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## Financing Constraints Determinants in African Countries

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### ABSTRACT

Survey of data on a sample of 1559 firms is used from 16 African countries taken from the World Business Environment Survey (WBES) to assess how successful a priori classifications are in distinguishing between financially constrained and unconstrained firms and more generally, the determinants of financing obstacles of firms. We find that large and foreign-owned firms report less financing obstacles. Our findings confirm the usefulness of size and ownership as a priori classifications of financing constraints, while they shed doubts on other classifications used in the literature. The results achieved also show that institutional development is the most important country characteristic explaining cross-country variation in firms' financing obstacles. This is both in small and medium enterprises. We use the ordered probit model to estimate all the regression models.

**Key words:** Africa, small and medium enterprises, financing obstacles, ordered probit model

### INTRODUCTION

The important role played by Small and Medium Enterprises in African economies has been increasingly realized over the past years. Not only are they important for the vitality of the business sector, they also provide new jobs. But in order to play their role in future, there is need for researchers and policy makers to identify this role and constantly interact to bring about a sustainable policy framework. For industrial development methods to have maximum effectiveness, they must include methods specifically adapted for work with small industries. It has long been known that technique suited to promoting large-scale industries is not the best in promoting modernization and growth in small industry and vice versa (Stanley and Morse, 1965).

Small and medium enterprises account for a large share of enterprises and a large share of the private sector of African economies. It is generally accepted that one of the government's major role in promoting economic growth is the creation of an appropriate business environment. This includes the trade regime, macro-economic policies, infrastructure investments and the regulatory environment. Many would rightly argue that weak factor markets and institutions in Africa are also to blame and that providing a conducive business environment may not be sufficient to raise the standards of African SMEs. Economic development requires the growth of productive firms. Theoretical considerations and existing empirical evidence point to the existence of financing constraints that limit firms' investment abilities. (Eifert and Ramachandran, 2004).

Ever since a seminal study by Fazzari *et al.* (1988), a large body of empirical literature has emerged to estimate financing constraints of firms. This literature relies on the assumption that external finance is more costly than internal finance due to asymmetric information and agency

problems and that the premium on external finance is an inverse function of a borrower's net worth. A firm is defined to be financially constrained if a windfall increase in the supply of internal funds results in a higher level of investment spending.

Fazzari *et al.* (1988) is assumed that there are cross-sectional differences in effects of internal funds on firms' investment, so that investment follows the optimal path for a priori unconstrained firms but a sub-optimal path for constrained firms. Subsequently, researchers have applied different a priori classifications of firms to distinguish financially constrained and unconstrained firms.

From the work by Fazzari *et al.* (1988) several methodologies have been suggested to test empirically the presence of financing constraints. Following Fazzari, Hubbard and Petersen, most studies derive an empirical specification from the firm's investment Euler equation that describes the firm's optimal investment pattern. One model is the q-model of investment, pioneered by Tobin (1969) and extended to models of investment by Hayashi (1982). Financial frictions are introduced to the model by adding financial variables such as cash flow. An alternative approach, introduced by Abel (1980), is to derive an empirical specification from the firm's investment Euler equation describing the firm's optimal investment pattern. The Euler model of investment has been applied and further developed by Bond and Meghir (1994), among others. A third approach, introduced by Demirgüç-Kunt and Maksimovic (1998), estimates a financial planning model to obtain the maximum growth rate firms can attain without access to external finance. They are able to infer the degree to which firms are financially constrained by comparing the growth rates with the actual growth rates of firms.

The first two approaches basically imply that financially constrained firms have high investment-cash flow sensitivity. Kaplan and Zingales (1997, 2000) question the validity of this interpretation. They show that under certain assumptions, investment-cash flow sensitivities may increase as financing constraints are relaxed. Povel and Raith (2002) find a U-shaped relationship between cash flow and investment, further adding to the controversy about the interpretation of cash-flow sensitivities.

Following Fazzari *et al.* (1988). It is usually assumed that there are cross-sectional differences in effects of internal funds on firms' investment, so that the investment equation should hold across adjacent periods for a priori unconstrained firms but be violated for constrained firms. This has led researchers to develop different a priori classifications of firms to distinguish financially constrained and unconstrained firms. From a theoretical point of view such sorting criteria should focus on a firm's characteristics that are associated with information costs.

Demirgüç-Kunt and Maksimovic (1998) found that financing constraints are lower in countries with more efficient legal systems. Love (2003) found a strong negative relationship between the sensitivity of investment to the availability of internal funds and an indicator of financial market development and concludes that financial development reduces the effect of financing constraints on investment.

Kaplan and Zingales (1997) classified firms into categories of not financially constrained to financially constrained based upon statements contained in annual reports. They classify firms as being severely financially constrained if these companies are in violation of debt covenants, have been cut out of their usual source of credit, are renegotiating debt payments, or declare that they are forced to reduce investments because of liquidity problems.

Our analysis contributes to the existing literature in two ways. First, by using survey data on a firm's perceived level of financing obstacles, we avoid having to imperfectly infer financing

constraints from financial statements of firms as in Fazzari *et al.* (1988) and also Kaplan and Zingales (1997). This allows us to not only test the validity of the a priori group classifications used in the literature to distinguish between financially constrained and unconstrained firms, but also to assess more accurately the determinants of financing obstacles. Second, as the database includes firms of all sizes from a large number of countries with different levels of institutional development, we can determine more precisely the most important firm-level predictors of financing obstacles.

The WBES includes a number of firm characteristics that we will relate to financing obstacles as reported by the firms themselves. Each of the firm characteristics we focus on in our tests has been used in the literature as proxy for information asymmetries or agency costs to split samples of firms a priori into groups of financially constrained and unconstrained firms.

We will test whether size or ownership predicts financing obstacles. The literature has proposed that smaller firms are financially more constrained. Schiffer and Weder (2001) have used the WBES survey to study how obstacles to doing business vary across firms of different size and report, among others, that perceived financing obstacles are higher for small firms than for large firms. We measure size by the dummy variables indicating whether the firm is small, medium or large.

Foreign-owned enterprises have easier access to international sources of external financing and are therefore expected to report lower financing obstacles. Government-owned enterprises are also expected to report lower financing obstacles since in many countries they receive direct budgetary support from the government and preferential treatment by government-owned financial institutions (Harrison and McMillan, 2003).

To control for the fact that country or sector specific characteristics might drive the responses of the firms, we will include sector and country dummies in the regression analysis and allow for correlation between error terms of firms within countries. A unique firm-level survey database is used to focus on two questions. First, how successful are these a priori classifications in distinguishing between financially constrained and unconstrained firms? Second and more generally, what are the determinants of financing obstacles of firms? The World Business Environment Survey (WBES) is a unique firm-level survey database, which offers a number of advantages.

First, the database provides information on the firm's perception of the degree to which it is financially constrained or not. Therefore, unlike previous studies that inferred financing constraints from company financial statements using different methodologies, measuring firms' financing obstacles directly can be from the data. Second, the database contains information on a broad cross-section of different types of firms in a large number of countries, including a large number of small and medium-sized enterprises. This is unlike previous studies that focused either on a sample of large, listed firms.

In our findings we are able to study how financing obstacles differ not only across countries, but also across firm size. As smaller firms are generally considered to face larger financing obstacles, it seems particularly important to investigate this largely ignored segment of the firm population.

The results indicate that many of the previously used a priori groupings are indeed effective in classifying financially constrained firms. However, we find that certain groupings are more effective than others. Specifically, size and ownership structure are effective categorizations of firms when studying financing obstacles; larger and foreign-owned firms report lower financing obstacles. Variables capturing these firm characteristics not only enter statistically significant in the regressions, but also explain large variations in firms' financing obstacles.

Beck *et al.* (2005) assess the importance of self-reported financing, legal and corruption obstacles for firm growth and find that many of these obstacles are indeed binding. They also

explore the effect of firm size and financial and institutional development on the relation between the reported obstacles and growth.

However, while Beck *et al.* (2005) focus on the role of country-level financial and institutional development in overcoming the constraining effect of financing obstacles, we analyze firm characteristics that explain differences in reported financing obstacles.

Among empirical work on finance and firm size, some authors also find favorable effects of financial development on small firms. Cetorelli and Strahan (2006) find that uncompetitive local banking markets in the US represents a barrier to the entry of new firms because the new firms have difficulty accessing credit. Some suggest that because small firms tend to hurt the most as a result of not being able to access finance due to underlying weaknesses of institutional environment, they hence benefit disproportionately from financial system's development, which relaxes their financing constraints. Large firms tend to internalize many of the capital allocation functions carried out by financial markets and financial intermediaries, thus they tend to benefit less from the development of financial markets and institutions compared to their smaller counterparts (Beck *et al.*, 2008).

In addition, research shows that small- and medium-sized enterprises (SMEs) not only incur higher financing obstacles than large firms, but that the effect of these financing constraints is stronger for SMEs than for large firms (Beck and Demirguc-Kunt, 2006). Policymakers in governmental and international aid organizations believe that in developing countries, small firms have inadequate access to external financing due to market imperfections (World Bank, 2007).

An alternative method to identify the impact of access to credit on firm performance is through controlled experiments. McKenzie and Woodruff (2008) designed a field experiment in Mexico that administered treatments of cash or equipment to randomly selected micro enterprises in their sample, hence generating shocks to capital stock that are uncorrelated with entrepreneurial ability or growth opportunities. Their results suggest returns to capital of 20-33% a month, which are much higher than market interest rates and even higher than returns from a similar experiment in Sri Lanka. Furthermore, interacting the treatment effect with different measures of financial constraints and access to finance, they find that the return is much higher (70-79% per month) for firms that report themselves as financially constrained. Indeed, they cannot reject the possibility of no return for the financially unconstrained group of firms. Very high levels of return at very low levels of capital stock also imply that there may be no minimum investment threshold below which returns to capital are so low as to discourage entry into self-employment.

## **THE MODEL**

**Data:** We obtain our data from World Bank's Enterprise Survey (WBES) conducted during 2002-2005 by the World Bank in 79 countries, including many low-income countries.

Our data contain detailed Firm-level data on the quality of the institutional environment in which firms operate. The World Bank has undertaken large numbers of firm level surveys with the express intention of measuring the quality of the business environment or the investment climate. The main purpose of the survey was to identify obstacles to firm performance and growth around the world. Thus, the survey contains a large number of questions on the nature and severity of obstacles, such as infrastructure, crime, macroeconomic policies, corruption, legal system deficiencies and financing. The database also has information on firms' characteristics, such as ownership, sales, employment and growth. The data also indicate whether a firm is a multinational enterprise, i.e. whether it has operations in other countries and the sector in which the firm is producing. In total, over 10,000 firms were surveyed, with the number varying across countries but with a

minimum of 100 firms per country. The sample of surveyed firms in each country was constructed to reflect the sectoral, ownership and size structure (Appendix). Data were mostly collected through personal interviews. In addition to the detail on the obstacles, one of the greatest values of this survey is its wide coverage of smaller firms. The survey is size-stratified, with 40% of observations on small firms (defined as employing 5-50 employees), 40% on medium-sized firms (51-500 employees) and the remainder from large firms (>500 employees).

Table 1 reports the composition of our sample according to size, ownership and other firm characteristics; small firms employ 5 to 50 employees, medium firms 51 to 500 employees and large firms over 500 employees. Multinational firms are firms that have holdings or operations in other countries. Foreign-owned firms are firms with foreign ownership. Government-owned firms are firms with government ownership.

Table 2 provides summary statistics; small enterprises employ 5 to 50 employees, medium enterprises 51 to 500 employees and large enterprises over 500 employees.

Foreign ownership indicates firms are firms with foreign ownership. Government ownership indicates firms with government ownership. Manufacturing, service, agriculture, construction and other are sectoral dummy variables. Exporter is a dummy variable that indicates if the firm is an exporting firm. Firms were asked more detailed questions to understand the nature of obstacles in the financial sector better. Management of the surveyed firms was asked to rate how problematic financing is for the operation and growth of their business. The perceived severity of the obstacles was quantified by assigning those values between 4, major obstacle and 1, no obstacle. These questions relate to general constraint financing, collateral requirements of banks and financial institutions, bank paperwork and bureaucracy, high interest rates, need for special connections with banks and financial institutions, banks' lack of money to lend, access to foreign banks, access to non-bank equity, access to export finance, access to financing for leasing equipment, access to finance for credit, whether corruption of bank officials creates a problem. High interest rates top the lists of specific financial obstacles, followed by the general constraint financing and the finance constraint credit. Corruption of bank officials, on the other hand, is rated as only minor obstacle.

Table 3a-d shows the correlation matrix between the general financing obstacle and the different firm characteristics we are considering, small and medium firms report significantly

Table 1: Report of the composition of our sample

Variables	No. of observations	Percent
Small	522	33.500
Medium	519	33.310
Large	517	33.180
Manufacturing	358	27.430
Service	363	27.820
Agriculture	88	6.740
Construction	234	17.930
Other	262	20.080
Government-owned	149	11.410
Privately-owned	1,157	88.590
Foreign-owned	385	29.390
Domestic-owned	925	70.610
Multinational	620	51.750
National	578	48.250

Source: Authors' own calculations based on WBES data

Table 2: Summary statistics

Variables	Observation	Mean	SD	Minimum	Maximum
Small enterprise	1559	0.334830	0.472082	0	1
Medium enterprise	1559	0.332906	0.471404	0	1
Large enterprise	1559	0.331623	0.470947	0	1
Manufacturing	1559	0.229634	0.420733	0	1
Service	1559	0.232842	0.422778	0	1
Agriculture	1559	0.056446	0.230856	0	1
Construction	1559	0.150096	0.357280	0	1
Other sector	1559	0.168056	0.374036	0	1
Government ownership	1559	0.095574	0.294101	0	1
Foreign ownership	1559	0.246953	0.431378	0	1
Exporter	1559	0.397691	0.489578	0	1
Finance constraint credit	1290	2.593798	1.062496	1	4
Finance constraint collateral	1332	2.568318	1.159932	1	4
Finance constraint paperwork	1327	2.515825	0.968263	1	4
Finance constraint high interest rates	1334	3.299850	0.918290	1	4
Finance constraint special connections	1314	2.218798	1.029032	1	4
Finance constraint lack money to lend	1306	1.922282	1.049124	1	4
Finance constraint access to foreign banks	1283	2.321902	1.182311	1	4
Finance constraint access to non bank equity	1254	2.354864	1.141639	1	4
Finance constraint export finance	1228	2.399837	1.148572	1	4
Finance constraint lease finance	1259	2.239873	1.104104	1	4
General constraint financing	1161	2.888028	0.952059	1	4
Corruption of bank officials	1304	1.867331	0.986497	1	4

Source: Authors' own calculations based on WBES data

Table 3a: Correlation matrix

	Gefinancin	Small	Medium	Large	Manuf	Service	Agric
Gefinancin	1.0000						
Small	0.1151	1.0000					
Medium	-0.0112	-0.5012	1.0000				
Large	-0.1020	-0.4998	-0.4976	1.0000			
Manuf	-0.0884	-0.1288	0.0738	0.0560	1.0000		
Service	-0.0546	0.0047	0.0520	-0.0560	-0.3008	1.0000	
Agric	0.0562	-0.0263	0.0277	-0.0011	-0.1335	-0.1347	1.0000
Const	0.0486	0.1585	-0.0339	-0.1244	-0.2294	-0.2315	-0.1028
Other	-0.0311	0.0810	0.0320	-0.1125	-0.2454	-0.2476	-0.1099
Goveru	-0.0670	-0.1659	0.0528	0.1139	-0.0115	0.0739	0.0623
Foreign	-0.1430	-0.1132	0.1194	-0.0053	0.1400	-0.0023	-0.0241
Expor	-0.1127	-0.1100	0.1352	-0.0240	0.2045	-0.0104	0.1022
Fccredit	0.2197	0.1485	-0.0238	-0.1247	-0.0432	-0.0941	-0.0190
Fccollat	0.2836	0.1909	-0.1133	-0.0777	-0.1276	-0.1143	0.0587
Fcpaper	0.2920	0.1752	-0.0257	-0.1488	-0.0626	-0.0679	0.0540
Fchirate	0.2335	0.0377	-0.0118	-0.0257	-0.0107	-0.1441	0.0218
Fesconnec	0.3015	0.1814	-0.0637	-0.1173	-0.0822	-0.0722	0.0154
Felmoney	0.2795	0.0787	-0.0110	-0.0672	-0.0557	-0.0665	0.0434
Fcafbank	0.3185	0.1486	-0.0652	-0.0818	-0.0907	-0.0816	0.0561
Fcanbequity	0.3253	0.1501	-0.0681	-0.0805	-0.0954	-0.0567	0.0554
Fcefinance	0.3128	0.0834	-0.0756	-0.0065	-0.0221	-0.1662	0.0489
Felfinance	0.3704	0.1451	-0.0858	-0.0571	-0.0717	-0.1051	0.0549
Corrbanffoff	0.3321	0.1884	-0.0459	-0.1419	-0.1426	-0.0308	0.070

Source: Authors' own calculations based on WBES data

Table 3b: Correlation matrix (cont'd)

	Const	Other	Govern	Foreign	Expor	Fccredit	Fccollat
Const	1.0000						
Other	-0.1889	1.0000					
Govern	-0.0755	0.0639	1.0000				
Foreign	0.0300	0.0171	-0.1457	1.0000			
Expor	-0.0039	0.0239	-0.0190	0.1699	1.0000		
Fccredit	0.0370	0.0026	-0.1058	-0.0594	-0.0845	1.0000	
Fccollat	0.0367	-0.0418	-0.0906	-0.2378	-0.1788	0.3132	1.0000
Fepaper	0.0242	-0.0199	-0.1002	-0.1435	-0.1322	0.3843	0.5228
Fchirate	0.0593	0.0146	-0.0653	-0.0267	-0.0055	0.2858	0.3723
Fescon~c	0.0364	-0.0133	-0.1231	-0.1531	-0.1403	0.4199	0.4310
Felmoney	0.0651	-0.0029	-0.0727	-0.0904	-0.0811	0.3157	0.2388
Fcafbank	0.0242	-0.0460	-0.0753	-0.2416	-0.1536	0.3963	0.4190
Fcanbequity	0.0145	-0.0594	-0.0124	-0.2278	-0.1505	0.4164	0.4333
Fcefinance	0.0188	-0.0517	-0.1096	-0.1760	-0.1042	0.4899	0.4188
Felfinance	-0.0025	-0.0503	-0.0434	-0.2066	-0.1595	0.5296	0.4363
Corrbanoff	0.0815	-0.0024	-0.0879	-0.1460	-0.1194	0.3484	0.2980

Source: Authors' own calculations based on WBES data

Table 3c: Correlation matrix (cont'd)

	Fepaper	Fchirate	Fescon~c	Felmoney	Fcafbank	Fcanbe~y	Fcefin~e
Fepaper	1.0000						
Fchirate	0.3692	1.0000					
Fescon~c	0.5540	0.3433	1.0000				
Felmoney	0.3143	0.2512	0.3959	1.0000			
Fcafbank	0.3835	0.2485	0.4733	0.4042	1.0000		
Fcanbequity	0.3875	0.2732	0.4429	0.3525	0.6592	1.0000	
Fcefinance	0.3772	0.2902	0.4257	0.3792	0.5346	0.6004	1.0000
Felfinance	0.4054	0.2565	0.4720	0.3722	0.5376	0.5594	0.6503
Corrbanoff	0.4281	0.2295	0.5200	0.5097	0.4677	0.3896	0.3796

Source: Authors' own calculations based on WBES data

Table 3d: Correlation matrix (cont'd)

	Felfin~e	Corrba~f
Felfinance	1.0000	
Corrbanoff	0.4320	1.0000

Source: Authors' own calculations based on WBES data

higher financing obstacles than large firms. Agricultural and construction firms seem to face higher obstacles, whereas Manufacturing firms report significantly lower financing obstacles. In order to determine which firm characteristics explain variation in financing obstacles, we therefore conduct multivariate analysis.

**Model set up:** The simple statistics presented in section 2.1 indicate that there are significant relations between firms' financing obstacles and their characteristics. While, these simple correlations are suggestive, they do not control for potentially confounding variables. We assume that the enterprise's underlying response can be described by the following equation:



$$\text{General constraint financing}_{i,k} = \beta \text{Firm Characteristics}_{i,k} + \gamma \text{Country}_k + \varepsilon_{i,k} \quad (1)$$

where, Financing Obstacle is either the general financing obstacle or one of the specific obstacles mentioned above, as reported by firm  $i$  in country  $k$ , or Firm Characteristics is a vector of firm attributes. These attributes include the firm size dummies, sectoral dummy variables and dummy variables for government-owned firms, foreign-owned firms. Country is a vector of country dummies that allow us to control for unobserved country-specific factors that might drive firms' responses.

Given that Financing Obstacle is a polychotomous dependent variable with a natural order, we use the ordered probit model to estimate regression (1). We assume that the disturbance parameter  $\varepsilon$  has normal distribution and use standard maximum likelihood estimation. Since omitted country characteristics might cause error terms to be correlated for firms within countries, we allow for clustered error terms.

In a second step, we explore whether financial, institutional and economic development helps alleviate financing obstacles. We therefore replace the country dummies with the country-level variables described above.

**Result and interpretation:** The regression estimated is:

$$\begin{aligned} \text{General constraint financing} = & \alpha + \beta_1 \text{manufacturing} + \beta_2 \text{services} + \\ & \beta_3 \text{agriculture} + \beta_4 \text{construction} + \beta_5 \text{size} + \beta_6 \text{Government ownership} + \\ & \beta_7 \text{Foreign ownership} + \beta_8 \text{Exporter} + \varepsilon \end{aligned} \quad (2)$$

General Financing constraints is the response to the question How problematic is financing for the operation and growth of your business? Answers vary between 1 (no obstacle), 2 (minor obstacle), 3 (moderate obstacle) and 4 (major obstacle). Size is either the log of total firm sales or two dummy variables indicating small and medium firms. Small firms employ 5 to 50 employees, medium firms 51 to 500 employees and large firms over 500 employees. Foreign indicates firms with foreign ownership. Government indicates firms with government ownership. All regressions also include country dummies. The regressions are estimated with ordered probit. Regressions in columns 1 and 2 use the whole sample. The regressions in columns 1 and 2 of Table 4 indicate that manufacturing and agriculture are the most robust predictors of financing obstacles. Since we include country and sectoral dummies in all regressions, we control for country- and sector-specific characteristics that might influence firms' responses in the survey. The results using the dummy variables are presented for small and medium and large firms as indicators of firm size. The dummy variables for small, medium and large enterprises enter significantly even when controlling for other firm characteristics that are conjectured to determine financing obstacles. Small firms report significantly higher financing obstacles than medium firms and both report higher financing obstacles than large firms Foreign-owned firms and exporter firms report significantly lower financing obstacles, even when controlling for other firm characteristics. We also find that government-owned firms report higher financing obstacles; finally, we note that manufacturing, agricultural and construction firms report larger financing obstacles.

Table 4: Financing obstacles and firm characteristics

Variables	General constraint financing (1)	General constraint financing (2)
Manufacturing	-0.26* (0.11)	-0.36** (0.11)
Service	-0.25* (0.11)	-0.38*** (0.11)
Agriculture	0.13 (0.16)	0.02 (0.16)
Construction	-0.02 (0.12)	-0.17 (0.12)
Other	-0.21 (0.12)	-0.36** (0.12)
Government ownership	-0.29** (0.11)	-0.19 (0.11)
Foreign ownership	-0.32*** (0.08)	-0.29*** (0.08)
Export	-0.16* (0.07)	-0.14* (0.07)
Small enterprise		1.49 (1.04)
Medium enterprise		1.37 (1.04)
Large enterprise		1.13 (1.04)
cut1		
Constant	-1.67*** (0.09)	-0.45 (1.03)
cut2		
Constant	-0.79*** (0.08)	0.45 (1.03)
cut3		
Constant	0.19* (0.08)	1.44 (1.04)
Log-likelihood	-1471.74	-1461.49
LR-Chi-square	57.36	77.85
R <sup>2</sup> _p-value	0.02	0.03

Source: Authors' own calculations based on WBES data. \*\*\*Significant at 1%; \*\*Significant at 5%; \*Significant at 10%

Table 5 shows the economic significance of firm characteristics for their financing obstacles; we report the estimated probability that a firm describes financing as major obstacle depending on its characteristics. Specifically, we set all variables at their actual value, except for the firm characteristic of interest. Based on the regressions of Table 4, estimated probabilities of rating financing as major obstacle to the operation and growth of the enterprises (Financing Obstacle = 4) are presented. Estimated probabilities are calculated for each enterprise setting all variables at its actual value, except for the firm characteristic of interest. In the case of dummies, the first line reports the probability if the dummy variable takes on the value one, while the second row reports the probability if the dummy variable takes on the value zero. The third row reports the difference between the first and second row. In the overall sample, manufacturing foreign ownership and service can each explain more than a five percentage point difference in the probability that a firm

describes financing as major obstacle. The size dummies yields differences between small and large firms, of around one percentage point.

Table 6a and b confirm the findings that larger and foreign-owned firms report lower obstacles; we report the results for regressions of specific financing obstacles on firm characteristics. We report results using size dummies as size indicators and country dummies as country indicators. The small firm dummy enters positively in most regressions, with the exception of access to interest rate and export finance. Medium-sized firms report higher obstacles than large firms. Exporter firms also report lower obstacles.

Overall, the results in Table 4-6 consistently point to the small and domestically owned firms as facing higher obstacles than other firms. Our result show that domestic firms face higher obstacles than foreign firms is consistent with Harrison and McMillan (2003) who find that the investment-cash flow sensitivity is higher for domestic firms than for foreign firms. Our findings

Table 5: Financing obstacles and firm characteristics: quantifying the effect

Variables	(1)	(2)
Manufacturing	0.1244906	0.1379148
	0.0790214	0.0736183
	0.0454692	0.0642965
Service	0.1234925	0.1413071
	0.0792843	0.0730245
	0.0442081	0.0682826
Agriculture	0.0702241	0.0826205
	0.0895738	0.0863750
	-0.0193497	-0.0037545
Construction	0.0905949	0.1114625
	0.0880033	0.0823140
	0.0025916	0.0291485
Other	0.1193089	0.1436173
	0.0830959	0.0772788
	0.0362130	0.0663385
Government ownership	0.1374429	0.1169869
	0.0839035	0.0831798
	0.0535394	0.0338071
Foreign ownership	0.1324895	0.1249781
	0.0761270	0.0751964
	0.0563625	0.0497817
Export	0.1037822	0.1001025
	0.0783546	0.0770251
	0.0254276	0.0230774
Small enterprise		0.0090886
		0.1905680
Medium enterprise		-0.1814794
		0.0116020
Large enterprise		0.1841198
		-0.1725178
		0.0170304
	0.1606252	-0.1435948

Source: Authors' own calculations based on WBES data

Table 6a: Specific financing obstacles and firm characteristic

Variables	Finance constraint credit (1)	Finance constraint collateral (2)	Finance constraint paperwork (3)	Finance constraint high interest rates (4)	Finance constraint special connections (5)	Finance constraint lack money to lend (6)
Manufacturing	-0.28* (0.11)	-0.70*** (0.11)	-0.20 (0.11)	-0.04 (0.12)	-0.32** (0.11)	0.00 (0.12)
Service	-0.38*** (0.11)	-0.77*** (0.12)	-0.32** (0.11)	-0.36** (0.12)	-0.42*** (0.11)	-0.04 (0.12)
Agriculture	-0.34* (0.16)	-0.33* (0.16)	0.00 (0.15)	0.09 (0.17)	-0.22 (0.16)	0.18 (0.16)
Construction	-0.23 (0.12)	-0.56*** (0.12)	-0.18 (0.12)	0.02 (0.13)	-0.25* (0.12)	0.15 (0.12)
Other	-0.29* (0.12)	-0.74*** (0.12)	-0.29* (0.12)	-0.13 (0.13)	-0.36** (0.12)	0.00 (0.13)
Government	-0.22 (0.12)	-0.31** (0.12)	-0.24* (0.11)	-0.10 (0.12)	-0.33** (0.12)	-0.15 (0.13)
Foreign	-0.02 (0.08)	-0.50*** (0.08)	-0.27*** (0.07)	-0.15 (0.08)	-0.31*** (0.08)	-0.20* (0.08)
Exporter	0.02 (0.07)	-0.07 (0.07)	-0.10 (0.07)	0.01 (0.07)	-0.09 (0.07)	-0.04 (0.07)
Small		0.34*** (0.08)	0.23** (0.08)	0.01 (0.09)		
Medium	-0.21** (0.08)				-0.30*** (0.08)	-0.05 (0.08)
Large	-0.42*** (0.09)	-0.05 (0.08)	-0.19* (0.08)	-0.12 (0.08)	-0.41*** (0.09)	-0.04 (0.09)
_lcountry_2	1.13*** (0.21)	0.21 (0.20)	0.76*** (0.20)	1.27*** (0.21)	0.93*** (0.20)	1.64*** (0.24)
_lcountry_3	1.27*** (0.17)	0.37* (0.17)	0.69*** (0.17)	1.12*** (0.18)	1.01*** (0.18)	2.08*** (0.22)
_lcountry_4	0.75*** (0.17)	0.09 (0.17)	0.88*** (0.17)	0.44** (0.17)	0.92*** (0.17)	1.59*** (0.22)
_lcountry_5	0.64*** (0.18)	0.61*** (0.18)	0.52** (0.17)	0.06 (0.17)	0.36* (0.18)	1.05*** (0.23)
_lcountry_6	0.70*** (0.17)	-0.11 (0.16)	0.43** (0.16)	0.80*** (0.17)	0.50** (0.17)	1.32*** (0.21)
_lcountry_7	0.85*** (0.16)	0.22 (0.16)	0.37* (0.16)	1.24*** (0.17)	0.32 (0.17)	0.94*** (0.22)
_lcountry_8	1.71*** (0.18)	0.07 (0.17)	0.95*** (0.16)	1.55*** (0.18)	1.17*** (0.17)	1.85*** (0.21)
_lcountry_9	0.93*** (0.20)	0.58** (0.20)	0.15 (0.19)	2.08*** (0.27)	0.28 (0.20)	1.05*** (0.24)
_lcountry_10	0.80*** (0.18)	-0.00 (0.18)	0.35* (0.17)	1.12*** (0.18)	0.52** (0.18)	1.30*** (0.22)
_lcountry_11	1.06*** (0.18)	0.28 (0.18)	0.50** (0.18)	0.86*** (0.19)	0.36 (0.19)	1.31*** (0.23)
_lcountry_12	-0.11 (0.17)	-0.39* (0.16)	-0.27 (0.16)	0.76*** (0.16)	-0.26 (0.18)	-0.05 (0.24)
_lcountry_13	1.10*** (0.19)	0.44* (0.18)	0.65*** (0.18)	0.79*** (0.18)	0.59** (0.18)	1.30*** (0.23)
_lcountry_14	0.86***	-0.50*	0.09	-0.01	0.20	0.11

Table 6a: Continued

Variables	Finance constraint credit (1)	Finance constraint collateral (2)	Finance constraint paperwork (3)	Finance constraint high interest rates (4)	Finance constraint special connections (5)	Finance constraint lack money to lend (6)
	(0.22)	(0.22)	(0.21)	(0.21)	(0.22)	(0.31)
_lcountry_15	0.94*** (0.16)	0.27 (0.16)	0.72*** (0.16)	1.10*** (0.17)	0.73*** (0.16)	1.51*** (0.21)
_lcountry_16	0.69*** (0.18)	0.27 (0.18)	0.37* (0.17)	1.56*** (0.20)	0.49** (0.18)	1.64*** (0.22)
cut1						
Constant	-0.63*** (0.16)	-1.27*** (0.16)	-0.93*** (0.16)	-0.99*** (0.17)	-0.71*** (0.16)	1.07*** (0.21)
cut2						
Constant	0.19 (0.16)	-0.60*** (0.16)	0.14 (0.16)	-0.30 (0.17)	0.14 (0.16)	1.76*** (0.21)
cut3						
Constant	1.12*** (0.16)	0.11 (0.16)	0.15 (0.16)	0.59*** (0.17)	0.14 (0.16)	1.76*** (0.21)
cut4						
Constant			1.18*** (0.16)		1.12*** (0.16)	2.54*** (0.21)
Log-likelihood	-1632.47	-1683.70	-1660.39	-1344.92	-1629.45	-1464.96
LR-Chi-square	282.02	307.93	240.02	279.57	279.79	326.10
R <sup>2</sup> -p-value	0.08	0.08	0.07	0.09	0.08	0.10

Source: Authors' own calculations based on WBES data. \*\*\*Significant at 1%; \*\*Significant at 5%; \*Significant at 10%

Table 6b: Specific financing obstacles and firm characteristic (cont'd)

	Finance constraint access to foreign banks (7)	Finance constraint access to non bank equity (8)	Finance constraint export finance (9)	Finance constraint lease finance (10)	General constraint financing (11)	Corruption of bank officials (12)
Manufacturing	-0.42*** (0.11)	-0.44*** (0.11)	-0.22 (0.12)	-0.42*** (0.12)	-0.30* (0.12)	-0.31** (0.12)
Service	-0.43*** (0.12)	-0.44*** (0.12)	-0.63*** (0.12)	-0.53*** (0.12)	-0.32** (0.12)	-0.16 (0.12)
Agriculture	-0.14 (0.16)	-0.14 (0.16)	-0.12 (0.16)	-0.24 (0.16)	-0.06 (0.17)	0.13 (0.16)
Construction	-0.32** (0.12)	-0.36** (0.12)	-0.33** (0.12)	-0.42*** (0.12)	-0.15 (0.13)	0.05 (0.12)
Other	-0.47*** (0.12)	-0.56*** (0.12)	-0.49*** (0.13)	-0.55*** (0.12)	-0.34** (0.13)	-0.15 (0.12)
Government	-0.26* (0.12)	0.05 (0.12)	-0.36** (0.12)	-0.01 (0.12)	-0.08 (0.11)	-0.21 (0.13)
Foreign	-0.53*** (0.08)	-0.51*** (0.08)	-0.40*** (0.08)	-0.37*** (0.08)	-0.28*** (0.08)	-0.27** (0.08)
Exporter	-0.01 (0.07)	-0.05 (0.07)	0.07 (0.07)	-0.01 (0.07)	-0.04 (0.07)	-0.04 (0.07)
Small		0.25** (0.08)	0.14 (0.08)	0.28*** (0.08)	1.42 (1.05)	
Medium	-0.19*				1.29	-0.28***

Table 6b: Continued

	Finance constraint access to foreign banks (7)	Finance constraint access to non bank equity (8)	Finance constraint export finance (9)	Finance constraint lease finance (10)	General constraint financing (11)	Corruption of bank officials (12)
	(0.08)				(1.05)	(0.08)
Large	-0.26**	-0.09	0.11	0.02	1.13	-0.36***
	(0.09)	(0.08)	(0.08)	(0.08)	(1.05)	(0.09)
_lcountry_2	1.19***	1.29***	1.02***	1.24***	0.95***	1.16***
	(0.22)	(0.21)	(0.22)	(0.22)	(0.21)	(0.23)
_lcountry_3	1.14***	1.09***	0.95***	0.83***	0.67***	1.31***
	(0.19)	(0.18)	(0.18)	(0.18)	(0.18)	(0.21)
_lcountry_4	0.69***	0.60***	0.71***	1.08***	0.61**	1.59***
	(0.18)	(0.17)	(0.18)	(0.18)	(0.20)	(0.20)
_lcountry_5	1.25***	0.77***	0.61**	1.22***	0.69***	0.98***
	(0.19)	(0.19)	(0.19)	(0.19)	(0.18)	(0.21)
_lcountry_6	0.74***	0.33	0.35*	0.79***	1.02***	1.20***
	(0.18)	(0.17)	(0.18)	(0.18)	(0.18)	(0.20)
_lcountry_7	0.55**	0.53**	0.38*	0.84***	0.59***	0.89***
	(0.18)	(0.17)	(0.18)	(0.18)	(0.17)	(0.20)
_lcountry_8	1.15***	0.84***	1.16***	1.70***	0.87***	1.50***
	(0.18)	(0.17)	(0.18)	(0.18)	(0.17)	(0.20)
_lcountry_9	0.83***	0.52*	0.65**	0.70***	0.70***	0.36
	(0.21)	(0.20)	(0.21)	(0.21)	(0.20)	(0.24)
_lcountry_10	1.12***	0.79***	0.80***	0.74***	0.96***	1.30***
	(0.19)	(0.18)	(0.19)	(0.19)	(0.20)	(0.21)
_lcountry_11	1.13***	0.89***	1.16***	1.02***	0.39*	0.92***
	(0.20)	(0.19)	(0.20)	(0.19)	(0.19)	(0.22)
_lcountry_12	-0.02	-0.07	-0.38*	-0.51**	0.13	-0.28
	(0.18)	(0.17)	(0.18)	(0.19)	(0.17)	(0.23)
_lcountry_13	0.93***	1.01***	1.08***	1.16***	0.74***	1.15***
	(0.20)	(0.19)	(0.20)	(0.19)	(0.18)	(0.21)
_lcountry_14	0.26	0.06	-0.36	-0.36	-0.56**	-0.09
	(0.24)	(0.23)	(0.24)	(0.26)	(0.21)	(0.32)
_lcountry_15	0.80***	0.64***	0.67***	1.13***	0.87***	1.74***
	(0.18)	(0.17)	(0.17)	(0.17)	(0.16)	(0.19)
_lcountry_16	0.83***	0.69***	0.60**	0.91***	0.79***	0.82***
	(0.19)	(0.18)	(0.19)	(0.19)	(0.18)	(0.21)
cut1						
Constant	-0.32	-0.41*	-0.40*	-0.09	0.10	0.49*
	(0.17)	(0.17)	(0.17)	(0.17)	(1.05)	(0.19)
cut2						
Constant	0.32	0.31	0.33	0.72***	1.07	1.33***
	(0.17)	(0.17)	(0.17)	(0.17)	(1.05)	(0.19)
cut3						
Constant	0.94***	1.01***	1.06***	1.53***	2.12*	2.19***
	(0.17)	(0.17)	(0.18)	(0.18)	(1.06)	(0.20)
cut4						
Constant						
Log-likelihood	-1594.76	-1591.48	-1537.06	-1504.71	-1400.73	-1394.22
LR-Chi-square	297.95	266.96	313.78	411.70	199.38	388.11
R <sup>2</sup> -p-value	0.09	0.08	0.09	0.12	0.07	0.12

Source: Authors' own calculations based on WBES data. \*\*\*Significant at 1%; \*\*Significant at 5%; \*Significant at 10%

sorting firms according to their size and ownership structure (foreign versus domestic ownership) in order to test the effect of financing obstacles leads to reasonable classifications. This also suggests that classification criteria based on size and ownership are most useful in testing the presence of financing constraints and identifying financially constrained firms.

## CONCLUSIONS

In this study we explore the firm characteristics that predict best firms' financing obstacles. We find that size and ownership predict financing obstacles best; smaller and domestic firms report higher obstacles. Categorizing firms by their size and ownership is therefore most useful when considering the effect of financial and institutional development on firms' financing constraints.

Given the limitations of existing methods to estimate financing constraints directly from firm-level data, our results based on survey data are an important contribution in improving our understanding of which firm attributes predict best firms' financing obstacles. The judgment leads to an efficient financial management as major obstacles are tackled.

## APPENDIX

Appendix 1: Number of firms by country

Country	No. of firms	Percent
1 Botswana	101	6.48
2 Cameroon	57	3.66
3 Cote d'Ivoire	97	6.22
4 Egypt	102	6.54
5 Ethiopia	105	6.74
6 Ghana	119	7.63
7 Kenya	113	7.25
8 Madagascar	116	7.44
9 Malawi	55	3.53
10 Nigeria	93	5.97
11 Senegal	124	7.95
12 South Africa	121	7.76
13 Tanzania	83	5.32
14 Tunisia	52	3.34
15 Uganda	137	8.79
16 Zambia	84	5.39
All sample	1,559	100.00

Source: Authors' own compilations based on WBES data

Appendix 2: Variable definitions and sources

Variables	Abbreviation of variables	Definition	Original source
Small enterprise	Small	Dummy variable that takes on the value one if firm is Small enterprise between 5 and 50 employees, zero otherwise	World Business Environment Survey (WBES)
Medium enterprise	Medium	Dummy variable that takes on the value one if firm is medium enterprise between 51 and 500 employees, zero otherwise	World Business Environment Survey (WBES)
Large enterprise	Large	Dummy variable that takes on the value one if firm is large enterprise more than 500 employees, zero otherwise	World Business Environment Survey (WBES)
Manufacturing	Manuf	Dummy variable that takes on the value one if firm is in the manufacturing industry, zero otherwise	World Business Environment Survey (WBES)

Appendix 2: Continued

Variables	Abbre viation of variables	Definition	Original source
Service	Service	Dummy variable that takes on the value one if firm is in the service industry, zero otherwise	World Business Environment Survey (WBES)
Agriculture	Agric	Dummy variable that takes on the value one if firm is in agriculture, zero otherwise	World Business Environment Survey (WBES)
Construction	Const	Dummy variable that takes on the value one if firm is in construction, zero otherwise	World Business Environment Survey(WBES)
Other sector	Other	Dummy variable that takes on the value one if firm is in other sector, zero otherwise	World Business Environment Survey (WBES)
Government ownership	Goveru	Dummy variable that takes on the value one if any government agency or state body has a financial stake in the ownership of the firm, zero otherwise	World Business Environment Survey (WBES)
Foreign ownership	Foreign	Dummy variable that takes on the value one if any foreign company or individual has a financial stake in the ownership of the firm, zero otherwise	World Business Environment Survey (WBES)
Exporter	Expor	Dummy variable that takes on the value one if firm exports, zero otherwise	World Business Environment Survey (WBES)
finance constraint	Fccredit	Dummy variable that takes on value one if firm has financed its investment with loans from commercial banks, zero otherwise	WorldBusinessEnvironmentcredit Survey (WBES)
Finance constraint collateral	Fccollat	Are collateral requirements of banks/financial institutions no obstacle (1), a minor obstacle (2), a moderate obstacle (3) or a major obstacle (4)?	World Business Environment Survey (WBES)
Finance constraint paperwork	Fepaper	Is bank paperwork/bureancracy no obstacle (1), a minor obstacle (2), a moderate obstacle (3) or a major obstacle (4)?	World Business Environment Survey (WBES)
Finance constraint high interest rates	Fchirate	Are high interest rates no obstacle (1), a minor obstacle (2), a moderate obstacle (3) or a major obstacle (4)?	World Business Environment Survey (WBES)
Finance constraint special connections	Fsconne	Is the need of special connections with banks/financial institutions no obstacle (1), a minor obstacle (2), a moderate obstacle (3) or a major obstacle (4)?	World Business Environment Survey (WBES)
Finance constraint lack money to lend	Felmoney	Finance Constraint-lack money to lend (1), a minor obstacle (2), a moderate obstacle (3) or a major obstacle (4)?	World Business Environment Survey (WBES)
Finance constraint access to foreign banks	Fefbank	Finance Constraint- access to foreign banks (1), a minor obstacle (2), a moderate obstacle (3) or a major obstacle (4)?	World Business Environment Survey (WBES)
Finance Constraint access to non bank equity	Fcanbeqnty	Finance Constraint-access to non bank equity (1), a minor obstacle (2), a moderate obstacle (3) or a major obstacle (4)?	World Business Environment Survey (WBES)
Finance Constraint export finance	Feefinance	Finance Constraint -export finance (1), a minor obstacle (2), a moderate obstacle (3) or a major obstacle (4)?	World Business Environment Survey (WBES)
Finance Constraint lease finance	Felfinance	Finance Constraint-lease finance (1), a minor obstacle (2), a moderate obstacle (3) or a major obstacle (4)?	World Business Environment Survey (WBES)
General constraint financing	Gcfinancin	How problematic is financing for the operation and growth of your business: no obstacle (1), a minor obstacle (2), a moderate obstacle (3) or a major obstacle (4)?	World Business Environment Survey (WBES)
Corruption of bank officials	Corrbanoff	Is the corruption of bank officials no obstacle (1), a minor obstacle (2), a moderate obstacle (3) or a major obstacle (4)?	World Business Environment Survey (WBES)

Source: Authors' own compilations based on WBES data



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