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ABSTRACT *Using Ethiopian firm-level data, we model the effect of different types of financing on firm growth. The form of financing is potentially endogenous to firm growth, and one contribution of this paper is to introduce a new instrumental variable which captures local variation in financial depth. Unlike previous studies of firms in low-income countries, we find evidence for a negative relationship between the use of external finance and firm growth, which suggests that there are substantial cross-country differences in the finance-growth nexus. We discuss possible explanations for this phenomenon and its implications for development policy.*

JEL classification: D24, G31, O55

Keywords: Ethiopia; firm growth; external financing

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I. Introduction

The microeconomic literature on the links between access to finance and firm growth has produced a number of contrasting results. On the one hand, there is evidence from some countries that firms with access to external finance grow more quickly (Ayyagari *et al*., 2010; Girma and Vencappa, 2015; Moore *et al*., 2005; Rajan and Zingales, 1998). This is consistent with evidence that for just some firms – those without access to external finance – growth is constrained by the size of internal funds (Carpenter and Petersen, 2002; Rahaman, 2011; Guariglia *et al*., 2011; Chen and Guariglia, 2013), and suggests some form of informational asymmetry and/or credit rationing that leads to a violation of the Modigliani-Miller theorem. However, some developing countries studies have found no relationship between access to external funds and firm growth: see for example Allen *et al*. (2012) and Beck *et al*. (2015). One possible explanation for this finding is that in countries with weak regulation of financial institutions, external finance is allocated to politically well-connected firms with a low marginal return to capital. Such an explanation is consistent with macroeconomic evidence that the link between financial depth and economic growth has been very weak in recent times (Rousseau and Wachtel, 2011), and that financial reforms will benefit growth only in the presence of good banking sector regulation (Demetriades and Rousseau, 2016).

Our contribution to the literature is to model the determinants of manufacturing firm growth in Ethiopia, a developing country which has relatively developed market institutions and has experienced high overall economic growth, but also performs poorly on aggregate measures of financial depth. Other parts of Africa enjoy more financial depth, but their economic growth is still low by international standards, and manufacturing production is constrained by poor infrastructure and weak property rights. These differences suggest that Ethiopia is a country in

which the quality of infrastructure and property rights are less likely to be binding constraints on investment and growth, but access to finance is more likely to be a constraint, so in Ethiopia there should be a particularly strong positive relationship between finance and growth. However, our results do not support this conjecture: we find strong evidence for a *negative* relationship between access to external finance for working capital and firm growth, and some evidence for a similar effect with regard to fixed capital. These results are robust to a variety of different estimation methods, including an Instrumental Variables estimator that exploits local variation in financial depth as an instrument for access to external finance. We suggest that one explanation for our results is that the Ethiopian financial system is still dominated by state-owned banks, and this system does not allocate credit to the firms with the highest rate of return to capital. In this sense, our microeconomic results are consistent with the macroeconomic results of Rousseau and Wachtel (2011) and Demetriades and Rousseau (2016). Access to credit will not be growth-enhancing while credit markets continue to suffer from systematic allocative inefficiency. We also note that these results for Ethiopia are very different from results for other parts of Africa (Ojah *et al*., 2010; Kiendrebeogo and Minea, 2016) and low-income countries elsewhere in the world (Ganesh-Kumar *et al*., 2001). This suggests a degree of institutional heterogeneity which should make us interpret the results of cross-country studies of finance and growth with some caution.

Section II discusses the Ethiopian context in more detail, section III presents our data analysis, and section IV concludes.

II. The Ethiopian Economy and Financial System

Over 2006-2015, the annual average growth rate of Ethiopian real per capita GDP was 7.6%, compared with an average of 2.0% for the whole of Sub-Saharan Africa (World Bank, 2016a).

The rapid expansion of the Ethiopian economy has been accompanied by a certain amount of industrialization. The economy is still dominated by agriculture, which accounts for about 45% of GDP, 80% of employment and 85% exports, but real annual manufacturing value added growth over the last decade (10.1%) has outstripped total real annual GDP growth (8.9%).[1] The ratio of gross fixed capital formation to value added in manufacturing is about 38% (Central Statistical Agency of Ethiopia, 2011), compared with a figure of about 32% for the whole economy (World Bank, 2016a).

Ethiopia's high rate of manufacturing sector growth reflects a business environment which is relatively favorable: the most recent *Doing Business* survey scores Ethiopia at 58% for the quality of contract enforcement, 59% for access to electricity and 69% for the quality of the tax system; this compares with average figures of 47%, 47% and 58% for the rest of Sub-Saharan Africa (World Bank, 2016b). However, Ethiopia performs more poorly regarding access to credit, with a score of 15%; the average score for the rest of Sub-Saharan Africa is 36%. Table 1 provides more detail about credit constraints in Ethiopia compared with those in the rest of Sub-Saharan Africa. For each country, the table shows the proportion of firms financing (i) their working capital and (ii) their fixed capital entirely from internal funds; data are taken from recent rounds of the World Bank's World Enterprise Survey (www.enterprisesurveys.org). Approximately two thirds of Ethiopian firms are constrained in this way, while the figure for most other Sub-Saharan African countries is below one half. This difference may reflect a lack of competition in the Ethiopian banking system, which is still dominated by state-owned banks (Bezabeh and Desta, 2014). In 2014/5 state-owned banks accounted for 65% of all bank credit, 42% of all bank branches and 51% of all branches outside of the capital city (National Bank of

Ethiopia, 2015). Ethiopia has only 29 bank branches per million people, compared with a Sub-Saharan average of 39 (World Bank, 2015a).

There may be some advantages in having some banks under state ownership; for example, the lending behavior of state-owned banks may be less sensitive to business-cycle effects (Bertay *et al*., 2015). However, the international survey by Megginson (2005) indicates that state-owned banks are relatively inefficient, in part because state ownership is associated with a greater risk of loan default, suggesting that these banks are more likely to lend to firms with low rates of return to capital. Moreover, there is international evidence that a more competitive banking sector alleviates credit constraints (Leon, 2015), and that competition from foreign banks improves the efficiency of loan allocation (Taboada, 2011). There is relatively little evidence specific to Ethiopia, but results reported by Tehulu and Olana (2014) indicate that in Ethiopia state ownership is associated with a significantly higher loan default rate. Given the dominance of state banks in the Ethiopian banking system, the fact that for 25 years Ethiopia has been governed by the same political party (the Ethiopian People's Revolutionary Democratic Front), the restrictions on foreign investment in financial services (Golub, 2009) and the small number of bank branches, there is reason to suspect that the system is highly monopolistic and may allocate loans on the basis of a firm's political connectedness rather than its marginal return to capital. In this case, we should not necessarily expect to see a positive relationship between access to external finance and firm performance.

III. Modeling Access to Finance and Firm Growth in Ethiopia

Data

Our results are based on data from the Ethiopian Enterprise Survey (http://microdata.worldbank.org/index.php/catalog/2577/study-description), which forms part of

the World Enterprise Survey. This survey is not a panel, but it contains a total of 1,492 observations from firms surveyed in 2011 and 2015 (with a few missing observations for some variables for some firms). The survey comprises a sample of firms stratified by industry (textiles, garments, leather goods, wood, paper, plastics and rubber, furniture, electronics, chemicals, hotel and restaurant services, wholesale trade, retail trade, transport services, information technology services and motor vehicle services), size (5-19 employees, 20-99 employees and over 100 employees), and region. The regions are Addis Ababa (919 observations), Amhara (112 observations), Dire-Dawa (27 observations), Oromia (219 observations), the Southern Nations, Nationalities and Peoples' Region (71 observations), and Tigray (144 observations). The survey includes responses to questions about access to finance, sales, employment, corruption, infrastructure, crime, competition, and obstacles to growth. Following Ayyagari *et al*. (2010), Rahaman (2011) and Beck *et al*. (2015), the sales and employment data are used to construct the following alternative measures of firm growth.

• *sales-growth*$_i$ is the logarithm of the ratio of reported sales by firm *i* for the current period to sales reported for three years ago.

• *empl-growth*$_i$ is the logarithm of the ratio of reported employment by firm *i* for the current period to reported employment for three years ago.

The coefficient of correlation between *sales-growth*$_i$ and *empl-growth*$_i$ is 0.26; this is significantly different from both zero and one ($p < 0.05$), so sales growth and employment growth represent connected but distinct measures of changes in firm size. Descriptive statistics for these two alternative dependent variables, which are approximately normally distributed, appear in Table 2.[2]

Our explanatory variables are constructed mainly from other information in the Enterprise Survey. The variables measuring access to finance are as follows.

• *wc-external*$_i$ is the proportion of the firm's working capital financed from external sources. This figure is based on responses to the question asking for an 'estimate [of] the proportion of this establishment's working capital that was financed through the following sources…' The alternative sources are 'internal funds / retained earnings,' 'banks' (privately owned and state-owned), 'non-bank financial institutions', 'credit / advances from suppliers / customers' and 'other'; see World Bank (2015b, page 21). Our explanatory variable is the figure reported for all categories except internal funds and retained earnings.

• *fc-external*$_i$ is the proportion of the firm's fixed capital financed from external sources. This measure is based on responses to a survey question with wording analogous to the one for working capital.

Descriptive statistics for the two explanatory variables appear in Table 2, with corresponding histograms in Figure 1. These histograms are highly skewed: *wc-external*$_i$ = 0 for 69% of the firms and *fc-external*$_i$ = 0 for 54% of the firms.[3] It may be that whether there is any external funding of investment at all is a better measure of access to external finance than the proportions *wc-external*$_i$ and *fc-external*$_i$. For this reason, we will also present results using the indicator variables I(*wc-external*$_i$ > 0) and I(*fc-external*$_i$ > 0) as alternative measures of access to external finance. Note that *wc-external*$_i$ and *fc-external*$_i$ are quite highly correlated (ρ = 0.31); given this collinearity, we will fit alternative models of firm growth incorporating either one or other of the financing variables, but not both.

In estimating effect of access to external finance on firm growth we will need to control for a range of firm characteristics that could be correlated with both firm growth and access to finance. These characteristics are as follows; descriptive statistics appear in Table 2.

• $firm\text{-}size_i$ is the initial number of employees in firm i (in thousands). Smaller firms may have more potential for growth, but their access to external finance may also be more constrained: see for example Rahaman (2011), Du and Girma (2012), and Kim *et al*. (2016).

• $firm\text{-}age_i$ is the age of the firm i (in tens of years), constructed by subtracting the reported year of establishment from the survey year. There is some evidence in the existing literature that younger firms grow more quickly; see for example Jovanovic (1982), Coad *et al*. (2014) and Haltiwanger *et al*. (2013). They may also find it more difficult to secure external finance.

• $experience_i$ is the number of years of experience of firm i's senior manager, $export\text{-}share_i$ is the percentage of sales accounted for by exports and $profit\text{-}margin_i$ is the ratio of after-tax profits to total asset value; $innovation_i$ equals one if firm i claims to have recently introduced new or significantly improved product or service and otherwise equals zero. All of these characteristics could be associated with higher productivity and a greater growth potential: see Goedhuys and Veugelers (2012), Gebreyesus (2009) and Coad and Rao (2008) on innovation, Jang and Park (2011) on profitability and Minondo (2014) on exports. These characteristics could also be associated with easier access to external finance.

• $domestic\text{-}own_i$ is an indicator variable which equals one if at least 50% of firm i is in private domestic ownership and equals zero otherwise; $foreign\text{-}own_i$ is an analogous indicator variable for private foreign ownership. Firms in private domestic ownership may find it especially

difficult to access external finance while state-owned firms find it especially easy, but ownership may also be correlated with entrepreneurial capacity and growth potential.

• $manufacturing_i$ equals one if firm *i* operates in the manufacturing sector (textiles, garments, leather goods, wood, paper, plastics and rubber, furniture, electronics or chemicals) and otherwise equals zero; $retail_i$ equals one if firm *i* operates in retail trade and equals zero otherwise. The omitted categories are restaurant services, wholesale trade, transport services, information technology services and motor vehicle services. Further sectoral disaggregation does not produce any statistically significant effects.

• $competition_i$ equals one if firm *i* competes against unregistered or informal firms and otherwise equals zero. Informal sector competition could hinder the growth of the formal sector firms in our sample, since the informal firms face lower compliance costs (Distinguin *et al*., 2016; Wang, 2016). However, informal sector firms are unlikely to have access to external finance, so formal sector firms producing similar products may face less competition for external finance.

• $power\text{-}loss_i$ is the reported percentage of annual sales loss due to electricity outages, $corruption_i$ is the percentage lost in informal payments to government officials, and $regulation_i$ is the percentage of time managers spend dealing with government regulations.

All of the variables above are constructed from responses in the Ethiopian Enterprise Survey. However, we also need to control for the size of the firm's local market, which could affect its growth potential and also be correlated with the instrument for access to finance described below, which is a measure of the number of local banks able to offer a loan. Our proxy for local market size is based on data from the 2011 Ethiopian Demographic and Health Survey (Central Statistical Agency of Ethiopia / ICF International, 2012). This stratified survey includes

questions about the physical assets owned by each household living at each sample point, including ownership of a refrigerator, a bicycle, a radio, a television, a motorcycle and a car. It also includes a question about access to electricity and about the materials from which the house is constructed. Responses to these questions form a set of indicator variables which can be aggregated by taking the first principal component across the whole sample. The resulting wealth index has been shown to be a good proxy for household income (Ucar, 2015; Filmer and Pritchett, 2001). Denoting the index value for the j^{th} household as $wealth_j$, we construct an average wealth index for each sample point *k* as $wealth_k = \sum_{j \in k} wealth_j \,/\, N_k$, where N_k is the number of households in the sample point. Each firm is identified as operating in a particular town (there are 42 towns), and we construct an average wealth index for town *h* as $wealth_h = \sum_{k \in h} wealth_k \,/\, M_h$, where M_h is the number of sample points associated with the town. Sample points are matched to towns using the reported latitude and longitude of each point: for large towns all sample points within a 20km radius of the town centroid are used, and for small towns all sample points within a 5km radius. Finally, the size of the town's economy is measured as $p_h \cdot wealth_h$, where p_h is the town's total population as reported in the 2007 census. In our model, the variable *economy-size*$_i$ is equal to the value of $p_h \cdot wealth_h$ for the town in which firm *i* is located, scaled so that the minimum value is zero and the maximum value is one.

Estimation strategy

We have two measures of firm growth ($x_i \in \{$*sales-growth*$_i$, *empl-growth*$_i\}$) and two measures of access to finance ($y_i \in \{$*wc-external*$_i$, *fc-external*$_i\}$). For each *x* and for each *y* (i.e. four equations

in total), our baseline results are based on an Ordinary Least Squares estimate of the following equation:

$$x_i = \beta_{xy} \cdot y_i + \sum_p \varphi_{xy}^p \cdot z_i^p + u_i^{xy} \quad (1)$$

Here, z_i^p indicates the value of the p^{th} control variable (*firm-size*$_i$, *firm-age*$_i$, *experience*$_i$, *export-share*$_i$, *profit-margin*$_i$, *innovation*$_i$, *domestic-own*$_i$, *foreign-own*$_i$, *competition*$_i$, *power-loss*$_i$, *regulation*$_i$, *corruption*$_i$, *economy-size*$_i$), the β and φ terms are parameters to be estimated, and u_i^{xy} is a residual.

The Ordinary Least Squares estimates may be biased if y_i is endogenous to x_i (for example, if there is unobserved heterogeneity across firms that is correlated with both growth performance and access to finance), so we report a second set of estimates fitted using an Instrumental Variables estimator. Our choice of instrumental variable is informed by the idea that a greater physical distance between borrower and creditor can impair access to finance (Petersen and Rajan, 2002), so access to finance depends on the local density of banking services. In towns with more bank branches, firms will have more choice of creditor, the local financial market will be less monopolistic and banks will have less incentive to restrict the supply of credit. The variable *bank-branches*$_i$ is the number of different banks branches in the town in which firm *i* is located (measured in tens of branches).[4] This variable is constructed from data collected by one of the authors using information provided by each individual bank; further details are available on request. Our model is identified by the exclusion restriction that the number of branches has no direct effect on firm growth. The number of branches may be correlated with the size of the local economy, and the size of the local economy with firm growth, but our variable *economy-size*$_i$ controls for this effect.[5] Recalling that $0 \leq y_i \leq 1$, our

first-stage model of y_i is fitted using the Fractional Logit estimator of Papke and Wooldridge (1996):[6]

$$y_i = \Lambda\left(\alpha_y \cdot \textit{bank-branches}_i + \sum\nolimits_p \theta_y^p \cdot z_i^p + v_i^y\right) \tag{2}$$

Here, $\Lambda(.)$ is the logistic function, the α and θ terms are parameters to be estimated, and v_i^y is a residual. In our second-stage model of x_i, y_i in equation (1) is replaced by $\hat{y}_i$ and the standard errors for each parameter estimate are computed using a bootstrap.

Noting the skewness of the distributions in Figure 1, we report a third set of results in which the continuous variable y_i is replaced by the indicator variable $I(y_i > 0)$. This indicator variable might also be endogenous to x_i, so these results incorporate a Heckman correction with first-stage Probit model of the following form:

$$\mathrm{P}\left(y_i > 0\right) = \Phi\left(\delta_y \cdot \textit{bank-branches}_i + \sum\nolimits_p \eta_y^p \cdot z_i^p\right) \tag{3}$$

Here, $\Phi(.)$ is the cumulative normal density function and the δ and η terms are parameters to be estimated. In our second-stage model of x_i, the Inverse Mills Ratio from equation (3), designated λ_i, is added to the right hand side of equation (1) and the standard errors for each parameter estimate are computed using a bootstrap.

Results

Our baseline Ordinary Least Squares estimates of the parameters in equation (1) are presented in Table 3. It can be seen that several of our control variables have a significant impact on firm growth. As anticipated, there is faster sales and employment growth among younger firms and

firms which have innovated. An extra ten years of age reduces sales and employment growth over the three-year period by about one percentage point; innovation raises sales growth by about 15 percentage points and employment growth by about 12. Firms grow faster in towns with a larger economy; *economy-size*$_i$ is an index measure, so to interpret the size of the effect we refer to the sample standard deviation of this variable reported in Table 2, which is about 0.5. The Table 3 parameter estimates of 0.04-0.05 imply that a two standard deviation increase in *economy-size* raises growth by four or five percentage points. However, the effect is much more precisely estimated for employment growth than for sales growth, so only the employment effect is statistically significant. Also, firms in the retail trade sector experience significantly slower sales growth – the difference is about 12 percentage points – although this is not accompanied by lower employment growth, implying a relative decline in labor productivity in this sector. Managerial experience significantly reduces employment growth – each year of experience lowering growth by about 0.3 percentage points – but without any corresponding sales effect, so experience is associated with growth in labor productivity but not in output.

Conditional on these effects, external funding of capital is associated with lower growth, although this effect is significant at the 5% level only for employment growth and working capital: here the parameter estimate implies that a firm financing its capital entirely from external sources has about 6% less growth over the three-year period than a firm financing its capital entirely from internal sources. The sales growth effects are significant at the 10% level, the parameter estimates implying that a firm financing its working capital or fixed capital entirely from external sources has 9-10% less growth over the three-year period than a firm financing its capital entirely from internal sources. However, these estimates might be biased because access

to external finance is endogenous to growth, so we need to model *wc-external*$_i$ and *fc-external*$_i$ explicitly.

Table 4 presents estimates of the parameters in equation (2) – the model of *wc-external*$_i$ and *fc-external*$_i$ – along with marginal effects indicating the average impact of a unit increase in each explanatory variable on the share of capital financed internally. The t-ratios are based on bootstrapped standard errors clustered at the town level. The table shows that a number of our control variables have a significant impact on the external financing share, with similar effects for working capital and fixed capital. Firms with more experienced managers are less reliant on internal financing, an extra year of experience increasing the external financing share by about 0.2 percentage points. Export-intensive firms are also less reliant on internal financing, a one percentage point increase in the share of exports in total sales increasing the external financing share by about 0.1 percentage points. A two standard deviation increase in the size of the local economy (an increase of about one unit: see above) increases the external financing share by about 15 percentage points. Conditional on these effects, and as anticipated, the number of bank branches in a town has a significantly positive effect on the firm's access to external financing. An extra ten branches in a town increases the external financing share for working capital by about a little under two percentage points and the share for fixed capital by a little over two percentage points.

Table 5 presents estimates of the determinants of firm growth using the fitted values for *wc-external*$_i$ and *fc-external*$_i$ in place of the observed values, along with t-ratios computed from bootstrapped standard errors to allow for the fact that these fitted values are generated regressors. Two sets of results are reported: in the first set of results the second-stage models of firm growth are fitted by Least Squares, while in the second the models are fitted using a Random Effects

estimator that allows for unobserved heterogeneity at the town level. There are eight sets of parameter estimates in total: two estimators × two dependent variables (*sales-growth*$_i$ and *empl-growth*$_i$) × two measures of access to finance (*wc-external*$_i$ and *fc-external*$_i$).

Table 5 shows that the choice of estimator and the choice of the measure of access to finance do not make an enormous difference to the results, though there are some differences in the precision of parameter estimates. Most of the significant control variable effects in Table 3 (the effects of firm age, managerial experience, and innovation) are also significant in Table 5, and there is little difference in the sizes of these effects. However, other significant effects in Table 3 (the effects of retail trade and economy size) are insignificant or only marginally significant in Table 5. Estimates of the parameters on *wc-external*$_i$ and *fc-external*$_i$ are slightly larger than in Table 3 but this difference is statistically insignificant. The parameters on *wc-external*$_i$ are significant at the 5% level in three out of four cases and significant at the 10% level in the other: a firm relying entirely on external financing for its working capital is predicted to have a sales and employment growth rate that is about 12-14 percentage points lower than that of a firm relying entirely on internal finance. The parameters on *fc-external*$_i$ are significant at the 10% level in the two sets of estimates for sales growth but not in the two sets of estimates for employment growth. Thus Table 5 produces quite strong evidence for a negative relationship between external finance for working capital and firm growth, but weaker evidence for a negative relationship between external finance for fixed capital and firm growth.

Finally, we present results in which the continuous variables *wc-external*$_i$ and *fc-external*$_i$ are replaced by the indicator variables I(*wc-external*$_i$ > 0) and I(*fc-external*$_i$ > 0). As noted above, these results are based on a Heckman correction to allow for the potential endogeneity of the indicator variables. Parameter estimates in the first-stage model – equation (3) above – are quite

similar to the first-stage results in Table 4 and are available on request. Table 6 reports the second-stage results, plus estimates of the δ parameter in equation (3).

The estimated sizes of the parameters on the control variables in Table 6 are very similar to those in Table 3, but some of the t-ratios are slightly larger in Table 6 so there are a few more statistically significant effects. In particular, there is a firm size effect in the employment growth equation that is significant at the 1% level, an extra thousand employees being associated with a growth rate that is about 20 percentage points lower. The I(*wc-external*$_i$ > 0) parameters are significant at the 1% level in both the sales growth equation and the employment growth equation. A firm financing its working capital partly from external funds is predicted to have a sales growth rate that is about five percentage points lower than other firms, and an employment growth rate that is about two percentage points lower. The I(*fc-external*$_i$ > 0) parameter in the sales growth equation is significant at the 5% level, while the corresponding parameter in the employment growth equation is significant at the 10% level. A firm financing its fixed capital partly from external funds is predicted to have a sales growth rate that is about six percentage points lower than other firms, and an employment growth rate that is about one percentage point lower. It does seem that the indicator variables give a more precise estimate of the effect of access to finance on firm growth, and constitute stronger evidence for such an effect. One possible explanation for this result is that *any* access to external finance reflects a firm that has good political connections, but politically connected firms have less growth potential, on average. Given that our instrumental variable for access to finance is measured at the town level, one interpretation of our findings is that certain towns are better politically connected than others; these towns have more banks and better access to finance but (holding constant the size of the local economy) their firms grow more slowly, on average.

IV. Summary and Conclusion

Using data from recent surveys of Ethiopian firms, we estimate the effect of a firm's access to finance on the growth of its sales and employment. Access to finance is measured by the proportion of its working capital (or fixed capital) funded from internal sources, or alternatively by a binary variable indicating whether all of its capital is funded from internal sources. We find a significant positive relationship between internal financing and growth: that is, firms with access to external finance grow more slowly. These effects are robust to estimation techniques that allow for the potential endogeneity of access to finance, using a town-specific measure of financial depth as an instrumental variable.

These results have stark implications for policies intended to enhance economic growth in developing countries through greater financial depth. It seems that firms with access to bank finance have less growth potential than those which do not, suggesting substantial allocative inefficiency in the banking sector. One possible source of inefficiency is that loans are given to firms with the best political connections, not those with the best investment opportunities. In the absence of institutional reforms designed to ensure that bank finance is allocated to firms with the highest return to capital, incentives to promote the expansion of existing banks are unlikely to stimulate very much growth in countries like Ethiopia.

Notes

1. See World Bank (2016a); the difference between the 8.9% here and the 7.6% above reflects Ethiopia's high population grow rate.

2. Table 2 provides sample statistics for all available observations of each variable. Sample sizes in the subsequent results tables are slightly smaller, and vary from one table to another, because of different missing observations for different variables.

3. These percentages are the reason for not disaggregating the different sources of external finance in our model: there are too few non-zero observations of each finance type to produce robust estimates of their effect. In particular, the average firm in the sample finances only 0.7% of its working capital and 0.8% of its fixed capital through loans from non-bank financial institutions, so microfinance from non-bank institutions is extremely limited.

4. All firms are in a town with at least one bank. An alternative measure is the number of banks operating in a town. Results using the alternative measure are available on request, but this alternative assumes that there is no competition between the managers of different branches of the same bank in a town.

5. If the exclusion restriction is invalid – for example, if our *economy-size* variable does not completely capture the size of the local economy – then our estimates of the β parameter in equation (1) are likely to be biased downwards: firms in towns with more bank branches are likely to be operating in a larger economy with more growth potential, and these firms are likely to have better access to external finance, i.e. a lower value of y. Our estimates of β are all positive, so if anything the results reported below underestimate the size of the effect that we claim to have found.

6. A Fractional Probit estimator produces results very similar to the Fractional Logit results reported below. We can also fit an equation for y using a double-hurdle Tobit model, and these results are available on request.

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Table 1. The proportion of firms financing investment entirely from internal funds

country	*working capital*	*fixed capital*	*country*	*working capital*	*fixed capital*
Ghana	36%	25%	Malawi	43%	51%
Kenya	24%	36%	Rwanda	35%	58%
Nigeria	23%	43%	Senegal	48%	45%
Uganda	38%	44%	Tanzania	40%	54%
Ethiopia	**69%**	**67%**	Zambia	46%	69%

Source: World Bank World Enterprise Survey (www.enterprisesurveys.org). Figures for each country are taken from an individual survey conducted between 2011 and 2015.

Table 2. Summary statistics

	observations	*mean*	*s.d.*
sales-growth	1,036	0.36	0.77
empl-growth	1,327	0.21	0.38
wc-external (0-1 scale)	1,474	0.15	0.73
fc-external (0-1 scale)	1,492	0.28	0.65
firm-size (thousands of employees)	1,332	0.08	0.27
firm-age (tens of years)	1,479	1.37	1.20
experience (years)	1,462	14.1	9.94
export-share (in %)	1,492	6.05	21.3
profit-margin (0-1 scale)	1,479	0.14	0.22
innovation (binary variable)	1,487	0.40	
domestic-own (binary variable)	1,389	0.93	
foreign-own (binary variable)	1,389	0.07	
manufacturing (binary variable)	1,492	0.44	
retail (binary variable)	1,492	0.24	
competition (binary variable)	1,396	0.36	
power-loss (in %)	1,492	5.61	11.5
regulation (in %)	1,403	6.94	13.5
corruption (in %)	1,350	0.36	3.81
economy-size (0-1 scale)	1,492	0.63	0.47
bank-branches (tens of branches)	1,492	6.58	4.25

The standard deviation (s.d.) is reported only for continuous variables and not for binary variables.

Table 3. Baseline Ordinary Least Squares parameter estimates

	dependent variable: sales-growth				*dependent variable: empl-growth*			
	coeff.	*t-ratio*	*coeff.*	*t-ratio*	*coeff.*	*t-ratio*	*coeff.*	*t-ratio*
wc-external	-0.093	*-1.78*			-0.064	*-1.98**		
fc-external			-0.105	*-1.82*			-0.072	*-1.24*
firm-size	-0.004	*-0.11*	-0.008	*-0.20*	-0.181	*-1.89*	-0.179	*-1.88*
firm-age	-0.013	*-3.38***	-0.013	*-3.38***	-0.011	*-4.84***	-0.011	*-4.89***
experience	-0.001	*-0.25*	-0.001	*-0.32*	-0.003	*-3.12***	-0.003	*-3.04***
export-share	-0.000	*-0.48*	-0.001	*-0.60*	-0.000	*-0.09*	-0.000	*-0.08*
profit-margin	0.010	*0.10*	0.005	*0.04*	-0.047	*-0.65*	-0.043	*-0.59*
innovation	0.152	*3.36***	0.156	*3.45***	0.120	*5.33***	0.119	*5.30***
domestic-own	0.220	*0.96*	0.223	*0.97*	0.103	*1.36*	0.094	*0.37*
foreign-own	0.332	*1.35*	0.335	*1.36*	0.068	*0.86*	0.060	*0.81*
manufacturing	-0.001	*-0.01*	-0.004	*-0.06*	-0.039	*-1.50*	-0.037	*-1.42*
retail	-0.119	*-2.07**	-0.119	*-2.07**	-0.029	*-1.02*	-0.027	*-0.96*
competition	-0.021	*-1.69*	-0.021	*-1.65*	-0.002	*-0.43*	-0.002	*-0.46*
power-loss	0.001	*0.21*	0.000	*0.18*	-0.000	*-0.38*	-0.001	*-0.35*
regulation	0.000	*0.05*	-0.000	*-0.05*	-0.002	*-1.96**	-0.002	*-1.86*
corruption	0.004	*0.49*	0.003	*0.46*	0.003	*0.94*	0.003	*0.86*
economy-size	0.039	*0.80*	0.039	*0.78*	0.054	*2.25**	0.052	*2.17**
sample size	*887*		*889*		*1,164*		*1,175*	

*T-ratios are computed from heteroscedasticity-robust standard errors. * indicates a parameter significantly different from zero at the 5% level and ** a parameter significantly different from zero at the 1% level. Sample sizes are smaller than those in Table 2 because different observations are missing for different variables.*

Table 4. Fractional logit models of access to finance

	dependent variable: wc-external			*dependent variable: fc-external*		
	coeff.	*t-ratio*	*m.e.*	*coeff.*	*t-ratio*	*m.e.*
bank-branches	0.130	*4.09***	0.016	0.113	*4.38***	0.022
firm-size	0.079	*0.40*	0.009	0.194	*0.81*	0.038
firm-age	-0.006	*-0.44*	-0.001	-0.001	*-0.08*	-0.000
experience	0.024	*3.62***	0.003	0.014	*2.53**	0.003
export-share	0.008	*2.39**	0.001	0.006	*2.46**	0.001
profit-margin	-0.112	*-1.29*	-0.013	-0.238	*-1.62*	-0.046
innovation	0.030	*0.24*	0.004	0.172	*1.61*	0.034
domestic-own	-1.453	*-0.25*	-0.174	-1.439	*-0.25*	-0.281
foreign-own	0.416	*0.08*	0.050	0.421	*0.08*	0.082
manufacturing	0.254	*1.66*	0.030	-0.031	*-0.25*	-0.006
retail	-0.046	*-0.27*	-0.005	-0.111	*-0.79*	-0.022
competition	0.012	*0.38*	0.001	-0.031	*-1.52*	-0.006
power-loss	-0.002	*-0.30*	-0.000	0.006	*1.42*	0.001
regulation	-0.014	*-3.44***	-0.002	-0.004	*-1.11*	-0.001
corruption	-0.005	*-0.20*	-0.001	0.013	*0.74*	0.003
economy-size	1.330	*4.48***	0.159	0.727	*2.95***	0.142
sample size		*1,169*			*1,180*	
F-test for joint significance		*64.3***			*59.4***	

*T-ratios are computed from bootstrapped standard errors. * indicates a parameter significantly different from zero at the 5% level and ** a parameter significantly different from zero at the 1% level. Sample sizes are smaller than those in Table 2 because different observations are missing for different variables.*

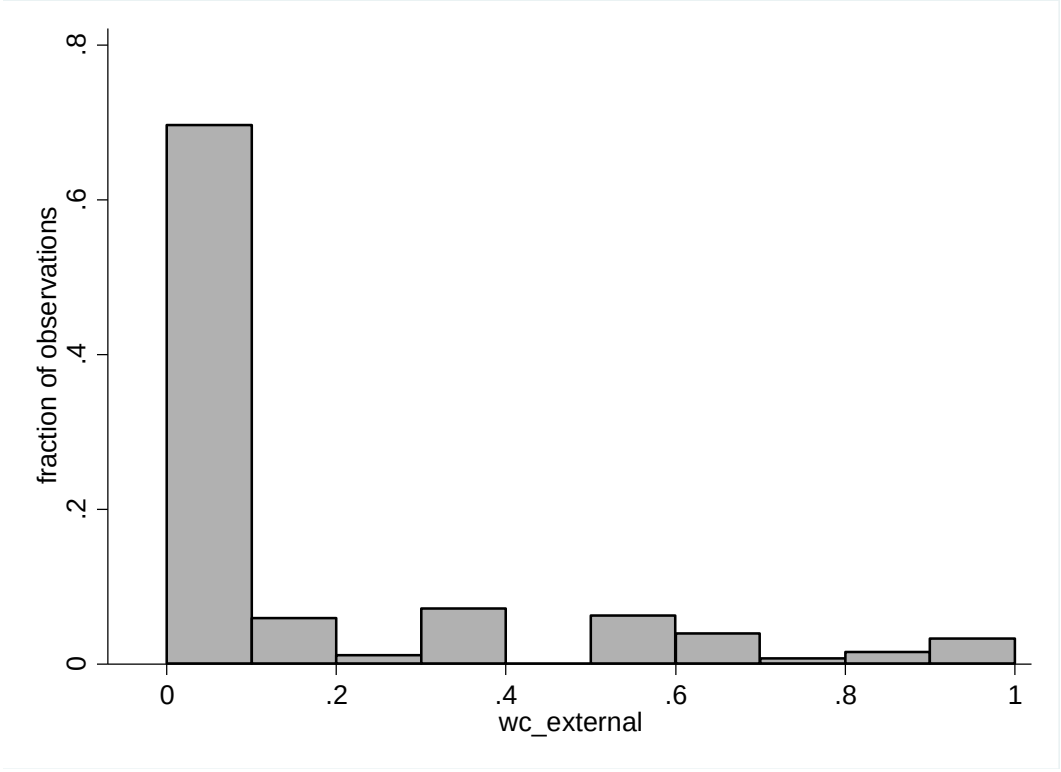
Table 5. Instrumental Variables parameter estimates

	Second-Stage Estimator: Least Squares								*Second-Stage Estimator: Random Effects*							
	dependent variable: sales-growth				*dependent variable: empl-growth*				*dependent variable: sales-growth*				*dependent variable: empl-growth*			
	coeff.	*t-ratio*	*coeff.*	*t-ratio*	*coeff.*	*t-ratio*	*coeff.*	*t-ratio*	*coeff.*	*t-ratio*	*coeff.*	*t-ratio*	*coeff.*	*t-ratio*	*coeff.*	*t-ratio*
wc-internal	-0.144	*-1.82*			-0.119	*-2.38**			-0.134	*-2.13**			-0.115	*-2.29**		
fc-internal			-0.137	*-1.90*			-0.068	*-1.39*			-0.167	*-1.88*			-0.088	*-1.35*
firm-size	0.013	*0.20*	0.030	*0.40*	-0.181	*-1.93*	-0.167	*-1.81*	0.013	*0.02*	0.022	*0.23*	-0.167	*-1.88*	-0.176	*-1.81*
firm-age	-0.014	*-3.11***	-0.013	*-3.07***	-0.011	*-4.69***	-0.011	*-4.65***	-0.014	*-1.69*	-0.014	*-2.42**	-0.011	*-4.72***	-0.011	*-4.49***
experience	0.002	*0.78*	0.001	*0.48*	-0.004	*-2.72**	-0.004	*-2.91***	0.002	*0.70*	0.002	*0.46*	-0.004	*-2.22**	-0.004	*-2.74**
export-share	0.001	*0.32*	0.002	*0.25*	-0.009	*-0.30*	-0.004	*-0.28*	0.005	*0.28*	0.002	*0.25*	-0.009	*-0.26*	-0.004	*-0.27*
profit-margin	0.024	*0.15*	0.114	*0.62*	-0.046	*-0.53*	-0.058	*-0.60*	0.013	*0.06*	0.124	*0.52*	-0.046	*-0.48*	-0.058	*-0.59*
innovation	0.159	*3.18***	0.132	*2.63**	0.120	*5.22***	0.123	*5.17***	0.156	*2.43**	0.123	*2.00**	0.119	*5.08***	0.123	*4.75***
domestic-own	0.054	*0.07*	0.281	*0.30*	0.116	*0.39*	0.086	*0.29*	-0.052	*-0.03*	0.230	*0.15*	0.120	*0.33*	0.086	*0.24*
foreign-own	0.162	*0.21*	0.389	*0.41*	0.083	*0.28*	0.053	*0.18*	0.056	*0.03*	0.330	*0.23*	0.083	*0.24*	0.053	*0.15*
manufacturing	0.024	*0.33*	-0.010	*-0.16*	-0.040	*-1.37*	-0.040	*-1.35*	0.030	*0.25*	-0.020	*-0.24*	-0.042	*-1.35*	-0.040	*-1.28*
retail	-0.126	*-1.92*	-0.136	*-2.18**	-0.030	*-0.88*	-0.03	*-0.84*	-0.120	*-1.39*	-0.130	*-1.69*	-0.030	*-0.90*	-0.030	*-0.85*
competition	-0.020	*-1.49*	-0.025	*-2.00**	-0.002	*-0.44*	-0.002	*-0.30*	-0.02	*-1.32*	-0.030	*-1.93*	-0.002	*-0.48*	-0.002	*-0.30*
power-loss	0.001	*0.10*	0.001	*0.58*	-0.001	*-0.33*	-0.005	*-0.44*	0.004	*0.12*	0.002	*0.59*	-0.004	*-0.32*	-0.004	*-0.47*
regulation	0.002	*0.87*	0.005	*0.33*	-0.002	*-1.74*	-0.002	*-1.82*	0.002	*0.66*	0.005	*0.30*	-0.002	*-1.52*	-0.002	*-1.74*
corruption	0.004	*0.29*	0.006	*0.52*	0.003	*0.64*	0.002	*0.54*	0.004	*0.30*	0.007	*0.65*	0.003	*0.65*	0.003	*0.60*
economy-size	0.010	*0.16*	0.07	*1.21*	0.060	*2.02**	0.050	*2.03**	0.010	*0.08*	0.060	*0.87*	0.060	*1.66*	0.050	*1.68*
sample size	*887*		*889*		*1,164*		*1,175*		*887*		*889*		*1,164*		*1,175*	

*T-ratios are computed from bootstrapped standard errors. * indicates a parameter significantly different from zero at the 5% level and ** a parameter significantly different from zero at the 1% level. Sample sizes are smaller than those in Table 2 because different observations are missing for different variables.*

Table 6. Parameter estimates using I(*wc-external* > 0) and I(*fc-external* > 0)

	dependent variable: sales-growth				*dependent variable: empl-growth*			
	coeff.	*t-ratio*	*coeff.*	*t-ratio*	*coeff.*	*t-ratio*	*coeff.*	*t-ratio*
I(*wc-external* > 0)	-0.045	*-2.74***			-0.023	*-2.98***		
I(*fc-external* > 0)			-0.060	*-2.30**			-0.010	*-1.75*
firm-size	0.005	*0.06*	0.005	*0.06*	-0.184	*-4.69***	-0.203	*-5.04***
firm-age	-0.012	*-2.93***	-0.013	*-2.98***	-0.011	*-5.18***	-0.011	*-4.85***
experience	-0.001	*-0.47*	-0.001	*-0.48*	-0.004	*-3.10***	-0.004	*-3.32***
export-share	-0.004	*-0.35*	-0.004	*-0.39*	-0.004	*-0.09*	0.002	*0.03*
profit-margin	0.038	*0.31*	0.028	*0.22*	-0.047	*-0.74*	-0.058	*-0.89*
innovation	0.150	*3.34***	0.157	*3.46***	0.119	*5.45***	0.140	*5.99***
domestic-own	0.217	*0.48*	0.218	*0.48*	0.094	*0.37*	0.078	*0.31*
foreign-own	0.312	*0.68*	0.313	*0.68*	0.060	*0.23*	0.038	*0.15*
manufacturing	-0.007	*-0.14*	-0.004	*-0.07*	-0.039	*-1.53*	-0.040	*-1.48*
retail	-0.112	*-1.97**	-0.109	*-1.91*	-0.028	*-1.01*	-0.044	*-1.47*
competition	-0.020	*-1.96**	-0.020	*-1.94*	-0.002	*-0.52*	0.003	*0.57*
power-loss	0.003	*0.16*	-0.005	*-0.02*	-0.004	*-0.37*	-0.002	*-1.47*
regulation	0.007	*0.05*	0.020	*0.12*	-0.020	*-2.28**	-0.015	*-1.88*
corruption	0.003	*0.52*	0.003	*0.56*	0.003	*0.90*	0.003	*1.10*
economy-size	0.083	*1.63*	0.077	*1.49*	0.053	*2.10**	0.064	*2.42**
λ	-0.495		-0.503		-0.016		-0.253	
first-stage coeff. on bank-branches	0.021	*2.58**	0.021	*2.55**	0.025	*2.44**	0.022	*2.12**



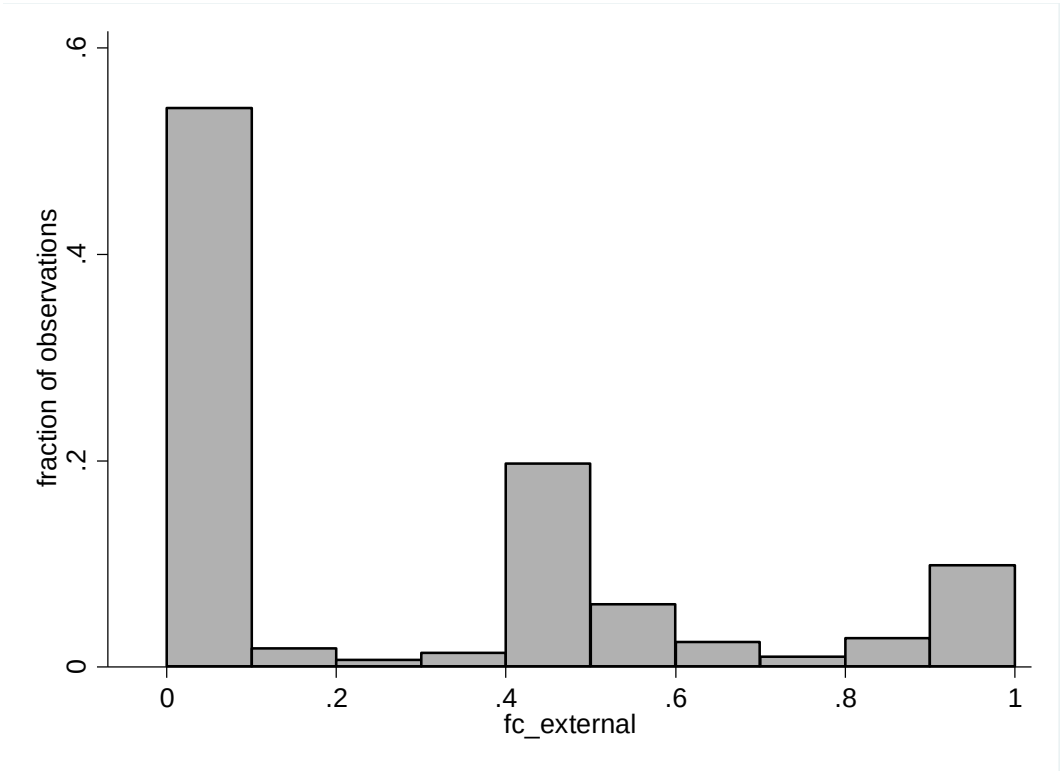


Figure 1. Frequency distributions for *wc-external* and *fc-external*