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Working Paper

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LICOS Discussion Paper, No. 116

Provided in Cooperation with:
LICOS Centre for Institutions and Economic Performance, KU Leuven

Suggested Citation: Rizov, Marian (2002) : Budget Constraints and Profitability: Evidence from a Transition Economy, LICOS Discussion Paper, No. 116, Katholieke Universiteit Leuven, LICOS Centre for Transition Economics, Leuven

This Version is available at:
http://hdl.handle.net/10419/75003

LICOS
Centre for Transition Economics

LICOS Discussion Paper

Discussion paper 116/2001

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BUDGET CONSTRAINTS AND PROFITABILITY: EVIDENCE FROM A TRANSITION ECONOMY

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Abstract:

A conceptual framework for analyzing the credit rationing and the link between credit access and profitability is developed. The empirical analysis using data from manufacturing firms in Bulgaria, provides direct estimates of credit rationing and its impact on profitability in transition economies. The results from the switching regression suggest that the presence of credit market constraints does impinge on profitability of credit rationed firms and support the credit crunch hypothesis for periods following the financial market collapse as a result of previous soft budget constraints.

Key words: credit rationing, profitability, economies in transition, Bulgaria

JEL classification: G3, L2, P2

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* The author thanks Joep Konings and Hylke Vandenbussche for encouragement and useful comments. The financial support of the Belgian Fund for Scientific Research is gratefully acknowledged. The author is solely responsible for the views expressed in the paper and any remaining errors.

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1. Introduction

A current policy objective of the governments in transition economies is to increase profitability and exports. Recent country assistance strategies and structural adjustment loans from the World Bank (World Bank, 2001a, 2001b) have pushed these governments to reduce subsidies and price interventions, and impose hard budget constraints by letting the private sector control production and marketing. Government investments have been declining, with the private sector supposed to pick up the slack. Thus, if private entrepreneurs are going to increase investment levels and invest in new technologies, they will need access to credit.

During transition, it is argued that firms face two phenomena, soft budget constraint and credit rationing at varying degrees depending on ownership, legal status and the institutional environment. Under soft budget constraints, for many of the firms the availability of investment funds is negatively related to profitability because firms use these funds for survival rather than restructuring (see, e.g., Grosfeld and Roland, 1997; Lizal and Svejnar, 2001). Furthermore, Berglof and Roland (1997) demonstrate

that the option to invest in new projects endogenously harden budget constraints when the average quality of investment projects is high and varied. Otherwise soft budget constraints may persist and refinancing of old loans will crowd out new finance, giving rise to an extreme form of credit rationing, the credit crunches on new loans. Thus, one of the leading explanations of the sharp decline in investment and output in transition economies is the credit crunch hypothesis (Calvo and Coricelli, 1994).

The literature on credit cites a number of market imperfections, which lead some potential borrowers to be rationed out of the loan market (see, e.g., Stiglitz and Weiss, 1981; Dewatripont and Maskin, 1995; Hubbard, 1998). These imperfections in the context of transition economies include: i) interest rate ceilings usually imposed by the government; ii) monopoly power in credit markets often exercised by former state banks; iii) large transaction costs incurred by borrowers in applying for loans; iv) moral hazard problems. In many cases a number of these imperfections combine to ration firms out of the loan market.

While much of the literature (e.g., Milde and Riley, 1988; Perotti, 1993; Zeller, 1994; Bratkowski, Grosfeld and Rostowski, 2000) concentrates on the determinants of access to capital with the idea of valuing the benefits to a future loan program, here we are primarily interested in how access to capital affects profits. This work fits in the body of the literature, which seeks to measure the degree and impact of credit constraints directly (e.g., Jappelli, 1990; Feder et al. 1990; Barham, Boucher and Carter, 1996; Claessens and Peters, 1997). This study presents some innovations to the literature on credit market disequilibria and develops the link between credit access and profitability. Using data from manufacturing firms in Bulgaria, we directly estimate

credit rationing and its effects.[1] Direct estimates allow one to circumvent the problem of identifying indirectly both the selection process of firm credit rationing and its effects on resource allocation.

The paper is organized as follows: In the next section 2, a conceptual framework concerning the rationing problem and the impact of credit constraints on profitability is developed. In section 3, the data and estimation procedures are presented and the results are discussed. Section 4 concludes.

2. Conceptual framework: Credit constraints and profitability

The literature on credit constraints (e.g. Evans and Jovanovic, 1989; Greenwald and Stiglitz, 1993; Schiantarelli, 1995; Hubbard, 1998) suggests that they can cause a misallocation of resources in firm production. This misallocation of inputs can then cause the credit-constrained firm to have lower profit levels than its unconstrained competitor. The lower profit levels can come from a number of sources including lower investment levels and a misallocation of variable inputs.

At the beginning of a production period, firms need to allocate their available resources between current period dividends, purchase of variable inputs for production, and investment. The firm unconstrained in the capital market can separate dividend policy from firm production decisions. Firms can then choose production inputs optimally for the production process they face. In this case, the level of firm credit will not affect the levels of inputs in production and investment and eventually profits. The credit-constrained firms, however, will have to choose among the investments they

[1] The data used in this paper come from the AMADEUS database. The sample consists of more than 1000 manufacturing firms and covers the period 1997-1999. This dataset covering a period of extreme credit rationing in Bulgaria, after the financial crisis of 1996/97, is particularly appropriate for studying the effects of credit constraints on firm profitability.

make and the inputs they buy dependent upon the level of credit they receive.[2] This will have a potentially detrimental impact on production and profits with those being lower for constrained firms.

2.1. The rationing problem

A firm will be credit constrained when it demands more loans than the markets are willing to supply. When markets do not clear fully through price adjustments, firm credit status will be a function of factors affecting both supply and demand of credit. Thus, the notional demand (K^D) and supply (K^S) of credit will adjust on the basis of interest rates and firm characteristics. Let the notional demand curve of a firm be represented by $K^D(R,A,E,u^D)$, where R is the market interest rate $(1+r)$, A represents firm capital assets, E represents firm quality, such as management organization, creditworthiness, etc., and u^D is a variable representing unobserved latent qualities. Define a variable Y^* as the reduced form excess demand for credit:

$$Y^*=K^D(R,A,E,u^D)-K^S(R,A,E,u^S) \qquad (1)$$

Since we cannot directly observe the amount of excess demand, only possible is a reduced form estimation where an indicator variable for the credit constraint is defined (see further). Let Y take on the values of zero and one as follows:

[2] In this analysis we do not consider explicitly issuing new equity as a source of finance. This simplifying assumption is empirically justified by the fact that only a few firms issue new shares and that stock markets are still rudimental in the economies in transition, in particular in Bulgaria (see, e.g., de Melo and Gelb, 1996).

$$Y = \begin{cases} 1 & if \quad Y^* > 0 \\ 0 & otherwise \end{cases} \tag{2}$$

In order to understand the determinants of credit status we are interested in characteristics of firms which influence the probability that $Y^*>0$. Define Z as a vector containing observable firm characteristics influencing either supply or demand (A and E). If Y^* values were observable we could write it as a function of Z in the following manner: $Y^*=\gamma' Z+\varepsilon$, where γ is a parameter vector to estimated and ε is a random disturbance term. With that formulation we can write the probability that $Y^*>0$ as $Prob(Y^*>0)=Prob(\gamma' Z+\varepsilon>0)$, where ε is an error term assumed to be normally distributed with mean zero and variance equal to one. The error term ε represents both the unobservable latent qualities of borrowers and lenders, u^D and u^S, as well as potential noise in the data.[3]

2.2. Credit constraints and profitability

Let firm profits for the unconstrained and the constrained status be denoted as Q^N and Q^C. In general the expected firm profits will be:

$$E(Q_i^N \mid Y_i = 0) = \beta^N{}' X_i + \mu^N{}' P + (\delta^N K_i^S) + E(\eta_i^N \mid Y_i = 0) \tag{3a}$$

$$E(Q_i^C \mid Y_i = 1) = \beta^C{}' X_i + \mu^C{}' P + \delta^C K_i^S + E(\eta_i^C \mid Y_i = 1), \tag{3b}$$

[3] This formulation leads to a standard probit model. Under the assumption that the error ε is normally distributed [~N(0,l)], the loglikelihood function for a probit will be $\ln L = \sum_{Y_i=0} \ln(1-\Phi_i) + \sum_{Y_i=1} \ln \Phi_i$, where Φ is the standard normal distribution evaluated at $\gamma' Z$.

where Y_i is the credit constraint indicator variable, X represents firm characteristics influencing profitability, P represents prices, and K^S is the loan amount supplied to that firm. The random variable η represents unobservable latent characteristics. We expect the common coefficients amongst these two equations to be different between the constrained and unconstrained status, i.e., $\beta^N \neq \beta^C$, $\mu^N \neq \mu^C$. For the credit constrained firms, we also expect that net revenues will increase with the amount of credit they received, K^S, implying $\delta^C > 0$. For the unconstrained firms, there should be no impact of K^S on profitability, i.e., $\delta^N = 0$.

In order to test the relationship between credit access and firm profits we apply an endogenous switching regression framework. Here the credit status, constrained or unconstrained, determines the switch between two different regimes describing the dependent variable. The analytical model of lenders and borrowers presumed that loan demand and supply was governed by firm assets and qualities as well as latent productivity attributes. To the extent that these latent productivity attributes are unobservable, they will be among the elements of the disturbance term η. For example, one would expect that the probability of a firm being credit constrained would decrease with the managerial ability in the firm; in the same time realized firm profits will increase with increase in managerial ability. However, if we cannot control for within-firm managerial skills with observable characteristics our disturbance term will be correlated with ε from the credit constraint equation.

Following Maddala (1983) for the endogenous switching model we assume two regimes with an endogenous switching equation. For any observation i the relevant structure is:

$$Q_i^N = \beta^N{}' X_i + \delta^N K_i^S + \eta_i^N \quad \text{iff} \qquad \gamma' Z_i + \varepsilon_i \leq 0 \tag{4a}$$

$$Q_i^C = \beta^C{}' X_i + \delta^C K_i^S + \eta_i^C \quad \text{iff} \qquad \gamma' Z_i + \varepsilon_i > 0, \tag{4b}$$

where the switching equation is the standard probit estimation of whether a firm is credit constrained from the previous section.[4] In practice, we observe only one value of *Q* dependent upon which regime that particular firm is in, constrained or unconstrained. The parameters of the probit equation can only be estimated up to a proportionality constant, so we assume that the variance of the random disturbance terms will be one: Var(ε_i)=1. We further assume that the random disturbance terms $\eta^N, \eta^C, \varepsilon$ have a trivariate normal distribution, with mean vector zero. For the credit constrained firms the implied econometric model will be as follows:

$$E(Q_i \mid Y_i = 1) = \beta^C{}' X_i + \delta^C K_i^S + v_\varepsilon^C \lambda(\varepsilon), \tag{5}$$

where $\lambda(\varepsilon)$ is the inverse mills ratio calculated from the probit equation describing credit constraints.[5] For the unconstrained firms similar equation applies. The second stage equations for both constrained and unconstrained firms, estimated separately, incorporate the corresponding mills ratios into a corrected linear regression for each of

[4] Price variables are omitted from the estimating equation because we assume that firms face same prices due to the luck of price information at firm level. However, including industry dummy variables in actual estimations capture some of the price effects at industry level.

[5] The inverse mills ratio is defined as follows:

$$\lambda(\gamma' Z_i) = \frac{\phi(\gamma' Z_i)}{1 - \Phi(\gamma' Z_i)},$$

where Φ and ϕ are respectively the cumulative and probability density functions of the normal distribution.

the two regimes. Thus second stage estimates for β^C and β^N will consistent and asymptotically normal.

3. Empirical tests: Data, estimation and results

The issue of credit rationing and its impact on firm profitability is particularly relevant for Bulgaria. In the first years of reforms, many loss-making (state) enterprises were kept afloat by bank credit. Periodic attempts to stabilize economy succeeded only temporary but were eventually undone by the failure to follow through with structural reforms. As a result non-payment of dues became contagious, affecting even financially sound firms, which in principle did not have liquidity problems. This situation of soft budget constraints resulted in a severe financial crisis in the winter of 1996/97. Radical reforms started in 1997 with the election of the new government who introduced a currency board and tightened the financing regime (table 1). The attempts of dealing with bad debts and the restructuring of the banking system led in the following few years to substantial difficulties in obtaining loans by firms. Many, mostly smaller and newly established firms were rationed out of the credit market (Dobrinsky, Dochev and Nikolov, 1997). Thus the case of Bulgaria presents a unique opportunity for studying the effects of budget constraints on profitability.

For our empirical analysis of credit rationing and the effect of credit constraints on profitability, we use balance sheet and profit and loss accounts data of Bulgarian manufacturing firms over the period 1997-1999. We have included only those firms that reported for the entire period 1997-1999, which gives a balanced panel of 1013 firms. The dataset is extracted from the AMADEUS database as the values are

expressed in millions of local currency in real terms.[6] Because of the short time period, we use cross-section data for the analysis by averaging the variables in the dataset. Estimating a dynamic investment model, in order to take the time series information into account, by using only three observations for each variable is misleading, since the adjustment process cannot be identified. Consequently, the coefficients we present refer to long-run average effects.[7]

3.1. Probability of rationing

Empirically we are interested in a measure of whether or not a firm is credit rationed. Discerning this rationing is complicated by the fact that many firms that do not take out loans may have zero demand for credit. Therefore one must distinguish between firms that have no credit because they have no demand and firms that have no credit because they received an insufficient supply. Similarly firms with a positive supply of credit may not have received the full amount of credit they wanted. Thus one must partition firms that received credit into those that received sufficient credit and those with excess demand that did not. However, distinguishing firms that are credit rationed amongst the ones that have received some loans is complicated. In order to do this we refer to the hierarchy of financing theory (e.g., Myers and Majluf, 1984; Fazzari, Hubbard and Petersen, 1988). The hierarchy of financing or "pecking order" theory implies that firms that have access to bank loans would not issue shares in the same time; if they do

[6] To be included in AMADEUS firms must comply with at least one of the following criteria: (i) turnover greater than 10 million EURO; (ii) number of employees greater than 150; (iii) total assets greater than 10 million EURO.

[7] For example, Rajan and Zingales (1995), Lensink, Bo and Sterken (1999), Budina, Garretsen and de Jong (2000) also use the procedure of averaging along the time dimension in analysis in which datasets cover only a few years.

so this would imply that these firms are constraint in obtaining the less costly bank financing.[8]

Table 2 presents the measures used to determine credit-constrained status. These are standard controls for demand of financing such as growth of sales and cash flow, measured at the beginning of period. High growth of sales indicates high growth opportunities and thus high demand for investment and for financing[9]. Low cash flow indicates high demand for external financing.[10] The supply of external funds can come from bank loans and new share issue.[11] A firm is certainly rationed if it has a potentially high demand for financing and faces no supply.

In our sample we classify firms as credit rationed if they have some demand for financing, as indicated by our proxy variables growth of sales and cash flow, and receive no supply of bank loans, measured as no increase in long- and short-term bank loans over the period 1997-1999. The supply of loans is very limited; only less than 10% of the firms in the sample show up some positive change in their loan position over the period of analysis. Thus the rationing status is mostly determined by the demand for external financing. From the firms that received some bank financing, ones that have increase their equity capital by issuing new shares, are also classified as bank credit

[8] In the literature there is a number of other arguments for issuing new equity such as diversification, corporate control, etc. However, in economies in transition those reasons are less likely because the cost of issuing new shares is very high even in the advanced transition countries such as poland and Hungary (Schardax and Reininger, 2001).

[9] In order to control for growth opportunities, analyses focus often on the *q* theory of investment. For the economies in transition, Lizal and Svejnar (2001) use reduced-form investment equation that includes sales instead of Tobin's *q*. The relationship between investment and sales is established by the neoclassical and accelerator models of investment demand (see e.g., Jorgenson, 1971 and Abel and Blanchard, 1986). Here, high growth of sales is determined as a positive change in sales.

[10] Low cash flow is determined as negative or zero free cash flow.

[11] We do not include in our considerations here trade credit, which despite important as a very short-term source of financing would not relax the investment financing needs of the firms. Besides, trade credit in transition countries is often due to non-payment and arrears not agreed *ex ante*, and not complying with any creditworthiness considerations.

constrained. Thus as credit constrained are classified 519 firms in total, or 51.2% of the sample.

The relevant variables in *Z*, influencing either supply or demand, specify firm assets, *A*, and firm (credit) quality measures, *E*. The capital measures include tangible fixed assets, working capital and the number of employees per unit of total assets. The tangible fixed assets represent a measure of firm size. Working capital plays important smoothing role in firm financing. The ratio of labor and total assets can also be interpreted as a technology indicator. Measures of loan applicant quality include the age of the firm, debt/equity ratio, type of ownership, and type of organizational (corporate governance) form.[12] In addition, industry dummy variables, created at two-digit NACE level, are included in the regressions. Table 3 presents variable definitions and summary statistics broken down by credit status.

The results from a probit estimation of the probability that a firm is credit constrained are presented in table 4. The model predicts 84% of the firm status correctly. The estimates show, which factors are more important to either supply or demand. Thus, a positive estimated coefficient γ, signifies a characteristic, which increases demand more than supply.

Many of the estimated coefficients show the predicted signs, with the probability of being credit constrained decreasing in both firm fixed assets measuring size and the age of the firm. This fits with the intuition that larger collateral-rich firms with longer operating history would be more likely to receive credit, yet also be less likely to need it. Firms with higher labor to assets ratio and higher debt to equity ratio are more likely

[12] There are three dummy variables describing ownership (share more than 50%), respectively for: (i) state owned firms; (ii) private owned firms; and (iii) the rest of firms including municipal and cooperative ownership. There are also three dummy variables describing corporate governance form. They are for: (i) public limited companies; (ii) private limited companies; and (iii) sole proprietorships.

to face credit rationing. The first ratio can be interpreted as a proxy for technology of the firm, with higher values indicating more labor-intensive firms that are less likely to grow and be profitable. The high values of debt/equity ratio are indicator of the likelihood for financial distress and thus higher credit risk. Working capital decreases credit demand, which suggests that it plays more as a source than as a user of funds. It seems that firms smooth investment with working capital (Fazzari and Petersen, 1993). Further the type of company governance and the ownership have significant impact on the probability of credit rationing. The public and private limited companies are least likely to be credit rationed compared with partnerships and sole proprietorships. The type of ownership has also significant impact on access to credit. Thus companies with private ownership more than 50% are less likely to be rationed than state and municipality owned firms as well as cooperatives. This might be a manifestation of removing the soft budget constraints in the economy, which were mostly enjoyed by the state owned firms. However, the fact that private firms are less likely to be credit rationed might simply imply that the demand for financing in these firms is lower than in the state ones. Low demand for external financing might be due to higher cash flows generated internally or to more efficient use of funds available, *ceteris paribus*. Finally, the dummy variables controlling for industry effects are in general insignificant. However, the firms operating in light industries such as food and textiles are least likely to face credit constraints.

3.2. Impact of credit constraints on profitability

In estimating firm profits we use operating profit functions in order to account for possible imperfections in capital and labor markets. Operating profits differ from

profits/losses for the period in that they do not account for depreciation costs and payments to fixed factors, which in this case include fixed capital, labor, and management. In an environment of imperfectly operating markets firms will not be able to trade their fixed factors out at a "market" price. The going market price for a fixed factor might well overstate or understate the real opportunity costs of using that factor in production. Therefore deviations of profits/losses for the period will be due to differences in firm endowments and access to markets.

As determined above, the appropriate dependent variable represents operating profits of the firm, while the independent variables will describe firm characteristics, which influence profits. The regressors for the constrained and the unconstrained firms are identical and represent again both fixed capital measures including tangible fixed assets and working capital as well as the number of employees per unit of total assets, and measures of firm quality characteristics such as age of the firm, type of ownership, and type of organizational form. In addition, again industry dummy variables, calculated at 2-digit NACE level, are included. Since we do not have price information at firm level we have dropped price variables from the equations. The dummy variables do, however, pick up some of the variation in prices. The dependent variable, operating profits, is hypothesized to be increasing in firm fixed assets as well for firms with private ownership. The credit-constrained firms are expected to have increasing profits in the liquidity variables as well. The effect of the rest of variables considered is unclear *a priory*.

Table 5 shows estimated coefficients for the profit function. The model produces fairly high levels of fit, Adj. R^2 equal to 0.782 and 0.881, respectively for the constrained and unconstrained firm subsamples. A reasonable number of the

coefficients are significant at conventional levels. As predicted a number of the coefficients are different between the credit constrained and unconstrained equations. In both subsamples Lambda is significant as in the constrained subsample it is negative indicating that there are unmeasured firm characteristics affecting negatively the profitability of those firms. The effect of Lambda for the unconstrained firms is positive thus indicating that these firms have unobserved characteristics contributing positively to their profitability. In general, such unobserved characteristics are managerial skills and experience. Thus, signs of Lambda might be interpreted in a way that credit constrained firms have bad managers while in unconstrained firms managers are better, *ceteris paribus*.

Further, an important general result is that in the constrained firm regression only significant are the coefficients of firm capital endowment variables, such as tangible fixed assets, working capital and bank loans, and the private ownership indicator. Clearly, more capital available in the firm relaxes the credit constraint and contributes positively to the firm profitability. The role of working capital as an investment and capital smoothing device is confirmed. The private ownership likely contributes to higher profitability through its disciplining effect as well as more efficient resource allocation in private firms.

The regression for the unconstrained subsample shows significant coefficients for most of the variables. Coefficients of capital endowment variables are significant as before, however, the coefficients of tangible fixed assets and bank loans are only significant at 10% level. Interestingly, the coefficient of fixed assets is negative indicating that larger firms have possibly more obsolete and thus less productive assets. Another interpretation is that the common pattern of the evolution of industry, where

smaller and younger firms are more profitable, is in action (Jovanovic, 1982). However, considering the highly significant positive coefficient of firm age lends support to the first explanation, which also is more plausible for the Bulgarian conditions. The significant negative coefficient of the employees per unit of total assets, a variable that proxies for the level of technology, is also supportive to the argument that labor intensive larger firms are less profitable. The effect of corporate governance is in favor to public limited companies, while the organization such as private limited company does not affect profitability. The effect of ownership is as expected. Private firms are more profitable, while state ownership has a negative impact on firm profitability.

4. Conclusion

The results of our estimations confirm the profit-liquidity hypothesis. The estimated coefficient on total bank loans owned by credit-constrained firms is much larger in magnitude, and with higher significance, compared to the corresponding coefficient of the unconstrained subsample. Thus, better access of firms to external financing would result in higher profitability. The need of investment, for replacing obsolete capital assets, even in currently unconstrained firms, as demonstrated by the weakly significant coefficient on total bank loans, reinforces this conclusion.

It seems that there is disparity between the perceived quality of firm tangible fixed assets and their real productivity. The evidence comes from the fact that fixed assets serving as collateral, decrease the likelihood of a firm being credit rationed. However, in the same time, for unconstrained firms, the amount of fixed assets is negatively correlated with profitability. Thus, larger, in capital assets firms, expected

by the lenders to be more creditworthy, turn out to be with lower capital productivity. This might be due to the fact that often assets of large firms are technologically obsolete. The implication is that lending to such firms may not be sustainable, if it does not lead to new investment.

Another important result is that factors other than capital endowment such as corporate governance, ownership and technology, can play significant role only when firms are not constrained in their access to financing. Private ownership always seems to positively affect profitability, however, its impact is stronger for unconstrained firms. This result can potentially have useful policy implications for the success of structural reforms in transition economies. Thus, in order corporate restructuring and privatization to result in higher productivity and growth of the economy, which is the current aim of reformist governments, a sound financial system is a necessary precondition. Important goal, in this context, must be removing of inherited soft budget constraints before they have led to financial crisis and consequently to "credit crunch" with a severe negative impact on firm profitability.

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Table 1 Credit and Investment in Bulgaria, 1994-1999

	1994	1995	1996	1997	1998	1999
Domestic credit	6.4	8.5	8.6	2.0	1.4	1.4
Loans to private sector	0.3	1.8	2.6	0.8	0.9	1.1
Fixed capital investment	1.1	1.3	1.0	0.8	0.8	1.2

Note: Values are in billions of 1995 BGL.
Source: IMF, International Financial Statistics

Table 2 Financial and credit status of firms

Firm status	Percentage of sample
Growth of sales is positive	81.4
Free cash flow is negative or zero	56.7
No long term loans obtained over the period 1997-1999	89.9
No short term loans obtained over the period 1997-1999	89.0
No new share issued over the period 1997-1999	93.8
Classified as credit rationed	51.2

Table 3 Summary statistics by credit status*

Variable description	Credit constrained	Unconstrained	Total sample
Operating profit, millions BGL	0.41	9.44	4.81
	(4.02)	(55.99)	(38.51)
Tangible fixed assets, millions BGL	8.11	58.46	31.66
	(18.25)	(203.91)	(141.12)
Age of the firm, years	30.33	41.76	35.90
	(20.41)	(26.91)	(24.37)
Employees per million of total assets	29.95	8.92	19.69
	(75.08)	(34.12)	(60.69)
Debt/Equity ratio	0.30	0.33	0.31
	(0.60)	(0.35)	(0.49)
Working capital, millions BGL	2.09	17.55	9.63
	(8.72)	(63.02)	(44.28)
Public limited company [0-1]	0.53	0.80	0.66
	(0.51)	(0.40)	(0.47)
Private limited company [0-1]	0.28	0.14	0.21
	(0.45)	(0.31)	(041)
State owned company [0-1]	0.30	0.19	0.25
	(0.48)	(0.38)	(0.42)
Private owned company [0-1]	0.34	0.37	0.35
	(0.48)	(0.48)	(0.48)
Total bank loans, millions BGL	4.22	39.06	21.21
	(13.65)	(233.26)	(162.53)
No observations	519	494	1013

*Reported figures are means and standard deviations, in brackets. Millions BGL are in real terms (1995=100).

Table 4 Probit model of the probability of credit rationing

Variable	Coefficient	t-statistics
Dependent variable: 1 if credit constrained and 0 otherwise		
Tangible fixed assets	-0.002	6.87 ***
Age of the firm	-0.009	4.23 ***
Employees per million of total assets	0.002	2.06 **
Debt/Equity ratio	0.010	2.42 **
Working capital	-0.003	4.41 ***
Public limited company	-0.515	3.25 ***
Private limited company	-0.256	1.79 *
State owned company	-0.171	1.65 *
Private owned company	-0.250	2.76 ***
Log-likelihood	-567.239	
No observations	1013	

Note: Estimation also included industry dummy variables created at 2-dogit NACE level and a constant. Significance levels are indicated as follows: *** 1%, ** 5%, and * 10%.

Table 5 OLS profit function estimation

Variable	Credit constrained		Unconstrained	
	Coefficient	**t-statistics**	**Coefficient**	**t-statistics**
Dependent variable: Operating profit				
Tangible fixed assets	0.023	2.53 **	-0.012	1.68 *
Age of the firm	-0.004	0.84	0.505	2.71 ***
Employees per million of total assets	0.001	0.95	-0.249	1.82 *
Working capital	0.427	3.20 ***	0.491	2.59 **
Public limited company	0.271	0.82	0.730	2.85 ***
Private limited company	0.667	1.45	0.740	1.30
State owned company	0.182	0.63	-0.486	1.79 *
Private owned company	0.552	1.88 *	0.603	2.25 **
Total bank loans	0.121	4.76 ***	0.016	1.69 *
Lambda	-3.476	2.39 **	2.327	2.60 **
Adj. R^2	0.782		0.881	
No observations	519		494	

Note: Estimation also included industry dummy variables created at 2-dogit NACE level and a constant. Significance levels are indicated as follows: *** 1%, ** 5%, and * 10%.