.016)	(0.016)
Financial dev	0.000	0.000	0.002***	0.002***	-0.000	-0.000
	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Institutional dev	-0.098***	-0.139***	-0.206***	-0.209***	-0.067**	-0.100***
	(0.030)	(0.032)	(0.036)	(0.037)	(0.032)	(0.034)
Observations	1,690	1,690	1,690	1,690	1,690	1,690
Pseudo R^2	0.160	0.139	0.178	0.164	0.163	0.142

Note: The table presents estimated marginal effects and standard errors (in parentheses). *, **, *** denote statistical significance at 10%, 5% and 1% level, respectively. The second column of each specification presents weighted results.

Table 8b reports the results of the credit constraints. The measure of whether a firm is credit constrained or not is only available for firms that desire to get credit. To overcome the potential risk of sample selection bias, we estimate a PSS model. We use a Wald test to test for the relevance of the sample selection problem. We reject the null hypothesis, which holds that the PSS model does not provide more information than a simple probit model in all models; consequently, we fit the PSS model. The coefficients of bank competition measures are all negative and significant at the 5% level of significance. Therefore, the results show that bank competition lowers firms' credit constraints, which also supports the market power hypothesis. One standard deviation of the Herfindahl-Hirschman index, the Lerner index, and the Boone indicator are 0.046, 0.086, and 0.906, respectively. The corresponding coefficients are -0.9351, -0.3298, and -0.0013. So, a one-standard deviation change in the Herfindahl-Hirschman index,

the Lerner index, or the Boone indicator lowers the chance of being credit constrained by about 4, 3, or 0.1 percentage points, respectively. These results are contrary to the findings of Ayalew and Xianzhi (2019) that firms are more credit constrained in more competitive banking markets in Africa. However, these results are in line with what Leon (2015) and Rakshit and Bardhan (2023) found: that in 69 developing and emerging countries and India, more competition in the banking sector makes it easier for businesses to get credit.

Furthermore, firms that are larger, audited, publicly listed, and privately held are less likely to be credit constrained. On the other hand, manufacturing firms and foreign-owned firms are associated with more credit constraints. Higher inflation rates worsen credit constraints for firms, while surprisingly firms in countries with higher income levels also face more credit constraints.

Table 8b. Bank competition and credit constraints (PSS estimation results).

Measures of competition						
Variables	**HHI**	**HHI**	**Lerner index**	**Lerner index**	**Boone indicator**	**Boone indicator**
Log firm size	-0.083***	-0.064***	-0.083***	-0.063***	-0.086***	-0.069***
	(0.015)	(0.017)	(0.015)	(0.018)	(0.014)	(0.016)
Log age	-0.018	-0.024	-0.017	-0.022	-0.015	-0.023
	(0.019)	(0.020)	(0.019)	(0.019)	(0.020)	(0.021)
Log experience	-0.009	0.002	-0.009	0.001	-0.013	-0.003
	(0.019)	(0.021)	(0.019)	(0.021)	(0.019)	(0.022)
Manufacturing	0.061*	0.059	0.058*	0.059*	0.033	0.034
	(0.033)	(0.036)	(0.032)	(0.032)	(0.037)	(0.042)
Exporter	0.045	0.082	0.039	0.069	0.046	0.089
	(0.049)	(0.053)	(0.049)	(0.055)	(0.051)	(0.057)
Foreign-owned	0.085*	0.063	0.071	0.042	0.098*	0.073
	(0.049)	(0.051)	(0.050)	(0.055)	(0.051)	(0.059)
Audited	-0.216***	-0.239***	-0.213***	-0.224***	-0.224***	-0.255***
	(0.031)	(0.044)	(0.033)	(0.057)	(0.029)	(0.038)
Subsidiary	0.026	0.043	0.026	0.042	0.029	0.048
	(0.035)	(0.039)	(0.036)	(0.042)	(0.036)	(0.039)
Publicly listed	-0.452***	-0.484***	-0.449***	-0.478***	-0.416**	-0.461***
	(0.164)	(0.167)	(0.162)	(0.167)	(0.169)	(0.175)
Privately held	-0.099***	-0.117***	-0.095***	-0.117***	-0.078**	-0.099**
	(0.038)	(0.042)	(0.034)	(0.035)	(0.038)	(0.043)
Competition	-0.935**	-0.825**	-0.329**	-0.291**	-0.001**	-0.001**
	(0.420)	(0.409)	(0.148)	(0.144)	(0.001)	(0.001)
Log GDPpc			0.283**	0.263**	0.291**	0.278**
			(0.124)	(0.109)	(0.131)	(0.121)
Inflation			0.047*	0.041*	0.024	0.025
			(0.026)	(0.023)	(0.029)	(0.029)
Financial dev	0.001	0.001	-0.001	-0.001	-0.000	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Institutional dev	-0.066	-0.066	-0.024	-0.034	-0.069	-0.059
	(0.059)	(0.059)	(0.066)	(0.065)	(0.065)	(0.066)
Observations	473	473	473	473	473	473
Wald test	200.22***	166.14***	201.31***	163.75***	189.64***	161.48***

Note: The table presents estimated marginal effects and standard errors (In parentheses). *, **, *** denote statistical significance at 10%, 5% and 1% level, respectively. The second column of each specification presents weighted results.

4.4. Bank Competition and Access to Loans

This section presents the results of the empirical test of the link between bank competition and access to loans. Table 9 reports the results. The results also support the market power hypothesis in this case. The coefficients of bank competition measures are all positive and significant at the 1% level of significance. That is, more bank competition improves firms' access to loans. Moyo and Sibindi (2022) find the same result for 14 Sub-Saharan African countries when using the Lerner index as a measure of competition. However, when using Boone's indicator as a measure of competition, Moyo and Sibindi (2022) find that bank competition lowers firms' access to finance. Love and Martínez Pería (2015) for 53 countries also find the results in line with ours: that bank competition has a positive

impact on the probability of a firm getting a loan. We used one standard deviation of the Herfindahl-Hirschman index, the Lerner index, and the Boone indicator, along with their coefficients of 0.0481, 0.0710, and 0.0910, to find that a change of one standard deviation in the Herfindahl-Hirschman index, the Lerner index, and the Boone indicator raises the chance of firms being able to get loans by about 0.2, 0.6, and 8 percentage points, respectively. Larger firms, firms whose top managers have more experience, exporting firms, audited firms, and publicly listed firms are associated with more access to loans. On the other hand, contrary to expectations, older firms, foreign-owned firms, and firms that are subsidiaries of larger firms are less likely to have access to loans. It would be expected that credit-issuing financial institutions develop trust and confidence in firms that have been operating for longer periods and hence grant loans to them relatively easily.

Privately held firms also have lower access to loans. As expected, firms in countries with higher levels of income and developed institutions are likely to have more access to loans. Surprisingly, the inflation rate also has a positive association with access to loans. This could be because inflation erodes the real value of loans, which makes it easier for firms to service loans, and increased ability to service loans inspires financial institutions to extend more loans to firms. Lastly, contrary to expectations, the financial sector's development enters all models negatively and significantly.

Table 9. Bank competition and access to loans (Probit estimation results).

Measures of competition						
Variables	**HHI**	**HHI**	**Lerner index**	**Lerner index**	**Boone indicator**	**Boone indicator**
Log firm size	0.037***	0.038***	0.034***	0.036***	0.034***	0.036***
	(0.006)	(0.007)	(0.006)	(0.007)	(0.006)	(0.008)
Log age	-0.016*	-0.009	-0.014	-0.008	-0.010	-0.002
	(0.009)	(0.011)	(0.009)	(0.011)	(0.009)	(0.011)
Log experience	0.043***	0.037***	0.037***	0.029**	0.037***	0.029**
	(0.009)	(0.012)	(0.009)	(0.012)	(0.009)	(0.012)
Manufacturing	0.012	0.017	-0.001	-0.003	0.017	0.023
	(0.015)	(0.019)	(0.016)	(0.018)	(0.015)	(0.018)
Exporter	0.047**	0.061**	0.046**	0.059**	0.046**	0.059**
	(0.022)	(0.027)	(0.022)	(0.026)	(0.022)	(0.027)
Foreign-owned	-0.119***	-0.128***	-0.107***	-0.113***	-0.120***	-0.129***
	(0.024)	(0.028)	(0.023)	(0.027)	(0.024)	(0.027)
Audited	0.151***	0.160***	0.135***	0.139***	0.142***	0.151***
	(0.016)	(0.019)	(0.017)	(0.019)	(0.016)	(0.019)
Subsidiary	-0.038**	-0.027	-0.053***	-0.048**	-0.042***	-0.032*
	(0.016)	(0.019)	(0.016)	(0.019)	(0.016)	(0.019)
Publicly listed	0.062	0.054	0.099*	0.097	0.071	0.058
	(0.054)	(0.061)	(0.053)	(0.059)	(0.053)	(0.060)
Privately held	-0.027*	-0.041**	0.019	0.014	-0.001	-0.017
	(0.016)	(0.018)	(0.017)	(0.019)	(0.017)	(0.019)
Competition	0.048***	0.025	0.071***	0.072***	0.091***	0.077***
	(0.017)	(0.019)	(0.011)	(0.013)	(0.024)	(0.026)
Log GDPpc			0.093	0.100	0.136*	0.139*
			(0.065)	(0.069)	(0.076)	(0.077)
Inflation			0.018	0.019	0.046***	0.042***
			(0.013)	(0.014)	(0.013)	(0.014)
Financial dev.	-0.001***	-0.001***	-0.001**	-0.001**	-0.002***	-0.002***
	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)
Institutional dev.	0.104***	0.083***	0.039	0.052	0.104***	0.095***
	(0.026)	(0.028)	(0.029)	(0.032)	(0.026)	(0.029)
Observations	1,534	1,534	1,534	1,534	1,534	1,534
Pseudo R^2	0.126	0.101	0.141	0.117	0.134	0.108

Note: The table presents estimated marginal effects and standard errors (in parentheses). *, **, *** denote statistical significance at 10%, 5% and 1% level, respectively. The second column of each specification presents weighted results.

4.5. Bank Competition and Access to Overdraft Facilities

This section presents the results of the empirical test of the link between bank competition and access to overdraft facilities. Table 10 reports the results. The degree of bank competition is positively related to access to overdrafts. The coefficients of the Herfindahl-Hirschman index and the Lerner index are significant at 1%, while the coefficient of the Boone indicator is significant at 5%. That is, more bank competition promotes firms' access to overdrafts. These results, like the others, support the market power hypothesis. They also agree with Love and Martínez Pería (2015) research that more competition between banks makes it easier to get overdrafts. There is a one-standard deviation change in the Herfindahl-Hirschman index, the Lerner index, and the Boone indicator. The coefficients for these changes are 0.0583, 0.0756, and 0.0612, respectively. These changes show that the probability of firms having access to overdrafts goes up by about 0.3, 0.7, and 6 percentage points, respectively.

Larger firms, older firms, manufacturing firms, audited firms, and privately held firms are associated with more access to overdrafts. On the other hand, just like with loans, foreign-owned firms and those that are subsidiaries of larger firms are less likely to have access to overdrafts. More developed financial sectors, generally, have a detrimental effect on firms' access to overdraft facilities. As expected, institutional development enters all models positively and significantly.

Table 10. Bank competition and access to overdraft facilities (Probit estimation results).

Variables	Measures of competition					
	HHI	HHI	Lerner index	Lerner index	Boone indicator	Boone indicator
Log firm size	0.076***	0.072***	0.077***	0.073***	0.077***	0.072***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.009)
Log age	0.045***	0.045***	0.042***	0.044***	0.041***	0.041***
	(0.011)	(0.012)	(0.011)	(0.012)	(0.011)	(0.012)
Log experience	-0.005	-0.007	-0.002	-0.003	-0.003	-0.005
	(0.011)	(0.012)	(0.011)	(0.012)	(0.011)	(0.012)
Manufacturing	0.021	0.010	0.034*	0.032	0.018	0.007
	(0.019)	(0.021)	(0.019)	(0.021)	(0.019)	(0.021)
Exporter	0.026	-0.018	0.026	-0.021	0.027	-0.017
	(0.028)	(0.030)	(0.028)	(0.030)	(0.028)	(0.030)
Foreign-owned	-0.054*	-0.049	-0.063**	-0.061**	-0.053*	-0.048
	(0.028)	(0.030)	(0.028)	(0.029)	(0.028)	(0.030)
Audited	0.063***	0.103***	0.075***	0.119***	0.066***	0.105***
	(0.018)	(0.019)	(0.018)	(0.019)	(0.018)	(0.019)
Subsidiary	-0.045**	-0.052**	-0.034*	-0.036*	-0.043**	-0.051**
	(0.019)	(0.021)	(0.019)	(0.021)	(0.019)	(0.021)
Publicly listed	-0.013	-0.007	-0.051	-0.055	-0.017	-0.007
	(0.072)	(0.076)	(0.072)	(0.075)	(0.073)	(0.076)
Privately held	0.078***	0.095***	0.033	0.037	0.064***	0.086***
	(0.019)	(0.020)	(0.021)	(0.023)	(0.020)	(0.022)
Competition	0.058***	0.032	0.076***	0.078***	0.061**	0.039
	(0.022)	(0.022)	(0.015)	(0.015)	(0.029)	(0.030)
Log GDPpc			0.063	0.060	-0.021	-0.014
			(0.086)	(0.085)	(0.088)	(0.087)
Inflation			0.010	0.011	-0.023	-0.014
			(0.017)	(0.017)	(0.016)	(0.016)
Financial dev.	-0.000	-0.000	-0.001**	-0.001**	-0.000	-0.000
	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Institutional dev.	0.191***	0.212***	0.285***	0.279***	0.200***	0.215***
	(0.031)	(0.032)	(0.038)	(0.038)	(0.035)	(0.035)
Observations	1,690	1,690	1,690	1,690	1,690	1,690
Pseudo R^2	0.105	0.106	0.110	0.113	0.105	0.106

Note: The table presents estimated marginal effects and standard errors (In parentheses *, **, *** denote statistical significance at 10%, 5% and 1% level, respectively. The second column of each specification presents weighted results.

5. CONCLUSION

The study uses firm-level data from World Bank Enterprise Surveys and bank-level data from Bank Scope to determine the effect of bank competition on firms' access to finance in CMA. The results provide evidence of the market power hypothesis in CMA. That is, more bank competition in CMA enhances firms' access to finance. Furthermore, the results are robust to weighting, which takes care of the country's overrepresentation bias risk. The findings directly impact policy by promoting bank competition to improve access to finance. Relevant authorities in the CMA should develop and implement policies that stimulate bank competition in order to promote firms' access to finance. Policies such as opening up for more bank entry and relaxing some restrictions on bank operations that may lead to uncompetitive behavior by banks may help. Developing a competition authority in Lesotho, the only CMA country without one, may also help foster competitiveness in the Lesotho banking sector and for the overall CMA. Also, besides bank competition, the only things that have a consistent effect on all specifications and measures of access to finance are the size of the firm and whether it is audited or not. While policymakers and other stakeholders cannot affect firm size, they can affect auditing practices. Insofar as being audited is one of the main drivers of firms' access to finance, encouraging and developing regulations that require firms to be audited can help improve firms' access to finance in CMA.

5.1. Limitations of the Study and Areas for Further Research

It is important to also highlight some limitations of the study. Other potential determinants of firm access to finance are omitted from the data analysis, which may affect the results. These are variables such as the manager's gender, the manager's educational level, and credit information availability that are omitted owing to inadequate or unavailability of data. There are also some research issues not addressed in this study that we feel are important and need further investigation. Stock markets are an alternative financing avenue for firms. Therefore, we need to include them in the relationship between bank competition and firms' access to finance. This will give an idea of how bank competition may affect firms' access to finance in the presence of substitute stock market products. This would require data on firms that are listed; however, this may be a challenge since a large number of firms are not listed in the CMA. The other challenge is that one member of CMA, Lesotho, does not have a stock market. Nonetheless, in the future, when adequate data is available on stock market products that firms can use for financing as well as on listed firms, this can be a crucial and insightful research venture.

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List of Appendices

Appendix A. Construction of competition measures.

1. Herfindahl Hirschman index

It is calculated as the sum of the squared market shares of each bank as follows:

$$HHI = \sum_{i=1}^{N} \left[\frac{assets_i}{total\ assets}\right]^2$$

Where $assets_i$ is the assets of bank i and $total\ assets$ is the banking system's total assets. Higher values indicate more concentration.

2. Lerner index

It is calculated as follows:

$$L_i = \frac{P(Q) - C_{qi}{}'\left(q_i, w_j\right)}{P(Q)}$$

Where L_i is Lerner index for firm i, Q is the total industry output, $P(Q)$ the market price, q_i and w_j are vectors of quantity produced by firm i and input prices and $C_{qi}{}'\left(q_i, w_j\right)$ is the marginal cost of firm i. In order to determine marginal cost of banks that is required in the computation of Lerner index we estimate the following translog cost function that includes single output and three inputs:

$$ln(C_{it}) = \alpha_0 + \alpha_1 ln(q_{it}) + \frac{1}{2}\alpha_2\ [ln(q_{it})]^2 + \sum_{j=1}^{3}\beta_j[ln(w_{j,it})] + \frac{1}{2}\sum_{j=1}^{3}\varphi_j[ln(w_{j,it})]^2 +$$

$$\sum_{j=1}^{3}\Omega_j\ [ln(q_{it})][ln(w_{j,it})] + \sum_{j\neq j'}\pi_j\ [ln(w_{j,it})][ln(w_{j',it})] + + \delta_1 t + \delta_2 t^2 + \delta_3 t ln q_{it} + \mathcal{E}_{it},$$

Where C_{it} is the total cost of bank i in year t, q_{it} is output produced by bank i in year t, $w_{j,it}$ is the price of j^{th} input for bank i in year t , and $\mathcal{E}$ is the error term. We include t, trend, as one of the independent variables to control for technical change. Taking the first derivative of the translog cost function with respect to output gives the marginal cost as follows:

$$C_{qi}{}' = \frac{\partial C_i}{\partial q_i} = \frac{C_i}{q_i}\left(\alpha_1 + \alpha_2 ln(q_i) + \sum_{j=1}^{3}\Omega_j\ [ln(w_{j,i})] + \delta_3 t\right)$$

Substituting for marginal cost in Lerner index equation, we therefore have:

$$L_i = \frac{P(Q) - \frac{C_i}{q_i}\left(\alpha_1 + \alpha_2 ln(q_i) + \sum_{j=1}^{3}\Omega_j\ [ln(w_{j,i})] + \delta_3 t\right)}{P(Q)}$$

Output of banks is proxied by total assets, output price by the ratio of total revenue to total assets, price of labour by the ratio of personnel expenses to total assets, price of funds by the ratio of interest expenses to total deposits, price of capital by the ratio of operating expenses to total fixed assets and bank total costs by the sum of personnel expenses, interest expenses and operating expenses. We estimate the translog cost function using OLS and use the estimated coefficients to compute marginal cost for firm i in year t, which we then use to compute Lerner index values.

3. Boone Indicator

It is calculated as the elasticity of profits or market share to marginal costs. To calculate this elasticity, we regress the log of market share (of assets) against a log measure of marginal costs over the period 2005-2019 as follows:

$$ln(MS_{it}) = \alpha + \beta lnMC_{it},$$

Where MS_{it} is market share for bank i in time t, α is a constant term, β is the Boone indicator and MC_{it} is marginal costs for bank i in time t. Market share is proxied by the ratio of each bank's total assets to total industry assets in each country. Marginal costs are determined using the same translog cost function as shown under Lerner index computation procedure above.

Appendix B. Variables, description and data source.

Variable name	Description/Measurement	Source of data
Dependent variables		
Financing obstacle	Based on the question: "To what degree is access to finance an obstacle to the current operations of this establishment?" Answers vary between 0 (No obstacle), 1 (Minor obstacle), 2 (Moderate obstacle), 3 (Major obstacle) and 4 (Very severe obstacle).	WBES
Credit constrained	Dummy variable equals to 1 if a firm that needed external funds refused to apply or was turned down and 0 if a firm that needed external funds had access to credit.	WBES
Creditline	Dummy variable equals to 1 if the firm has a loan or credit line, and 0 otherwise.	WBES
Overdraft	Dummy variable equals to 1 if the firm has an overdraft facility and 0 otherwise.	WBES
Need	Dummy variable equals to 1 if a firm needed external funds in the last year.	WBES
Independent variables Firm-level control variables		
Firm size	Number of permanent full-time employees.	WBES
Age	Age of the firms (In years).	WBES
Experience	Experience in this sector that the top manager has (In years).	WBES
Manufacturing	Dummy variable equals to 1 if the firm is in the manufacturing industry and 0 otherwise.	WBES
Exporter	Dummy variable equals to 1 if 10% or more of sales are exported and 0 otherwise.	WBES
Foreign-owned	Dummy variable equals to 1 if 50% or more of the firm is owned by foreign organization and 0 otherwise.	WBES
Audited	Dummy variable equals to 1 if the firm have its annual financial statement checked and certified by an external auditor and 0 otherwise.	WBES
Subsidiary	Dummy variable equals to 1 if the firm is part of larger firm and 0 otherwise.	WBES
Publicly listed	Dummy variable equals to 1 if the firm is a publicly listed company and 0 otherwise.	WBES
Privately held	Dummy variable equals to 1 if the firm is a limited liability company and 0 otherwise.	WBES
Construction	Dummy variable equals to 1 if the firm submitted an application to obtain a construction-related permit over the last two years and 0 otherwise.	WBES
Measure of competition variables		
HHI	Herfindahl Hirschman index measured as the sum of the squared market shares of assets of each bank.	BankScope
Lerner index	Value of the Lerner index	BankScope
Boone indicator	Value of the Boone indicator	BankScope
Country-level control variables		
GDP_{PC}	GDP per capita (Constant USD).	WDI
Inflation	Inflation rate. Measured as annual change in the GDP deflator.	WDI
Financial dev	Ratio of domestic credit to the private sector to GDP.	GFDD
Institutional dev	Institutional development. The average composite index of voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law and control of corruption	WGI

Note: This table contains descriptions of variables that are used in estimations.
GFDD: Global financial development database.
WBES: World bank enterprise surveys.
WDI: World development indicators.
WGI: World governance indicators.

Appendix C. Correlation matrix (Firm and country-level variables).

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) Financing obstacle	1.000												
(2) Need	0.274	1.000											
(3) Credit constrained	0.178	-0.052	1.000										
(4) Creditline	0.072	0.248	-0.631	1.000									
(5) Overdraft	-0.131	-0.039	-0.354	0.212	1.000								
(6) Log firm size	-0.176	-0.108	-0.298	0.154	0.265	1.000							
(7) Log age	-0.222	-0.172	-0.129	-0.003	0.234	0.407	1.000						
(8) Log experience	-0.091	-0.067	-0.110	0.081	0.155	0.254	0.523	1.000					
(9) Manufacturing	-0.088	0.071	-0.106	0.096	0.100	0.358	0.120	0.093	1.000				
(10) Exporter	-0.091	-0.028	-0.081	0.096	0.086	0.332	0.155	0.097	0.215	1.000			
(11) Foreign-owned	-0.024	-0.007	0.000	-0.019	-0.071	0.098	-0.078	-0.074	0.040	0.132	1.000		
(12) Audited	0.052	0.008	-0.295	0.237	0.059	0.176	0.009	0.085	0.075	0.091	0.102	1.000	
(13) Subsidiary	-0.118	-0.075	-0.044	0.028	-0.005	0.206	0.093	0.008	0.011	0.113	0.181	0.171	1.000
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**	**(13)**
(14) Publicly listed	-0.015	-0.026	-0.092	0.043	-0.015	0.081	0.038	0.015	-0.044	0.038	0.037	0.044	0.089
(15) Privately held	-0.238	-0.248	-0.078	-0.071	0.179	0.233	0.307	0.145	0.105	0.035	0.013	-0.040	0.043
(16) Construction	0.153	0.302	-0.095	0.131	0.015	-0.002	-0.055	0.038	-0.082	0.032	-0.009	0.068	-0.021
(17) HHI	-0.141	-0.200	0.118	-0.129	0.116	-0.056	0.142	0.096	-0.098	-0.073	-0.175	-0.130	-0.034
(18) Lerner	-0.229	-0.328	0.131	-0.256	0.185	0.049	0.328	0.131	-0.076	-0.040	-0.164	-0.306	-0.122
(19) BI	-0.280	-0.120	-0.005	-0.086	0.050	0.116	0.169	-0.001	0.255	0.049	0.028	-0.097	0.033
(20) Log GDPpc	-0.203	-0.149	0.099	-0.090	0.140	-0.011	0.147	0.129	0.045	-0.063	-0.218	-0.120	-0.036
(21) Inflation	0.042	0.192	-0.105	0.136	-0.137	0.067	-0.159	-0.131	0.171	0.090	0.224	0.137	0.079
(22) Financial dev	-0.303	-0.135	0.061	-0.093	0.162	0.094	0.226	0.147	0.232	-0.018	-0.210	-0.165	-0.050
(23) Institutional dev	-0.122	-0.033	0.011	0.012	0.161	0.011	0.068	0.156	0.113	-0.050	-0.209	-0.025	-0.064
Variables	**(14)**	**(15)**	**(16)**	**(17)**	**(18)**	**(19)**	**(20)**	**(21)**		**(22)**		**(23)**	
(14) Publicly listed	1.000												
(15) Privately held	-0.141	1.000											
(16) Construction	-0.004	-0.211	1.000										
(17) HHI	-0.016	0.343	-0.065	1.000									
(18) Lerner	-0.007	0.561	-0.231	0.559	1.000								
(19) BI	-0.020	0.405	-0.419	-0.137	0.381	1.000							
(20) Log GDPpc	-0.050	0.333	-0.097	0.891	0.471	-0.043	1.000						
(21) Inflation	0.032	-0.240	-0.061	-0.919	-0.508	0.346	-0.796	1.000					
(22) Financial dev	-0.073	0.405	-0.249	0.441	0.512	0.420	0.755	-0.323		1.000			
(23) Institutional dev	-0.100	0.093	0.054	0.268	0.080	-0.008	0.586	-0.333		0.676		1.000	

Note: This table contains correlations between variables that are used in estimations.