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## Credit Constraints in Manufacturing Enterprises in Africa

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*We investigate the question whether firms in Africa's manufacturing sector are credit constrained. The fact that few firms obtain credit is not sufficient to prove constraints, since certain firms may not have a demand for credit while others may be refused credit as part of profit maximising behaviour by banks. To investigate this question, we use direct evidence on whether firms had a demand of credit and whether their demand was satisfied in the formal credit market, based on panel data on firms in the manufacturing sector from six African countries. Of those firms with a demand for credit, only a quarter obtained a formal sector loan. Our analysis suggests that while banks allocate credit on the basis of expected profits, micro or small firms are much less likely to get a loan than large firms. We also find that outstanding debt is positively related with obtaining further lending. The role of outstanding debt is likely to be a reflection of inefficiency in credit markets, while the fact that size matters is consistent with a bias as well, although we cannot totally exclude that they reflect transactions costs on the part of banks. We present an analysis showing how much more profitable small firm must be to obtain a loan than large firms.*

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## 1. Introduction

Credit programmes have long been a favoured intervention by donors and governments in Africa. Implicit in these interventions is a concern that credit markets are not functioning well and that their malfunctioning results in low economic activity and growth. There are well-established reasons for credit markets not to be perfect (for a review see Hoff et al. (1993)). The core reason is the lack of functioning markets for risk when information is imperfect and contract enforcement is difficult. In this paper we focus specifically on the demand and supply of credit and investigate whether small firms face a bias in lending by banks and financial institutions.

There is a large literature on firm-level credit constraints in developed and developing countries. Most of the empirical literature focuses on the consequences of credit constraints in a standard neoclassical investment model (e.g. Fazzari et al. (1988), Bond and Meghir (1994), Schiantarelli (1996), Hubbard (1998)). Under a perfectly competitive credit market, any financial information about the firm should be orthogonal to investment decisions and therefore to the investment path. In particular, following Miller-Modigliani's theorem, firms should be indifferent between internal and external sources of funds, so any information related to the current liquidity of the firm should be irrelevant for investment. The standard test for credit constraints consists of adding over-identifying restrictions to an equation describing the investment path, such as an Euler equation or a flexible accelerator model. In most tests significant effects on the over-identifying restrictions have been found, leading to the conclusion that credit constraints matter for investment, and by implication that firms are credit constrained.

In this paper we are not taking this standard route, but look for more direct evidence on credit market participation and constraints faced by firms. We seek to measure directly the demand for external funds of firms and the decision rules applied by financial institutions to grant loans. We model the loan allocation process in two stages. In the first stage the firm decides whether it has a demand for credit, in the second the bank decides whether to approve the loan application.

We use data on six countries - Ghana, Zimbabwe, Kenya, Côte d'Ivoire, Burundi, and Cameroon - drawn from the Regional Program for Enterprise Development (RPED) co-ordinated by the World Bank. Using the same sample, Biggs and Srivastava (1997) discuss the salient features of the credit transactions in the data sets. Fisman (1998) and Fafchamps (1997, 2000) have analysed trade credit transactions in these data. Using credit data from one round of the Zimbabwe survey, Raturi and Swamy (1999) analyse whether ethnic differences result in constraints in the formal credit market

The paper is organised as follows. In the next section, we discuss the problems of identifying credit constraints using firm level data and present an empirical model for analysing the problem. In section 3 we present the data and provide our measures of credit market participation. In section 4 the results are presented for the demand and supply of credit. Section 5 concludes.

## 2. Modelling credit demand and supply

The data innovation in this paper is to use firm answers to questions about their attitudes to loans to assess whether or not they are constrained. We define firms as “unconstrained” in the credit market if they state that they do not wish to obtain external funds or that they were able to obtain a loan. Those that applied and were refused, and those that did not apply because they expected to be refused, are considered “constrained”. This definition is one of potential “loan rationing” in that we identify whether a firm that would have liked a loan could not get one. We cannot account for cases of “size rationing” in which firms borrow less than desired.

Defining  $y_{i1}=1$  if the firm has a demand for external finance and  $y_{i2}=1$  if credit demand is satisfied then our model is:

$$z_{i1} = \alpha_i + \beta_1 x_{i1} + e_{i1}; y_{i1} = 1 \text{ if } z_{i1} > 0, y_{i1} = 0 \text{ otherwise} \quad (1)$$

$$z_{i2} = \alpha_i + \beta_2 x_{i2} + e_{i2}; y_{i2} = 1 \text{ if } z_{i2} > 0, y_{i2} = 0 \text{ otherwise} \quad (2)$$

Clearly  $y_{i2}$  is observed only when  $y_{i1}=1$ .

Equation (1) can be thought of as the demand for credit by the firm and equation (2) as the supply of finance from the bank or financial institution. Setting up the model in this way enables us to investigate how the factors affecting the demand for finance differ from the factors affecting supply. The factors determining the demand for credit in equation (1) are those determining whether firms want to expand their activities either by investing or by increases in their working capital, taking into account the cost of alternative sources of funds, including from internal sources. Equation (2) will reflect the possibility of credit constraints operating on this demand.

Standard models of investment and credit market imperfections can give us guidance on the variables to include in each equation<sup>1</sup>. Controlling for risk attitudes, firms will invest if the expected return exceeds the cost of using funds for investment. In an economy without either credit market imperfections, or adjustment costs, only unanticipated changes to the conditions faced by the firm in the economy should matter for net investment. However, this would not be the case if credit markets are imperfect. In that case, the returns to investment, the cost of external funds as well as the opportunity cost of using internal or other sources of funds are likely to be different and matter for investment demand, and by implication for the demand and supply of credit. The demand for credit will therefore be modelled as a function of a number of firm-specific variables affecting the differences between the returns on capital to the firm and the cost of capital to the firm. We seek to model the returns to capital by profit rates, and control for changes in these returns by introducing time, sectoral and country dummies. The cost of capital to the firm includes the opportunity cost of alternative sources but also factors that affect the cost of external funds in the presence of market imperfections, including collateral requirements or transactions costs in applying for loans. We model the opportunity cost by the availability of alternative sources of funds, including informal credit or access to overdraft financing. We control for access to collateral by including assets and outstanding

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<sup>1</sup> See Bond and Meghir (1994) for a comprehensive discussion of the modelling issues.

debt. Finally, if adjustment costs in capital allocation are present, then investment and credit demand will be affected by the desired capital stock in each period. The later we model by the approach adopted by Caballero, Engel and Haltiwanger (1995). Appendix 2 gives the details.

In modelling the factors that determine the supply of credit it is clear that banks would like to use the same information to allocate credit as is used by firms to decide their demand. We hypothesise that banks cannot use the full information set used by firms. We propose to assume that banks use sector-specific predictions of profitability for each firm, based on sector, country, time, ownership, legal status and other easily observable characteristics. We further assume that the banks have access to information on the current formal debt position and on the capital of the firm, which they can use to assess its current net worth and the ability to provide collateral for loans. We use the debt-capital ratio as our measure of the firm's formal debt position. At least two arguments can be advanced as to how this variable will affect credit supply. High rates of debt may reduce the willingness of the financial sector to satisfy the demand for credit of the firms, since the risk of bankruptcy may be higher. Conversely high debt ratios may be a signal of credit worthiness.

We include in both the demand and supply equations a wide range of variables to control for the heterogeneity of firms in our sample. These include its legal status, ownership structure, firm age and whether it keeps accounts. These controls can be interpreted as proxies for transactions costs in applying for loans so they will affect the demand for credit, and as proxies for the enforcement and monitoring costs which will influence the supply of credit. We also include sectoral, time and country dummies as controls.

Finally, dummies describing the size of the firm are entered. In terms of the issue as to whether or not small firms are credit constrained the interpretation of the effects of these dummy variables is a key part of the policy debate. We have data that enables us to pose the question in the following form: if we include a wide range of variables which control for the heterogeneity of firms in our sample is it still true that both the demand and supply of credit is related to firm size?

In posing that question we are confronted with a range of econometric issues possibly the most important being that our controls for the heterogeneity of the firms may be inadequate and that there is a selectivity problem posed for those obtaining the credit. To address these econometric issues we use three methods of estimating these equations. In the first we allow for the possibility of selectivity bias, in the second we allow for unobserved heterogeneity by means of random effects and in the third model we use a fixed effects logit estimator. While in principle we would like to allow for both selectivity and unobserved heterogeneity this did not prove possible.

### 3. Credit market participation by African manufacturing enterprises

The data used in this paper is a sample drawn from a survey of firms in the manufacturing sectors of Cameroon, Ghana, Kenya, Zimbabwe, Burundi and Côte d'Ivoire, collected between 1992 and 1996. Firms interviewed range in size from micro (less than five employees) to those employing over a thousand. Firms were selected from four sectors in manufacturing, food, textile, wood and metal. In most

countries, a good sampling frame for the smaller or informal sector firms was missing. This has meant that the samples over-represent large and formal sector firms relative to the population. Details on the survey are in Bigsten et al. (1999a) and Biggs and Srivastava (1997). Table 1 gives an overview of some of the firms' involvement in credit markets and other characteristics<sup>2</sup>. Both the percentage of firms receiving loans and formal sector debt as a percentage of capital are low<sup>3</sup>. Most lending is collateralised and the value of collateral is typically high, on average more than twice the value of the loan. Many more firms obtain overdrafts than loans. Alternative sources of credit are limited. Informal sector borrowing, while not uncommon, remains low in all countries considered. Informal credit markets are relatively unimportant for the manufacturing sector in these economies. The survey also found that ROSCAs were irrelevant and virtually absent in most countries except for Cameroon (Biggs and Srivastava (1997)).

In Table 1 we also report on the possible reasons for credit market participation. Just under half the firms report having invested in plant and equipment in the last year. The investment rates relative to capital are very low, on average only about 12 percent. Working capital needs may be another reason for high credit demand. We use the total costs (material inputs and other costs) plus the wage bill as a proxy of the cash flow needed, relative to the capital stock. Trade credit from suppliers provides an important means of financing working capital. For most firms it provides the single most important source of working capital financing, with 62 percent of firms receiving some at the time of the survey. Relative to capital, it is very significant, and well above the value of overdraft facilities received<sup>4</sup>. Trade credit is analysed in detail by Cuevas et al. (1993), Fisman (1998), Fafchamps et al. (1995) and Fafchamps (1997, 2000) and is not discussed further in this paper.

In short, these data suggest that financial market involvement, especially in the form of borrowing, is limited. There are also important differences with respect to the size of the firms (number of employees). Large firms receive more loans and have, relative to capital, a higher indebtedness. They have far more access to overdraft facilities. They rely less on informal credit, but even micro and small firms have relatively low informal debt relative to capital. Large firms invest far more, even though the amounts involved relative to capital remain modest on average. Small firms appear to have more need of working capital relative to capital, probably linked to under-capitalisation of their activities. Finally, the use and relative value of collateral does not differ for large or smaller firms.

Table 2 gives the distribution of firms applying for loans in the previous year. A large number of firms do not apply for loans. From those applying, the majority of firms obtain loans<sup>5</sup>. Overall, about a fifth of firms applied for loans, with just under 60

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<sup>2</sup> For details of the institutional setting of credit markets in each of the six countries and a description of characteristics by country see the working paper version of this paper, Bigsten et al. 2000. In Appendix 1 we provide a summary of key features of the institutional settings.

<sup>3</sup> The capital definition used in this paper is the replacement value of plant and equipment. In some cases, sales values are used when replacement values are missing.

<sup>4</sup> Note that the data reported only include trade credit received, not trade credit given to e.g. customers, which would reduce the net rates considerably.

<sup>5</sup> For a small number of loan applications, no decision had been reached at the time of the survey. These observations were dropped from the data.

percent obtaining them. Across the size distribution, the differences are large with many fewer applications and a smaller success rate among the smaller firms. The large number of firms not applying does not mean that they are not credit constrained, since they may not want to incur the transactions if they suspect they will not obtain any loans.

In table 3 the reasons are given as to why they did not apply for a loan in the last year. It seems that about 34 percent of firms reported that they did not apply because they did not need one and another 14 percent did not want to incur debt or had already too much debt. But quite a few firms gave reasons more closely related to being constrained: 12 percent reported not applying because they did not think they would get one, 9 percent did not have sufficient collateral and 8 percent found the process too difficult. High interest rates were quoted by 9 percent of firms.

It is possible to interpret these answers in terms of the existence of credit constraints. Some firms appear not to be interested in credit: they do not want a loan or do not find it in their interest to incur more or any debt. Others are clearly providing answers suggesting credit market constraints: those who do not have enough collateral, for whom the process is too difficult and others who think they will be refused a loan even if they are willing to pay current interest rates. These firms will be considered in the “constrained” group<sup>6</sup>. One group is more problematic: those who report that high interest rates are the reason for not applying. It suggests that they are not willing to pay current prices, so that they can hardly be considered rationed. Nevertheless, they could be facing the increasing part of the supply curve due to monitoring cost, making credit too expensive for them. In this case they are indeed suffering the consequences of the market imperfections. Since we aim to focus more on rationed groups at given interest rates, we include the group reporting high interest rates as the reason for not applying, as belonging to the “unconstrained, no credit demand” group. To this group we also add those firms which do not want to borrow because they do not need them or do not want to have (more) debt.

Using this information we can allocate all firms in three groups: those “unconstrained without credit demand”, those “constrained” defined as those that applied for loans but were rejected and those rejected after applying for a loan, and finally an “unconstrained with credit demand” group who obtained loans. Table 4 provides the frequencies of firms in these groups by firm size.

Across our sample a large proportion of firms - on average more than half - do not have any credit demand. About a third either applied and were rejected for loans, or did not apply expecting to be rejected, and can be considered constrained. Across the size distribution, the differences are large. Close to two-thirds of the micro firms appear constrained, while this is true for only 10 percent for the large firms. A large proportion of large firms, about two-thirds, simply do not participate in the credit

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<sup>6</sup> Note that this classification is consistent with the theoretical discussion: firms have a demand for outside funds, but are not willing or able to apply because of the collateral constraint, perceived low success rates and high transactions costs. Note also that those applying but whose application was rejected would be firms which found it in their interest to apply (and incur costs) given the perceived success rate. Applications are still risky and those firms with rejected applications faced the ‘bad’ ex-post outcome.

market because they do not want to, compared to only a third of the micro firms. Very few micro-firms apply for loans but this cannot be interpreted as meaning that they do not have a demand for external funds. As most firms in Africa are micro and small firms, the evidence suggests that most are credit constrained.

#### 4. The demand and supply of Credit

The data in Table 4 can be used to measure the demand for credit by the firm, whether the firm would like a loan, and the supply of credit by the bank, whether the firm does receive a loan. We now turn to modelling equations (1) and (2) above. Table 5 presents the results of the demand for credit and Table 6 the supply. Three models for demand and supply are presented. The first, Tables 5 and 6 Column [1], is a selectivity model in which both equations are probits. Selectivity will arise as only firms with a demand for credit will be in the market for a loan. The second, column [2] of both Tables, models the decisions by means of a random effects model. Finally we present a fixed effect logit model in column [3]. The second two models are our alternative ways of dealing with the unobserved heterogeneity across the firms. Relatively few firms report a change in status so to retain sufficient degrees of freedom we restricted the explanatory variables in model 3 to those related to the financial structure of the firm and we replace the size dummies by the log of employment. In Table 5 we are modelling the decision of the firm as to whether it wishes to acquire credit. In Table 6 we are modelling the decision of the bank as to whether to supply the credit.

In Table 5 we show that high indebtedness - measured as outstanding debt excluding any loans obtained in the current year - makes a firm more likely to have a demand for external finance. The squared term is negative, but the overall effect only starts becoming negative at a ratio with debts 66 percent above total capital. Evaluated at the mean, a doubling of the ratio of debt relative to capital at the beginning of the period increases the demand for loans by 13 percent. In contrast access to overdrafts reduces the demand for credit. These results are very similar across all three models. These results suggest that high indebtedness acts as a signal of being credit worthy rather than as a signal of being at increased risk of default. We find some effect from the ownership and firm age variables. Co-operatives are more likely to have a demand for external finance (by 36 percent) and firms with some foreign ownership have lower demand (17 percent less likely relative to private domestic firms). Younger firms are also more likely to demand external finance presumably reflecting their more limited access to other sources of finance.

We turn now to the question of the relationship between size and the demand for credit. Medium sized firms – which are defined as those with between 26 and 100 employees – are less likely to have a demand for credit than large firms. However the coefficients on micro and small firms are not significantly different from zero. In other words, controlling for a series of characteristics typically correlated with small or micro firms the demand for credit is not significantly different for large and small



or micro firms<sup>7</sup>. This result must be interpreted with some caution. It is possible, that there is insufficient variation in size over our sample to be able to distinguish between unobserved heterogeneity and size as determinants of the demand for credit.

We now consider the supply of finance in Table 6, again present the three models. Several findings stand out. First, firms with high expected profits are more likely to get credit than other firms – consistent with banks screening applications to obtain a portfolio of profitable ventures. In particular, evaluated at mean characteristics, doubling the expected profitability ratio increases the probability that a firm will get a loan by about 27 percent<sup>8</sup>. Secondly, we find very strong and significant firm size effects. Relative to large firms, micro firms have 31 percent less chance of having credit demand satisfied, while this is respectively 20 and 13 percent lower for small and medium firms. Note that this effect exists despite controls for whether firms have accounts and for a number of other firm characteristics. In other words, the size effects must reflect the role of other characteristics correlated with size, beyond these included in the regression. Thirdly, we also note a strong and positive effect of outstanding debt, although the square is negative again. We would have expected an overall negative effect, especially at high values of debt over capital – highly indebted firms are likely to be quite risky to give additional loans to. For most reasonable values, we find a positive effect: the overall effect becomes negative for a debt-capital ratio of 1.76. Evaluated at the mean, a doubling of the debt over capital ratio increases the probability of having its credit demand satisfied by 13 percent for all firms. This result is again more consistent with the notion that high debt signal credit worthiness rather than an increased risk of bankruptcy<sup>9</sup>. It will be noted that the selectivity term in Table 6 column [1] is not significant and there are only minor differences in the coefficient estimates between the selectivity and the random effects model.

In Table 6 column [3] we report a very restricted version of the model using the fixed effect logit estimator. We drop the squared term on formal debt and confine our attention to four variables: formal debt to capital, access to overdraft, predicted profitability and firm size. Despite the small data set, some of the earlier results appear quite robust when looking at credit allocation. In particular predicted profitability appears to play a positive role in the bank's allocation rules. Furthermore, the effect of outstanding formal debt is retained as well. Employment is only significant at 12 percent, but given the small sample this means it cannot easily be discarded, relatively small movements in employment appear to affect the probability of obtaining credit when demanded<sup>10</sup>. This would give support for the view that a change in employment in a relatively short period affects the probability of banks

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<sup>7</sup> Note that dropping some of these variables typically correlated with size, such as ownership structure, legal status and whether the firm keeps accounts, still did not result in a monotonic negative relationship between size and the demand for credit: it is highest for micro firms, lowest for medium firms and large and small firms have similar demand in between the two.

<sup>8</sup> Note that the reported marginal effects are conditional on expressing a demand for loans.

<sup>9</sup> This suggests that once credit has been obtained, systematic access seems guaranteed. Whether the very high level of the debt-capital ratio required to induce a reduced probability of lending, is still consistent with efficiency at the level of the banks cannot be assessed using our data.

<sup>10</sup> Calculating marginal effects from the fixed effects logit model is not self-evident since the probability of a particular outcome (and therefore the marginal effects) still contain the firm-specific fixed effects in a non-linear function.

allocating credit. Since this finding is present after controlling for observed and unobserved underlying characteristics of firms, it is less likely to be a reflection of relatively high transactions costs on the part of banks to allocate loans to these smaller firms<sup>11</sup>.

Another way of looking at the firm size effect is to consider the way banks appear to require a small firm to have a higher (predicted) profitability before they offer a loan to it, compared to a larger firm. Table 7 and figure 1 illustrate this, based on the conditional results of the sample selection specification. For a firm with mean characteristics, the probability that it will obtain a loan when it desires is about 21 percent. Keeping other characteristics constant, a medium firm would need a profitability ratio of 56 percent, but this increases to more than 200 percent for a micro firm. A large firm would in this case even get a loan with this probability when its profit/capital ratio would be minus 8 percent. Similar differences are obtained at higher probabilities of receiving a loan. Figure 1 shows this relationship as well, but this time from a slightly different specification in which the size dummies are replaced with the log of employment in the sample selection model, allowing a smooth relationship between predicted profitability needed and firm size. For large firms, expected profitability seems not at all important, while for small and micro firms, the required profitability increases fast. The higher demands imposed on small and micro firms in allocating loans is a sign of a bias against them<sup>12</sup>.

## 5 Conclusions

We have investigated the question as to whether firms in the manufacturing sector in Africa are credit constrained. The fact that few firms obtain credit is not sufficient to prove constraints, since certain firms may not have a demand for credit while others may be refused credit as part of profit maximising behaviour by banks. To investigate this question we have used direct evidence on whether firms had a demand of credit and whether their demand was satisfied in the formal credit market, based on panel data on firms in the manufacturing sector from six African countries.

We find, as expected, that demand for credit is strongly related to size. However we cannot reject the hypothesis that this is related to the heterogeneity of the firms rather than their size. We find, on the supply side, that banks allocate credit on those firms with higher expected profits and a larger outstanding debt. Further the smaller the firm the less likely it is to be given a loan. This effect is strong and present in the regressions, despite including several variables typically referred to as explaining why small or ‘informal’ firms do not get credit.

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<sup>11</sup> This would not be a sign of a bias if costs are *directly* related to firm size and not related to unobserved characteristics that are typically present in small firms. Of course, we cannot exclude this possibility so that the evidence is still only suggestive rather than conclusive.

<sup>12</sup> Pooling tests show that all the main effects are similar across the different countries in the sample. We conducted a set of pooling likelihood ratio tests in the form of linear restrictions on a more general formulation of model, in which the formal debt ratio, firm size and predicted profit were interacted with country dummies. We used the sample selection model for this purpose. Both on these three variables as a group or separately, we find that the country-level interactions are not significant.

This finding enables us to present a figure showing the trade-off between profitability and size. Keeping other characteristics constant, a medium firm would need a profitability ratio of 56 percent, but this increases to more than 200 percent for a micro firm. The higher demands imposed on small and micro firms in allocating loans provides one measure of the cost of size.

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## Appendix 1: The context

In all countries considered, we can find a relatively wide array of financial institutions, with private banks coexisting with a limited number banks and financial institutions with mixed or government ownership. In some, such as in Zimbabwe, the financial sector is even virtually exclusively private owned; in others, such as in Ghana, some largely government owned non-bank financial institutions exist as well. Kenya, Zimbabwe and Côte d'Ivoire can be considered as having relatively well-developed financial systems (Soyibo (1997)). In all countries, despite the emergence of stock exchanges, capital markets remain underdeveloped, implying that equity financing has to come via internal funds or via the credit market. Government involvement in credit market institutions is continuing, as is the banking sectors' role in financing the public sector. Country details can be found in Dercon and Ayalew (1994), Dercon (1995), and Gunning and Mumbengegwi (1995).

During this period, economic reform was continuing in these economies, including some initiatives related to monetary and banking reform. In the 1970s and 1980s, financial repression, with resulting negative real interest rates and extensive government controls was prevalent in Africa. In recent years, different initiatives as part of structural adjustment programmes have sought to rectify this situation in the economies considered. In Ghana, reforms started early, in 1983, with financial sector reforms since the second part of the 1980s. Gradually, liberalisation of the banking sector resulted in more private sector involvement, but initially the financial infrastructure and legal framework were weak. Since 1989, interest rates are freely determined through inter-bank transactions. In Zimbabwe, interest rates were liberalised as part of the structural adjustment programme (ESAP) in 1990, resulting in very high interest rates in subsequent years. In Cameroon, and to a lesser extent as in Côte d'Ivoire, a crisis developed in the financial and banking system after a series of shocks in the mid-1980s. Liberalisation in Cameroon was started in 1989, with further financial sector reforms on the agenda. Reforms included the setting up an institution for delinquent loan recovery, debt rescheduling for private banks and the public sector and several regulatory changes. Macroeconomic instability continued well into the 1990s, partly rectified by the devaluation of 1994. The crisis in the banking sector was by no means resolved by these measures.

In Kenya, private sector involvement and diversity in financial services offered has been exceptional for African standards; nevertheless many government controls remained in place at the time of the survey. Since 1991, interest rates have been liberalised. Since then, however, interest rates have often remained negative, probably linked to closely knit business interests, including between public and private sector institutions. Lending by the public sector remains high, crowding out private lending. During the survey period, the system was seriously under threat, with half the banking system in distress or in questionable financial order, mainly linked to poor lending policies. The Ministry of Finance has exempted many banks from regulations under the Banking Act. Property rights on collateral are also poorly enforced by the judicial system.

During the period 1991-95, Côte d'Ivoire experienced the highest growth rates, but this hides negative growth in the period 1993-94, before the devaluation of the Franc CFA. Ghana continued to grow each year, while stagnation continued in Zimbabwe,

Cameroon and Kenya. Real interest rates were only systematically positive in Ghana. In Côte d'Ivoire and Cameroon, they turned strongly negative with relatively high inflation after the devaluation in 1994, which was a temporary effect - high positive rates were noted in the preceding years and afterwards. In Zimbabwe, rates turned strongly positive in the latter part of the period considered. As the discussion above suggested, negative interest rates are usually not linked with official lending policy at cheap rates. In general, nominal interest rates were high in all countries considered and negative rates directly stem from higher inflation than officially foreseen. Observed periods of apparent financial repression mainly stem from macroeconomic instability. Finally, in terms of monetary deepening, Côte d'Ivoire and Kenya have the highest degree as measured by M2 over GDP. In general, they can be considered to be low. There is no evidence of a systematic increase in financial deepening in recent years, despite the reforms. In conclusion, due to the lack of well-developed capital markets, the financial sector is the main source for external funds in all countries considered. Liberalisation and reforms have started to open up the banking sector, but concerns about the strength and viability of the system remain in many of these economies. Large fluctuations in real interest rates linked to continuing macroeconomic instability contribute to an unfavourable lending climate.

## Appendix 2: Desired capital stock and mandated investment

Caballero et al. (1995) define mandated investment as the deviation between desired and actual capital:

$$(I/K)_{it}^{\text{MANDATED}} = k_{it}^* - k_{it-1} \quad (\text{A1})$$

where  $k_{it}^*$  and  $k_{it-1}$  are the log of desired and actual capital. Desired capital, the stock that firms would hold if adjustment costs were temporarily removed, is equal to frictionless capital, the stock would hold if they never faced adjustment costs, plus a firm specific constant.

To estimate desired capital, we follow the procedure explained in Bigsten et al. (1999b). Since desired capital equals frictionless capital plus a firm-specific constant, we estimate the log of desired capital as a function of log output and a firm specific constant using fixed effects. We impose no restrictions on the output elasticity. However, desired capital is not observable. Following Caballero et al. (1995), we assume that deviations from desired and actual capital stock are stationary over time. Consequently, we can use the actual stock series and interpret the regression as determining long-run desired capital. Our measure of the firm's desired capital is the predicted value from this regression.

Note that to calculate mandated investment using desired capital, we need to use the capital stock in the previous. This would result in the loss of a further observation. To avoid this, in our calculations of mandated investment, we used the capital stock net of investment in the current year as a measure of capital in the beginning of the current year, so that no further observation is lost.

## Appendix 3: Predicted Profits

Table A.1 Prediction model profits rate (profits over capital) (n=1321)

	coefficient	t-value	
wood sector	0.01	0.16	
textile sector	-0.02	-0.29	
metal sector	-0.16	-1.81	+
state sector	0.10	0.26	
solo firm	0.16	1.79	+
Partnership	-0.01	-0.06	
Private corporation	-0.19	-1.55	
State corporation	-0.44	-1.32	
Subsidiary domestic firm	-0.09	-0.42	
State/private domestic firm	0.14	0.56	
Subsidiary foreign	0.13	0.58	
Private foreign firm	0.01	0.09	
Private domestic firm	0.07	0.72	
State/private domestic firm	-0.32	-0.99	
State/private, domestic and foreign firm	-0.06	-0.16	
Capital city?	-0.08	-0.51	
Ghana*wave 1	0.15	0.66	
Ghana*wave 2	-0.09	-0.52	
Ghana*wave 3	-0.20	-1.22	
Cote d'Ivoire*wave 1	0.35	1.78	
Cote d'Ivoire*wave 2	0.82	4.20	**
Cameroon*wave 1	0.26	1.21	
Cameroon*wave 2	-0.03	-0.14	
Cameroon*wave 3	-0.17	-0.84	
Kenya*wave 1	-0.04	-0.23	
Kenya*wave 2	-0.03	-0.17	
Kenya*wave 3	-0.15	-0.94	
Burundi	0.02	0.11	
Zimbabwe*wave 2	-0.03	-0.23	
Zimbabwe*wave 3	0.06	0.39	
micro firm	0.31	2.29	*
small firm	0.11	1.04	
medium firm	0.06	0.66	
Constant	0.75	4.23	**
Further controls for location (towns) included			
Joint significance F( 45, 1275) = 2.57**			
R-squared = 0.083			
Adj R-squared = 0.051			

\*\*=significant at 1%

\*=significant at 5%

+ =significant at 10%



Figure 1 Iso-probability lines

Source: : calculated from sample selection model in Table 6 column [1] but replacing size dummies with log of employment to obtain smooth relationship.

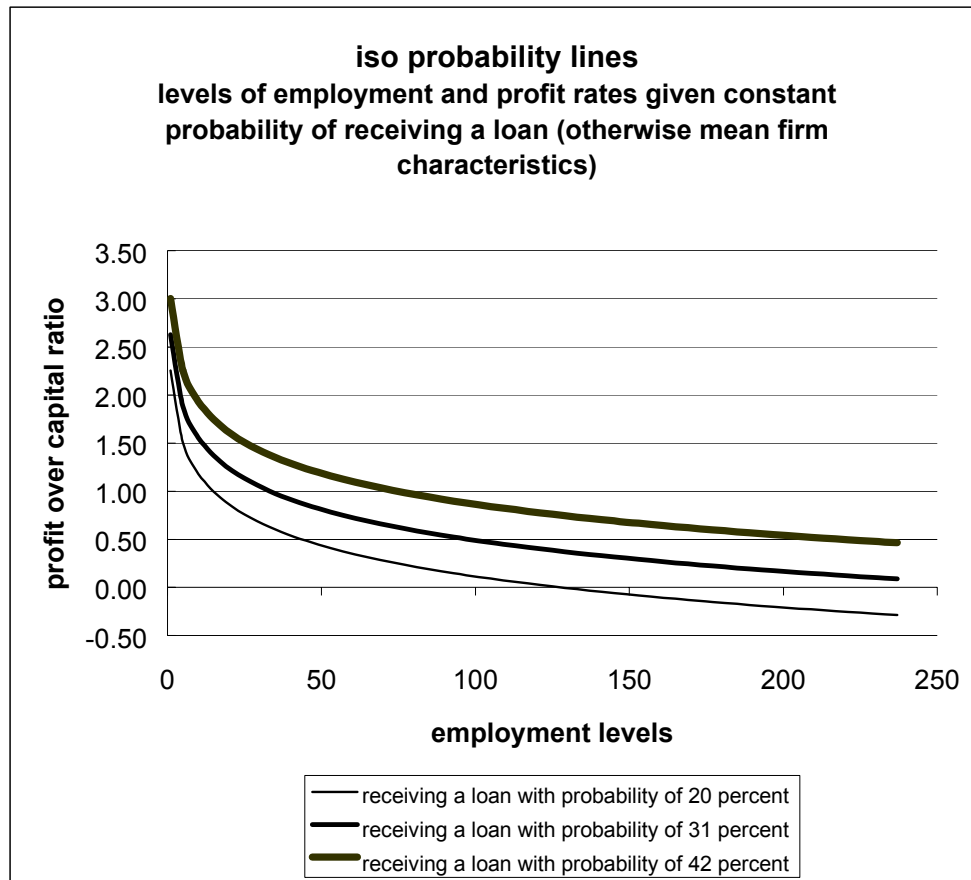


Table 1 Credit market participation and firm size (by employees)

	Micro	Small	Medium	Large	All
Received loan in last year?	0.02	0.07	0.11	0.21	0.10
Debt to banks as % of capital	0.07	0.11	0.14	0.18	0.12
% firms with overdraft facility	0.10	0.30	0.64	0.86	0.47
Overdraft as % of capital	0.06	0.09	0.16	0.25	0.14
% firms with informal sector debts	0.16	0.16	0.09	0.09	0.13
Informal debt as % total capital	0.07	0.09	0.02	0.04	0.06
% firms currently receiving trade credit	0.32	0.53	0.70	0.90	0.62
Trade credit outstanding as % capital	0.15	0.23	0.33	0.35	0.27
% firms providing collateral (formal loans)	0.73	0.78	0.81	0.77	0.78
Collateral value to loan size ratio	1.82	2.48	1.92	2.18	2.13
% firms invested in last year	0.33	0.38	0.45	0.71	0.46
Investment as % of capital	0.09	0.10	0.07	0.09	0.12
Costs as % capital	3.89	3.14	2.21	1.90	2.70
Observations	645	330	546	510	2031

Pooled sample across countries and time.

Table 2 Formal credit market participation by Firm Size (percentages of firms)

	Micro	Small	Medium	Large	All
did not apply	92	82	80	75	82
applied and did not receive	6	11	9	5	8
applied and received	2	7	11	20	10

Table 3 Why did firms not apply for loans? By firm size (percentages of firms)

	Micro	Small	Medium	Large	All
Inadequate collateral (C)	15	10	3	2	9
don't want debt (NC)	9	11	9	5	9
Process too difficult (C)	13	8	4	1	8
didn't need one (NC)	15	29	50	60	34
didn't think I'd get one (C)	23	14	6	3	12
Interest rate too high (NC)	4	12	14	11	9
Already heavily indebted (NC)	1	3	4	5	5
Other	20	13	10	13	15
					100

Table 4 Credit constraints by Firm Size

	Micro	Small	Medium	Large	All
no credit demand	33	50	67	66	55
demand, but rejected *	64	42	21	10	33
received loan	3	8	12	23	12

\*includes firms that suggested that a loan application would be rejected by banks

Table 5 The Demand for Credit

	Selectivity			Random Effects Probit			Fixed Effect Logit		
	[1]			[2]			[3]		
coeff	z-value	coeff		z-value	coeff		z-value		
Solo firm	-0.01	-0.12		-0.02	-0.16				
Partnership	0.14	0.92		0.12	0.55				
State corporation	0.26	0.75		0.35	0.79				
Cooperative	0.95	2.47	**	1.21	2.36	*			
Subsidiary domestic	0.15	0.56		0.13	0.38				
Subsidiary foreign	-0.18	-0.52		-0.22	-0.50				
Private foreign firm	-0.50	-3.70	**	-0.60	-3.42	**			
Private domestic/foreign	-0.23	-1.83	+	-0.29	-1.74	+			
State/private domestic	-0.33	-0.84		-0.27	-0.55				
State/private foreign	-0.27	-0.95		-0.32	-0.82				
State/private foreign/domestic	-0.29	-0.61		-0.46	-0.77				
Firm age	-0.01	-2.53	*	-0.01	-2.48	*			
Firm in capital city?	-0.01	-0.10		-0.04	-0.37				
Formal debt/capital	0.83	3.32	**	0.92	2.95	**	1.56	1.90	+
(Formal debt/capital) <sup>2</sup>	-0.25	-2.15	*	-0.26	-1.89	+	-0.44	-1.38	
Overdraft/capital	0.06	0.79		0.05	0.55		-0.54	-0.97	
Access to overdraft?	-0.21	-2.04	*	-0.21	-1.67	+	-0.48	-1.08	
Accounts?	-0.42	-3.48	**	-0.49	-3.34	**			
Informal debt/capital	-0.01	-0.06		0.01	0.06		-0.11	-0.16	
Profit/capital ratio	0.00	-0.14		0.02	0.39		0.27	1.96	*
Mandated investment	-0.09	-1.66	+	-0.05	-0.68		-0.24	-1.16	
Micro	0.13	0.70		0.20	0.85				
Small	-0.07	-0.53		-0.07	-0.43				
Medium	-0.27	-2.38	*	-0.32	-2.17	*			
Ln (Employment)							0.27	0.68	
Cote d'Ivoire	0.89	5.17	**	0.80	3.42	**			
Cameroon	0.74	5.55	**	0.69	3.71	**			
Zimbabwe	0.08	0.66		0.08	0.53				
Ghana	0.31	2.50	*	0.55	3.27	**			
Burundi	0.06	0.24		0.11	0.37				
Number of observations		1322			1322		378		
Wald		52.39	**						
Test on $\rho$ (heterogeneity) <sup>a</sup>				$\chi^2$ (1) = 21.2	**				
Wald joint significance				$\chi^2$ (36) = 135.3	**				
LR Joint significance							$\chi^2$ (12) = 25.2	**	

Base groups: private domestic firms, firms with limited liability legal status, Kenya, large firms. Regression controls also for sectors and for year using dummies.

<sup>a</sup> This test the presence of group-wise autocorrelation in the errors, with the null of  $\rho = 0$ .

\*\*=significant at 1%

\*=significant at 5%

+ = significant at 10%

Table 6 The Supply of Credit

	Selectivity		Random effects Probit		Fixed Effect Logit				
	[1]		[2]		[3]				
	coeff	z-value	coeff	z-value	coeff	z-value			
Solo firm	-0.06	-0.27	-0.01	-0.05					
Partnership	-0.36	-1.24	-0.50	-1.28					
State corporation	0.12	0.23	-0.06	-0.08					
Cooperative	0.98	2.01	0.86	1.31					
Subsidiary domestic	0.07	0.17	-0.02	-0.04					
Subsidiary foreign	3.07	0.01	0.00	0.00					
Private foreign firm	-0.05	-0.20	0.31	0.89					
Private domestic/foreign	-0.05	-0.21	0.11	0.36					
State/private domestic	1.48	1.54	2.23	1.73	+				
State/private foreign	0.46	0.85	0.76	1.03					
State/private foreign/domestic	3.73	0.01							
Firm age	0.00	-0.72	0.00	0.07					
Firm in capital city?	0.24	1.38	0.40	1.71	+				
Formal debt/capital	1.44	3.97	**	1.61	2.92	**	6.40	1.99	*
(Formal debt/capital) <sup>2</sup>	-0.41	-2.74	**	-0.45	-2.12	*			
Overdraft/capital	-0.30	-1.40		-0.50	-1.61				
Access to overdraft?	0.53	2.59	**	0.82	3.35	**	-2.88	-1.40	
Accounts?	0.38	1.61		0.71	2.33	*			
Predicted (Profit/capital ratio)	0.95	2.30	*	1.37	2.43	**	7.12	1.77	+
Micro	-2.06	-3.69	**	-2.97	-3.52	**			
Small	-0.73	-2.89	**	-1.03	-2.98	**			
Medium	-0.61	-3.14	**	-0.72	-2.62	**			
Ln (Employment)							1.99	1.49	
Selection term	0.83	1.61							
Cote d'Ivoire	-0.98	-1.62		-1.94	-2.65	**			
Cameroon	-0.49	-1.37		-1.07	-2.78	**			
Zimbabwe	-0.15	-0.66		-0.26	-0.83				
Ghana	-0.27	-1.05		-0.59	-1.86				
Burundi	-0.71	-1.51		-1.13	1.76	+			
Number of observations	551			551			52		
Test on $\rho$ (heterogeneity) <sup>a</sup>				$\chi^2(1) = 1.42$					
Wald joint significance				$\chi^2(34) = 36.53$	**				
LR Joint significance							$\chi^2(4) = 15.15$	**	
LR test on selection term	1.58								

Base groups: private domestic firms, firms with limited liability legal status, Kenya, large firms. Regression controls also for sectors and for year using dummies.

<sup>a</sup> This test the presence of group-wise autocorrelation in the errors, with the null of  $\rho = 0$ .

\*\*=significant at 1%

\*=significant at 5%

+ = significant at 10%

Table 7 Predicted profitability relative to firm size

firm size (number employees)	predicted profitability (profit over capital ratio) needed to receive a loan with probability of		
	21 percent	31 percent	42 percent
micro (1-5)	2.08	2.46	2.83
small (6-25)	0.69	1.06	1.44
medium (26-100)	0.56	0.93	1.31
large (100+)	-0.08	0.30	0.67

Source: calculated from sample selection model in Table 6 column [1].