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BULGARIA: ASYMMETRIC SUPPLY AND DEMAND RESPONSES***

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**ABSTRACT**

The paper seeks to assess how a major policy regime change – such as the introduction of the currency board in Bulgaria – affects the flow of bank credit to the corporate sector. An attempt is made to identify the determinants of corporate credit separately from the viewpoint of lenders and borrowers. The estimated credit supply and credit demand equations provide empirical evidence of important changes in microeconomic behavioral patterns which can be associated with the policy regime change. The results also suggest a considerable asymmetry in the response of credit supply and credit demand to the policy shock: while the supply shifts were quite pronounced, the patterns of firms' credit demand remained fairly stable. The policy implications of the detected asymmetry in microeconomic adjustment are also discussed in the paper.

**Keywords:** corporate credit, credit supply and credit demand, regime change, currency board, transition economy

**JEL classification numbers:** G21, G32, G38

POLICY REGIME CHANGE AND CORPORATE CREDIT IN BULGARIA:  
ASYMMETRIC SUPPLY AND DEMAND RESPONSES

**1. Introduction**

Bulgaria's difficult transition from plan to market was marked by persistent macroeconomic and financial instability leading to a major economic collapse in 1996-1997. In 1997 a currency board arrangement (CBA) was established as a "policy of last resort" with the aim to impose fiscal and financial discipline. The change in the monetary regime was accompanied by a comprehensive package of policy reforms affecting not only the macroeconomic but also the institutional environment and the functioning of the financial system. In particular, the norms of prudential bank lending and bank supervision were tightened considerably; at the same time bankruptcy procedures were simplified and streamlined. All in all this amounted to a major policy regime change, in fact, the most important policy shift during the whole transition period.

It has been widely acknowledged that Bulgaria's macroeconomic performance has changed dramatically since 1997. Macroeconomic and financial stability have been restored and economic activity started to recover; inflation was brought down to single-digit numbers, real incomes have been rising and the chronic fiscal gap has been closed. A CBA is an extremely rigid macroeconomic regime which hardens macro-budget constraints as it eliminates direct central bank credits to finance the budget deficit. It also hardens micro-budget constraints, in the first place in the banking system, as the central bank can no longer engage in refinancing commercial banks. However, so far there has been relatively little research on how this policy regime change affects the relations between enterprises and banks and the flow of bank credit to the firms, and whether it helps impose hard micro-budget constraints in the corporate sector.

This paper addresses some of the microeconomic implications of this policy regime change, focusing on the flows of bank credit to the enterprise sector and analysing independently the determinants of corporate credit from the side of lenders and borrowers. To this effect we use results from the recent literature to formulate and specify equations reflecting the motivation behind lending and borrowing decisions. These equations are estimated econometrically using firm level data for Bulgarian firms for the period 1995-1999. In analyzing the results we seek to identify changes in behavioral patterns which can be associated with the change in the policy regime.

We find a considerable asymmetry in supply and demand responses. The most important behavioral changes took place on the supply side, reflecting adjustments in bank lending practices. By contrast, we observed little changes in the patterns of firms' credit demand that could be associated with the policy regime change. We suggest an interpretation of these asymmetric supply and demand responses in terms of the outcomes of the 1997 policy reform in the banking and enterprise sectors.

## **2. The determinants of corporate credit: supply and demand aspects**

### ***2.1. Theoretical background***

There are important distinctions and specificities in the motivation of lenders and borrowers to engage in this process. However, while there is a considerable body of literature dealing with the more general issue of corporate finance, relatively few publications deal directly with the motivation of credit supply and demand.

One strand in the literature on corporate finance focuses on the role of bank-enterprise relations in imperfect credit markets<sup>1</sup> claiming that banks are better positioned than other

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<sup>1</sup> In perfect markets firms are indifferent to the choice between internal or external sources of finance. Market imperfections such as information asymmetries, incompleteness of contracts and principal-agent problems, add a premium to the would-be cost of capital in a perfect market because banks incur monitoring, agency and

creditors to collect relevant information on the actual state of firms (Diamond (1984), (1989); Mayer (1988)). Banks are motivated to establish long-term relations with their clients as this helps them to overcome the existing information asymmetries by providing the opportunity for better monitoring; consequently, this reduces lending risk and costs. In turn, firms are also motivated to enter into long-term relations with their creditors as lower lending risk reduces borrowing costs. Hence the notion of relationship banking is a relevant one both when dealing with credit supply and demand. Empirical studies on the topic have provided abundant evidence in support of the conjecture that long-term enterprise-bank relations are important determinants of bank lending (Cole (1998); Petersen and Rajan (1994)).

The so called portfolio approach to credit supply (for an overview see Fase (1995)) starts with the assumption that banks maximize a utility function under a set of balance sheet constraints which allows to derive directly credit supply functions. However, the derivation assumes a perfect financial market while treating the private sector (comprising the corporate and household sectors) as one homogeneous entity. These limitations restrict the use of this model when trying to address the specific issues related to corporate finance in imperfect markets.

The demand for any type of credit – including firm's demand for commercial bank credit – can be analyzed within the context of money demand in the broader sense, an issue which is well developed in economic theory. One of the more specific approaches to corporate demand for commercial bank credit (Melitz and Pardue (1973), among others) is based on the assumptions that credit demand is driven by the need to adjust the firms' balance

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transaction costs. The wedge between the costs of external and internal funds is a source of financial pressure for the firms and may give rise to adverse selection and credit rationing on capital markets (Stiglitz and Weiss (1981); Hubbard (1998)). Imperfect information, especially in a period of financial distress, may also induce adverse selection due to the failure by the creditors to distinguish between viable and unviable firms (Mayer, (1998)).

sheets in accordance with the changes (including anticipated ones) in firms' assets. Depending on the maturity structure of the asset side, firms may have a preference towards financing them with liabilities of a matching, or relevant, maturity structure. In this scheme, the demand for corporate credit plays a special role as it sometimes may also serve as a buffer towards a desired maturity structure.

One of our main goals in analysing the flows of corporate credit is to trace the effect of a policy shock, such as the introduction of the CBA on the determinants of these flows. The theoretical literature suggests that policy may have an effect on credit supply and demand in various ways. Thus changes in monetary policy do affect banks' and firms' behavior due to the existence of a transmission mechanism through which monetary shocks affect real economic performance. The more traditional view of a money channel (or interest rate transmission mechanism) implies that monetary shocks affect the economy through their effect on interest rates (the cost of credit), which is basically a demand effect. Thus a monetary contraction results in higher cost of (short-term) credit which causes the demand for credit to fall; in turn, given that financial markets are imperfect, the lower inflow of financial resources, affects firms' performance. The recently advanced "credit channel view" implies that monetary policy shocks affect real economic performance through the supply of credit by financial intermediaries due to shifts in the supply schedule of the latter. In turn, the literature makes a distinction between a "bank lending channel" which pertains to banks only and is related to their dual nature of holders of deposits and generators of loans to firms and a "broad credit channel" which treats the supply of external funds to firms by all financial intermediaries (Oliner and Rudebusch (1996); Hu (1999)).

The credit channel view is also consistent with the assumption of the existence of market imperfections, in particular, information asymmetries between borrowers and lenders which give rise to the above mentioned monitoring cost premium (Gertler (1988); Hubbard,

(1995)). One implication of the existence of a credit channel in the monetary transmission mechanism is that it induces a heterogeneous response both of the credit market and of the firms due to which the increase in the cost premium for external finance will not be uniformly distributed across firms. The reason for this heterogeneity is the fact that the existing credit market imperfections are likely to impact in a different manner on various categories of firms in the event of a monetary shock. In particular, the credit channel view is consistent with the empirical finding that the effect of a monetary shock should be more severe for small firms (that are more likely to face information costs) than for large firms (Oliner and Rudebusch (1996)) or that the negative effect of a monetary contraction on investment is greater for highly leveraged firms (which are more likely to suffer a reduction in their collateralizable net worth due to the monetary shock) than for less leveraged firms (Rondi et al. (1998); Hu (1999)).

Various supply and demand effects may emerge due to the existence of transition-specific market imperfections which feature the economies undergoing transition from plan to market. In particular, corporate financial flows are seriously affected by the existence of “soft budget constraints”. Initially the term soft budget constraints was used by Kornai (1980) to denote paternalistic behavior on the part of the state in the *ex-post* bailing out of loss-making state-owned enterprises (SOEs) that found themselves in financial distress. Later, the concept was extended in different directions, in particular subsuming adverse selection in long-term banking lending under imperfect information when banks are not capable of properly distinguishing between profitable and unprofitable projects or, in more general terms, when they face *ex-ante* inefficiency in financing but have *ex-post* benefits of refinancing (Berglof and Roland (1998)). Having made an initial advance to an enterprise, a bank may continue lending, treating losses as sunk costs and believing that further lending will increase the overall net present value of the total investment beyond what may be realised if they stop



financing the firm. A major difference between this concept and Kornai's notion of soft budget constraints lies in the *ex-ante* attitude of creditors. While creditors (in particular, the state) explicitly bail out unprofitable firms (this information is available *ex-ante*), the adverse selection in the second case is due to imperfect information: if the relevant information had been available to the creditors *ex-ante*, they would have declined to finance the project altogether (Schaffer (1998)). In reference to long-term enterprise-bank relations in a transitional environment, it has been observed that relationship banking in imperfect markets may also involve moral hazard and may give rise to soft budget constraints for the borrowing firms.

Dobrinsky et al. (2001) conjecture that some specific types of soft budget constraints in a transitional environment may emerge as a result of distortions in incentive structures. In particular, distorted incentives may have an effect both on the determinants of credit supply and credit demand.<sup>2</sup> In turn, incentive structures are a reflection of the institutional environment and the conduct of economic policy in the broader sense. Consequently, policy reforms and policy shocks can be expected to affect the determinants of credit flows both on the supply and the demand side.

The empirical research in this area is confronted with one additional difficulty, namely the absence of direct observations on supply and demand: observed bank lending only provides information on the intersection points of the supply and demand curves which is not sufficient to identify each of the two schedules. Most empirical studies on the issue try to overcome the problem by assuming a leading role of one of the two sides, usually demand. Other studies analyse bank credit in the broader context of enterprise finance without

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<sup>2</sup> For example, opportunistic behaviour on the part of banks may offset proper monitoring and screening on the supply side. In turn, demand patterns may be driven by survival strategies rather than by viable business strategies.

attempting a distinction between supply and demand decisions (Cärare and Perotti (1997); Dobrinsky et al. (2001)). Among the few empirical studies that explicitly distinguish between credit supply and demand is that by Bratkowski, Grosfeld and Rostowski (2000) who analyse the access to bank finance by new private firms in the Czech Republic, Hungary and Poland on the basis of an enterprise survey. They overcome the above difficulty by using additional exogenous information: a special question in the survey inquiring about the firms' intention to apply for bank credit which reflects credit demand proper.

We use these theoretical underpinning to specify estimable equations for the supply of and demand for corporate credit. Since theory does not provide clues as to the possible structural forms of these equations we basically rely on reduced forms. Data considerations, in particular, the availability of relevant statistical data, also has played a certain role in the specification of these equations.

In the absence of direct observations on supply and demand, observed bank lending only provides information on the intersection of the supply and demand curves and this is not sufficient to identify correctly each of the two schedules. The absence of additional exogenous information on the supply and demand patterns does not allow to overcome the ensuing simultaneity problems completely. We offer a partial solution to the problem by carefully specifying the two types of equation and selecting specific sets of variables depicting supply and demand factors. In addition we use interaction variables to partially offset endogeneity effects.

## ***2.2 Modelling credit supply***

On the basis of the theoretical considerations outlined above, we have selected a set of independent variables which are conjectured to reflect supply factors, determining the willingness of banks to extend credit to firms. The rationale behind each such variable is discussed below and actual specification of the credit supply equation has the following form:

$$(1) \quad C_i = a_0 + a_1 C_i(-1) + a_2 PD_i + a_3 [C_i(-1) * PD_i] + a_4 FC_i + a_5 ED_i + a_6 S_i + a_7 DD_i + a_8 OD_i + \varepsilon_i,$$

where:

-  $C_i$  is a binary variable defining the access to bank credit. It takes the value of 1 when during the year there have been flows of bank credit from the banks to the firm.

-  $PD_i$  is a profitability dummy which takes values of 1 when the firm's operational profitability  $P_i > 0$  and is 0 otherwise;

-  $[C_i(-1) * PD_i]$  is an interaction variable defined as the product of the lagged value of  $C_i$  and the profitability dummy;

-  $FC_i$  is a fixed capital ratio defined as the share of fixed assets in the firm's total assets;

-  $ED_i$  is a dummy for exporting firms. The dummy takes a value of 1 if in two out of the three years for which export data were available the ratio "exports/sales" was larger than a pre-defined threshold (30%), and is 0 otherwise;

-  $S_i$  is a size variable defined as the market share of individual firms within NACE 2-digit sectors;

-  $DD_i$  is a delinquency dummy indicating the incidence of past financial indiscipline in credit service among the firms that had access to bank credit. This variable takes the value of 1 in the case when there were incidents of payment arrears (in the sense of either principal or interest, or both, being in arrears) in the firms' credit record for the previous year;

-  $OD_i$  stands for a set of dummy variables defining ownership based on four categories of ownership (SOEs, firms privatized to domestic investors, other domestically owned private firms and firms with foreign participation).

The rationale behind this specification of the credit supply equation is the following. To avoid the endogeneity and reverse causality problems (the confusion of supply and

demand factors) we have tried to exclude from the supply equation variables that may reflect demand and may give rise to reverse causality. The backside is that the equation may be curtailed.

The presence of the lagged dependent variable  $C_i(-1)$  has a dual interpretation. On the one hand, it reflects relationship banking in the vein of the literature discussed in section 2.1. Long-term enterprise-bank relations help to reduce information asymmetries; banks would be more willing to lend again if they have already done so (we consider the banking sector as a whole as the lending party). On the other hand, a positive association can be interpreted as evidence of soft budget constraints on the part of the banks in the sense of Berglof and Roland (1998).

The rest of the variables reflect credit screening and monitoring by the banks as well as the credit channel hypothesis. The profitability variable is intended to capture the sensitivity of lending to the firm's financial health (a test for adverse selection in bank lending). The operational profitability of the firm can be regarded as a measure of its viability so its presence allows to check whether banks are more inclined to lend to viable firms. This coefficient is expected to have a positive sign (the opposite can be interpreted as evidence of adverse selection).

Obviously, in this case we cannot fully eliminate the identification and causality problem because firms' profits/losses may affect their demand for credit as well. In order to circumvent this problem (at least partly) we use in addition an interaction variable between the profitability dummy and the lagged value of the access to credit variable. The rationale is to test whether long-term enterprise-bank relations are associated with the firm's viability.

The fixed capital ratio variable is aimed to capture the importance of collateral for the supply of bank credit, which is an essential aspect of bank lending in the credit channel view. Fixed assets can be used to collateralize bank loans and, in the case when collateral is an

important determinant in banks' decision to extend a credit, the more collateralable fixed assets a firm has, the more likely it would be to have access to bank credit. As, in accordance with the acting banking regulations in Bulgaria bank are required to take collateral, the prior is that, in the case of proper screening, there would be a positive association between bank lending and the fixed capital ratio. Size is another variable that would allow to test the credit channel hypothesis. The prior is that a credit squeeze is more likely to affect smaller firms.

Several variables reflect the specificity of bank lending in a transitional environment. Ownership is assumed to be associated with governance and thus should capture the way governance affects banks' lending decisions. The presence of the delinquency variable is intended to capture the incidence of "soft lending" and/or distorted incentives in lending: whether and how a history of financial indiscipline by the firms in their past borrowing affects subsequent bank lending to these firms. The export variable is intended to check whether exporting firms have higher credibility as borrowers of bank credit (which is the prior).

### ***2.3 Modelling the demand for corporate credit***

The specification of the credit demand equation is based on a generally defined money demand function extended with in accordance with the conceptual approach outlined above. The demand for credit in general, as a form of money demand, can be assumed to depend on two main variables: the income or activity level and the cost of credit. In accordance with the discussion in section 2.1, we augment this basic specification with variables mirroring the adjustments in the firms' balance sheets as well as such related to the specifics of this type of financial flows. The actual specification of the credit demand equation is as follows (its justification is discussed below):

$$(2) \quad C_i = a_0 + a_1 C_i(-1) + a_2 YD_i + a_3 (YD_i * Large_i) + a_4 (YD_i * OD_i) + a_5 ID_i + \\ + a_6 (ID_i * Large_i) + a_7 (ID_i * OD_i) + a_8 IvD_i + a_9 (IvD_i * Large_i) + a_{10} (IvD_i * OD_i) +$$

$$+ a_{11} PD_i + a_{12} LD_i + a_{13} (PD_i * LD_i) + a_{14} DR_i + a_{15} R_j + \varepsilon_i,$$

where:

- $C_i$  is the same binary variable as specified above.
- $YD_i$  is an income or activity dummy variable which takes the value of 1 if the change of real sales over two subsequent years is positive (growing firms), and is 0 otherwise.
- $Large_i$  is a dummy variable for large firms. Three criteria are used for the classification by size: total sales, total assets and employed labor. First the firms are broken down into three subgroups by each of these criteria. For the final classification a firm is defined as “large” (the dummy takes a value of 1) if it satisfies at least two of the three criteria.
- $ID_i$  is a dummy for firms actively investing in fixed assets.<sup>3</sup> It takes the value of 1 either if the ratio of investment to sales in a given year is larger than the same ratio in the previous year (firms with a growing investment share) or if the share of investment to sales is greater than a pre-defined threshold (10% in our case), and is 0 otherwise. The idea behind this definition is to identify those firms whose investment pattern in the given year is likely to instigate demand for external finance, and we define two such categories of firms: 1) firms whose investment pattern changes compared to the previous year; 2) firms with relatively high levels of investment activity compared to other firms.
- $IvD_i$  is a second investment dummy variable reflecting investment in inventories. It takes the value of 1 if the ratio of inventories to sales in a given year is larger than the same ratio in the previous year (firms with a growing inventory share), and is 0 otherwise.
- $OD_i$  is the above specified set of ownership dummy variables.
- $PD_i$  is the profitability dummy specified above.

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<sup>3</sup> Due to the underdeveloped capital market, investment in financial assets by Bulgarian firms was virtually negligible.

-  $LD_i$  is a dummy for firms facing liquidity constraints. The liquidity constraint dummy is constructed as follows: it takes a value of 1 if the firm's quick ratio (the ratio between the sum of accounts receivable and liquid assets to the firm's current liabilities) is smaller than 1 (the critical level of the quick ratio) in the given year and is 0 otherwise.

-  $DR_i$  is a variable reflecting the firm's leverage, defined as the share of long-term debt in the firm's total assets.

-  $R_j$  is a sector-specific real interest rate defined as the average annual nominal interest rate on bank credit discounted by the sector-specific producer price index (defined at the NACE 2-digit level).

The rationale behind this specification of the credit demand equation is as follows. We do not have information about which firms actually asked for credit but only about those that actually received it. Similarly to the credit supply equation, in order to avoid endogeneity problems we have tried to exclude from the demand equation variables that may reflect demand and may give rise to reverse causality.

In this case, similarly to credit supply, we also use the lagged value of  $C_i$  but in this case it is intended to capture habit persistence in credit demand. Admittedly, in this case the reverse causality issue cannot be fully eliminated.  $YD_i$ ,  $ID_i$  and  $IvD_i$  are activity variables which seek to reflect the effect on demand for external finance of a general expansion of business activity and/or investment activity. The prior is for a strong positive association; a weak statistical association between the dependent variable and these activity variables would suggest the presence of distorted or perverse incentives (the demand for external funds is not based on viable business and investment projects). In addition to using the activity variables separately, we also interact them with size and ownership variables to account for possible heterogeneity in credit demand among various categories of firms.

$PD_i$  and  $LD_i$  are aimed at testing the incidence of adverse selection: whether firms in poor financial health and/or facing liquidity constraints are more likely to seek and get access to bank credit. In the case of the liquidity dummy there is no ambiguity about the causality and the interpretation of the results in terms of adverse selection. However, in the case of the profitability dummy, again we cannot fully eliminate the endogeneity problem because – as mentioned before – firm's profit/loss position may affect also bank's decision to extend the loan. In order to get around the reverse causality issue and be able to capture the incidence of adverse selection with respect to  $PD_i$  we use the interaction variable ( $PD_i * LD_i$ ) which combines the profitability dummy with the variable related to financial strain.

The leverage variable  $DR_i$  seeks to identify statistical association between the demand for credit and indebtedness. The prior is that heavily indebted firms may be subject to financial strain due to high servicing costs which may lead them to seek new credit. In turn, if heavily indebted firms are more likely to get credit – which would be revealed by a positive statistical association – this may be an indication of the incidence of soft budget constraints on the part of the banks in the sense of Berglof and Roland (1998).<sup>4</sup>

We have also included in the credit demand equation the variable  $R_j$ , the sector-specific real interest rate on bank credit.<sup>5</sup> The rationale is the following. Due to the nature of transition from plan to market, during the period we are analysing, there has been considerable realignment of relative prices across sectors of economic activity. Consequently, firms belonging to different branches have been facing *de facto* different real costs of bank credit which may have affected their demand for bank loans.

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<sup>4</sup> Obviously in this case we also have interference of supply and demand factors; however in this case the main driving push definitely comes from the demand side.

<sup>5</sup> When we estimate the credit equation using annual cross-section data, it is not possible to include the interest rate proper in the equation as it is a constant.



### **3. Empirical analysis of corporate credit under a policy regime change**

The arguments outlined above suggest that a major policy shock such as the policy reforms that accompanied the introduction of the CBA in Bulgaria should have considerable repercussions on the flow of bank credit to the corporate sector. In the first place, the regime change in monetary policy (which, among other things, eliminated direct central bank refinancing of the banking system) is likely to have affected bank lending through both the money and credit channels. Secondly, the important institutional and legislative changes can be expected to have had a strong effect on incentive structures in the banking and enterprise sectors, thus affecting both the supply and the demand side. However uncovering the actual changes at the microeconomic level – such as the changes in borrowing and lending practices – essentially remains an empirical issue. For this purpose we estimate the specified credit supply and credit demand equations.

The prior is that the policy shock affected the underlying structural relations governing the supply of and demand for bank credit. Accordingly, these changes can be expected to show up in the parameters of the reduced form supply and demand equations. Hence our research strategy is to estimate these equations for individual years (those before and after the policy regime change) – rather than for the period as a whole – and to trace and analyze the changes in the estimated parameters.

The empirical analysis is based on a comprehensive enterprise data set covering corporate entities that report to the National Statistical Institute using the double entry accounting method. The number of firms covered in this analysis for the period 1995-1999

varies from some 8,400 firms in 1994 to more than 28,000 firms in 1999. Table 1 shows some descriptive statistics for the sample for firms used in the estimation.<sup>6</sup>

(table 1 here)

To take into account the behavioral impact of corporate governance we differentiate between four ownership categories of firms: 1) SOEs; 2) Firms privatized to domestic investors (former SOEs, in which domestic investors hold a majority stake at the moment of reporting, and there is no foreign participation); 3) Other domestically owned private firms (mostly *de novo* private firms), and 4) Firms with foreign participation (these are either privatized or *de novo* firms; foreign investors may not have a majority stake).

The second and the third panels of table 1 reflect the firms' access to bank credit. These data provide evidence of a general credit crunch in the years immediately following the introduction of the currency board caused by a withdrawal of the banks from lending to the corporate sector. The evidence of changes in corporate performance in this descriptive statistics is mixed. Thus average profitability was on the decline after 1997 while in terms of sales growth, after an improvement in 1998 the situation deteriorated again in 1999. On the other hand, there was a marked improvement in financial discipline: the share of firms with arrears on bank credit rapidly declined after 1997 (the sixth panel).

### ***3.1 Credit supply***

The estimation results for this equation are presented in table 2. The equations were estimated for each year from 1995 to 1999 using probit techniques. The Wald tests for structural break for two subsequent years are highly significant suggesting instability of the estimated relationship over time, a result that provides support for the approach based on

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<sup>6</sup> Due to the data requirements of the specified equations some firms from the data base had to be dropped from the estimation. Table 1 reports only the data for those firms that contain the full statistical information used in the estimation of the credit supply and demand equations.

single year (rather than panel) estimations. The results of this test are also consistent with the conjecture of ongoing changes in behavioral patterns during the period that we scrutinize.

(table 2 here)

In general, the estimation results are quite in line with the expectations based on theoretical considerations; in addition they provide evidence of significant changes in the motivation of bank lending which accompany the change in the policy regime.

The estimated coefficients can be divided in two groups, depending on their stability over time. The first group consists of coefficients reflecting relative stability of the underlying relations during this period. The estimation results highlight the importance of relationship banking: the coefficient of the lagged dependent variable is positive and highly significant; its absolute value also suggests that long term enterprise-bank relations are among the important determinant of the supply of bank credit. On the other hand, as noted above, this result may also be interpreted as evidence of the persistence of soft budget constraints. Another coefficient that is always estimated as positive and highly statistically significant is size. This is also in line with the prior that large firms are more likely to have access to bank credit than smaller firms and is consistent with the credit channel hypothesis. The estimation results also indicate that exporting firms are more likely to have access to bank credit than those that only operate on the domestic market: with the exception of the results for 1997 this coefficient is also estimated as positive and highly significant.

The profitability coefficient is also positive in all years but its statistical significance declines somewhat in the last two years; the estimated coefficient also declines in absolute value. However, counter to expectations, the coefficient of the interaction variable between relationship banking and viability was not estimated as statistically significant. This might suggest that while long-term enterprise-bank relations do matter for banks' decisions (as it follows from the estimated coefficient of the lagged dependent variable), the allocation of

credit to firms with such relations was not necessarily associated with their present profitability. The combination of these results implies that while profitability – hence viability – does affect bank lending (overall these results are in line with expectations), its effect is somewhat ambiguous and is probably not always of prime importance as a determinant of bank lending.

For the rest of the coefficients, there is a considerable variation in the course of the period. On the whole the estimation results suggest changes in some aspects of bank lending behavior roughly occurring in 1997 and thus coinciding with the introduction of the currency board. For example, the ownership dummies for all categories of private firms after 1998 are estimated as positive and highly significant which is not the case in the first three years: in the beginning of the period some of these coefficients are negative, although not statistically significant. These results imply that after the policy regime change banks were much more inclined to lend to non-state-owned firms than they were in the past.

One of the important indications of a change in the patterns of bank lending is the estimated coefficient of the delinquency dummy. In the years 1995-1998 this coefficient is positive but in the first three years it is not statistically significant. However, in 1999 it changes sign and is estimated as highly significant (indicating that past incidence of financial indiscipline in the servicing of bank credit was negatively associated with the access to bank credit in that year). This suggests that banks started to pay much greater attention to the past credit history, a pattern that was not observable in the past.<sup>7</sup> Another indication of change is the dynamics of the coefficients of the fixed capital ratio. From being insignificant in the initial two years they turn into positive and highly significant in the last three years indicating

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<sup>7</sup> As to the positive and significant coefficient in 1998, this might be a ramification of the bank crisis when a large number of banks were closed; as a result firms were switching to new banks and the latter might not have been able to perform proper screening.

that the availability of collateral has become a more important determinant of bank lending decisions. Moreover, these changes can be interpreted as an improvement in credit screening as banks became more stringent in implementing the existing regulations.

One of the important outcomes of this series of estimations is the value of the estimated intercept of the equation. As can be visibly traced, in the last two years (1998 and 1999), the value of this coefficient declined considerably compared to the beginning of the period. Such a change is equivalent to a shift-*cum*-change-in-slope of the credit supply schedule after the introduction of the CBA and is another piece of evidence of a change in bank lending behavior. This result, mirroring the credit crunch by the banks in response to the policy shock, is also consistent with the credit channel hypothesis.

In summary, as a result of the policy regime change banks generally became more reluctant to lend to the corporate sector but they were more likely to lend to private firms than to SOEs. At the same time, they continued to be more inclined to lend to firms with long-term enterprise-bank relations, to large and to exporting firms. Profitability did not seem to be a prime determinant of bank lending in Bulgaria either before or after the introduction of the CBA. We also find evidence of a change in bank lending toward better credit screening: firms with a record of financial indiscipline were less likely to get access to bank credit in the end of the period; banks also started to put a greater emphasis on collateral.

### ***3.2 Credit demand***

The estimation results for the credit demand equation are presented in table 3. Similarly to the case of credit supply, and given the evidence of structural break across time, these equations were estimated separately for each year from 1995 to 1999 using probit techniques.

(table 3 here)

The lagged dependent variable – which in this case we interpret as habit persistence – is again one of the important determinant of financing decisions. This is not a surprising outcome when regarded from the demand side of corporate credit, especially as concerns short-term capital. As the production cycle within a firm has a repetitive character, once a firm establishes a cycle involving borrowing (say, to finance working capital), this pattern is likely to repeat itself over the next cycles.

The estimated coefficients of the activity variables generally match the prior outlined above. Indeed, most of the estimated “pure” (non-interacted) coefficients are positive and statistically significant for all the three activity variables. The coefficients of the non-interacted activity variables are in line with the prior and do not reveal any abnormal demand patterns for the sample of firms taken as a whole. However, the two types of interaction variables which are used in conjunction with the activity variables highlight some important nuances of credit demand for certain categories of firms. Thus large firms display specific patterns of credit demand with respect to some of the activity variables. Within this category, the statistical association of credit demand with the growth of sales is considerably stronger than that for the sample as a whole; by contrast, the reverse is true with respect to investment in fixed assets.

SOEs is the one category of firms that has distinctly different patterns of credit demand compared with other ownership categories.<sup>8</sup> Moreover, there is strong evidence of distortions and deviations from the prior in the demand patterns of SOEs. For example, in the case of SOEs there is a systematic negative association between growth of sales and demand for credit; for the second half of the period the same is valid for the growth in inventories. The association between investment in fixed assets and credit demand is generally also negative, but not always statistically significant. These findings are indicative of persistent, perverse

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<sup>8</sup> Most of the coefficients for the other ownership categories turned out to be statistically insignificant.

patterns of behavior among SOEs where credit demand is likely driven by survival motives rather than by the expansion of activity.

Apart from this case, however, we do not find strong evidence of adverse selection. The profitability dummy in most cases is positive and statistically significant; in the few cases of negative signs, the coefficients are not statistically significant. The coefficient of the liquidity dummy is, as expected, positive and in most cases statistically significant. The interaction of profitability and liquidity reveals one important change taking place over the period 1995-1999. In the first year the coefficient of this variable is negative which is a sign of adverse selection (credit going to loss-making firms facing liquidity constraints). However, it turns positive and highly significant in the last two years reversing the above pattern. Leverage, as measured by the long-term debt ratio, is also positively associated with credit demand and over time the link strengthens in the last two years.

The negative implications of the emergence of differentials in real interest rates due to realignments in relative prices is highlighted by the estimated coefficients of the sectoral real interest rate variable. Until 1997 (the period of high inflation) the coefficient of this variable is negative and statistically significant but in the years after (when inflation subsided to very low levels) it becomes statistically insignificant. This outcome points to one specific damaging impact of high inflation, namely its distortive effect on relative prices due to their differential speed of adjustment. In turn, this creates additional borrowing difficulties for the firms with a relatively slow price adjustment due to the implied effect on real interest rates.

It is worth noting that unlike the case of credit supply the estimated parameters of the credit demand equation (in particular, the intercept) do not hint at a systematic downward shift in the demand schedule. There was probably a one-off shift taking place in 1997 (the year when the CBA was introduced) but it is difficult to trace such changes during the rest of the period.

In summary, the estimated credit demand equations reveal significantly less signs of change in the patterns of microeconomic behavior than the credit supply equation. Although the Wald test indicates that there was structural change in the underlying relationship over time, we do not observe reversals of signs or significant changes of the values of important coefficients as is the case in the supply equation. In the main, the signs and values of the coefficients of the estimated demand equation reflect relatively stable credit demand patterns over the whole period. Only in one case (the interaction of profitability and liquidity and the sectoral real interest rate) it is possible to trace an obvious reversal of previous patterns. These results suggest important differences in the adjustment of the banking and enterprise sectors following the introduction of the CBA.

#### **4. Discussion and conclusions**

The methodology suggested in this paper aims at studying separately the determinants of corporate credit from the viewpoint of lenders and borrowers. The suggested credit supply and demand equations are based on findings in the recent theoretical literature on corporate finance in imperfect financial markets. This empirical application of this methodology enables us to analyze separately the patterns of lending and borrowing in Bulgaria and to trace the adjustments on the two sides following a major policy regime change such as the introduction of the CBA in 1997. In our empirical analysis we first check the conformity of our estimation results with the theoretical background but then also seek to detect behavioral changes that can be associated with the policy shock and to highlight the motivation and driving forces behind these changes. Given the nature of the transitional environment in Bulgaria, we also seek to highlight the importance of incentives and governance in shaping microeconomic behavior.

As regards the first aspect of our research agenda, our results are broadly consistent with the theoretical priors, especially for the years after the policy regime change. On the



supply side, the empirical results suggest that banks have a revealed preference to lend to firms with long-term enterprise-bank relations, to large firms and to exporting firms. These results are consistent with the literature on relationship banking in imperfect markets as they highlight the importance of monitoring and agency costs as a determinant of bank lending in an environment where financial markets are marred by numerous distortions and imperfections.

On the whole the parameters of the estimated credit demand equations are also in conformity with the expectations. Our results provide evidence that expected changes in activity level within the firms as well as habit persistence were among the important determinants of credit demand of Bulgarian firms; liquidity constraints and indebtedness also played a role in shaping credit demand. The results also point to a segmentation of the market of corporate borrowers in Bulgaria which is consistent with the notion of a heterogeneous response to monetary shocks conjectured by the credit channel hypothesis. Thus, for example, we detect specificities in the credit demand patterns of large firms. In addition, the category of SOEs displays markedly different borrowing patterns compared to any category of private firms. Throughout the period SOEs' borrowing practices are characterized by distorted incentives as market forces do not seem to play a leading role in motivating their borrowing decisions.

As regards the second aspect of our research strategy, we find empirical evidence of significant changes in bank-enterprise relations that can be associated with the policy regime change. The finding that we consider as the most important in this respect is the detection of an asymmetric response of credit supply and demand to the policy shock. The estimated credit supply equation provides clear evidence of a change in banks' lending patterns over the period 1995-1999. The results provide strong evidence of a credit crunch after the introduction of the CBA with banks becoming more reluctant to lend to the corporate sector.

Besides, one can observe a shift in their lending preferences as they appear to be more likely to lend to private firms rather than to SOEs (who used to be the preferred borrowers in the past). We also find evidence of a change in bank lending toward better credit screening: firms with a record of financial indiscipline were less likely to get access to bank credit in the end of the period while the role of collateral in securing firm's access to bank credit increased. These results suggest an increased role of the firms' payment discipline in shaping bank lending decisions. In addition, while we find some evidence of distorted incentives and perverse lending patterns in the first years, there are considerably less signs of such patterns in the last years of this period.

Notably, the estimated credit demand equation provides much less evidence of change for the years after the introduction of the CBA. More generally, the policy shock does not seem to have triggered substantial adjustments in the firms' credit demand patterns.

These findings have important policy implications. The methodological framework of our analysis suggests that the adjustments in the flows of bank credit would result both from a monetary transmission of the macroeconomic policy shock and from changes in the microeconomic and institutional environment, in particular, incentive structures. On the supply side we find evidence of both types of adjustments. Consistent with the "bank lending channel" view, we detect systemic shifts and changes in the slope of the credit supply schedule in the years following the introduction of the CBA, which likely reflect the direct effect of the monetary shock. Besides, we detect behavioral changes in bank's lending patterns that reflect changing incentive structures. In general, in the years after the policy reform the lending practices of Bulgarian banks appear to be more or less in conformity with the theoretical expectations for normal banking practices in market conditions (which was not always the case in the past). This outcome suggests that the 1997 reforms have been successful in triggering some necessary changes in bank's behavior and performance.

By contrast, we find no evidence of major adjustments on the demand side. While the absence of direct effects of the macroeconomic policy shock on enterprise performance is not unexpected (as in this case there is no direct monetary transmission), what is surprising is that we do not find notable performance- and governance-related changes in the firms' credit demand patterns. Given the fact that there is abundant evidence of distorted incentives in the pre-CBA period (Dobrinsky et al., 2001), and the fact that financial indiscipline in the corporate sector was an important ingredient of the 1996-97 crisis this is a somewhat startling outcome as a number of reform measures undertaken in 1997 were aimed at mending the existing problems. Within the context of our modelling framework, this might suggest that the policy reform of 1997 did not generate major changes in firms' incentive structures, at least what concerns their credit demand patterns until the final year of estimations (1999).

Overall the results presented in this paper seem to offer strong empirical support to the conclusion that the changes in corporate credit in Bulgaria after the introduction of the CBA were mostly driven by the supply side. Our empirical analysis of the determinants of credit flows suggests an almost instantaneous supply response to the policy shock whereas we do not detect a discernible demand response until the end of the reference period. These asymmetric responses of the supply and demand side can also be interpreted in terms of asymmetric outcomes of the policy reforms initiated in 1997 in the banking and enterprise sectors.

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**Table 1. Selected descriptive statistics for the firms in the sample**

	1995	1996	1997	1998	1999
<b>1. Number of firms</b>					
SOEs	5021	4616	3248	2433	1697
Privatized firms (domestic investors)	212	280	919	1002	1280
Other domestically owned private firms	3166	9115	7747	17302	23870
Firms with foreign participation	32	614	515	843	1214
<b>All firms</b>	<b>8431</b>	<b>14625</b>	<b>12429</b>	<b>21580</b>	<b>28061</b>
<b>2. Share of firms with access to bank credit (% of total)</b>					
SOEs	27.2	20.6	12.4	4.0	3.2
Privatized firms (domestic investors)	29.3	15.0	24.4	12.6	12.3
Other domestically owned private firms	40.7	15.8	17.2	7.9	7.4
Firms with foreign participation	28.1	6.7	7.8	7.1	6.9
<b>All firms</b>	<b>32.3</b>	<b>16.9</b>	<b>16.1</b>	<b>7.6</b>	<b>7.4</b>
<b>3. Share of firms with positive operating profit (% of total)</b>					
SOEs	45.3	44.5	50.0	41.7	33.2
Privatized firms (domestic investors)	65.1	61.8	69.5	47.6	35.6
Other domestically owned private firms	72.5	63.6	72.3	68.9	60.9
Firms with foreign participation	68.8	57.3	63.7	62.5	54.9
<b>All firms</b>	<b>56.1</b>	<b>57.3</b>	<b>65.9</b>	<b>64.6</b>	<b>57.8</b>
<b>4. Share of firms with a past record of financial delinquency (% of total)</b>					
SOEs	10.7	10.0	4.3	1.6	0.5
Privatized firms (domestic investors)	4.7	6.8	8.5	4.8	2.5
Other domestically owned private firms	7.2	3.9	2.4	1.3	0.5
Firms with foreign participation	15.6	1.5	2.1	2.7	0.7
<b>All firms</b>	<b>9.3</b>	<b>5.8</b>	<b>3.4</b>	<b>1.6</b>	<b>0.6</b>
<b>5. Share of firms with growing sales (% of total)</b>					
SOEs	79.0	27.5	20.4	58.1	38.0
Privatized firms (domestic investors)	73.1	41.4	20.7	53.1	38.2
Other domestically owned private firms	82.7	43.1	28.1	53.5	41.0
Firms with foreign participation	81.3	48.5	27.4	54.0	40.4
<b>All firms</b>	<b>80.2</b>	<b>38.4</b>	<b>25.5</b>	<b>54.0</b>	<b>40.7</b>
<b>6. Share of firms facing liquidity constraints (% of total)</b>					
SOEs	65.2	71.4	71.5	69.1	65.8
Privatized firms (domestic investors)	53.3	49.6	71.6	74.5	75.9
Other domestically owned private firms	51.2	61.4	65.6	55.7	53.6
Firms with foreign participation	56.3	77.4	75.7	55.2	49.5
<b>All firms</b>	<b>59.6</b>	<b>65.0</b>	<b>68.0</b>	<b>58.0</b>	<b>55.2</b>
<b>7. Average long-term debt ratio (% of total assets)</b>					
SOEs	2.6	5.2	2.8	2.9	2.6
Privatized firms (domestic investors)	2.4	3.1	4.2	5.4	5.7
Other domestically owned private firms	1.7	5.2	5.2	4.0	4.6
Firms with foreign participation	14.9	10.9	7.5	7.6	9.6
<b>All firms</b>	<b>2.3</b>	<b>5.4</b>	<b>4.6</b>	<b>4.0</b>	<b>4.7</b>

Source: National Statistical Institute; authors' calculations.

**Table 2. Probit estimations of the credit supply equation, 1995-1999**

Dependent variable: access to bank credit (binary).

	1995	1996	1997	1998	1999
Lagged dependent variable	1.461 [25.01]***	1.591 [30.63]***	1.154 [17.88]***	0.915 [18.87]***	1.458 [27.36]***
Operating profitability (P>0) dummy	0.269 [6.17]***	0.276 [6.59]***	0.152 [3.96]***	0.062 [1.74]*	0.049 [1.65]*
Interaction between lagged dependent variable and profitability (P>0) dummy	0.091 [1.32]	-0.059 [0.95]	0.086 [1.17]	-0.051 [0.85]	0.067 [1.02]
Fixed capital ratio	0.072 [0.96]	-0.025 [0.40]	0.223 [3.99]***	0.378 [7.48]***	0.340 [7.58]***
Dummy for exporting firms	0.345 [5.49]***	0.295 [5.66]***	0.076 [0.89]	0.358 [6.72]***	0.169 [3.11]***
Size variable (market share)	1.628 [3.50]***	2.564 [4.46]***	4.164 [6.01]***	2.279 [4.68]***	3.955 [4.04]***
Delinquency dummy (for firms with a record of credit arrears)	0.026 [0.45]	0.034 [0.68]	0.030 [0.43]	0.166 [2.14]**	-0.424 [4.01]***
Ownership dummy – privatized firms (domestic investors)	0.076 [0.73]	-0.204 [1.90]*	0.395 [6.79]***	0.530 [7.15]***	0.634 [7.73]***
Ownership dummy – other domestically owned private firms	0.291 [7.95]***	-0.139 [4.13]***	0.331 [8.49]***	0.481 [8.73]***	0.478 [6.89]***
Ownership dummy – firms with foreign participation	-0.233 [0.89]	-0.359 [3.70]***	-0.056 [0.57]	0.375 [4.25]***	0.422 [4.64]***
Constant	-1.409 [27.28]***	-1.684 [34.49]***	-1.785 [31.98]***	-2.336 [35.88]***	-2.311 [31.14]***
Number of observations	8431	14625	12429	21580	28061
Pseudo R <sup>2</sup>	0.269	0.281	0.159	0.108	0.165
Test for structural break at year (t) vs. year (t-1) (Test statistics $\chi^2$ )		632.67***	200.13***	665.26***	263.16***

Note: Absolute value of z statistics in brackets; \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%.

**Table 3. Probit estimations of the credit demand equation, 1995-1999**

Dependent variable: access to bank credit (binary).

	1995	1996	1997	1998	1999
Lagged dependent variable	1.453 [42.78]***	1.539 [51.97]***	1.131 [34.06]***	0.846 [28.72]***	1.378 [41.52]***
Growth of sales dummy	0.477 [8.46]***	-0.040 [1.15]	0.079 [2.08]**	0.043 [1.45]	0.124 [4.33]***
Interaction between growth of sales dummy and dummy for large firms	0.617 [6.91]***	0.428 [3.81]***	0.674 [4.42]***	0.411 [3.32]***	0.513 [3.13]***
Interaction between growth of sales dummy and dummy for SOEs	-0.331 [6.49]***	-0.011 [0.17]	-0.334 [3.82]***	-0.281 [3.52]***	-0.272 [2.26]**
Dummy for firms actively investing in fixed assets	0.276 [5.35]***	0.286 [7.43]***	0.456 [12.74]***	0.063 [1.76]*	0.138 [4.11]***
Interaction between investment dummy and dummy for large firms	0.014 [0.11]	0.040 [0.35]	0.312 [2.55]**	0.288 [1.27]	0.136 [0.44]
Interaction between investment dummy and dummy for SOEs	-0.116 [1.64]	-0.135 [2.16]**	-0.319 [4.62]***	-0.214 [1.41]	-0.314 [1.34]
Dummy for firms with growing investment in inventories	0.111 [2.31]**	-0.108 [3.18]***	0.219 [6.24]***	0.145 [4.94]***	0.265 [9.21]***
Interaction between inventory dummy and dummy for large firms	0.110 [0.90]	0.464 [3.95]***	0.382 [2.68]***	0.402 [3.52]***	0.460 [3.84]***
Interaction between inventory dummy and dummy for SOEs	0.006 [0.10]	0.104 [1.87]*	-0.040 [0.56]	-0.273 [3.35]***	-0.346 [3.60]***
Profitability dummy	0.445 [6.66]***	0.150 [2.36]**	0.141 [1.77]*	-0.035 [0.60]	0.046 [0.84]
Dummy for firms facing liquidity constraints	0.586 [9.16]***	0.179 [2.98]***	0.368 [4.79]***	0.146 [2.53]**	0.055 [1.06]
Interaction between profitability and liquidity dummies	-0.241 [3.12]***	0.132 [1.84]*	0.013 [0.15]	0.139 [2.06]**	0.154 [2.44]**
Leverage (long-term debt ratio)	0.167 [0.90]	0.047 [1.31]	0.009 [0.63]	0.673 [19.95]***	0.906 [17.96]***
Sector-specific real interest rate on credit		-0.002 [3.16]***	-0.020 [4.40]***	0.001 [1.12]	0.001 [0.87]
Constant	-1.998 [27.74]***	-1.691 [20.38]***	-3.319 [10.05]***	-1.917 [33.66]***	-2.063 [39.06]***
Number of observations	8356	14298	12258	20746	23672
Pseudo R <sup>2</sup>	0.295	0.288	0.187	0.127	0.194
Test for structural break at year (t) vs. year (t-1) (Test statistics $\chi^2$ )		572.41***	194.36***	479.40***	226.26***

Note: Absolute value of z statistics in brackets; \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%.



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