The Role of Bank Lending in Market-Based and Bank-Based Financial Systems

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Theoretical models of the role of credit in business cycles and of the transmission mechanism have largely concluded that, given capital market imperfections, credit conditions may amplify and propagate the effect of shocks in the economy. This paper compares the behavior of loans to households and loans to nonfinancial corporations in Austria, Germany, the Netherlands and the United Kingdom. Analyzing credit aggregates in these countries in a framework accounting for diverging economic environments allows for an assessment of how the amplifying and asymmetric effects of credit aggregates differ between market-based and bank-based financial systems. The results show that the state of the economy impacts the way in which shocks are propagated through credit markets. The effects of shocks are smoothed over time in bank-based financial systems irrespective of the economic environment and in market-based systems only during periods of subdued economic growth or tight liquidity conditions. During economic recoveries we observe an amplifying effect in market-based systems. Thus, the deceleration in credit growth in the above-mentioned countries between 1999 and 2003 was mainly demand-side rather than supply-side driven, given the overall slowdown of the economy.

1 Credit Markets and the Transmission Mechanism

Credit aggregates not only play an important role in the transmission mechanism of monetary policy in general (Bernanke and Blinder, 1988), but they may also be an important indicator of the monetary stance and liquidity conditions at the national level. This may be especially relevant for countries with an exchange rate peg or members of a monetary union, where the interest rate level or "national" monetary aggregates may have lost leading indicator properties, while "national" credit aggregates may still have a more direct impact on national spending and therefore on national inflation.

To date, empirical studies for the euro area that relate money and credit to business cycles concentrate chiefly on the cyclical properties of money, prices and interest rates of the euro area aggregate or of some large economies. Only very few studies focus on credit aggregates; moreover, countries like Germany and Austria are hardly ever included.

This paper summarizes evidence for the role of credit aggregates in the transmission mechanism for Austria (AT), Germany (DE), the Netherlands (NL) and the United Kingdom (U.K.) obtained in Kaufmann and Valderrama (2004).[1] The analysis of these countries allows comparing potential differences in the propagating role of credit aggregates depending on the type of financial system.

Moreover, loans to households and loans to nonfinancial corporations are not only determined by different spending components but are also affected by asymmetric information and financial constraints in different ways. Owing to data availability, we can model these credit aggregates separately.

There is a large body of theoretical models which predict that, owing to the existence of asymmetric information, credit markets propagate shocks to the economy. Moreover, the procyclicality of bank lending results in an amplification of the business cycle – with this effect more pronounced during recessions – and thus leads to asymmetric effects of monetary policy over time. To capture this type of non-linearity, we use a Markov-switching vector autoregressive model

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[1] See Jacobs and Kakes (2001) and Sensier et al. (2002) for similar studies featuring the Netherlands and the U.K., respectively.

(MS-VAR). In this model, parameters switch according to an unobservable state variable that is assumed to capture changing credit or economic regimes and is estimated together with the model parameters.

The paper is organized as follows: The next chapter motivates the use of non-linear modeling based on theoretical models of credit cycles. Chapter three describes some stylized facts about the evolution of credit aggregates and the institutional framework of the four countries included in the study. Chapter four discusses the methodology and empirical evidence. Our conclusions round out the paper in chapter five.

2 Asymmetric Effects of Credit Markets over the Business Cycle

There is a large body of theoretical and empirical models that assign a significant role to credit aggregates in the transmission mechanism of monetary policy and which relate not only money but also credit to business cycles. Despite their different approaches, all coincide in predicting that owing to the existence of credit market imperfections, such as asymmetric information, credit markets propagate shocks to the economy.

In these models, business cycles are amplified through borrowers' balance sheets (this is referred to as the financial accelerator effect).[2] During economic upturns borrowers' improving net worth reduces agency costs and therefore the cost of external finance, which in turn results in higher investment. By contrast, during downturns, due to the lack of internal financing, credit constraints restrict investment. This negative effect is larger than the positive effect during upturns. It is even stronger when we take the possibility of debt default into account.[3] In this type of model, higher debt default during a recession leads to exaggerated responses of the economy to an initial liquidity shock.

Thus, the pro-cyclicality of bank lending results in an amplification of the business cycle, which is more pronounced during recessions, and consequently leads to asymmetric effects of monetary policy shock or of any other shock over the business cycle. These types of models also imply that monetary policy affects the economy not only through the interest rate channel but also through credit aggregates and balance sheets.

Empirical studies at the aggregate level have confirmed this hypothesis, showing that credit aggregates and the composition of external funds react to liquidity shocks and in turn affect investment behavior.[4]

Empirical evidence at the individual bank and firm level for the four countries chosen in this study tends to confirm the hypothesis that credit aggregates are relevant for the transmission mechanism and have asymmetric effects over the business cycle.[5]

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[2] Bernanke and Blinder (1988) and Bernanke and Gertler (1989).

[3] Kiyotaki and Moore (1997a, 1997b) and Kocherlakota (2000).

[4] Bernanke and Blinder (1989), Kashyap et al. (1993), Bernanke and Gertler (1995) and Christiano et al. (1996).

[5] See Austria: Frühwirth-Schnatter and Kaufmann (2004), Kaufmann (2003), Valderrama (2001, 2003a) and Wesche (2000); Germany: Vermeulen (2002), Chatelain et al. (2003) and von Kalckreuth (2003); the Netherlands: van Ees and Garretsen (1994) and van Ees et al. (1999); the United Kingdom: Guariglia (1999) and Hall (2001).

3 Credit Aggregates in Market-Based and Bank-Based Financial Systems

Modeling credit aggregates for four EU countries with different financial systems allows us to investigate whether the role of credit aggregates in the transmission mechanism depends on the institutional framework. In particular, we expect that owing to the "house bank" principle characteristic of bank-based systems, credit constraints and asymmetric propagation through credit markets may be less severe than in market-based systems.

Thus, although the level of indebtedness is usually higher in bank-based systems, debt default occurs less frequently owing to the existence of close lending relationships. This house bank principle allows both lenders and borrowers to overcome some of the asymmetric information problems found in imperfect capital markets by building long-standing relationships. Thanks to these lending relationships borrowers are less dependent on internal funds, since lenders will provide their clients with liquid funds even during an economic downturn. As a result, borrowers can smooth spending decisions over the cycle, as lending in this case is mostly demand driven.[6]

Evidence at the firm level confirms that the advantage of lending relationships comes from a lower dependence on internal funds and not through lower cost of capital.[7] At the aggregate level, relationship lending should translate into smoother business cycle fluctuations or smoother credit cycles. To test this hypothesis, we compare results for Austria, Germany, the Netherlands and the U.K., i.e. two small and two large countries in the EU representative of bank-based and market-based financial systems.

Austria and Germany have very similar banking systems that are characterized by close lending relationships.[8] The U.K., by contrast, is a market-based financial system with the highest market capitalization in Europe, while the ratio of loans to nonfinancial corporations to GDP is low compared with other EU countries. It is not easy to find a small country in Europe with a market-based system. The best candidate is the Netherlands, showing a high share of stock issues and a substantial market capitalization compared with most other countries in Europe. Market capitalization in the Netherlands is the third highest of the 15 EU countries after the U.K. and Luxembourg.[9] Although lending relationships may also be present in the Netherlands and the U.K.,[10] at the aggregate level, the effect is expected to be smaller than in Austria and Germany.

Charts 1 and 2 largely confirm this perception. The ratio of loans to GDP for the household sector is larger in the U.K. and the Netherlands, which reflects the rapid liberalization of bank lending to consumers during the 1990s. In contrast, the ratio of

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[6] See Ongena and Smith (1998) and Boot (2000) for a more detailed account of all possible effects of lending relationships.

[7] Petersen and Rajan (1994, 1995), Ongena and Smith (1998), Houston and James (1999), Boot (2000).

[8] Evidence for Germany is extensive, see for example Chirinko and Elston (1996), Elsas and Krahnen (1998) and Harhoff and Körting (1998); for evidence for Austria, see Valderrama (2001, 2003a and 2003b).

[9] Data for 2000. See Rajan and Zingales (2003).

[10] See van Ees and Garretsen (1994), van Ees et al. (1998) and de Haan and Sterken (2002) for the Netherlands.

Chart 1

Ratio of Loans to Households to GDP

Source: Eurostat, NCBs.
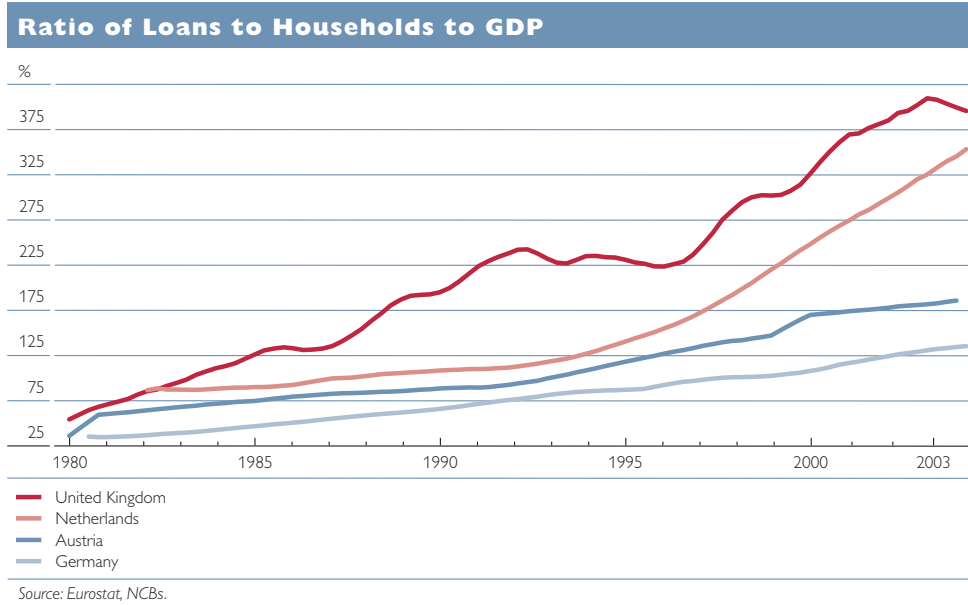
loans to GDP for nonfinancial corporations is quite high in Austria and Germany compared with the relatively low level in the U.K., while the Netherlands are somewhere in-between. This is consistent with the higher market capitalization observed in both the U.K. and the Netherlands.

Chart 2

Ratio of Loans to Nonfinancial Corporations to GDP

Source: Eurostat, NCBs.
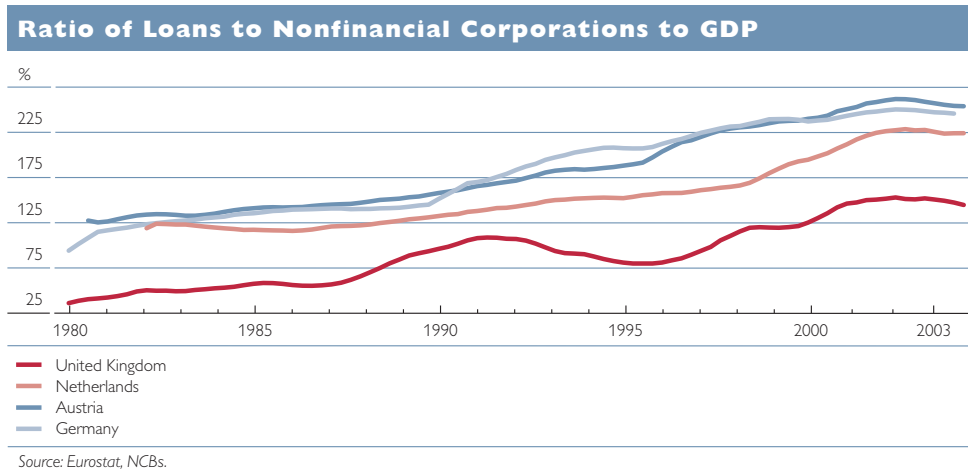
In the same fashion, we observe that the ratio of loans to GDP increases steadily in most countries except in the U.K. This is again consistent with the hypothesis that in the absence of long-term lending relationships, credit aggregates tend to be more volatile.

4 Empirical Estimates Confirm Asymmetric Effects of Lending

In order to test whether credit markets propagate and amplify shocks to the economy and whether they do so in an asymmetric manner, we use a non-linear model of credit systems for households and nonfinancial corporations for four EU countries with

differing financial systems (see box below for a description of the methodology).

In the light of the well-known identification problem,[11] we do not attempt to discriminate between loan demand and supply. The system describing loans to nonfinancial corporations includes (in that order) investment, imports, the CPI and the three-month interest rate.[12] The system describing lending to households includes consumption, net disposable income, the CPI, loans to households and the short-term interest rate. We use quarterly seasonally adjusted data covering the period from the first quarter of 1980 up to the last quarter of 2002. The effective sample period is adjusted to the country-specific data length.

Model and Estimation[13]

In order to capture the non-linear dynamics predicted by theoretical models, we estimate a Markov-switching vector autoregressive model (MS-VAR), which allows for regime switching coefficients. Under the most general specification all model parameters may depend on the unobservable state s_t:

$$y_t = v(s_t) + A_1(s_t)y_{t-1} + A_2(s_t)y_{t-2} + ... + A_q(s_t)y_{t-q} + \varepsilon_t, \varepsilon_t \sim i.i.d.N(0, \textstyle\sum(s_t)),$$

where s_t can take a value of 1 to K and the probability of being in any regime conditional on the past regime is constant and exogenous. The method used here allows estimating the dates of the regime shifts and the model parameters simultaneously. Thus, it is not necessary to have any a priori knowledge about the dates in which the economy shifts into a different regime.

The estimation is cast into a Bayesian framework and the inference is obtained by using Markov Chain Monte Carlo (MCMC) simulation methods. Thus, the inference on the joint posterior distribution of the parameters and the state variable is obtained by iteratively simulating the parameters and the path of the state variable out of their conditional posterior distribution.

Based on explorative tools, such as scatter plots and marginal posterior distributions of the simulated values of the state-specific parameters, we find a restriction that identifies the states. We also find which parameters are not switching or which are insignificant and can be restricted to zero. Finally, we test this specification against a linear alternative by means of the Bayes factor.[14]

The final model is used to compute state-dependent impulse response functions, whereby the structural model is identified by means of a Cholesky decomposition of the respective (state-dependent) covariance matrix. We obtain the distribution of the impulse responses by using draws of the simulations to compute the related impulse responses.

4.1 Market Imperfections Affect Households and Firms Differently

In order to determine whether these systems are better modeled in a non-linear framework, we first estimate an unrestricted version of each model with two lags, where all parameters are switching. Based on this benchmark estimation, we restrict those parameters which are not switching to be equal across regimes and those which are insignificant to be zero.

The unrestricted and the final specifications are also tested against a non-

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[11] We carry out the analysis by using observations on credit growth and interest rate changes. The movements in these variables do not tell us anything about whether they are due to changes in supply or demand.

[12] We chose the short-term interest rate because we were interested in studying the effects of monetary policy and also because a substantial part of loans are extended with a variable interest rate clause. For Austria in particular, the data (available only since 1995) show that lending rates follow the short-term interest rate more closely than the long-term interest rate.

[13] See Kaufmann and Valderrama (2004) for a detailed and technical description of the modeling strategy.

[14] Twice the difference of the log of the marginal likelihood is interpretable on the same scale as the well-known likelihood ratio test with X^2 distribution.

switching specification by means of the Bayes factor.[15] The tests show that in all four countries and for both households and nonfinancial corporations, a linear system is rejected against our non-linear restricted specification.

Since the switching in this type of model is estimated simultaneously with the parameters of the system, it is the relationship among these variables which drives the regime switching. Thus, we expect to relate the states of the economy obtained in each system to specific economic periods or to specific credit regimes.

Table 1

Regimes Related to		
	Nonfinancial corporations	Households
AT	Economic conditions	Conditions in credit markets
DE	Economic conditions	Conditions in credit markets
NL	Conditions in credit markets	Economic conditions
UK	Economic conditions	Conditions in credit markets

Table 1 relates the periods of the regimes to economic and credit market conditions for each system. In all countries, except the Netherlands, the switch in regimes of nonfinancial corporations is driven by economic conditions, while for loans to households it can be related to conditions in the credit market.

These results are consistent with the hypothesis that market imperfections, such as asymmetric information and moral hazard, affect households and firms in different ways. In fact, lending to households is expected to be driven more strongly by supply and less by lending relationships. In particular, these countries saw a process of financial liberalization during the period under study that was accompanied by a rapid growth of consumer credit. This also explains the decoupling of lending to households from the business cycle.

In the following subsection we assess the propagating role of credit aggregates and examine whether the response to shocks is asymmetric between regimes. To this end, we turn to the estimated impulse responses.

4.2 Asymmetric Effects of Lending Depend on the Structure of the Financial System

The effects of lending on the spending variable in our eight credit systems depend on the country-specific financial system (see table 2). As expected for bank-based systems, where the house bank principle prevails, lending does not influence investment in either regime. The effect is, however, asymmetric in market-based financial systems. In the systems for loans to households, we find exactly the opposite to be the case.

Thus, as expected, in bank-based financial systems lending to nonfinancial corporations neither propagates nor amplifies shocks, while lending to households affects consumption. In particular, we observe that lending amplifies shocks in times of rapid credit growth, while it does not in the regime where credit growth is subdued.

The results for market-based financial systems show exactly the opposite situation. We find that lending to nonfinancial corporations has procyclical effects during "normal" economic conditions whereas it has an in-

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[15] See footnote 14.

Table 2

Effects of Lending on the Spending Variable		
	Nonfinancial corporations	Households
AT	Investment not driven by lending	Asymmetric effect on consumption
DE	Investment not driven by lending	Asymmetric effect on consumption
NL	Asymmetric effect on investment	Consumption not driven by lending
UK	Asymmetric effect on investment	Consumption not driven by lending

significant effect on investment during downturns. Thus, even in market-based financial systems, there seems to be some kind of lending relationship that shields businesses from liquidity conditions during an economic slowdown.

The fact that consumption is not affected by credit markets in market-based systems may be due to the inclusion of mortgage loans. In bank-based systems, we find that lending to households also increased in the second half of our sample in the wake of financial liberalization.

Table 3 summarizes the response of lending to the spending variable for the eight credit systems estimated. The response of lending to nonfinancial corporations again depends on the country-specific financial system and corroborates the hypothesis that in bank-based systems lending is mainly demand driven. In the case of loans to households it is not possible to draw a clear conclusion.

Table 3

Response of Lending to the Spending Variable		
	Nonfinancial corporations	Households
AT	Demand driven	No reaction to consumption
DE	Demand driven	Asymmetric
NL	Asymmetric	No reaction to consumption
UK	Asymmetric	Demand driven

4.3 The Interest Rate Has Asymmetric Effects on Spending

Using a credit system allows us to investigate the interest rate channel. As stated by the credit view of the transmission mechanism, the effect of interest rate changes on investment and consumption is in many cases insignificant (see table 4). However, we find that the interest rate effect differs between regimes. Thus, both credit aggregates and the interest rate have asymmetric effects on lending and on spending variables.

It is worth mentioning that while we can characterize the effect on spending variables by the country-specific financial system, lending reacts differently to the interest rate. It is evident from table 5 that, while asymmetric effects in bank-based systems are only found for consumption, in market-based systems such effects are only found for investment. This is reflected in the insignificant response of investment in bank-based systems and of consumption in market-based systems.

Table 4

Effects of the Interest Rate on the Spending Variable		
	Nonfinancial corporations	Households
AT	No effect on investment	Asymmetric effect on consumption
DE	No effect on investment	Asymmetric effect on consumption
NL	Asymmetric effect on investment	No effect on consumption
UK	Asymmetric effect on investment	No effect on consumption

Table 5

Effects of the Interest Rate on Lending

	Nonfinancial corporations	Households
AT	Asymmetric	Insignificant
DE	Asymmetric	Asymmetric
NL	Positive	Asymmetric
UK	Asymmetric	Asymmetric

5 Policy Implications

The results we obtain for two regimes in each country can be related to periods of different economic conditions or to periods of different conditions on the credit market.

For Austria and Germany, the two countries in our sample that represent bank-based financial systems, we find that lending to nonfinancial corporations propagates shocks to the economy, but neither amplifies them nor constrains economic activity in periods of subdued growth or tight liquidity conditions. This confirms the smoothing role of the house bank principle. For households we find that lending does not restrict consumption. However, the evidence is less clear-cut due to the inclusion of mortgage loans in lending to households.

In the two countries representing market-based financial systems we find evidence for a financial accelera-tor[16] effect in the firm sector and, particularly for the U.K., also a strong pro-cyclical effect of credit markets during periods of economic recovery. The evidence for the household sector is less significant as the acceleration of lending during the 1990s was used to finance residential and financial investment rather than consumption.

In summary, we find evidence for credit markets acting as shock propagators and having non-linear effects on the real economy. In bank-based systems the effects of shocks are smoothed, while in market-based systems we observe an amplifying effect during favorable economic conditions. However, we find that in periods of subdued economic growth or tight credit conditions, the responses are similar to those found for bank-based financial systems, i.e. credit constraints do not become binding.

References

Bernanke, B. S. and A. S. Blinder. 1988. Credit, Money, and Aggregate Demand. In: The American Economic Review (78). 435–439.

Bernanke, B. S. and A. S. Blinder. 1989. The Federal Funds Rate and the Channels of Monetary Transmission. In: The American Economic Review (82). 901–921.

Bernanke, B. S. and M. Gertler. 1989. Agency Costs, Net Worth, and Business Fluctuations. In: The American Economic Review (79). 14–31.

Bernanke, B. S. and M. Gertler. 1995. Inside The Black Box: The Credit Channel of Monetary Policy Transmission. In: The Journal of Economic Perspectives (9)1. 27–48.

Boot, A. W. A. 2000. Relationship Banking: What Do We Know? In: Journal of Financial Intermediation (9). 7–25.

[16] Refers to response of credit market conditions to "shocks" to the economy that may amplify and spread the effect of the shocks. For example, credit may become harder to obtain for households and firms in an economic downturn, which can intensify and prolong the downturn.

Chatelain, J. B., A. Generale, I. Hernando, U. von Kalckreuth and P. Vermeulen. 2003. Firm Investment and Monetary Transmission in the Euro Area. In: Oxford Review of Economic Policy (19)1. 73–83.

Chirinko, R. S. and J. A. Elston. 1996. Banking Relationships in Germany: Empirical Results and Policy Implications. Federal Reserve Bank of Kansas City. Research Working Paper 5.

Christiano, L. J., M. Eichenbaum and C. Evans. 1996. The Effects of Monetary Policy Shocks: Evidence from the Flow of Funds. In: The Review of Economics and Statistics. 16–34.

van Ees, H. and H. Garretsen. 1994. Liquidity and Business Investment: Evidence from Dutch Panel Data. In: Journal of Macroeconomics (16). 613–627.

van Ees, H., H. Garretsen, L. de Haan and E. Sterken. 1998. Investment and Debt Constraints: Evidence from Dutch Panel Data. In: Brakman S., H. van Ees and S. K. Kuipers (eds.). Market Behavior and Macroeconomic Modelling. London: Macmillan. 159–179.

Elsas, R. and J. P. Krahnen. 1998. Is Relationship Lending Special? Evidence from Credit-File Data in Germany. In: Journal of Banking and Finance (22). 1283–1316.

Frühwirth-Schnatter, S. and S. Kaufmann. 2004. How Does Monetary Policy Affect Bank Lending? An Analysis Using Austrian Bank Data. Oesterreichische Nationalbank (revised version of) Working Paper 85.

Guariglia, A. 1999. The Effects of Financial Constraints on Inventory Investment: Evidence from a Panel from UK Firms. In: Economica (66). 43–62.

de Haan, L. and E. Sterken. 2002. Corporate Governance, Relationship Lending and Monetary Policy: Firm-Level Evidence for The Euro Area. University of Groningen. CCSO Working Paper 12.

Harhoff, D. and T. Körting. 1998. Lending Relationships in Germany: Empirical Results from Survey Data. In: Journal of Banking and Finance (22). 1317–1353.

Hall, S. 2001. Financial Accelerator Effects in UK Business Cycle. Bank of England Working Paper 150.

Houston, J. and C. M. James. 1999. Do Relationships have Limits? Banking Relationships, Financial Constraints and Investment. In: Journal of Business (74)3. 347–74.

Jacobs, J. and J. Kakes. 2001. Credit Demand Asymmetry in the Netherlands 1983–1997. Netherlands Central Bank MEB Series 11.

von Kalckreuth, U. 2003. Monetary Transmission in Germany: New Perspectives On Financial Constraints and Investment Spending. In: Angeloni I., A. Kashyap and B. Mojon (eds). Monetary Policy Transmission in the Euro Area. Cambridge University Press.

Kashyap, A. K., J. C. Stein and D. W. Wilcox. 1993. Monetary Policy and Credit Conditions: Evidence from the Composition of External Finance. In: The American Economic Review (83). 78–98.

Kaufmann, S. 2003. The Cross-Sectional and the Time Dimension of the Bank Lending Channel: The Austrian Case. In: Angeloni I., A. Kashyap and B. Mojon (eds). Monetary Policy Transmission in the Euro Area. Cambridge University Press. 347–358.

Kaufmann, S. and M. T. Valderrama. 2004. Modeling Credit Aggregates. OeNB. Mimeo.

Kiyotaki, N. and J. Moore. 1997a. Credit Cycles. In: Journal of Political Economy (105)2. 211–248.

Kiyotaki, N. and J. Moore. 1997b. Credit Chains. London School of Economics. Mimeo.

Kocherlakota, N. R. 2000. Creating Business Cycles through Credit Constraints. In: Federal Reserve Bank of Minneapolis Quarterly Review (24). 2–10.

Ongena, S. and D. C. Smith. 1998. Bank Relationships: A Review. In: Harker, P. and S. Zenios (eds.). The Performance of Financial Institutions. Cambridge University Press.

Petersen, M. and R. Rajan. 1994. The Benefits of Lending Relationships: Evidence from Small Business Data. In: Journal of Finance (49). 1367–1400.

Petersen, M. and R. Rajan. 1995. The Effect of Credit Market Competition on Lending Relationships. In: Quarterly Journal of Economics (110). 406–443.

Rajan, R. and L. Zingales. 2003. Banks and Markets: The Changing Character of European Finance. NBER Working Paper 9595.

Scheinkman, J. A. and L. Weiss. 1986. Borrowing Constraints and Aggregate Economic Activity. In: Econometrica (54). 23—45.

Sensier, M., D. R. Osborn and N. Öcal. 2002. Asymmetric Interest Rate Effects for the UK Real Economy. Centre for Growth & Business Cycle Research, University of Manchester. Discussion Paper 10.

Stiglitz, J. E. and A. Weiss. 1981. Credit Rationing in Markets with Imperfect Information. In: The American Economic Review (71). 393—410.

Valderrama, M. T. 2001. Balance Sheet and Bank Lending Channels: Some Evidence from Austrian Firms. In: Focus on Austria 3—4. Oesterreichische Nationalbank. Vienna. 138—154.

Valderrama, M. T. 2003a. The Role of Trade Credit and bank Lending Relationships in the Transmission Mechanism in Austria. In: Angeloni I., A. Kashyap and B. Mojon (eds). Monetary Policy Transmission in the Euro Area. Cambridge University Press. 221—232.

Valderrama, M. T. 2003b. Banking Structure and Investment in Austria: Some Empirical Evidence. In: Focus on Austria 1. Oesterreichische Nationalbank. Vienna. 150—170.

Vermeulen, P. 2002. Business Fixed Investment: Evidence of a Financial Accelerator in Europe. In: Oxford Bulletin of Economics and Statistics (64)3. 213—231.

Wesche, K. 2000. Is there a Credit Channel in Austria? The Impact of Monetary Policy on Firms' Investment Decisions. Oesterreichische Nationalbank. Working Paper 41.