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Access to finance and firm performance: Evidence from African countries☆

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Abstract

This study conducts an empirical investigation of the effects of access to finance on the growth of firms in African countries. In order to achieve this, we made use of a new rich enterprise-level data set from the World Bank's Enterprise Surveys and employ both subjective and objective measures of access to finance. The subjective measure of access to finance is obtained from the ranking of access to finance as no obstacle or severe obstacle to business operations. The objective measure of access to finance is a variable which measures whether firms are constrained in obtaining credit or not. We use data for 10,888 firms across 30 African countries and the results using the subjective measure show that the access to finance constraint exerts a significant negative effect on firm growth. Also, the results using the objective measure show that firms that are not credit constrained experience faster growth than firms which are credit constrained. These results lend credence to the view that financing is very important for firm growth, and justifies the many measures and initiatives being put in place to make more finance available for African firms.

JEL classification: G10; G20; L25; O16

Keywords: Access to finance; Firm growth; Financial constraints; Africa

1. Introduction

The importance of finance to the growth of firms has been well documented in the literature and the firm-financing gap has become common terminology, depicting the inadequate access to finance faced particularly by firms (OECD, 2006a,b; Deakins et al., 2008; IFC, 2010). Insufficient finance is a key obstacle to firm growth (Malhotra et al., 2007) and it has been found that small firms face bigger challenges in obtaining finance as compared to larger firms (Schiffer and Weder, 2001; Beck et al., 2002). Financing is important for firms because it helps in expansion of operations, innovation, and investing in production facilities and new staff (OECD, 2006b). There has been increased attention focused on the role of firms in affecting economic growth, employment creation, and poverty reduction. Firms have been identified as important avenues for employment and job creation in both developing and developed countries.

However, many firms that are willing to expand often find it difficult to obtain financing from financial institutions and are thus credit constrained. This essentially constitutes the 'financing-gap' faced by firms and this gap is more prevalent in developing countries while it is not such a problem in advanced economies because various risk-coping strategies have been adopted by banks for lending to firms (OECD, 2006b). Thus, the financing-gap is essentially a problem for developing countries. It is well known that out of the group of developing countries, African countries are severely disadvantaged in financial development (Allen et al., 2011; Beck et al., 2009; Fowowe and Abidoye, 2013; Fowowe, 2013). Thus, the firm-financing gap is likely going to be a bigger problem for African countries than for countries in other developing regions.

This has indeed been observed from available survey data as access to finance has consistently ranked as one of the top constraints cited by firms. In Gelb et al.'s (2007) study of 26 African countries, it is seen that on average, the percentage of firms citing access to finance as a major or severe constraint was higher than for any other constraint (electricity, corruption, macro-economic instability, and labour regulations). Also, in the study by Dinh et al. (2012) which used a sample of over 39,000 firms across 98 countries, it was found that access to finance was

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ranked as either the biggest or second biggest obstacle by firms in Eastern Europe and Central Asia, Sub-Saharan Africa, East Asia and Pacific, Middle East and North Africa, and South Asia. It was only in Latin America and the Caribbean that access to finance was ranked as the third biggest obstacle. Looking closely at the 38 Sub-Saharan African countries in Dinh et al.'s (2012) study, it is seen that electricity was the top ranked constraint in 16 countries while access to finance was the top ranked constraint in 11 countries.

This study conducts an empirical investigation of the effects of access to finance on the growth of firms in African countries. In order to achieve this, we make use of a new rich enterprise-level data set from the World Bank's Enterprise Surveys and employ both subjective and objective measures of access to finance. This ensures the robustness of the results and thus the results are not influenced by idiosyncratic differences of respondents as may be reflected in subjective data.

This study will add to the existing literature in 3 main ways. Firstly, our exclusive focus on firm-level data for African countries offers new insights into understanding the behaviour and performance of African firms, and this would assist in developing new and innovative ways for achieving firm growth which is important in alleviating poverty. Secondly, we deviate from many existing studies by constructing objective measures of firms' access to finance following the method described in Kuntchev et al. (2013) and this offers a more comprehensive understanding of how finance affects the performance of firms. Thirdly, this study addresses the 'twin' issues of finance that firms face – access to finance constraints and participation in financial markets – and thus offers a broad analysis and discussion of finance for firms in Africa.

2. Literature review

One of the central tenets of the vast literature on the finance-growth nexus is that finance promotes growth by channelling credit to the most eligible firms and there is a lot of macroeconomic evidence which shows that financial development enhances overall growth of the economy (Levine, 2005). There have also emerged an increasing number of microeconomic studies which have shown that finance exerts a positive effect on the growth of firms (Demirguc-Kunt and Maksimovic, 1998).

We can identify 3 broad group of studies that have examined the effects of access to finance on growth of firms across the world. The first group of studies are early studies that combined firm-level data with broad macroeconomic indicators of financial development for a cross-section of countries to examine the relationship between a more developed financial sector and firm performance. Such studies include Demirguc-Kunt and Maksimovic (1998), Beck et al. (2008, 2006), and Demirguc-Kunt et al. (2006). The second group of studies are country-specific studies which also combined firm data with financial development. Such studies include Butler and Cornaggia (2007) and Girma et al. (2008). The broad consensus from these studies is that better developed financial systems foster the growth of firms. The third group of studies make use of recent firm-level data, especially from the World Bank, which relies on responses from firms on various constraints to doing business and on their accessibility to financial markets. This has given rise to new studies which make use of strictly firm level data to examine how access to finance and other constraints affect firm performance. Such studies include Beck et al. (2005), Ayyagari et al. (2008), Dinh et al. (2012), Aterido and Hallward-Driemeier (2010), and Aterido et al. (2011).

This last group of studies forms the central focus of this study. Existing studies into the effects of financing constraints and access to finance on the performance of firms have largely made use of data across a broad spectrum of developed and developing countries. This study focuses exclusively on African countries which have been shown to be generally less financially developed than countries in other regions. The study will therefore enhance in understanding how improved and better functioning financial markets will enhance the growth of African firms.

3. Data

3.1. Enterprise Surveys dataset

This study uses data from the Enterprise Surveys which are a newly available firm-level data set provided by the World Bank and its partners across the world. The surveys cover more than 130,000 firms in 125 countries during the period 2006–2012. The Enterprise Surveys focus on the many factors that shape the business environment and these factors can be accommodating or constraining for firms and play an important role in whether a country will prosper or not (World Bank, 2012). The surveys are administered to a representative sample of firms in the non-agricultural formal private economy and makes use of a uniform universe, uniform methodology of implementation, and a core questionnaire which makes the surveys comparable across countries and survey years.

The core questionnaire, which contains survey questions answered by business owners and top managers around the world, provides both subjective and objective information on the business environment that firms confront. The subjective evaluations show the severity of obstacles that firms face and the questionnaire asks firms to rank 16 components of the business environment, indicating which represent the biggest obstacles, and to evaluate these 16 components on a scale of 1–5 (1 being no obstacle and 5 being a severe obstacle). This makes it possible to identify the top obstacles and examine the obstacles firms consider the most important. The Enterprise Surveys are also very good because they provide a set of objective measures of the business environment, such as if firms have an overdraft facility or how many times do power outages occur. These objective measures become very useful particularly when we want to overcome the potential shortcomings of subjective measures. Aterido et al. (2011) note that drawbacks of subjective measures include the fact that firms' perceptions of the business environment reflect idiosyncratic differences in the degree of optimism or pessimism of the individuals responding to the survey. Also, subjective measures are deficient because answers are likely to be strongly influenced by the experience and performance of the firm.

Table 1
Summary of firms in the sample.

Country	No. of firms	Percentage
Angola	360	3.31
Benin	150	1.38
Botswana	268	2.46
Burkina Faso	394	3.62
Cape Verde	156	1.43
CAR	150	1.38
Chad	150	1.38
Congo Rep	151	1.39
Cote d'Ivoire	526	4.83
DRC	359	3.30
Eritrea	179	1.64
Ethiopia	644	5.91
Gabon	179	1.64
Ghana	616	5.66
Lesotho	151	1.39
Liberia	150	1.38
Madagascar	445	4.09
Malawi	300	2.76
Mauritius	398	3.66
Mali	619	5.69
Mozambique	599	5.50
Niger	150	1.38
Rwanda	241	2.21
Senegal	625	5.74
Sierra Leone	150	1.38
South Africa	1057	9.71
Togo	155	1.42
Zambia	603	5.54
Cameroon	363	3.33
Zimbabwe	600	5.51
Total	10,888	100.00

This study is concerned with examining the effects of access to finance on the performance of African firms. We will make use of both subjective and objective measures of access to finance from the World Bank's Enterprise Surveys to achieve this objective.

We use a sample of 10,888 firms from 30 African countries for which data are complete for our analysis. Table 1 presents the breakdown of firms in the sample and it is seen that the mean sample size is 362 firms, although actual figures vary by country. Some countries have a higher representation than others, with countries such as Ethiopia, Ghana, Mali, Senegal, South Africa, Zambia, and Zimbabwe having more than 5% of the total sample. South Africa has the largest number of firms (1057) in the sample, representing 9.71%; while five countries (Benin, Central African Republic, Chad, Liberia, Sierra Leone) have the lowest number of firms (150), representing 1.38% of the sample.

3.2. Dependent variable: performance of firms

Our ideal measure of firm performance would be a combination of both financial and non-financial measures. Financial measures can be represented by profit, revenue, returns on investment (ROI), returns on equity (ROE), earnings per share (EPS) (Santos and Brito, 2012; Chong, 2008). They have the advantage of being objective, simple and easy to understand. However, they have the drawback of being not easily available and being historical, therefore offering only lagged information. They can also be subject to manipulations, and incompleteness (Santos and Brito, 2012; Chong, 2008). Non-financial measures include number of employees, revenue growth, revenue per employee, market share, customers' satisfaction, customers' referral rates, employees satisfaction, social and environmental performance. The non-financial measures have the disadvantage of being subjective (Santos and Brito, 2012; Chong, 2008). Owing to the limitations of the financial and non-financial measures, it has become the generally acceptable standard to employ a hybrid approach combining both financial and non-financial measures of performance.

However, we are constrained by data and the measure of firm performance we employ is stipulated by the available data. Thus, following other studies (Dinh et al., 2012; Aterido et al., 2011; Aterido and Hallward-Driemeier, 2010), we measure firm performance using firm growth, which is subsequently measured by employment growth. Although the enterprise surveys dataset contains data on both employment and sales of firms, like other researchers we make use of employment rather than sales growth. This is because amongst other things, sales growth is more volatile and more prone to reporting and measurement biases. This is particularly so if survey respondents are reporting sales from 3 years ago (Dinh et al., 2012). Also, for tax reasons, firms might not report actual sales (Dinh et al., 2012). For the level of employment which is used to calculate firm growth, we follow other studies (Dinh et al., 2012; Aterido et al., 2011; Aterido and Hallward-Driemeier, 2010) in using growth of permanent workers and do not include other forms of employment such as contract labour or temporary workers. This is because the consistency of reporting of total employment (permanent plus temporary) varies across countries (Aterido et al., 2011). Also, the employment of permanent workers will more likely reflect the log-run performance of the firm, and are more important for policy makers because non-permanent forms of employment tend to be considered as substandard or less preferred by workers (Aterido et al., 2011).

Following Dinh et al. (2012) firm growth is calculated as the log difference between the current number of permanent employees and the number of permanent employees three years before the survey year, divided by the difference between the survey years. This is given as:

$$FG_{it} = [(\ln S_{it} - \ln S_{i,t-3})/3]$$

where FG_{it} is firm growth, S_{it} is firm size, represented by permanent employment. Calculation of firm growth in this manner helps to reduce the impact of outliers on firm growth. Thus, the firm growth rates we obtain are symmetric around zero, with the lowest rate at −3.13 and the highest rate at 2.34.

Table 2 presents summary statistics for firm growth and it is seen that average growth of firms is 0.05. Average firm growth in some countries such as Angola, Ethiopia, Gabon, CAR, Chad, Ghana, Lesotho, Malawi, Mauritius, Senegal and South Africa is higher than the sample average. Also, some countries have average firm growth which is lower than the sample average

Table 2
Employment growth of firms, by country.

Country	Employment growth			
	Mean	Std. dev.	Min	Max
Angola	0.09	0.14	−0.34	1.00
Benin	0.04	0.16	−0.53	0.78
Botswana	0.04	0.13	−0.57	0.66
Burkina Faso	0.04	0.11	−0.88	0.63
Cape Verde	0.03	0.11	−0.34	0.84
CAR	0.07	0.08	−0.23	0.43
Chad	0.07	0.13	−0.60	0.59
Congo Rep	0.05	0.15	−0.69	0.71
Cote d'Ivoire	0.05	0.26	−3.13	0.76
DRC	0.02	0.14	−0.60	1.54
Eritrea	−0.04	0.13	−0.69	0.49
Ethiopia	0.08	0.12	−0.67	0.71
Gabon	0.08	0.20	−0.95	1.06
Ghana	0.06	0.12	−0.39	0.62
Lesotho	0.07	0.21	−1.11	0.95
Liberia	0.05	0.19	−0.57	0.93
Madagascar	0.03	0.15	−0.60	1.70
Malawi	0.07	0.16	−0.46	0.85
Mauritius	0.07	0.24	−0.94	2.34
Mali	0.06	0.10	−0.37	0.40
Mozambique	0.05	0.11	−0.42	0.55
Niger	0.06	0.13	−0.45	0.49
Rwanda	0.05	0.11	−0.23	0.75
Senegal	0.06	0.10	−0.37	0.68
Sierra Leone	0.04	0.16	−0.78	0.83
South Africa	0.07	0.09	−0.70	0.49
Togo	0.03	0.12	−0.42	0.43
Zambia	0.05	0.12	−0.52	0.63
Cameroon	0.03	0.11	−0.77	0.67
Zimbabwe	−0.07	0.20	−0.98	0.94
Total	0.05	0.15	−3.13	2.34

(Cape Verde, DRC, Madagascar, Togo, Cameroon) and some countries have negative growth (Eritrea, Zimbabwe). The highest firm growth is recorded in Mauritius while the lowest growth is in Cote d'Ivoire.

3.3. Access to finance variables

This study is interested in examining how access to finance affects firm growth in African countries. Thus, our primary explanatory variables are access to finance constraints and variables measuring participation in financial markets. Our measure of access to finance constraints is a subjective measure which is obtained from the respondents' ranking of the 16 constraints of the business environment. Specifically, respondents rank "access to finance" (along with 15 other variables) on a scale of 1–5 (1 being no obstacle and 5 being a severe obstacle). Thus, if access to finance is a constraint on firm performance, it will have a negative sign.

The access to finance constraint variable is a subjective measure and we need to obtain objective measures of access to finance. Although subjective measures offer useful insight into the business environment, they have some shortcomings. Firstly, subjective measures are firm perceptions of the business environment and this could reflect idiosyncratic differences in the degree of optimism or pessimism of the respondents (Aterido et al., 2011). Also, answers could be influenced by the experience and performance of the firm (Aterido et al., 2011). In light of this, it is important to use objective measures to examine how finance affects firm performance in African countries.

The World Bank Enterprise Surveys provide a large set of objective measures of business environment constraints. In addition to subjective information on access to finance as an obstacle, the questionnaire also collects objective information on aspects of financial access, such as use of external sources of finance, loans or line of credit outstanding, and loan applications. We make use of these information in creating 3 objective measures of access to finance.

Our first objective measure of access to finance uses the definition of credit constrained status of Kuntchev et al. (2013). Kuntchev et al. (2013) used the Enterprise Surveys data to construct 4 groups that measure the extent to which firms were credit constrained during the fiscal year referenced in each survey. The first group is called Full Credit Constrained (FCC), the second group is called Partially Credit Constrained (PCC), the third group is called Maybe Credit Constrained (MCC), and the fourth group is called Non Credit Constrained (NCC).

According to Kuntchev et al. (2013), the firms in the FCC group applied for a loan and were rejected and do not have any type of external finance. The FCC group includes the firms that meet all the following conditions simultaneously:

i. Did not use external sources of finance for both working capital and investments during the previous year;
ii. Applied for a loan during the previous year;
iii. Do not have a loan outstanding at the time of the survey which was disbursed during the last fiscal year or later.

The firms in the PCC group manage to find some other forms of external finance and the PCC group includes firms that meet the following conditions:

i. Used external sources of finance for working capital and/or investments during the previous fiscal year and/or have a loan outstanding at the time of the survey, and either;
ii. Did not apply for a loan during the previous fiscal year and the reason for not applying for a loan was other than having enough capital for the firm's needs. Some of these reasons may indicate that firms may self-select out of the credit market due to prevailing terms and conditions, thus some degree of rationing is assumed or;
iii. Applied for a loan but was rejected.

The firms in the MCC group have had access to external finance and there is evidence of them having bank finance and the MCC group includes firms that:

i. Used external sources of finance for working capital and/or investments during the previous fiscal year and/or have a loan outstanding at the time of the survey;
ii. Applied for a loan during the previous fiscal year.

Table 3
Access to finance constraint and access to finance/participation in financial markets variables (mean), by country.

	Access to finance constraint	CCS	Overdraft	Creditline
Angola	3.26	2.63	0.15	0.11
Benin	3.46	2.44	0.66	0.41
Botswana	2.45	3.3	0.53	0.50
Burkina Faso	4.00	2.19	0.61	0.34
Cape Verde	2.82	2.77	0.39	0.45
CAR	3.08	2.65	0.57	0.26
Chad	3.19	2.52	0.74	0.15
Congo Rep	2.70	2.39	0.60	0.22
Cote d'Ivoire	3.80	1.65	0.26	0.11
DRC	3.54	1.88	0.21	0.18
Eritrea	1.41	3.51	0.38	0.14
Ethiopia	2.79	2.38	0.25	0.14
Gabon	2.52	2.64	0.21	0.15
Ghana	3.65	2.30	0.13	0.18
Lesotho	2.21	3.09	0.45	0.32
Liberia	2.84	2.51	0.15	0.24
Madagascar	2.83	2.78	0.32	0.21
Malawi	3.07	2.83	0.58	0.40
Mauritius	2.88	3.31	0.64	0.54
Mali	3.56	2.21	0.07	1.0
Mozambique	2.97	2.25	0.13	1.0
Niger	3.06	2.76	0.72	0.40
Rwanda	2.65	2.79	0.49	0.56
Senegal	3.11	2.32	0.13	1.0
Sierra Leone	2.95	2.14	0.42	0.19
South Africa	1.78	3.17	0.52	0.30
Togo	3.25	2.26	0.65	0.21
Zambia	2.45	2.74	0.33	1.0
Cameroon	3.44	2.52	0.54	0.41
Zimbabwe	3.77	1.97	0.22	0.13

For the firms in the NCC group, independent of their current level of external finance, they are happy with their current financing structure for both working capital and investment. The NCC group includes firms that:

i. Did not apply for a loan during the previous year;
ii. The reason for not applying for a loan was having enough capital for the firm's needs.

We then create the ordinal variable Credit Constrained Status (CCS) for which: 1 = FCC, 2 = PCC, 3 = MCC, 4 = NCC. Thus, higher values of CCS denote higher values of access to finance.

In addition, the Enterprise Surveys contain information on whether firms have overdraft facilities in the year under consideration, and whether firms have a line of credit or loans from financial institutions. These objective data are transformed into 2 variables which further measure access to finance. The first variable, CREDITLINE, is a dummy variable which has a value of 1 if the firm has a loan or creditline, and 0 otherwise. The second variable, OVERDRAFT, is a dummy variable which has a value of 1 if the firm has an overdraft facility and 0 otherwise.

Table 3 presents mean values of the access to finance constraint and objective access to finance variables and we observe interesting variability across countries. The access to finance constraint is high in countries such as Burkina Faso, Cote d'Ivoire, Zimbabwe, Cameroon, Ghana, Mali, Democratic Republic of Congo, Benin and Angola. This implies that finance is a particularly severe constraint to firms in these countries. It is observed that the access to finance constraint is low in countries such as South Africa, Eritrea, Lesotho, Zambia, and Botswana. This seems to suggest that firms in these African countries face less severe constraints in accessing finance. Table 3 also shows that for the CCS variable, countries such as Eritrea, Mauritius, Botswana, South Africa, Lesotho, Malawi and Caper Verde have high values, implying that firms in these countries have high access to finance. On the other hand, countries such as Burkina Faso, Cote d'Ivoire, Democratic Republic of Congo, and Zimbabwe have low CCS values, thus, firms in these countries have low access to finance. It is interesting to note that generally, countries with high access to finance constraints also have low access to finance. This supports the validity of our variables and lends credence to the ensuing analysis.

3.4. Control variables

Having obtained our measures of access to finance constraint and objective access to finance variables, it is important to control for general business conditions, firm characteristics, and country controls.

We control for general business conditions using variables contained in the Enterprise Surveys dataset to measure business regulatory conditions and corruption. Firms are asked to state the percentage of senior management time that was spent in dealing with government regulations. They were also asked about the frequency of inspections or requirements for meeting by tax officials. These variables are used to measure business regulations and respectively assigned the names REGULATION1 and REGULATION2. Firms are also asked to state the percentage of total annual sales paid in informal payments and this variable is used to measure corruption and is assigned the name CORRUPTION.

The Enterprise Surveys contain important data on firm characteristics and these include information on size, age, sector, and ownership. This is an important feature of the data which affords us the opportunity to examine if and how business environment conditions differ across, and affect differently, different types of firms (Aterido et al., 2011). The inclusion of these firm characteristics help in controlling for the differences in objective conditions facing firms with different characteristics (Aterido et al., 2011). The firm characteristics used are size of the firm, age of the firm, and ownership structure. The size of the firm is represented with 4 categories: micro, small, medium, large. For the purposes of our analysis, we have included 3 size categories (small, medium, large) with the omitted category being micro enterprises. SMALL comprises of firms who have between 11 and 50 employees, MEDIUM comprises of firms with 51–200 employees, while LARGE comprises of firms who have over 200 employees. The age of the firm is represented in the dataset with 3 categories: young, mature, old. Only 2 categories (mature, old) have been included in our analysis, and the omitted category is young. MATURE comprises of firms whose age is between 6

and 15 years while OLDER comprises of firms aged 16 years and above. 2 variables are used to measure ownership structure. GOVERNMENT is a dummy variable which has a value of 1 if 10% or more of the firm is government owned, while FOREIGN is a dummy variable which has a value of 1 if 10% or more of the firm is foreign owned.[1]

Following other studies (Dinh et al., 2012; Aterido et al., 2011) the country controls included are GDP per capita (PCGDP), ratio of trade to GDP (TRADE), inflation (INFL), and average growth of GDP over previous 3 year period (GDPGROWTH). These were obtained from African Development Indicators Database of the World Bank.

4. Model specification

This study seeks to examine the effects of access to finance constraints and participation in financial markets on growth of firms in African countries. Based on the preceding discussion, we will estimate models where employment growth is the dependent variable and variables measuring access to finance constraints and participation in financial markets are our primary explanatory variables. Additional variables measuring business conditions, corruption, firm characteristics, and country controls are included as control variables. Thus, the analysis comprises of two sections dealing first with access to finance constraints and then with objective access to finance.

4.1. Access to finance constraints and firm growth

In order to estimate the effects of access to finance constraints on firm growth, we make use of the subjective measures of the investment climate obtained from the Enterprise Surveys. The primary variable of interest is our measure of access to finance constraint, denoted FC, which is the access to finance constraint ranked by firms on a scale of 1–5 (1 being no obstacle and 5 being a severe obstacle). Thus, if access to finance is a constraint on firm performance, it will have a negative sign. We include the other constraints to the business environment in the variable OC in order to examine how important financial exclusion is a constraint to firm growth when compared with other obstacles (Ayyagari et al., 2008). We include firm characteristics to capture size of the firm (SMALL, MEDIUM, LARGE), age of the firm (MATURE, OLDER), business regulatory conditions (REGULATION1, REGULATION2), corruption (CORRUPTION) and country controls. The inclusion of these firm characteristics help in controlling for the differences in objective conditions facing firms with different characteristics (Aterido et al., 2011).

Thus, we estimate the following model:

$$FG_i = \alpha_0 + \alpha_1 FC_i + \alpha_2 OC_i + \alpha_3 SMALL_i + \alpha_4 MEDIUM_i + \alpha_5 LARGE_i + \alpha_6 MATURE_i + \alpha_7 OLDER_i + \alpha_8 REGULATION_i + \alpha_9 CORRUPTION_i + \alpha_{10} COUNTRYFIXEDEFFECTS + \varepsilon_1 \quad (1)$$

where FG = firm growth, obtained by calculating employment growth of the firm;

FC = access to finance constraint;

OC = a matrix of the 15 remaining constraints of the business environment: access to land; business licensing and permits; corruption; courts; crime, theft and disorder; customs and trade regulations; electricity; inadequately educated workforce; labour regulations; political instability; practices of competitors in the informal sector; tax administration; tax rates; electricity and transport;

SMALL = firms employing between 11 and 50 employees;

MEDIUM = firms employing between 51 and 200 employees;

LARGE = firms employing above 200 employees;

MATURE = a firm which is between 5 and 15 years old;

OLD = a firm which is above 15 years old;

REGULATION1 = the percentage of senior management time that was spent in dealing with government regulations;

REGULATION2 = the frequency of inspections or requirements for meeting by tax officials;

CORRUPTION = state the percentage of total annual sales paid in informal payments.

4.2. Objective access to finance/participation in financial markets and firm growth

In order to estimate the effects of participation in financial markets on firm growth, we make use of the objective measures of financial access provided in the Enterprise Surveys dataset. These measures include information on use of external sources of finance, loans or line of credit outstanding, and loan applications. We make use of these information in creating 3 objective measures of access to finance: credit constrained status (CCS), loans or lines of credit (CREDITLINE), and OVERDRAFT (OVERDRAFT).

Thus, we estimate the following models:

$$FG_i = \beta_0 + \beta_1 CCS_i + \beta_2 SMALL_i + \beta_3 MEDIUM_i + \beta_4 LARGE_i + \beta_5 MATURE_i + \beta_6 OLDER_i + \beta_7 REGULATION_i + \beta_8 CORRUPTION_i + \beta_9 COUNTRYEFFECTS + \varepsilon_2 \quad (2)$$

$$FG_i = \beta_0 + \beta_1 CREDITLINE_i + \beta_2 SMALL_i + \beta_3 MEDIUM_i + \beta_4 LARGE_i + \beta_5 MATURE_i + \beta_6 OLDER_i + \beta_7 REGULATION_i + \beta_8 CORRUPTION_i + \beta_9 COUNTRYEFFECTS + \varepsilon_3 \quad (3)$$

[1] We discovered a lot of missing observations for both variables measuring foreign and government ownership. For foreign ownership, only 1975 observations were valid, while only 182 observations were valid for the variable measuring government ownership. Thus, these variables were eventually excluded from our analysis.

$$FG_i = \beta_0 + \beta_1 OVERDRAFT_i + \beta_2 SMALL_i + \beta_3 MEDIUM_i + \beta_4 LARGE_i + \beta_5 MATURE_i + \beta_6 OLDER_i + \beta_7 REGULATION_i + \beta_8 CORRUPTION_i + \beta_9 COUNTRYEFFECTS + \varepsilon_4 \quad (4)$$

$$FG_i = \beta_0 + \beta_1 BOTHLOANS_i + \beta_2 SMALL_i + \beta_3 MEDIUM_i + \beta_4 LARGE_i + \beta_5 MATURE_i + \beta_6 OLDER_i + \beta_7 REGULATION_i + \beta_8 CORRUPTION_i + \beta_9 COUNTRYEFFECTS + \varepsilon_5 \quad (5)$$

where CCS = credit constrained status;

CREDITLINE = dummy variable which has a value of 1 if the firm has a loan or creditline 0 otherwise;

OVERDRAFT = dummy variable which has a value of 1 if the firm has an overdraft facility and 0 otherwise;

BOTHLOANS = a linear combination of CREDTILINE and OVERDRAFT.

4.3. Methodology

As evident from Eqs. (1)–(5), our data do not have a time dimension since they are from surveys conducted at a particular point in time.[2] Thus, as other studies have done econometric estimations will be carried out using cross-sectional regressions (Dethier et al., 2011).

5. Empirical results

5.1. Access to finance constraints and performance of firms

The results of examining the effects of access to finance constraints on the performance of African firms are presented in Table 4. In Table 4, we have included all business environment obstacles in the same equations and added country controls in the first column, country and firm controls in the second column, and country, firm and business regulatory environment controls in the third column. The negative sign and significance of this coefficient implies that inadequate finance is a serious constraint on the growth of firms. The results show that access to finance constraint has a significant negative effect on employment growth. These results are similar to other studies (Dinh et al., 2012; Ayyagari et al., 2008) and show that inadequate financing is a serious constraint that African firms face, and which adversely affects their growth.

[2] The surveys were conducted in 2007 for 6 countries: Ghana, Mali, Mozambique, Senegal, South Africa, Zambia; 2009 for 17 countries: Benin, Burkina Faso, Cape Verde, Chad, Congo, Cote d'Ivoire, Eritrea, Gabon, Lesotho, Liberia, Madagascar, Malawi, Mauritius, Niger, Sierra Leone, Togo, Cameroon; 2010 for 3 countries: Angola, Botswana, DRC; 2011 for 4 countries: CAR, Ethiopia, Rwanda, Zimbabwe.

Table 4
Effect of business environment constraints on employment growth of African firms using firm, country and business regulatory controls.

Dependent variable: employment growth			
Constraints to business environment	1	2	3
Access to finance	−0.003**	−0.001	−0.004**
	(0.001)	(0.001)	(0.001)
Electricity	0.0001	0.00003	0.003
	(0.001)	(0.001)	(0.001)
Telecommunications	0.003	0.003*	−0.001
	(0.001)	(0.001)	(0.002)
Transportation	−0.002	−0.002	−0.001
	(0.001)	(0.001)	(0.002)
Customs and trade	0.005***	0.003**	0.003
	(0.001)	(0.001)	(0.002)
Informal sector competitors	−0.006***	−0.004***	−0.004**
	(0.001)	(0.001)	(0.001)
Crime/theft	0.001	0.001	0.002
	(0.001)	(0.001)	(0.001)
Tax rates	−0.002	−0.002	−0.002
	(0.001)	(0.001)	(0.002)
Tax administrations	0.003*	0.003*	0.006**
	(0.001)	(0.001)	(0.002)
Business licensing and permits	0.001	0.002	0.001
	(0.001)	(0.001)	(0.002)
Political instability	−0.003**	−0.004***	−0.007***
	(0.001)	(0.001)	(0.002)
Corruption	−0.002*	−0.003**	−0.005**
	(0.001)	(0.001)	(0.001)
Courts	−0.004**	−0.004**	−0.005*
	(0.001)	(0.001)	(0.002)
Labour regulations	−0.003*	−0.005***	0.001
	(0.001)	(0.001)	(0.002)
Low educ. labour	0.002	0.001	0.0003
	(0.001)	(0.001)	(0.002)
Access to land	0.003**	0.003**	0.003*
	(0.001)	(0.001)	(0.001)
Adj. R^2	0.0102	0.0452	0.0516
Obs.	8497	8497	2958

The model in column 1 includes country controls.
The model in column 2 includes country and firm controls.
The model in column 3 includes country, firm and business regulatory controls.
* Indicates significant at the 10% level.
** Indicates significant at the 5% level.
*** Indicates significant at the 1% level.

From Table 4, the other constraints which have significant negative effect on firm growth are customs and trade, informal sector competitors, tax rates, political instability, courts and labour regulations.

5.2. Objective access to finance/participation in financial markets and performance of firms

Table 5 contains the results of estimating the effects of objective access to finance variables on the performance of African firms. Table 5 contains the results of estimations using the objective access to finance variables – credit constrained status variable (CCS), loans and credit lines (CREDITLINE), and overdraft (OVERDRAFT) – and including country, firm and business

Table 5
Effect of access to finance variables on employment growth of African firms using firm, country and business regulatory controls.

Dependent variable: employment growth					
	1	2	3	4	5
CCS	0.005***	0.006***	0.006***	0.005***	0.005***
	−0.001	(0.001)	(0.001)	(0.001)	(0.001)
OVERDRAFT			−0.005		
			(0.004)		
CREDITLINE				0.009**	
				(0.004)	
BOTHLOANS					0.005
					(0.004)
CONSTAN	−0.043***	−0.012	−0.013	−0.005	−0.009
	(0.012)	(0.015)	(0.015)	(0.015)	(0.015)
Adj. R^2	0.0565	0.0525	0.0526	0.0531	0.0526
Obs.	8660	5946	5946	5946	5946

The model in column 1 includes country and firm controls.
The models in columns 2–5 include country, firm and business regulatory controls.
** Indicates significant at the 5% level.
*** Indicates significant at the 1% level.

regulation controls. We observe that the credit constrained status variable is consistently statistically significant.

The results show that the credit constrained status (CCS) has a significant positive effect on employment growth of African firms. Considering the fact the variable CCS is an ordinal variable for which higher values indicate greater access to financial markets, thereby implying that higher values of CCS denote higher values of access to finance. Thus, the finding of significant positive coefficients for CCS imply that access to financial markets have had a positive impact on growth of firms in Africa. Thus, the higher access firms have to financial markets, then the higher growth they will experience. On the other hand, firms who are credit constrained, that is, who do not have access to financial markets will experience lower growth. This result is in consonance with the results obtained from the previous section, and highlights the importance of finance to the performance of firms.

The results also show that firms that have loans and credit lines have faster growth rates as the coefficient on this variable is significant positive. Also, the variable which is a combination of both types of credit facilities (BOTHLOANS), has a positive and statistically significant coefficient. This further buttresses the finding that access to financial markets has a positive effect on the performance of firms.

6. Specification robustness tests

6.1. Instrumental variable estimation

One important drawback of the Enterprise Surveys dataset is that because it is essentially self-reported data, there is the possibility that some managers will always complain even if they are not facing severe constraints (Carlin et al., 2006). Thus, the responses might reflect idiosyncratic differences in the degree of optimism or pessimism of managers responding to the survey (Aterido et al., 2011). Also, some inefficient firms may overstate the constraints that they face (Beck et al., 2005), while answers may be influenced by the experience and performance of the firm (Aterido et al., 2011). This raises the possibility that endogeneity could be present, thereby leading to a bias in the results of our OLS. This is because on one hand, a firm might be experiencing low growth because of difficulty in obtaining credit, and firms who are able to access finance will be able to expand and generate higher profits, thereby promoting growth (Dinh et al., 2012; Ahmed and Hamid, 2011). On the other hand however, high performing firms might be better able to access financing from banks (Aterido and Hallward-Driemeier, 2010; Fafchamps and Schundeln, 2013). Thus, it could be difficult to extract causality between firm performance and access to finance. In light of this, we conduct instrumental variable estimation to address the potential endogeneity bias arising from the possible reverse causality between firm growth and access to finance.

The choice of instruments has always been a central issue to instrumental variable estimation. For an instrument to be valid, it must both be relevant, that is, correlated with the endogenous RHS variable; and at the same time it must be exogenous, that is, it must be uncorrelated with the error term. Following Beck et al. (2014), we use measures of the banking regulatory and supervisory structure as instrumental variables for access to finance. It is expected that bank regulation and supervision will have an effect on access to finance but be orthogonal to firm performance. The data is obtained from Barth et al. (2013) and the instrumental variables used are average tenure of bank supervisors, and an index of overall supervisory independence from both banks and politicians.

The results of the instrumental variable estimation are presented in Table 6. The first column contains the access to finance constraint variable and this variable has a significant negative coefficient. This is in line with the results obtained previously and confirms our previous findings that firms who have difficulty in obtaining credit have poorer growth. Columns 2–5 contain the results using the objective access to finance variables. The

Table 6
Effect of access to finance on employment growth of African firms: instrumental variable estimation.

Dependent variable: employment growth					
Independent variables	1	2	3	4	5
Access to finance constraint	−0.031***				
	(0.005)				
CCS		0.145***			0.115***
		(0.022)			(0.021)
OVERDRAFT			0.157***		
			(0.024)		
CREDITLINE				0.659***	
				(0.157)	
BOTHLOANS					0.128***
					(0.019)
Hausman test	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]
First stage F-statistic	102.01	76.15	36.53	115.43	86.65
Sargan test	[0.2149]	[0.2239]	[0.1647]	[0.1508]	[0.2585]
Obs.	4512	4512	4512	4512	4512

All models include country and firm controls.
Figures in () are standard errors.
Figures in [] are p-values.
*** Indicates significant at the 1% level.

results show that access to finance as measured by the ability to obtain bank loans, overdraft facilities or credit lines improves the growth of African firms. Thus, the results of the instrumental variable estimation confirm our previous findings. We can conclude that firms that are able to participate in financial markets will be able to grow faster. The diagnostic statistics show that the instrumental variable estimation is appropriate. The Hausman statistic supports the endogeneity of the access to finance variables. The F-statistic of the first-stage regressions are all above 10, thereby suggesting that our instruments are strong. The Sargan test also supports the validity of the instruments.

6.2. Further analysis by firm size and age

It would be interesting to see how the effects of access to finance constraints and participation in financial markets on firm growth are affected by firm characteristics. Many studies show differential impact of finance on firm growth based on size or age of the firm. Thus, we conduct further analysis based on firm size and age.

Firstly, we examine how the effect of access to finance constraint on firm growth is affected by size and age of firms. The results for these are presented in Table 7. The results from columns 1 and 2 show negative coefficients for firm size and age thereby offering evidence against Gibrat's law of proportionate effects that growth is random. Our results add to the many studies which have found evidence against Gibrat's law and found that firm growth is affected by size and age (Yasuda, 2005; Calvo, 2006; Dinh et al., 2012). The significant negative coefficient on firm age indicates that younger firms in these African countries grow faster than older firms. These results are similar to other studies who found that smaller and younger firms in Africa grow faster than older and larger firms (Ramachandran and Shah, 1999; Sleuwaegen and Goedhuys, 2002; Bigsten and Gebreeyesus, 2007). The coefficient on size though negative, is

Table 7
Effect of access to finance constraint on employment growth of African firms: further analysis by firm size and age.

Dependent variable: employment growth			
Independent variables	1	2	3
Access to finance constraint	−0.005***	−0.006***	−0.007***
	(0.001)	(0.001)	(0.002)
Labour size	−0.001	−0.002	
	(0.001)	(0.001)	
Age	−0.02***	−0.03***	
	(0.001)	(0.003)	
Access to finance × small			0.000
			(0.002)
Access to finance × medium			−0.0001
			(0.003)
Access to finance × large			−0.002
			(0.005)
Access to finance × mature			0.007***
			(0.002)
Access to finance × older			0.004
			(0.002)
Adj. R^2	0.0191	0.0323	0.0402
Obs.	8440	2947	8497

The model in column 1 includes country controls.
The model in column 2 includes country, firm and business regulatory controls.
The model in column 3 includes country and firm controls.
*** Indicates significant at the 1% level.

insignificant and this might be due to the fact that the size variable employed by many studies has led to spurious regressions (Bigsten and Soderbom, 2006). Bigsten and Soderbom (2006) citing Davis et al. (1996) describe the concept of "regression fallacy" which arises as a result of transitory fluctuations in size or when there are transitory measurement errors in observed size. Bigsten and Soderbom (2006) note that if this problem is not addressed, results of tests disproving Gibrat's law might be too good. Following Bigsten and Soderbom (2006) we have

Table 8
Effect of access to finance on employment growth of African firms: further analysis by firm size and age.

Dependent variable: employment growth					
Independent variables	1	2	3	4	5
CCS	0.005***				0.005***
	(0.001)				(0.001)
OVERDRAFT		0.004			
		(0.003)			
CREDITLINE			0.003		
			(0.003)		
BOTHLOANS				0.002	0.0009
				(0.003)	(0.003)
Labour size	−0.002	−0.001	−0.0007	−0.0008	−0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Age	−0.019***	−0.018***	−0.018***	−0.018***	−0.019***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Adj. R^2	0.0175	0.0158	0.0158	0.0157	0.0174
Obs.	7832	7832	7832	7832	7832

All models include country and firm controls.
*** Indicates significant at the 1% level.

used average employment size rather than the initial size and this could explain why we have not observed a significant coefficient for size. Bigsten and Soderbom (2006) note that when other studies have employed this method for measuring the size variable, they find that size becomes insignificant.

Table 8 presents the results of testing for how firm size and age affect growth when the various objective access to finance variables are included in the model. We obtain similar results to what we observed from Table 7. We find that both size and age have negative coefficients, and similar to results obtained from Table 7, we do not find evidence in support of Gibrat's law. We find from Table 8 that the coefficient on age is statistically significant while size is insignificant. The significant negative coefficient on age indicates that as firms grow old, their growth slows, thereby showing that younger firms grow faster than older firms.

The results from Tables 7 and 8 show that access to finance constraints adversely affect firm growth, as we find a significant negative coefficient on the access to finance constraint variable in Table 7. Also, we find a significant positive coefficient on our objective access to finance variable (CCS) in Table 8. These results offer more support to previous results, and show the importance of finance to firm growth in African countries.

A number of studies have also found that size is a determining factor in firms' access to finance, indicating considerable heterogeneity across firms in financial constraints and access to finance. Aterido et al. (2011) found that smaller firms have less access to finance than larger firms. For African firms, Bigsten and Soderbom (2006) found that a greater proportion of smaller firms are credit constrained. Table 9 presents our access to finance constraint and objective access to finance variables by firm size and age. The data supports earlier studies as we observe that older firms have lower access to finance constraints, and at the same time, have higher access to finance. Young firms on the other hand have the highest access to finance constraints and lowest access to finance. Also, Table 9 shows that large firms have the lowest access to finance constraint and highest access to finance, while small firms have the highest access to finance constraint and lowest access to finance.

Table 9
Access to finance constraint and access to finance variables (mean), by firm characteristics.

	Access to Finance Constraint	CCS	Overdraft	Creditline	Bothloans
Older	2.903	2.645	0.419	0.433	0.607
Mature	2.943	2.548	0.312	0.451	0.590
Young	3.208	2.342	0.289	0.431	0.581
Large	2.436	2.987	0.680	0.497	0.757
Medium	2.687	2.902	0.575	0.465	0.696
Small	2.932	2.622	0.374	0.399	0.570
Micro	3.233	2.268	0.197	0.456	0.559

We have tested for this in the third column of Table 7 by interacting firm size and age characteristics with the access to finance constraint, and we also tested for this in Table 10 by interacting firm size and age with the objective measures of access to finance. The results from Tables 7 and 10 show a differential impact of finance on growth by age, while we do not find statistical significance impact of finance on firm growth by size. The results from Table 10 show that age indeed matters in affecting how firms benefit from access to finance. The results show that access to finance (CCS) increases growth of young firms more than growth of mature or older firms. Thus, the availability of credit is more beneficial to young firms, as they grow more relative to older firms. This implies that young firms stand to benefit more from access to finance than older firms. Also, the results from column 3 of Table 7 reveal that smaller firms suffer more from access to finance constraints than mature or older firms. The result reveals that growth of small firms is hampered more than growth of mature firms when both firms are faced with the same constraints in accessing finance. Thus, our results support the views of other studies who found that the impact of finance on firm growth depends on the size of the firm.

Table 10
Effect of Access to finance on employment growth of African firms: further analysis by firm size and age.

Dependent variable: employment growth				
Independent variables	1	2	3	4
CCS	0.009***			
	(0.003)			
OVERDRAFT		−0.015		
		(0.008)*		
CREDITLINE			0.002	
			(0.007)	
BOTHLOANS				−0.0001
				(0.007)
Access to Finance*Small	−0.001	−0.001	−0.01	−0.009
	(0.002)	(0.008)	(0.007)	(0.007)
Access to Finance*Medium	−0.004	−0.006	−0.01	−0.016
	(0.004)	(0.01)	(0.009)	(0.01)
Access to Finance*Large	0.001	−0.007	−0.05***	−0.023
	(0.007)	(0.01)	(0.015)	(0.018)
Access to Finance*Mature	−0.008***	0.006	0.008	0.001
	(0.003)	(0.009)	(0.008)	(0.008)
Access to Finance*Older	−0.01***	0.009	0.01	0.008
	(0.003)	(0.009)	(0.009)	(0.009)
Adj. R^2	0.0395	0.0395	0.0396	0.0388
obs	7884	7884	7884	7884

Notes: ***Indicates significant at the 1% level, *Indicates significant at the 10% level.
All models include country and firm controls.

7. Conclusion and policy implications

In summary, our results have provided two important insights into the financing of firms in Africa. Firstly, our results have shown that inadequate finance has an inhibiting effect on growth of African firms. This was evident from the estimations which showed a significant negative effect of access to finance constraints on firm growth. Secondly, our results showed that participation in financial markets promotes firm growth, as we found significant positive relationships between various objective measures of access to finance and firm growth.

The implications of these results are that firms who wish to grow must overcome credit constraints and obtain more external finance. This presents an important challenge to governments, financial institutions and households and firms in African countries and concrete efforts need to be undertaken to overcome constraints in obtaining finance and boost access to financial services. In order to address and overcome this challenge, the issue needs to be addressed from both the supply and demand dimensions. On the supply dimension, there is need for proper understanding of the nature of financial systems in African countries; while on the demand side, we need to understand how African firms have typically interacted with financial markets.

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