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Does direct foreign investment affect domestic credit constraints?

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Abstract

Firms in developing countries cite credit constraints as one of their primary obstacles to investment. Direct foreign investment may ease credit constraints by bringing in scarce capital. Alternatively, if foreign firms borrow heavily from domestic banks, they may crowd local firms out of domestic capital markets. Using firm data from the Ivory Coast, we test whether: (1) domestic firms are more credit constrained than foreign firms, and (2) whether borrowing by foreign firms exacerbates domestic firm credit constraints. Results provide support for both hypotheses. We also find that state-owned enterprises (SOEs) are less financially constrained than other domestic enterprises.
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> ‘‘Not all direct foreign investment around the world represents net capital flows. Often such investments are financed in local markets.’’
> *Martin Feldstein (2000)*

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1. Introduction

Firms in developing countries typically cite credit constraints as one of their primary obstacles to investment.[1] Direct foreign investment may ease credit constraints by bringing in scarce capital. For example, domestically owned businesses in poor countries are much more likely to face credit constraints than multinational firms.[2] This is one of the reasons policy makers in developing countries have eased restrictions on inward DFI and in many instances provide special incentives for DFI. Yet, if foreign firms borrow heavily from local banks, they may exacerbate domestic firm credit constraints by crowding them out of domestic capital markets.[3]

Apart from anecdotal and survey evidence, there is little empirical evidence on capital market imperfections and firm level investment in developing countries[4]. One reason for the limited empirical evidence is the difficulty in obtaining detailed firm-level data for these countries. Most of the existing evidence is difficult to interpret because these surveys are typically administered by institutions in a position to make loans such as the World Bank. Hence, firms have an incentive to report that they are credit constrained. Leading theorists, however, recognize the important role that capital market imperfections play in developing countries.[5] There is also a large body of empirical evidence for developed countries that suggests that capital market imperfections play an important role in determining firm-level investment decisions.[6]

In this paper, we analyze whether incoming foreign investment in developing countries plays an important role in alleviating domestic firms' credit constraints. We measure the impact of incoming direct foreign investment on domestic firms' credit constraints using firm-level data for the Ivory Coast. Specifically, we use an augmented Euler investment model to test the following hypotheses: (1) domestic

[1]In a recent survey of executives in 20 African countries, financing constraints were cited as a major obstacle to business expansion (Harvard Institute for International Development and World Economic Forum, 1998). In the Ivory Coast, financing constraints were ranked third out of 21; the first and second obstacles were taxation and political instability.

[2]In a recent survey on Kenya, the primary complaint of domestically owned businesses was credit constraints. Multinational enterprises in Kenya, however, did not cite credit constraints as a problem. Rather, they cited access to foreign exchange as their primary obstacle to doing business.

[3]For example, Stiglitz in an address to the Chicago Council on Foreign Relations (1998) argues that there is broad agreement about the fact that foreign direct investment brings additional capital. Feldstein (2000) argues that this is not necessarily the case.

[4]A recent exception is Love (2000), which shows that the sensitivity of investment to availability of internal funds (a proxy for financing constraints) is linked to overall financial development. Other exceptions are Tybout (1983), Harris et al. (1994), Jaramillo et al. (1996), Gelos and Werner (1999), Patillo (2000), and Bigsten et al. (2000).

[5]See for example, Aghion et al. (1999) and Banerjee and Newman (1994).

[6]For an excellent survey, see ''Capital-Market Imperfections and Investment,'' by R. Glenn Hubbard (1998). See also Schiantarelli (1996) on methodological issues.

firms face different credit constraints than foreign firms, and (2) borrowing by foreign firms affects the credit constraints of domestic firms. We modify the standard Euler investment model by introducing a borrowing constraint and then use as proxies for the shadow value of the constraint two measures of financial distress, the debt to asset and interest coverage ratios. In the absence of such constraints, these financial variables should not play a role in determining future investment. Using this framework, we also explore the differential impact of DFI on the credit constraints of state-owned enterprises (SOEs) and private domestic firms.

The results suggest that only domestic firms face credit constraints in the Ivory Coast. We also find evidence of crowding out. Specifically, we find that the share of foreign long-term borrowing at the sector level exacerbates domestic firms' credit constraints and has no effect on foreign firms' credit constraints. When we split domestic firms into public (government-owned) and private firms, we find that public firms' investment decisions are not sensitive to debt ratios or the cost of debt. Nor is there any evidence that public firms are affected by foreign borrowing in domestic credit markets. We interpret this as evidence in support of the notion of a soft budget constraint for public firms. In contrast, private domestic firms appear more credit constrained than foreign firms and are crowded out by foreign borrowing. Finally, we find little evidence that this crowding out takes place via product markets.

Why would borrowing by foreign firms crowd out domestic firms? One plausible mechanism by which this may happen is indirect. Foreign firms may simply be more profitable and/or have access to more collateral and thus be a better investment for lending institutions.[7] A World Bank country economic report for Cote d'Ivoire (1978) suggests that local banks found lending to local enterprises more costly because they were generally considered more risky. This problem was compounded by the fact that interest rates were fixed, thus creating excess demand for loans and the likelihood of credit rationing. Because of interest rate ceilings, banks could not compensate for the extra cost of lending to domestic firms and hence preferred to lend to foreign firms.[8]

To determine why domestic firms are more credit constrained than foreign firms, we compare the profitability of domestic and foreign firms using standard ratio analysis. Overall, foreign firms are somewhat more profitable than domestic firms. Thus, it may be that given the choice, lenders prefer to lend to foreign firms. However, when we interact relative profitability with debt ratios and interest coverage, we find little evidence that it is relative profitability that is driving our

[7] Alternatively, it may have been that foreign firms had better relationships with the bankers for any of a variety of reasons.

[8] This same study states that because of low domestic interest rates, foreign firms preferred to keep excess liquidity offshore. And, as a result, the government borrowed heavily abroad to capitalize local banks.

results. Instead, the share of foreign borrowing remains significant. We conclude that the relative profitability of foreign firms is not driving our results. This paper does not attempt to calculate the implications of our results for overall welfare in Cote d'Ivoire. To properly account for the total impact of DFI on the host country, we would need to take into account the impact of foreign investment on domestic wages, profits, and employment; the role of foreign investors in promoting technology transfer; and the contribution of foreign investors to tax revenues. This is beyond the scope of this paper. However, we do compute the net impact of DFI on the availability of capital, adding together the inflows from equity purchases and foreign borrowing and subtracting the local borrowing of these firms. Because the majority of DFI in Cote d'Ivoire was financed locally, DFI did not represent a large increase in net capital flows to the economy. In fact, borrowing on local credit markets by foreign firms significantly exceeded the sum of equity purchases and foreign borrowing by these firms. From that perspective, total capital available to purely domestic firms actually shrank.

Our contribution is twofold. First, we shed light on an important question in development economics: does DFI ease or exacerbate domestic firms' credit constraints? Second, this paper provides an additional test of the approaches used by Fazzari, Hubbard, and Peterson (1988), Whited (1992), and Bond and Meghir (1994) to identify credit constraints. This literature relies on an observed correlation between investment and measures of internal (cash flow) or external (debt) funds, after controlling for other factors, to identify credit constraints. If there were no capital market imperfections, then a firm's financial structure should have no impact on investment. Typically, as a test of the approach, this literature selects firms which are a priori likely to be credit constrained, such as small firms, firms with high debts, or firms paying out low dividends. Researchers then examine whether these firms exhibit higher correlations between either investment and cash flow (FHP), or between investment and debt to asset ratios and interest coverage (Whited, 1992). Kaplan and Zingales (1997) have criticized this approach, arguing that firms which are identified as credit constrained by FHP are in fact not constrained, based on company statements and balance sheet evidence.[9] Our research provides additional support for both FHP and Whited (1992) by adding a new selection criterion: foreign ownership. One advantage of this approach is that ownership seems to provide a more exogenous criterion for splitting the sample than firm size or dividend policy, which has been the focus of

[9]FHP respond to this critique with a number of counter-arguments. They argue that the sample used by Kaplan and Zingales is too homogeneous to provide reliable results. FHP point out that using measures like cash stock relative to fixed investment, unused lines of credit and leverage are not reliable as indicators of relative financing constraints. They also point out that asking managers how constrained they are is not informative; in particular, company reports (relied on by Kaplan and Zingales to prove that some low dividend payout firms were not really constrained) do not indicate whether applications for loans were actually denied. See Fazzari, Hubbard, and Peterson (2000).

previous studies on credit constraints. In developing countries, we would expect that firms with foreign equity participation (and hence preferential access to capital markets) should be less credit constrained, and consequently should exhibit no relationship between investment and the availability of (internal or external) funds.

The remainder of this paper is organized as follows. Section 2 outlines the general approach used for testing for credit constraints and crowding out. Section 3 discusses the Ivorian banking sector and describes the data. Section 4 presents results of estimation. Section 5 explores the underlying reasons for the differences between domestic and foreign firms borrowing capabilities and also presents extensions on the basic results. Section 6 discusses the implications and Section 7 concludes.

2. Testing for credit constraints and crowding out: the framework

A large body of literature is devoted to determining the impact of financing constraints on investment behavior. The central idea of these studies is that investment should not be determined by a firm's net worth or internal funds but only by the firm's expected future profitability. The primary means for testing this hypothesis has been to estimate investment equations including Tobin's Q (as a proxy for expected future profitability) and measures of net worth as explanatory variables. To the extent that measures of net worth predict investment behavior, researchers conclude that financing constraints are present.

We use a similar approach except that the firms in our sample are not publicly traded and hence we do not have a direct measure of Tobin's Q. Instead, we use an Euler equation approach augmented to include the possibility of borrowing constraints. This follows fairly closely the approach used by Whited (1992), Bond and Meghir (1994) and Love (2000). Using this framework, we focus on two basic questions: (1) are firms in the Ivory Coast credit constrained, and (2) does borrowing by foreign firms exacerbate the credit constraints of domestic firms. Both of these hypotheses can be nested in the same general specification. To test for the presence of credit constraints, we proxy for the shadow value of relaxing the borrowing constraint using two firm-level measures of financial distress, the debt to assets ratio (DAR) and the interest coverage ratio (COV).

The basic idea is that, in the context of the Euler equation, these indicators of financial distress should not have any impact on future investment in a world of perfect information. If, however, there are information asymmetries which restrict borrowing, then firms that are financially distressed today will be forced to substitute investment tomorrow for investment today. Hence, the model predicts a positive relationship between the shadow value of the constraint (proxied by DAR and COV) and future investment. To test for a differential impact of ownership, we include interaction terms equal to our proxies for credit constraints multiplied by ownership. Finally, to test for the possibility of crowding out, we include a

variable that measures the overall level of foreign borrowing by sector and a variable that measures the overall level of foreign sales by sector. The model is described below in more detail.

2.1. An Euler equation specification

We estimate a version of the Euler equation, combining insights from Whited (1992), Bond and Meghir (1994), Gilchrist and Himmelberg (1995) and Love (2000). This is a relation between investment rates in successive periods, derived from dynamic optimization in the presence of symmetric, quadratic costs of adjustment. Under these assumptions, and as long as we assume that expectations are formed accordingly, the Euler equation model has the advantage of controlling for all expectational influences on the investment decision. Thus, we are not as susceptible to the criticism that financial variables are merely picking up information about expected future profitability of the firm.

The theoretical framework is very similar to Bond and Meghir (1994), except that we explicitly introduce a borrowing constraint in the framework, along the same lines as Whited (1992) and Love (2000). One potential criticism of Bond and Meghir (1994) is that they interpret rejection of their model as an indicator of credit constraints. Although this interpretation is quite plausible, the advantage of explicitly including credit constraints in the initial formulation is that it is no longer necessary to reject the model in order to find evidence of credit constraints, nor is it necessary to assume that rejection of the model implies the presence of credit constraints. The other advantage of our approach is that since the coefficient on cash flow is no longer the critical variable of interest for identifying credit constraints, the possibility that cash flow proxies for unobserved profit opportunities no longer poses a critical estimation problem.

A firm i is assumed to maximize the present discounted value of current and future net cash flows. The firm borrows at time t an amount given by B_{it}, and pays interest on the debt given by i_{it}. Inflation is denoted by π_{it}. The credit constraint is modeled either as a non-negative dividend constraint or as a ceiling on borrowing, denoted by B^*_{it}. Letting L_{it} denote variable factor inputs, w_{it} the price of variable factors, p^I_{it} the price of the investment good, p_{it} the price of output, β^t_{t+j} the nominal discount factor between period t and period $t+j$, δ the rate of depreciation, $F(K_{it}, L_{it})$ the production function gross of adjustment costs, $G(I_{it}, K_{it})$ the adjustment cost function and $E_t(.)$ the expectations operator conditional on information available in period t, the firm solves

$$\max E_t\left[\sum_{j=0}^{\infty}\beta^t_{t+j}R(K_{i,t+j}, L_{i,t+j}, I_{i,t+j})\right] \tag{1}$$

Subject to the following constraints:

$$K_{it} = (1-\delta)K_{i,t-1} + I_{it} \tag{1.1}$$

$$B_{it} \leq B_{it}^{*} \tag{1.2}$$

$$B_{it} \geq 0 \tag{1.3}$$

$$R_{it} = p_{it}F(K_{it}, L_{it}) - p_{it}G(K_{it},L_{it}) - w_{it}L_{it} - p_{it}^{I}I_{it} - i_{t-1}B_{it-1} + B_{it} - (1 - \pi_{t-1})B_{i,t-1} \tag{1.4}$$

and

$$R_{it} \geq 0. \tag{1.5}$$

The first constraint, (1.1) is the capital stock accounting identity. Capital stock in this period is equal to capital stock in the last period, net of depreciation, plus this period's investment. The second constraint (1.2) restricts borrowing to be less than some maximum amount of outstanding debt for firm i at time t. The third constraint (1.3) imposes the constraint that debt must be greater than or equal to zero. The fourth constraint (1.4), defines the firm's dividends (equivalent to net revenue). Dividends are defined as cash inflows less cash outflows. Inflows include sales and net borrowing, while outflows include factor and interest payments and investment expenditures. The final constraint (1.5) restricts dividends (or net revenue) to be non-negative. This constraint has the same effect as a restriction on new share issues, and as in the case of a restriction on issuing debt, can be loosely interpreted as a premium on outside equity finance.

The Euler equation characterizing the optimal investment path relates marginal adjustment costs in adjacent periods. If η_{it} represents the shadow value of the constraint (e), γ_{it} represents the shadow value of the constraint (b), and ϕ_{it} represents the shadow value of the constraint (c) then we can write,

$$(1-\delta)(1-(\gamma_{it}-\phi_{it}))\beta_{t+1}^{t}E_t\left[\left(\frac{\partial R}{\partial I}\right)_{i,t+1}\left(\frac{1+\eta_{i,t+1}}{1+\eta_{it}}\right)\right] = \left(\frac{\partial R}{\partial I}\right)_{it} + \left(\frac{\partial R}{\partial K}\right)_{it} \tag{2}$$

Defining $\theta_{it} = (1+\eta_{i,t+1}/1+\eta_{it})$, the first order condition becomes:

$$(1-\delta)(1-(\gamma_{it}-\phi_{it}))\beta_{t+1}^{t}E_t\left[\theta_{it}\left(\frac{\partial R}{\partial I}\right)_{i,t+1}\right] = \left(\frac{\partial R}{\partial I}\right)_{it} + \left(\frac{\partial R}{\partial K}\right)_{it}$$

The right-hand side of Eq. (2) represents the marginal cost of investment today net of the marginal increase in output (because investment is assumed to be immediately productive). The left-hand side of Eq. (2) represents the present value of the marginal adjustment cost of investing tomorrow. Note that because investment is immediately productive, postponing the investment decision involves no future loss in output. The value $\gamma_{it} - \phi_{it}$ represents the (net) multiplier associated with the borrowing constraint. Compared to an unconstrained firm, the

firm facing a binding liquidity constraint has a higher value of $\gamma_{it} - \phi_{it}$ and thus incurs a higher marginal cost of investment today. Thus, the constrained firm behaves as if it has a higher discount rate and for a given level of adjustment costs today, will require a higher rate of return on investment today relative to investment tomorrow. Ceteris paribus, constrained firms will intertemporally substitute investment tomorrow for investment today.

The factor θ_{it} is the relative shadow cost of external finance in periods t and $t+1$. If the shadow cost of external funds is higher in period t than it is expected to be in period $t+1$ then $\theta_{it} < 1$ and it acts as an additional discount factor which makes current period funds more expensive to use than the next period funds and therefore induces the firm to postpone or reduce investment. In perfect capital markets, $\eta_{it} = \eta_{i,t+1} = 0$ for all t and hence $\theta_{it} = 1$, and $\gamma_{it} - \phi = 0$ and the firm is not constrained.

If we rewrite $\theta_{it} = 1 - \Lambda_{it}$, where $\Lambda_{it} = (1 - (1 + \eta_{i,t+1})/(1 + \eta_{it}))$, then our combined debt and dividend constraint is given by $(1 - (\gamma_{it} - \phi_{it}))(1 - \Lambda_{it})$. We now define,

$$\Omega_{it} = \gamma_{it}. - \Lambda_{it}\gamma_{it} + \theta_{it} - \Lambda_{it}\theta_{it}$$

So,

$$1 - \Omega_{it} = (1 - \Lambda_{it})(1 - (\gamma_{it} - \theta_{it})).$$

Substituting, (2) becomes:

$$(1-\delta)\beta^{t}_{t+1}E_t\left[(1-\Omega_{it})\left(\frac{\partial R}{\partial I}\right)_{i,t+1}\right] = \left(\frac{\partial R}{\partial I}\right)_{it} + \left(\frac{\partial R}{\partial K}\right)_{it} \tag{2'}$$

The major challenge is to find empirical proxies for the derivative of net revenue R with respect to I and K, as well as to find proxies for Ω_{it}. If we specify the adjustment cost function as $G(I_{it},\ K_{it}) = (b/2)*[(I/K)_{it} - c]^2 K_{it}$, which is linearly homogenous in investment and capital, Bond and Meghir (1994) show that the derivatives of net revenue with respect to I and K can be written as:

$$\left(\frac{\partial R}{\partial I}\right)_t = -b\alpha p_t\left(\frac{1}{K}\right)_t + bc\alpha p_t - p^t_t \tag{3a}$$

$$\left(\frac{\partial R}{\partial K}\right)_t = \alpha p_t\left(\frac{Y}{K}\right)_t - \alpha p_t\left(\frac{\partial F}{\partial L}\frac{L}{K}\right)_t + b\alpha p_t\left(\frac{i}{K}\right)^2_t - bc\alpha p_t\left(\frac{I}{K}\right)_t \tag{3b}$$

where, $Y = F - G$ denotes net output and $\alpha = 1 - (1/\varepsilon) > 0$. We allow for imperfect competition but the price elasticity of demand ($\varepsilon > 0$) is assumed to be constant. Y is assumed to be linearly homogeneous in K and L.

If we begin by assuming that there are no credit constraints ($\Omega_{it} = 0$), then combining (3a) and (3b) above, and adding the subscript j to denote sector, yields the following estimating equation:

$$\left(\frac{I}{K}\right)_{ij,t+1} = \beta_t\left(\frac{I}{K}\right)_{ijt} - \beta_2\left(\frac{I}{K}\right)^2_{ijt} - \beta_3\left(\frac{C}{K}\right)_{ijt} + \beta_4 U_{ijt} + \beta_5\left(\frac{Y}{K}\right)_{ijt} + s_j + v_{ij,t+1}. \tag{4}$$

where

$$C_{ijt} = p_{ijt}\,F(K_{ijt}, L_{ijt}) - p_{ijt}\,G(I_{ijt}, K_{ijt}) - w_{ijt}L_{ijt}$$

is real cash flow and U_{ijt} is the real user cost of capital. Expected future investment (proxied by actual future investment) is positively related to current investment and negatively related to the square of current investment. Future investment is negatively related to current cash flow and positively related to the user cost of capital. Under imperfect competition, future investment is positively related to current (Y/K). We also include sector-specific effects.

The negative association between current cash flow and future investment is explained in the following way. A high level of current cash flow implies lower net marginal adjustment costs today. Because in equilibrium, marginal adjustment costs are equated across periods in expectation, this implies lower expected marginal adjustment costs and hence lower expected investment tomorrow.

2.2. Testing for credit constraints and crowding out using the Euler specification

We need to modify the basic specification in (4) to test for credit constraints. As is evident from the first order condition (2′), we need to find empirical proxies for Ω. If we linearize (using a Taylor expansion) the product of $(1-\Omega)$ and next period's derivative of net revenue with respect to investment, then we can take Ω to the right-hand side of (4). We will empirically proxy for Ω with two firm-level measures of financial distress: the ratio of debt to fixed assets (*DAR*), and a measure of interest coverage (*COV*). In a world with no credit constraints, these measures should have no impact on investment since all that matters is the expected future profitability of investment. In a credit constrained world, these two measures will be positively related to future investment. Firms that are financially distressed are more likely to be up against their borrowing constraints and are hence more likely to postpone investment until tomorrow.

Following Whited (1992), *DAR* is the ratio of the market value of the firm's debt to the value of the firm's fixed assets. Thus, *DAR* can be interpreted both as a measure of a firm's lack of collateral and as a measure of a firm's current demand for borrowing relative to its capacity to borrow. The interest coverage ratio, *COV*, is defined as the ratio of the firm's interest expense to the sum of the firm's interest expense plus cash flow. A higher value of *COV* today means that a firm is exhausting relatively more resources on servicing its debt and is likely to be closer to its debt capacity.

To test whether foreign presence in sector j and year t alters domestic firms' credit constraints, we interact these firm-level variables with the share of foreign borrowing in sector j and year t. This yields the following empirical proxy for Ω:

$$\begin{aligned}\Omega = {} & \beta_5\, DAR_{ijt} + \beta_6\, COV_{ijt} \\ & + \beta_7\, DAR^{*}_{ijt} FDEBT_Sector_{jt} + \beta_8\, COV^{*}_{ijt} FDEBT_Sector_{jt} \\ & + \beta^{*}_{9} FDEBT_Sector_{jt}\end{aligned} \tag{5}$$

The coefficients on *DAR* and *COV* are expected to be positive and significant if the firm is credit constrained. The coefficients β_7 and β_8 are expected to be positive and significant if foreign borrowing ($FDEBT_Sector_{jt}$) exacerbates credit constraints for firms in sector j at time t. This interaction term is meant to capture ''credit rationing'' by lenders. We interpret the coefficients on the interaction of our *DAR* and *COV* variables with foreign debt as an indicator of crowding out.

One potential area of concern is that foreign firms' share of the debt market is really capturing the negative impact of foreign entry on domestic market share, and consequently on the level of investment. To control for that possibility, we also test the following modified equation:

$$\begin{aligned}\Omega = {} & \beta_5 DAR_{ijt} + \beta_6 COV_{ijt} \\ & + \beta_7 DAR^{*}_{ijt} FDEBT_Sector_{jt} + \beta_8 COV^{*}_{ijt} FDEBT_Sector_{jt} \\ & + \beta^{*}_{9} FDEBT_Sector_{jt} \\ & + \beta_{10} DAR^{*}_{ijt} FSALE_Sector_{jt} + \beta_{11} COV^{*}_{ijt} FSALE_Sector_{jt} \\ & + \beta^{*}_{12} FSALE_Sector_{jt}\end{aligned} \tag{6}$$

$FSALE_Sector_{jt}$ is a measure of the level of foreign sales in sector j at time t. If the level of foreign sales in sector j makes domestic firms less profitable and therefore less able to borrow in sector j at time t, then the coefficients β_{10} and β_{11} should be positive. Eq. (6) consequently is a robustness check on our crowding out hypothesis via financial markets. If, instead, domestic firms are crowded out of local markets due to product market competition, then adding these additional terms should reduce or eliminate the significance of crowding out in the financial sector.

2.3. Estimation issues

A number of issues come up in estimation. First, the user cost of capital is typically unobservable. Like most researchers, including Bond and Meghir (1994), we proxy for the user cost of capital using firm dummies. Second, our model is restrictive in the sense that we would expect domestically owned and foreign owned enterprises to exhibit both different degrees of credit constraints as well as different sensitivities to foreign entry. To allow for a differential degree of constraints, we introduce the variable *DFI_Firm*, which is the share of foreign

equity participation at the plant level, varying between 0 and 100 percent. What this means is that we will allow all the coefficients in Eqs. (4), (5) and (6) to vary with the degree of foreign ownership. We will also allow for an independent effect of foreign ownership in a plant on investment. If foreign ownership increases the overall level of investment, we should observe a positive coefficient on DFI_Firm_{ijt}. If foreign firms are less credit constrained (or not constrained at all) than domestic firms then the sign of the coefficient on the interactions between *DAR* and *COV* and *DFI_Firm* should be negative (or zero).

Our final estimating equation is thus:

$$\frac{I_{ijt+1}}{K_{ijt}} = \sum_{O=d}^{f} \left[\begin{array}{l} \beta_1^O \left(\frac{I}{K}\right)_{ijtO} - \beta_2^O \left(\frac{I}{K}\right)^2_{ijtO} - \beta_3^O \left(\frac{C}{K}\right)_{ijtO} + \beta_4^O U_{iO} + \beta_5^O \left(\frac{Y}{K}\right)_{ijtO} + \beta_6^O DAR_{ijtO} \\ + \beta_7^O COV_{ijtO} + \beta_8^O DAR^*_{ijtO} FDEBT_Sector_{jtO} + \beta_9^O COV^*_{ijtO} FDEBT_Sector_{jtO} \\ + \beta_{10}^O FDEBT_Sector_{jtO} + \beta_{11}^O DAR^*_{ijtO} FSALE_Sector_{jtO} \\ + \beta_{12}^O COV^* FSALE_Sector_{jtO} + \beta_{13}^O FSALE_Sector_{jtO} + s_{jO} + d_{t+1,O} + \varepsilon_{ijtO} \end{array} \right] \quad (7)$$

Where O stands for ownership, d is domestic and f is foreign. Firms with more than an average of 49% foreign ownership over the sample period are considered foreign, otherwise, they are domestic. We also include sector dummies, s, and time dummies, d.

3. Background information

3.1. The banking sector

In the 1980s, a dominant features of the Ivorian financial system was the country's membership in the West African monetary union, which limited independent monetary policy and led to a policy of regulated interest rates. Credit demand significantly exceeded supply, leading to credit rationing and constraining the ability of firms to borrow locally to meet the investment needs. The system was dominated by commercial banks, who did little in terms of resource mobilization or term lending to productive sectors. The system was primarily designed to provide trade-related loans, with the small proportion of lending to productive activities going primarily to large and well-established concerns, many foreign owned. In part, banks were driven to these lending practices because of interest rate ceilings, which led to very small profit margins and consequently discouraged them from taking risks.

By 1984, there were 21 licensed banks in Cote d'Ivoire. The biggest four banks controlled over three-quarters of all non-government deposits. Another important characteristic of the top four banks was that all four were closely linked with French shareholder banks. For example, ownership of the largest bank, SGB-CI,

was divided between the French Bank Societe Generale (37%), other foreign banks (25%), private Ivorians (29%), and the Ivorian government (9%).

3.2. Data

The firm data are taken from the Banque de Donnees Financieres (BdDF), which is instructed to gather annual information on all industrial firms in the Ivory Coast. The panel is unbalanced, with the number of firms in individual years ranging from around 250 in the 1970s to nearly 500 in the mid-1980s. Although the coverage of the industrial sector is incomplete (informal enterprises are excluded and small formal firms are under-represented), the BdDF covers almost all large and medium-sized formal manufacturing enterprises. From this sample, we deleted a number of observations where firms reported zero or negative sales, employees, and/or material inputs. This left us with a sample of 399 firms over the period 1974–1987. Since the panel is unbalanced, not all firms are represented over all years.

We estimate Eq. (7) using our panel of 399 Ivorian firms during the period 1974–1987. These estimates require data on real output, capital stock, labor costs, material costs, investment, borrowing and ownership shares. We do not use reported profits; instead we compute operating cash flow as total sales less the cost of labor, material inputs and taxes. The value of the real capital stock was constructed using the perpetual inventory method. All variables were deflated by two-digit sectoral level price deflators to obtain real values. Table 1 reports summary statistics for the 399 firms in our sample.

Our measure of foreign borrowing at the sectoral level is defined as:

Table 1
Descriptive statistics of variables used in analyses

Variable	Number of observations	Mean	Standard deviation
Public ownership	2403	0.06	0.16
Private ownership	2403	0.19	0.31
Foreign ownership	2403	0.75	0.33
Investment/capital stock	2403	0.31	0.29
Log of real sales	2403	19.92	1.43
Operating cash flow/capital stock	2403	0.41	0.35
Share of foreign LT borrowing in sector j year t	2317	0.69	0.28
Share of foreign ST borrowing in sector (SC)	2317	0.74	0.22
Share of foreign ST borrowing in sector (BC)	2317	0.65	0.23
Share of foreign public borrowing in sector	2403	0.72	0.23
Share of total foreign borrowing	2317	0.69	0.25
Share of foreign sales	2403	0.72	0.24

Note: (1) SC stand for suppliers credits and BC bank credits. (2) The total variance of the share of foreign borrowing is 0.061 of which 52% is cross-sectoral variation and the remaining 48% is time-series variation. The total variance of the share of foreign sales is 0.056 of which 46% is cross-section variation and the remaining 56% is time-series variation.

$$FDEBT_Sector_{jt} = \frac{\sum_i DEBT_{ijt} * DFI_Firm_{ijt}}{\sum_i DEBT_{ijt}} \tag{8}$$

Our measure of foreign sales at the sectoral level is defined as:

$$FSALE_Sector_{ijt} = \frac{\sum_i REAL\ SALES_{ijt} * DFI_Firm_{ijt}}{\sum_i REAL\ SALES_{ijt}} \tag{9}$$

Our justification for using sector level variables derives from the fact that in order to mitigate portfolio risk, banks frequently diversify according to sector[10]. As an illustration, one 1995 publication which discusses bank risk management explains that ''diversification means avoiding concentration in a single company, *industry group* or geographic area'' [italics added for emphasis]. We also have evidence that in 1976 banks in the Ivory Coast were assigned sectoral limits by the Banque Centrale des Etats de L'Afrique de L'Ouest (World Bank, 1978)[11].

The importance of foreign equity participation during the period 1974 to 1987 is significant and variable by sector (see Table 2). The share of foreign equity was particularly high in the leather industry (93.12%) while in other sectors such as food it was less important (61.53%). Domestic participation is split between private and SOEs with private domestic firms taking the lead in all sectors but rubber and cement. In addition to cross-section variation, there were also substantial changes in the share of foreign ownership over the sample period.. Although variable, foreign participation in the Ivorian economy was significant. As a share of total reported sales in the economy foreign firms accounted for 83.15% in 1975 and 70.10% in 1987. The importance of borrowing by foreign firms is a slightly trickier issue since it is likely that foreign firms have access to funds overseas while domestic firms may not. As a share of total credit in the economy foreign firms accounted for 76.32% in 1975 and 60.89% in 1987. This probably overstates somewhat the extent to which foreign firms relied on local bank financing as opposed to other sources of financing. Nevertheless, data for 1985 (Table 2) indicate that on average only 12.8% of foreign firms' long-term funds came from overseas. Thus, a substantial portion of borrowing by foreign firms was done locally.

The number of firms in each sector and the distribution of ownership are provided in Table 2. For purposes of presentation, we aggregate up to the 2-digit SIC level (ten sectors): food processing, textiles & apparel, leather products, wood

[10]Chapter 10 in Active Bank Risk Management: enhancing investment & credit portfolio performance, The Globecom Group Ltd., 1995.

[11]The majority of manufacturing activity was located in Abidjan and thus it would have been impossible to diversify on a regional basis (World Bank, 1978).

Table 2
Ownership structure for 1975–1987 and origin of long term borrowing by foreign firms in 1985

Sector	Ownership structure by sector 1975–1987				Origin of long term borrowing by foreign firms in 1985 (millions of cfa francs)		
	Number of firms	Domestic public	Domestic private	Foreign	Total borrowing	Amount borrowed abroad[a]	Percent borrowed abroad
Food	85	8.05%	30.31%	61.53%	15,315	2031	13.26
Textiles & Clothing	38	11.15%	17.08%	71.60%	5610	596	10.62
Leather products	15	0%	6.89%	93.12%	559	52	9.30
Wood products	60	0.28%	25.89%	73.49%	7380	839	11.37
Chemicals	53	4.40%	13.61%	82.00%	6820	687	10.07
Rubber & Cement	6	20.42%	19.31%	60.27%	4610	167	3.62
Building materials	17	7.77%	24.03%	68.20%	1160	177	15.26
Transportation materials	35	0.69%	2.05%	99.14%	3690	1867	50.60
Tools	45	0.53%	2.33%	93.22	3870	262	6.93
Paper products	45	8.70%	24.16%	67.14%	3420	45	1.32
Total	399	5.14%	18.52%	75.97%	52,344	6,723	12.84

[a] The majority of borrowing from abroad was done in France. However some credit was sourced elsewhere but details of the origins of these loans are not available.

products, chemicals, rubber & cement, building materials, transportation materials, tools and paper products. Our analysis defines sectors at the four-digit level but is robust to defining sectors at the two and three digit level.

4. Investment equation estimates

The standard solution to measuring the user cost of capital is to assume that it can be captured by a firm fixed effect, which we already allow for in Eq. (7). Our approach to accounting for firm-fixed effects is to sweep out the fixed effects by taking deviations from firm means. However, this could induce bias in the lagged dependent variable which is one of the independent variables in Eq. (7). One solution to this problem is to account for the potential firm fixed effect by taking a within transformation, and then applying instrumental variables (IV) estimation or Generalized Method of Moments (GMM) estimation. Our approach is to sweep out the firm fixed effect by taking a Helmert transformation of Eq. (5), and then estimate the transformed equation using GMM.[12]

Table 3 reports the results from estimating Eq. (7). The basic specification is reported in column (1). We allow the coefficients to vary across foreign-owned and domestically-owned firms. As indicated earlier, a foreign firm is defined as one for which more than 49 percent of the equity is owned by foreigners. The basic specification does not include debt or interest coverage. The restrictions imposed by the model are generally accepted: the coefficient on lagged investment is positive, the coefficient on squared (lagged) investment is negative, the coefficient on Y/K is positive and the coefficient on cash flow is negative. Since we have more instruments than exogenous variables, we have a number of overidentifying restrictions in each regression. Hansen's J statistic, reported in Table 3, is distributed as a chi-square and indicates whether the overidentifying restrictions of the model are accepted.[13] In every case, the overidentifying restrictions are accepted.

[12]The Helmert transformation involves taking deviations from future means (see Arellano and Bover, 1991 for details). This procedure leaves the untransformed variables orthogonal to the transformed error term for period $t-1$ and greater. Hence, we use as instruments, levels of the variables dated $t-1$ and earlier.

[13]Because we are using GMM and because we have more instruments than exogenous variables (we have used levels of all variables in the regressions plus sector dummies as instruments), we have a number of overidentifying restrictions. Specifically, the number of overidentifying restrictions comes from fact that we have to assume that the error term is orthogonal to each of the instruments or at least close to orthogonal or that the expectation of the product of the error and the instrument is approximately equal to zero. Hansen's J is a statistic derived from the sample values of the error terms and the instruments. If the moment conditions were satisfied, HJ would be exactly equal to zero. We can say how statistically different from zero HJ is because it is distributed as a chi-square with degrees of freedom equal to the number of instruments minus the number of parameters we are estimating.

Table 3
GMM estimates of augmented Euler investment equation to test for credit constraints and crowding out

Dependent variable: Investment/fixed assets	(1) Basic model		(2) Test for credit constraints		Tests for "crowding out" or "credit rationing"				Comparison of private and state-owned enterprises			
					(3) Via financial sector		(4) Via product markets		(5) Test for credit constraints		(6) "Crowding out" via financial sector	
	D	F	D	F	D	F	D	F	SOE	Private	SOE	Private
Explanatory variables												
Lagged (investment/fixed assets)	0.592	0.342	0.563	0.357	0.539	0.358	0.589	0.353	0.358	0.539	0.738	0.431
	(0.141)	(0.073)	(0.149)	(0.055)	(0.127)	(0.046)	(0.125)	(0.054)	(0.492)	(0.158)	(0.256)	(0.144)
Lagged (investment/fixed assets)^2	−0.331	−0.151	−0.293	−0.137	−0.282	−0.135	−0.317	−0.132	−0.094	−0.279	−0.397	−0.245
	(0.127)	(0.043)	(0.115)	(0.058)	(0.104)	(0.047)	(0.111)	(0.032)	(0.112)	(0.111)	(0.232)	(0.090)
Lagged (sales/fixed assets)	0.017	0.011	0.031	0.012	0.039	0.013	0.039	0.012	0.059	0.009	0.039	0.037
	(0.008)	(0.003)	(0.010)	(0.005)	(0.012)	(0.003)	(0.006)	(0.004)	(0.019)	(0.002)	(0.014)	(0.013)
Lagged cash flow (CF)	−0.041	−0.021	−0.086	−0.019	−0.096	−0.019	−0.101	−0.018	−0.122	−0.021	0.037	−0.024
	(0.021)	(0.005)	(0.025)	(0.007)	(0.038)	(0.005)	(0.029)	(0.007)	(0.079)	(0.003)	(0.122)	(0.011)
Lagged debt to assets ratio (*DAR*)			0.103	0.004	0.051	0.128	0.081	0.014	−0.027	0.116	−0.027	0.061
			(0.031)	(0.037)	(0.012)	(0.127)	(0.033)	(0.149)	(0.128)	(0.039)	(0.134)	(0.015)
Lagged interest coverage ratio (*COV*)			0.011	0.001	0.012	0.009	0.022	0.005	0.006	0.011	−0.006	0.014
			(0.002)	(0.001)	(0.003)	(0.016)	(0.003)	(0.008)	(0.015)	(0.001)	(0.009)	(0.004)
Share foreign borrowing sector *J* year *t*					−0.061	0.189	−0.219	0.183			0.822	−0.216
DAR * Share foreign borrowing					(0.032)	(0.084)	(0.161)	(0.089)			(0.577)	(0.004)
					0.356	−0.163	0.431	−0.213			0.422	0.361
					(0.016)	(0.146)	(0.152)	(0.367)			(0.566)	(0.101)
COV * Share foreign borrowing					0.026	−0.012	0.031	−0.013			−0.026	0.017
					(0.009)	(0.023)	(0.011)	(0.004)			(0.133)	(0.003)
Share foreign sales sector *J* year *t*							−0.407	−0.063			0.111	−0.330
							(0.224)	(0.151)			(0.151)	(0.124)
DAR * Share foreign sales							0.157	0.102			0.202	0.227
							(0.359)	(0.333)			(0.233)	(0.359)
COV * Share foreign sales							0.017	0.007			0.027	0.012
							(0.005)	(0.023)			(0.023)	(0.008)
N	2068		1876		1937		1876		1937		1876	
Hansen *J* statistic	65.06		51.25		54.15		51.46		48.82		46.57	
P-value	0.51		0.88		0.81		0.87		0.92		0.95	

Column (2) introduces the two proxies for credit constraints, the ratio of lagged debt to assets (*DAR*), and the lagged interest coverage ratio (*COV*). The coefficients on *DAR* and *COV* are significant and positive for domestic firms, equal to 0.103 and 0.011 respectively. For foreign firms, however, those coefficients, at 0.004 (for *DEBT*) and 0.001 (for *COV*) are close to zero in magnitude and insignificant. This suggests that domestic firms are credit constrained, while foreign enterprises are not. The addition of *DEBT* and *COV* substantially improves the fit of the model, as indicated by the fall in the value of the Hansen J Statistic.

Column (3) tests for crowding out in the financial sector. As in column (2), we allow the coefficients on the independent variables to vary across foreign and domestic enterprises. The coefficient on the interaction of *DAR* and *COV* and the share of foreign borrowing at the sector level indicates the extent of crowding out. The results in column (3) indicate that foreign firms crowd out domestic firms. The coefficient on *DAR* and *COV* interacted with sectoral foreign share of total borrowing is positive and statistically significant. The coefficient on *DAR* alone is half the magnitude in column (1), confirming that a large part of the credit constraints identified in column (1) are due to foreign entry. The results in column (3) also indicate that there is no crowding out of foreign firms: *DAR* and *COV* interacted with sectoral foreign share of borrowing is not significant.

The focus of this paper is the coefficient on the share of foreign borrowing interacted with *DAR* and *COV*. The coefficients on *DAR* and *COV* are equal to 0.05 and 0.01 for domestic enterprises, which we interpret as the extent of credit constraints facing those firms when there is zero foreign borrowing. The distribution of the share of foreign borrowing has a mean of 0.69 and a standard deviation of 0.28 (Table 1). Therefore a one standard deviation increase in the share of foreign borrowing implies an increase of 0.09 for the coefficient on *DAR*, which is nearly a 300 percent increase, from 0.05 to 0.14. A one standard deviation increase in the share of foreign borrowing implies an increase in the coefficient on *COV* of 0.007, which implies nearly a doubling of the coefficient on *COV*. Another way to interpret the magnitudes is to ask how an increase in foreign borrowing from 60 to 70 percent of sectoral borrowing would affect the coefficients on *DAR* and *COV*. This would imply that the coefficient on *DAR* would increase from 0.05 to 0.09, nearly doubling its value, while the coefficient on *COV* would increase by 25 percent (from 0.012 to 0.015).

One possible explanation for the observed correlation between *DAR* (or *COV*) and foreign sector share of total borrowing and investment could be the following: domestic firms face greater domestic competition with foreign entry. Increased competition—which could be correlated with the foreign share in domestic borrowing—leads to both lower investment and a decline in profits, which are correlated with cash flow. We test for this possibility in column (4). We add two additional terms, *DAR**Share Foreign Sales and *COV**Share Foreign Sales to the basic specification. Share Foreign Sales is defined as the share of foreign-owned firms in total sales in a particular sector and year. If foreign borrowing is simply a

proxy for competition, then the crowding out variables should become statistically insignificant. The results in column (4) suggest that this is not the case. The coefficients on *DAR* and *COV* interacted with foreign borrowing remain the same in magnitude and are statistically significant. The coefficient on Share Foreign Sales is negative and significant for domestic firms and insignificant for domestic firms. However, Share Foreign Sales interacted with *DAR* and *COV* are generally insignificant. This suggests that while foreign competition has a direct negative impact on investment by domestic firms, it does not affect domestic firms credit constraints.

In a number of African countries, SOEs play a major role in all aspects of the economy, including manufacturing. Cote d'Ivoire is no exception. Table 2 shows that SOEs account for a large share of sales in a number of sectors, such as food products, rubber and cement. Yet, SOEs are likely to face a very different set of credit constraints than their private sector counterparts. Bertero and Rondi (2000) indicate that the cash flow-investment correlation could differ from private sector firms for a number of reasons. To the extent that SOEs benefit from a soft budget constraint, they may be less credit constrained than private enterprises. This would indicate a weaker link (or no link at all) between investment and cash flow. On the other hand, an argument could also be made that the link between cash flow and investment is likely to be stronger for public enterprises. Bertero and Rondi (2000) argue that agency problems are more severe in public enterprises. To the extent that managers of SOEs are more likely to pursue private objectives, they may wish to over invest relative to the optimum. This may lead us to find a stronger link between cash flow and investment for this set of firms.

The last two columns of Table 3 redo the specification reported in columns (2) and (4), but allow coefficients to vary across public and private enterprises. Although the coefficients on investment and lagged investment are significantly different in magnitudes, for both the private enterprises and the SOEs the signs are as expected. While the coefficients on *DAR* and *COV* remain significant and positive for domestically owned private enterprises, the coefficients on both measures of credit constraints are insignificant for SOEs. These results are consistent with the perception that SOEs, due to their access to soft loans or government support, are less likely to be credit constrained than private sector enterprises. The evidence also suggests that there is no crowding out; SOEs are unaffected by foreign investors. These results are robust to adding *DAR* and *COV* interacted with the share of foreign sales. We also tested for crowding out by public sector enterprises, but found that their borrowing had no impact on other enterprises. The results (not reported here) suggest that crowding out is restricted to foreign enterprises.

There appears to be fairly robust evidence of crowding out of domestic firms by foreign firms. The interaction between our debt and interest coverage measures with the level of foreign borrowing at the sector level is positive and significant across all specifications. Finally, the results suggest that crowding out only affects

domestically owned, private enterprises. Neither SOEs nor other foreign enterprises are crowded out by foreign entry in their sector.

5. Extensions

Results of our analysis suggest that only domestic firms are credit constrained and that foreign firms crowd out domestic firms in local capital markets. Both (1) as a test of the Euler equation approach and (2) to allow us to gain insights into why foreign firms are crowding out domestic firms, we report quantitative measures of operational and financial health in Table 4. If the Euler equation approach accurately measures the extent of credit constraints, then we would expect that foreign firms would appear to be less constrained using quantitative

Table 4
Why would domestic firms get crowded out? A comparison of firm characteristics by ownership

Variable	*N*	Mean domestic SOE	Mean domestic private	Mean foreign	t-statisticin for change mean
A. Investment, cash flow and sales growth					
I_t/K_{t-1}	2403	0.166	0.325	0.363	1.962
Cash flow$_t/K_{t-1}$	2403	0.254	0.421	0.417	0.454
Real sales growth$_t$	2403	0.089	0.039	0.042	0.547
Real capital stock (millions of CFA)	2403	1,579.0	148.0	249.1	4.195
B. Debt ratios and growth[2]					
Debt to assets ratio (DAR)$_t$	2403	0.427	0.269	0.271	0.736
Interest coverage ratio (COV)$_t$	2403	0.858	0.419	0.373	2.018
Real debt growth	2403	0.331	0.182	0.345	3.098
C. Profitability ratios[3]					
Profit margin	2251	0.099	0.044	0.047	0.886
Return on assets	2251	0.161	0.006	0.084	4.745
Asset turnover	2403	2.779	3.437	4.249	8.027
D. Firm size					
Sales (millions of CFA)	2403	3157	322	857	8.579
Number of employees	2403	501	68	149	7.423

(1) Results were obtained by regressing ratios on a dummy variable for ownership and a constant. *T*-statistic is for the difference in mean between private domestic and foreign firms. (2) Debt to assets ratio is the real value of outstanding debt divided by the real value of current assets and is meant to capture both a firm's demand for borrowing relative to its capacity to borrow and as a measure of collateral. The interest coverage ratio, *COV*, is defined as the ratio of the firm's interest expense to the sum of the firm's interest expense plus cash flow. A higher value of *COV* today means that a firm is exhausting relatively more resources on servicing its debt and is likely to be closer to its debt capacity. (3) Profit margin is defined as the ratio of real profits to real sales, return on assets is defined as the ratio of real profits to real assets and asset turnover is defined as the ratio of real sales to real assets.

ratios such as cash flow to investment and debt to capital. We also report different measures of profitability across the two sets of firms. Foreign firms may crowd out domestic firms on local credit markets simply because they are more profitable. We are particularly interested in identifying whether foreign firms crowd out domestic firms, after controlling for the same level of profitability, a possibility we will explore later in this section. Such a result would suggest that crowding out may not be an efficient outcome; there may be a ''bias'' in favor of allocating credit to foreigners.

5.1. Financial ratio analysis

5.1.1. Economic and debt ratios

The results in Panels A and B of Table 4 suggest that, using a wide range of indicators, domestic firms are more credit constrained. The means show that investment relative to capital is significantly lower for domestic relative to foreign firms. Although cash flow levels are similar for private domestic and foreign firms, sales growth is slightly lower. The next set of ratios in Table 4 are leverage ratios. Overall, the debt to assets ratio is about the same for private domestic and foreign firms, but significantly higher for SOEs. The interest coverage ratio (*COV*) is significantly higher for private firms relative to foreign enterprises, indicating that they face higher borrowing costs. Real debt growth is significantly lower for private domestic enterprises compared to SOEs and foreign enterprises. These results are consistent with the earlier regression results showing that domestic firms are more financially constrained than both foreign enterprises and SOEs.

5.1.2. Profitability ratios

The next set of ratios in Table 4 measure profitability. Using three different measures of profitability, there is some evidence that firms with foreign assets are more profitable than private domestic enterprises. However, the evidence is mixed. There is no statistically significant difference between profit margins for domestic private and foreign firms. Return on assets and asset turnover indicate how intensely the firm's assets are being put to use. The substantially higher ratios for foreign as compared to domestic firms may indicate that foreign firms are more profitable. However, the higher return on assets for foreign firms could be partly explained by their lower interest payments, as indicated by the lower interest coverage ratio.

5.1.3. Firm size

The last set of ratios in Table 4 measure firm size. One possible critique of our results is that they simply reflect the fact that foreign enterprises are larger than domestic enterprises, and therefore more profitable and less credit constrained. The means reflecting differences in firm size suggest that this may be the case. Using sales or employee measures of firm size, the results indicate that private domestic

enterprises are significantly smaller than foreign firms. Again, the means highlight the importance of separating SOEs from other domestic enterprises. SOEs are significantly larger than either foreign or private domestic enterprises, and also more profitable than their private sector counterparts.

5.2. Does firm size or higher profitability explain the impact of foreign investment?

If foreign firms are significantly larger than domestically owned enterprises, then domestic firms may be crowded out due to size rather than ownership issues. There is a vast literature documenting that smaller enterprises are discriminated against on credit markets relative to large firms. Table 5 lists the baseline specification from Table 3, then adds a number of different variables to check for the robustness of the crowding out variable. In column (2), we add the interaction of *DAR* and *COV* with measures of foreign relative to domestic firm size. The results indicate that relative firm size in not driving the results. The coefficients on *DAR* and *COV* interacted with the share of foreign borrowing remain significant and positive.

The profitability ratios in Table 4 highlight the possibility that foreign firms may crowd out domestic enterprises because they are simply more profitable. We test for whether crowding out occurs as a result of the superior profitability of foreign firms by adding the interaction of *DAR* and *COV* with the sector-level relative profitability of foreign enterprises. We measure the profitability of foreign firms relative to the profitability of domestic firms by taking the ratio of the measure of the profitability of foreign firms in sector j year t to the measure of profitability for the domestic firm. These results are robust to two separate measures of profitability, the relative return on assets or relative asset turnover, but since the results were unaffected only results using return on assets are reported in Table 5. We conclude that relative profitability may matter, but it is not driving our results on crowding out of domestic firms by foreign enterprises.

5.3. Alternative measures of risk groups

One potential criticism of our approach is that banks do not use four-digit level classifications in determining loan levels. Consequently, measuring the share of foreign borrowing at the four-digit level may not adequately capture the role played by foreign firms on local credit markets. Consequently, we explored three alternative approaches to analyzing the role played by foreign firms in local borrowing. First, instead of defining the sector at the four-digit level, we redefined sectors at the more aggregated two digit level. This allows for the possibility that banks allocate funds with sector targets defined at a more aggregated sector level than the four-digit level. Second, we classified firms into borrowing groups based on how correlated their profits were. This approach is similar to sorting firms

Table 5
GMM estimates of augmented Euler investment equation: Robustness checks of crowding out variable

Dependent variable:Investment/fixed assets	(1) Baseline specification		(2) Relative firm size		(3) Relative profitability		(4) Sector at two digit level		(5) Grouped by "Market Beta"		(6) Grouped by firm Size	
	D	F	D	F	D	F	D	F	D	F	D	F
Explanatory variables												
Lagged (investment/fixed assets)	0.589	0.353	0.658	0.341	0.416	0.424	0.489	0.333	0.548	0.345	0.558	0.374
	(0.125)	(0.054)	(0.199)	(0.075)	(0.189)	(0.056)	(0.235)	(0.114)	(0.143)	(0.057)	(0.283)	(0.145)
Lagged (investment/fixed assets)^2	−0.317	−0.132	−0.348	−0.134	−0.169	−0.178	−0.327	−0.142	−0.299	−0.131	−0.367	−0.155
	(0.111)	(0.032)	(0.008)	(0.043)	(0.011)	(0.049)	(0.111)	(0.034)	(0.108)	(0.062)	(0.124)	(0.067)
Lagged (sales/fixed assets)	0.039	0.012	0.014	0.010	0.027	0.011	0.039	0.012	0.027	0.010	0.048	0.037
	(0.006)	(0.004)	(0.006)	(0.004)	(0.013)	(0.003)	(0.007)	(0.003)	(0.012)	(0.003)	(0.016)	(0.014)
Lagged cash flow (CF)	−0.101	−0.018	−0.056	−0.011	−0.064	−0.014	−0.111	−0.018	−0.077	−0.014	−0.036	−0.027
	(0.029)	(0.007)	(0.008)	(0.004)	(0.022)	(0.008)	(0.031)	(0.009)	(0.031)	(0.005)	(0.012)	(0.013)
Lagged debt to assets ratio (*DAR*)	0.081	0.014	0.099	−0.436	0.096	−0.244	0.271	−0.222	0.331	−0.082	0.327	0.061
	(0.033)	(0.149)	(0.029)	(0.541)	(0.32)	(0.271)	(0.114)	(0.339)	(0.111)	(0.088)	(0.118)	(0.117)
Lagged interest coverage ratio (*COV*)	0.022	0.005	0.038	0.022	0.036	−0.043	0.022	−0.005	0.019	−0.016	0.026	−0.014
	(0.003)	(0.008)	(0.011)	(0.037)	(0.014)	(0.071)	(0.006)	(0.011)	(0.004)	(0.012)	(0.004)	(0.015)
Share foreign borrowing sector *J* year *t*	−0.219	0.183	−0.235	0.136	−0.215	0.119	−0.229	0.183	−0.133	0.116	−0.222	0.016
	(0.161)	(0.089)	(0.084)	(0.055)	(0.048)	(0.041)	(0.051)	(0.090)	(0.059)	(0.129)	(0.077)	(0.009)

DAR * share foreign borrowing	0.431	−0.213	0.393	0.587	0.297	0.319	0.345	0.147	0.130	0.249	0.212	0.361
	(0.152)	(0.367)	(0.163)	(0.553)	(0.338)	(0.440)	(0.161)	(0.267)	(0.051)	(0.222)	(0.009)	(0.221)
COV * Share foreign borrowing	0.031	−0.013	0.087	−0.033	0.049	0.044	0.031	−0.013	0.032	0.021	0.036	0.017
	(0.011)	(0.004)	(0.029)	(0.033)	(0.013)	(0.062)	(0.015)	(0.004)	(0.015)	(0.911)	(0.011)	(0.077)
Share foreign sales sector *J* year *t*	−0.407	−0.063	−0.417	−0.053	−0.301	−0.073	−0.307	−0.073	−0.404	−0.053	−0.317	−0.063
	(0.224)	(0.151)	(0.213)	(0.141)	(0.124)	(0.161)	(0.164)	(0.151)	(0.214)	(0.251)	(0.144)	(0.251)
DAR * Share foreign sales	0.157	0.102	0.167	0.122	0.147	0.112	0.257	0.102	0.167	0.102	0.157	0.102
	(0.359)	(0.333)	(0.359)	(0.224)	(0.259)	(0.222)	(0.459)	(0.333)	(0.459)	(0.333)	(0.359)	(0.333)
COV * Share foreign sales	0.017	0.007	0.011	0.007	0.011	0.008	0.026	0.007	0.016	0.007	0.018	0.007
	(0.005)	(0.023)	(0.015)	(0.023)	(0.014)	(0.033)	(0.015)	(0.023)	(0.014)	(0.022)	(0.015)	(0.033)
Relative firm size sector *J* year *t*			0.010	0.002								
			(0.008)	(0.002)								
DAR * Relative firm size			−0.031	0.001								
			(0.031)	(0.001)								
COV * Relative firm size			−0.021	0.001								
			(0.023)	(0.009)								
Relative profitability sector *J* year *t*					0.020	−0.027						
					(0.019)	(0.022)						
DAR * Relative profitability					0.043	0.001						
					(0.033)	(0.011)						
COV * Relative profitability					−0.007	−0.014						
					(0.006)	(0.014)						
N	1876		1876		1876		1915		1906		1876	
Hansen *J* statistic	51.46		42.89		37.09		43.30		10.44		46.57	
P-value	0.87		0.93		0.98		0.70		0.40		0.95	

Notes: (1) The Helmert transformation is used to eliminate firm-level fixed effects. Instruments used are levels of all variables in the regression and sector and/or risk category dummies. (2) Standard errors in parentheses are robust and corrected for correlation across observations within sectors. (3) In all specifications, domestic firms are those firms for which average foreign ownership over the life of the firm is less than or equal to 49%.(4) Results are robust to outliers using the dfbeta criterion prior to estimation by GMM. (5) Relative profitability and size are computed by sector year as the ratio of foreign firm profitability(size) to domestic firm profitability(size). (6) Market beta is estimated as correlation between firm level profit margin and industry-wide profit margin. Firms are sorted into 10 groups according to market beta. (6) Firm size is based on the real value of sales. Similar results are obtained using the number of workers.

according to their market beta in the finance literature. However, our approach is somewhat different than the standard methodology in finance, primarily because we do not have stock prices or any information on stock market activity. Instead of the usual approach to deriving a firm's beta, we regressed each firm's annual profit margin (defined as real profits over real sales) on the economy-wide profit margin. The resulting estimated coefficient is the firm's ''market beta''. We then sorted firms into ten approximately equal groups, according to the value of their ''beta''. This approach assumes that banks allocate funds across different risk groups based on how correlated their profits are with each other, and that banks diversify risk by limiting funds allocated within any high or low beta group. Finally, we also defined loan groups by classifying firms according to size. This assumes that banks allocate loans according to firm size.

The results of these alternative classifications for loan groups are reported in Table 5. All three alternative specifications yield the same results as before: (1) domestic enterprises are credit-constrained, foreign firms are not; and (2) foreign borrowing crowds domestic firms out of the local credit markets. This ''crowding out'' is observed regardless of whether the sector is defined at the 2 or 4 digit level. Crowding out is also significant if we assume that banks distribute credit on the basis of size or on the basis of market betas. These results suggest that our estimates are robust to different assumptions about how banks allocate credit across firms.

Although not the focus of this paper, it is also interesting to examine what the results in Table 5 imply about the impact of foreign borrowing on the level of domestic investment. While the focus of this paper is on credit constraints, it is also important to understand the determinants of domestic investment. We can measure the impact of foreign borrowing on domestic investment by taking the derivative of Eq. (7) with respect to *FDEBT_Sector*. The net impact of changes in the share of foreign borrowing on the level of domestic investment is given by the sum of $\beta_8^0 DAR + \beta_9^0 COV + \beta_{10}^0$. If we choose sample means for *DAR* and *COV*, the sum of these three components is always negative. This suggests that an increase in the foreign share of total borrowing is associated with a fall in the level of domestic investment. This result is consistent across all specifications in Table 5.

6. Policy implications

To properly account for the total impact of DFI on the host country, we would need to take into account the impact of foreign investment on domestic wages, profits, and employment; the role of foreign investors in promoting technology transfer; and the contribution of foreign investors to tax revenues. This is not addressed in this paper. However, we do compute the net impact of DFI on the

availability of capital, adding together the inflows from equity purchases and foreign borrowing and subtracting the local borrowing of these firms.

The fact that foreign firms borrowed locally does not necessarily mean that the net impact of DFI on capital flows was negative. We also must consider the fact that foreign firms brought in equity. Table 6 shows the total amount borrowed by foreign firms and the total amount of equity brought in by foreign firms. In all years, the amount borrowed domestically substantially exceeds the equity contribution of foreign firms. Note that these figures do not properly measure the impact of foreign investment on net capital flows, as they do not account for repatriated profits and workers remittances. Table 6 indicates that because the majority of DFI was financed locally, DFI did not represent a significant increase in net capital flows to the economy. In fact, borrowing on local credit markets by foreign firms significantly exceeded the sum of equity purchases and foreign borrowing by these firms. To the extent that joint ventures are not considered local firms, the results suggest that the total amount of funds available to purely domestically owned firms actually shrank with the increase in foreign investment.

These negatives must be balanced against potential positives in order to obtain a complete picture of the welfare implications of the DFI. Beneficial effects of DFI include technology transfer, employee training and higher wages, and tax revenues. Table 6 indicates that foreign firms did contribute a significant amount to total tax revenues. This is the focus of research elsewhere (Branstetter and Feenstra, 1999). Branstetter and Feenstra analyze the welfare gains from the

Table 6
Contribution of DFI to capital

Year	Foreign tax/ total tax	Foreign tax/ foreign sales	Total foreign borrowing (bn. cfa francs)	Total foreign equity (bn. cfa francs)	Foreign equity/foreign borrowing
75	79.03%	17.63%	44.00	26.70	60.68%
76	81.87%	19.14%	64.00	33.10	51.72%
77	78.27%	23.48%	79.70	33.20	41.66%
78	75.60%	26.01%	112.00	37.40	33.39%
79	75.10%	27.62%	136.00	42.60	31.32%
80	75.67%	30.00%	162.00	50.40	31.11%
81	74.72%	31.46%	169.00	52.80	31.24%
82	74.34%	33.97%	181.00	56.40	31.16%
83	72.00%	34.43%	208.00	59.40	28.56%
84	74.91%	40.93%	199.00	65.40	32.86%
85	74.52%	42.19%	195.00	61.10	31.33%
86	71.03%	42.74%	204.00	66.00	32.35%
87	65.63%	39.44%	185.00	63.70	34.43%

Notes: Total Foreign Borrowing does not reflect total foreign local borrowing as these numbers are only available for 1985. In 1985, foreign firms borrowed 12.84% of all monies borrowed abroad. Thus, in 1985, the amount borrowed locally was approximately 170 billion cfa francs. Foreign inflows in 1985 were 61 billion cfa francs and equity as a share of foreign borrowing was approximately 36%.

inflow of foreign investment into China, calculating the implied weights in the social welfare function. However, they do not address the possibility that foreign investors could affect local credit markets, possibly crowding out domestic firms.

This issue is an important one because one major reason cited in policy discussions for why foreign firms should be encouraged to relocate in one's home country is that these foreign firms bring in scarce capital. Our results suggest that policy makers should be more careful about assuming that direct foreign investment expands the availability of credit for domestic investors. The extreme case would be a foreign investor who sets up a foreign firm in the host country and finances 100 percent of his or her investment from local credit markets. To the extent that foreign investors may present more profitable investment opportunities, local banks may be applauded for awarding them a higher percentage of loans. Yet our results suggest that the crowding out of local firms by foreign investors largely cannot be explained by differences in profitability. In summary, our results suggest that the expected benefits from foreign investors in terms of jobs, technology transfer, and competition must be weighed against the potential cost of greater credit constraints on domestic firms.

7. Conclusion

In this paper, we attempt to answer a question, which has not been addressed elsewhere: does the entry of foreign enterprises in developing country credit markets hurt their domestic competitors? Although foreign investment conveys benefits by bringing in scarce capital, those benefits may be mitigated if foreign enterprises crowd out domestic enterprises in the local credit markets. Our results suggest a difference between the credit constraints faced by domestic and foreign firms. In addition, we find that one major reason why domestic enterprises are more credit constrained than their foreign counterparts in the same sector is due to crowding out by foreign entrants. Further, we find that one contributing factor is that foreign firms are more profitable and more liquid. Hence, foreign firms might be a better investment for local banks than domestic firms. Nevertheless, our results remain even after we control for the higher profitability of foreign enterprises. In other words, even after controlling for the profitability of foreign firms, domestic enterprises are still ''crowded out'' by their foreign competitors.

We also examine the performance of state-owned enterprises (SOEs) relative to their private sector counterparts. For SOEs, debt to asset measures and interest coverage do not significantly affect investment, indicating that SOEs are not credit constrained. Nor is there any evidence that they are affected by foreign borrowing on domestic credit markets. These results suggest that SOEs are not credit constrained, perhaps because during this period they could be characterized by being subject to a soft budget constraint. In addition, SOEs are not crowded out by

foreign enterprises of domestic credit markets, in contrast to their private sector counterparts.

We explore whether our results on crowding out could be due to unobserved factors, such as increased competition from foreign enterprises or differences in firms' size. Our results suggest that this is not the case. Although the Ivory Coast may be an unusual case, our empirical results suggest that policy makers should be cautious in assuming that foreign investors expand credit opportunities for domestic enterprises. In the Ivory Coast, foreign investors certainly eased credit constraints for firms with foreign investment, but firms which did not receive foreign investment became more credit constrained. These results are probably driven by a number of factors. First, interest rates were set below market rates, which led to credit rationing. This led foreign investors to borrow heavily on local credit markets, and at the same time encouraged banks to lend to less risky investors, since margins were low. Second, the banking sector was highly concentrated and dominated by firms with ties to French banks, which were probably biased towards lending to foreign firms.

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