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The Impact of Monetary Policy on the Financing Behaviour of Firms in the Euro Area and the UK

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ABSTRACT *According to the 'broad credit view' bank-dependent firms are more strongly affected by monetary contractions than firms with access to non-bank forms of external finance. Within the credit view the bank lending channel focuses on the special role of bank loans, and predicts that monetary contractions reduce loan supply to firms facing information problems. However, the 'relationship lending channel' argues that, especially in bank-based economies, bank-dependent firms have close ties with banks, which may reduce the sensitivity of their use of bank debt to monetary shocks. The sensitivity of corporate debt structures to changes in the monetary policy stance is analysed using a sample of 22,000 firms in the Euro area and the UK. Evidence is found for the credit view, the relationship lending channel, but not for the bank lending channel.*

KEY WORDS: Broad credit view, bank lending channel, relationship lending, monetary policy

1. Introduction

Asymmetric information in financial markets has serious consequences for corporate finance. First, it creates a wedge between the costs of external and internal funds, which can be especially wide for informationally opaque (e.g. small) firms. Consequently, such firms may not be willing to attract external capital and rely on internal finance instead (Myers and Majluf, 1984). Second, quantity rationing may occur, as external financiers are not willing to provide informationally opaque firms all the funds they need, because financiers are not able to fully assess the credit risks involved (the so-called flight to quality; Bernanke *et al.*, 1996). So, in the 'broad credit view', credit market imperfections affect firms' financing and investment decisions. Initial credit frictions may be amplified by developments in other financial markets, for example an equity price fall deteriorating firms' balance sheets, and hence decreasing credit worthiness (the financial accelerator).

Information problems and the emanating credit market frictions are also relevant for the way monetary policy affects firms. The credit view involves two channels, the 'balance sheet channel' and the 'bank lending channel'. The balance sheet channel corresponds closely to the financial

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accelerator mechanism: a monetary policy contraction may negatively affect firms' balance sheets and credit worthiness, for example, making it harder to acquire new loans. This amplifies the working of the traditional interest rate channel of monetary policy. The bank lending channel on the other hand concerns the balance sheets of the *banks*: a monetary contraction drains their liquidity positions, forcing them to reduce the supply of loans. Both channels are likely to work out differently for firms that are informationally opaque and for which intermediated credit is the only available source of external finance, on the one hand, and firms that are well known to investors and have easy access to the public capital market on the other. In general, opaque and bank-dependent firms will be affected more by a monetary policy contraction. Yet, it is conceivable, especially in bank-based economies, where relationship lending is relatively important, that banks invest in long-term relationships with their clients, thereby reducing the asymmetric information problems by screening and monitoring. This could make bank-dependent firms less susceptible to loan supply shocks. Hence, this so-called relationship channel could mitigate or even neutralize the effects of the bank lending channel.

In this paper we analyse the sensitivity of debt structures of a large group (22,000) of European firms to changes in monetary policy in the years 1990–1997. The firms in the sample are selected from the 11 countries that joined the European Monetary Union (EMU) right from the start in 1999 and the UK. We distinguish total debt, short- and long-term bank debt, and trade credit. We investigate the broad credit view, the bank lending channel, and the role of relationship lending. One of the problems in establishing the bank lending channel is the identification of loan demand and supply. Is a reduction of lending after a monetary policy contraction due to lower credit demand by firms (because of a drop in investment expenditure) or to lower supply of banks (forced by reduced bank liquidity)? This is a general problem when investigating the bank lending channel, as that channel concerns the supply side only. This problem is solved in the literature by the so-called identification through heterogeneity methodology, which can be applied to panel data such as our sample of firms. This method involves splitting up the sample into groups of firms according to characteristics that *a priori* can be expected to be indicative of the degree to which a firm might suffer from credit constraints (for example, small versus large firms). Then, assuming that demand conditions in the economy on average develop similarly for these groups, one is able to interpret the differences in impact of monetary policy on borrowing behaviour as originating from the supply side. A nice feature of our database is that we can distinguish firms by legal form, i.e. private versus public firms. This is a useful distinction, as private firms are significantly more bank dependent than public firms that have access to public capital markets. Throughout Europe comparable legal definitions of public and private firms are used (we refrain from a detailed analysis of remaining national differences here). Other distinctions that we make are between small and large firms and high- and low-leveraged firms.

We focus on changes in the composition of liabilities on European corporate balance sheets due to changes in monetary policy. The analysis of the composition of external funds can shed light on the impact of monetary policy, especially by addressing the question whether firms are able to switch from bank loans to other sources of funds. We do not address the issue whether these changes in capital structure actually change the user cost of capital and through that capital investment of firms (see Chatelain *et al.*, 2003, for such a study for European firms). The present study follows the line of research that deals with the relationship between corporate finance and monetary policy as set out by Oliner and Rudebush (1996a, 1996b) and Kashyap *et al.* (1993, 1996). Our main contribution focuses on four elements. First, we present new micro-data evidence on the impact of monetary policy on corporate debt structures for the whole Euro area, at the same time providing new results on the main determinants of the capital structure of European

firms. Secondly, we employ mainly legal form as a firm-level indicator of bank dependence and informational opaqueness. Thirdly, we investigate the relevance of a country's financial system for corporate financial behaviour. Fourth, we investigate the influence of the business cycle on the response of firms to monetary policy.

The paper is structured as follows. In Section 2 we first present an overview of the relevant literature on the credit view and the relationship lending view on monetary transmission. Section 3 then describes the data. In Section 4 we present the empirical set-up and in Section 5 we discuss the results. We summarize and conclude in Section 6.

2. The Credit View, the Lending Channel, and Relationship Lending

Imperfect information affects the working of financial markets. Both public and private asset markets suffer from information problems and their consequences, such as agency costs, costs of monitoring, screening, or auditing. Private financial markets, like the market for bank loans, are likely to be affected more than public, *e.g.* equity, markets. The broad credit view focuses on the effect of financial imperfections on monetary transmission (Gertler and Gilchrist, 1993, 1994). A change in monetary policy does not only have an impact on real economic activity via the interest rate channel, but, for example, also through the role of e.g. loans. If credit conditions change as a result of monetary policy, the ensuing revaluations of the net worth positions of agents can amplify the consequences for real expenditure (Kiyotaki and Moore, 1997). The impact can also manifest itself by changing conditions in other asset markets such as housing or equity markets (Aoki *et al.*, 2004), or in the balance sheets of firms (the so-called balance sheet channel). In these latter cases the so-called financial accelerator is at work (Bernanke *et al.*, 1996).

Specific attention in the broad credit view literature is given to the bank lending channel. In the bank lending channel the focus is on the supply of loans by private banks. Here we can distinguish two lines of research. The first line is initiated by Kashyap *et al.* (1993), who for the US examine the composition of credit between bank and non-bank sources on the macro level. They find that after a monetary contraction bank credit decreases more than non-bank credit (commercial paper). Oliner and Rudebusch (1996a, 1996b) and Gertler and Gilchrist (1994) criticized the results. The latter argue that the macro-data used by Kashyap *et al.* may merely reflect that small firms are more bank dependent and more sensitive to the business cycle than large firms and therefore respond more to a monetary contraction by cutting back their demand for bank credit. Identification of the bank lending channel on the macro-level is therefore problematic and can better be established by estimating demand models exploiting heterogeneity between agents. The second line of research of the bank lending channel therefore focuses on the behaviour of individual banks. Banks with healthy balance sheet positions are more able to shield their loan portfolios from monetary policy shocks and therefore are in a better position to maintain the old levels of loan supply after a contraction (Kashyap and Stein, 1995, 2000; Angeloni *et al.*, 2003). For example, Van den Heuvel (2002) addresses the role of capital adequacy requirements and shows that banks with low capital show delayed but amplified responses to monetary contractions.

Next, we discuss a more recent microeconomic view on bank–firm relations, relationship lending, and turn to its relevance for monetary policy. The theory of relationship lending is based on the notion that close ties between banks and borrowers can be economically beneficial (see Sharpe, 1990; Boot, 2000; Elsas, 2005 for reviews of the literature). Relationship lending can be defined as a long-term implicit contract between a bank and its debtor. Close ties between the bank and the borrower create well-known benefits: intertemporal smoothing, increased credit

availability, enhancement of borrowers' payoffs, and more efficient decisions if borrowers face financial distress. In bank-based economies banks have incentives to invest in such long-term relationships and therefore to acquire more relevant information on the borrowers. As Boot and Thakor (2000) show in a theoretical model, this investment in knowledge about the firm's conditions comes at a cost, but also has a benefit: the firm will be able to increase profitability. Suppose that we observe a firm that has a close link with a bank. After a monetary contraction both the firm and the bank have an incentive to maintain the existing lending relation, maybe after some renegotiation on the terms of the loan. In such a case we expect, when estimating the interest rate elasticity of loan demand, to find lower values for bank-dependent firms than for firms that use relatively more non-bank finance. It is clear that small or more opaque firms benefit from relationship lending ties. Larger firms, although they may have similar relationship lending ties to smaller firms, are more likely to be sensitive to bank loan cost price changes, and will use other sources of funds more quickly.

Thus, the above overview shows that two channels of monetary transmission, i.e. the bank lending channel and the relationship lending channel, work in opposite directions for the impact of the transmission of monetary policy. The bank lending channel amplifies, while the relationship lending channel mitigates the effect of monetary tightening. This is the main theme investigated in the empirical part of this study.

The existing empirical literature on relationship lending is mainly focused on the consequences of relationships on loan pricing, credit availability, or efficiency of work-out decisions by banks if firms face financial distress. A few studies analyse the incidence of relationship lending. One of the problems in the literature is the identification of the 'relationship component' of loans. Unfortunately we also lack good indicators of relationship lending at the firm level. We would need indicators such as the length of banking relationships, the interest rates paid on individual bank loans during these relationships (Keasey and Watson, 2000), institutional relationships such as the German 'Hausbanks' (Elsas, 2005) and possibly other elements of loan contracts (see the surveys by Harhoff and Korting, 1998; and Lehman *et al.*, 2004) or information on lenders (Sterken and Tokutsu, 2002). The balance sheet data we use in this paper do not include such information. Therefore, we use a national indicator of bank dependence, based on the World Bank indicators of financial structure (Beck and Levine, 1999), which measures whether a country is bank or market based. Differences in bank basedness between countries reflect the availability of public information about firms' credit worthiness and the efficiency of banks in acquiring this information, as De Fiore and Uhlig (2004) show.

Finally, we conclude this section with some remarks on the existing empirical results. In the literature there are extensive overviews of empirical results obtained with credit view models. We refer to Bernanke *et al.* (1996), Hubbard (1998) and Lensink *et al.* (2001) for an overview of the impact of financing constraints on investment, and the results of the Eurosystem's project on monetary transmission (Angeloni *et al.*, 2003). It is not our goal to give an extensive overview of the broad literature; instead we focus on three relatively unexplored elements of this literature: what is the impact of monetary shocks on the composition of firms' liabilities, what is the impact on the use of trade credit, and what is the evidence of relationship lending? To start with the latter: there is no substantial evidence so far of the role of relationship lending, the single exception being Mizen and Yalcin (2002). They find evidence for the UK that small, highly indebted and younger firms are affected more by a monetary contraction than large, less-indebted or older firms. They use the age of the firms as a proxy variable of relationship lending and so find indirect evidence of its relevance. There is a larger body of empirical literature on the impact of bank dependence on the formation of interest rates in individual loan contracts though (Lehmann and

Neuberger, 2001; Degryse and Ongena, 2005). Although there is no clear unanimity, it seems that long-lasting bank lending relations lead to 'softer' combinations of interest rates and collateral requirements.

With respect to the impact of monetary policy shocks on firms' financing decisions the first study is Kashyap *et al.* (1993), who present an aggregated analysis for the US economy (we discussed this study above). Gertler and Gilchrist (1994) and Oliner and Rudebusch (1996a, 1996b) show there can be large differences in financing behaviour between large and small firms. Oliner and Rudebusch show that large firms rely on bank loans and issue commercial paper during a monetary contraction; hence they do not confirm the bank lending channel. Mizen and Yalcin (2002) find evidence of the broad credit view for the UK and for the bank lending channel as well. Finally, there are only a few studies that analyse the role of trade credit in monetary transmission. Normally one would expect to find that firms that face high asymmetric information costs (and consequently cannot issue commercial paper) will use more trade credit in times of a monetary contraction (Meltzer, 1960). Mateut *et al.* (2003) indeed find evidence of such a trade credit channel. Nilsen (1999) finds that even large firms switch to trade credit, especially firms without a bond rating.

3. Data

The source of the company database used in this study is 'AMADEUS' from Bureau van Dijk, containing profit and loss account and balance sheet data, as well as information on number of employees, legal form, etc., for more than 200,000 European firms. We use data for the EMU-11 countries that adopted the euro in 1999 (so we exclude Greece), and the UK. We filter the data in several ways. First, firms are selected on a consolidated level. Only when consolidated data are not available in the file, unconsolidated data are used. This selection procedure avoids double inclusion of firms with both consolidated and unconsolidated data. We merge several files each effectively containing some three years of data into one dataset for the period 1990–1997. Second, we select companies with two-digit ISIC-codes equal to 15–37, 45, 50–52, 55, 60–63; these are firms with activities in manufacturing, construction, trade, and transportation.

Table 1 gives the country representation of our sample. It also gives the number of firms by legal form. About 55% of the companies in the sample are public and 45% private.[1] The main corporate governance characteristics of these two types of firms are the following. Public firms offer shares to the public; these shares can be quoted on a stock exchange. Their liability is limited. Private firms do not offer shares publicly. The liability of the shareowners is extended. In general, the equity ownership of public firms is dispersed, while that of private firms is concentrated. To compensate for the differences in liability, reporting and disclosure requirements for public firms are more binding than for private firms. So it is likely that private firms are more opaque. The minimum share capital requirements are higher for public firms. The requirements for quoted public firms are even more severe. We note that firm size – for example, measured by total assets or employment – is *not* among the criterions for private or public ownership. Share capital size *is* a criterion but that does not relate directly to total assets. Only 2% of the firms in the sample have quoted shares, which makes the sample quite representative for the population of firms in continental Europe. Faccio and Lang (2002) show that 44% of European firms are owned by families and that only for 37% of the firms the shares are widely owned.

Table 1. Number of firms in the sample

	Public firms	of which: quoted	Private firms	All firms
Austria	81	4	54	135
Belgium	4641	24	380	5021
Finland	1368	22	0	1368
France	12,525	113	1859	14,384
Germany	358	94	1138	1496
Ireland	36	23	177	213
Italy	6144	35	3543	9687
Luxembourg	77	0	28	105
Netherlands	304	138	2552	2856
Portugal	708	31	458	1166
Spain	5464	37	548	6012
Total EMU–11	31,706	521	10,737	42,443
United Kingdom	1883	938	15,318	17,201
Total sample	33,589	1459	26,055	59,644

Table 2 gives the liability composition of the firms in the sample. We observe that private firms have more bank debt than public firms; they have almost twice as much short-term bank loans. This implies that private firms are more bank dependent than public firms. Note that Table 2 contains aggregate means: that is we measure total bank loans of all firms over total assets. One could also calculate firm ratios and average these ratios. In such a case we are able to test for significant differences between ratios. Testing reveals that all mean values are significantly different even at the 1% significance level. The larger average bank dependence of private firms makes the sample-split into public and private firms especially interesting, as the legal form may be a good indicator of informational opaqueness. The lower bank dependence of public firms may reflect the fact that public firms, being better known to the outside

Table 2. Capital structure by legal form. Ratios of total assets; aggregate averages for 1990–1997

	Public firms	of which: quoted	Private firms	All firms
Equity	0.32	0.38	0.32	0.32
Long-term bank debt	0.12	0.14	0.12	0.12
Other noncurrent liabilities	0.14	0.11	0.09	0.12
Noncurrent liabilities	0.26	0.25	0.20	0.24
Short-term bank debt	0.11	0.08	0.21	0.14
Trade credit	0.15	0.12	0.11	0.13
Other current liabilities	0.17	0.18	0.16	0.17
Current liabilities	0.43	0.40	0.47	0.44
Total liabilities	1.00	1.00	1.00	1.00
Memo items:				
Total bank debt	0.23	0.22	0.33	0.26
Other debt	0.46	0.41	0.36	0.42
Median total assets (million euros)	11.3	67.6	10.7	11.2
Median number of employees	90	793	128	106

Note: Rows may not add up due to rounding.

investors as a result of more intense disclosure, suffer less from asymmetric information problems than private firms and therefore have easier access to non-bank sources of external finance. The softer disclosure and reporting requirements for private firms and the fact that their shares are not publicly held make it likely that private firms are more opaque and prone to asymmetric information problems than public firms. This distinction is different from the large–small firm dichotomy more commonly found in the literature. As a matter of fact, the table shows that public firms in our sample are not significantly larger than private firms. Medians for total assets are comparable, while median employment is higher for private firms. Quoted public firms are on average of course much larger than public firms, and therefore they are considered separately in the analysis. As has been mentioned before, a small fraction of the sample consists of quoted firms.

A second source of data that we use is the database on financial structure and economic development from the World Bank. We use this database for the construction of a country-specific indicator of bank basedness (BB_{jt}), defined as:

$$BB_{jt} = 100 \cdot \frac{PC_{jt}}{ST_{jt} + PC_{jt} + PRB_{jt} + PUB_{jt}} \tag{1}$$

ST_{jt} = stock market capitalization, PC_{jt} = private credit by deposit money banks, PRB_{jt} = private bond market capitalization and PUB_{jt} = public bond market capitalization in country j in year t. A high (low) value for this indicator indicates that the financial system of country j in year t is bank (market) based. According to this measure, Austria and Germany are bank-based economies, the UK market based; see Table 3 for a full overview.

Table 3. Indicator of bank-basedness

	BB_j (median)	Market- or bank-based
Austria	56.26	Bank
Belgium	26.95	Market
Finland	43.51	Bank
France	44.72	Bank
Germany	51.50	Bank
Ireland	38.82	Market
Italy	29.44	Market
Luxembourg	.	.
Netherlands	38.50	Market
Portugal	48.32	Bank
Spain	47.84	Bank
United Kingdom	40.02	Market

Explanatory note: $BB_{jt} = 100 \cdot \frac{PC_{jt}}{ST_{jt} + PC_{jt} + PRB_{jt} + PUB_{jt}}$, where ST_{jt} = stock market capitalization, PC_{jt} = private credit by deposit money banks, PRB_{jt} = private bond market capitalization and PUB_{jt} = public bond market capitalization in country j in year t. Note that Belgium and Italy are market based according to this indicator due to the high proportion of public debt. Economies with indicator values of 41.00 or higher are considered to be bank based.

4. Empirical Model

Our main interest concerns the impact of monetary policy shocks on the financing behaviour of firms. First, how do firms adjust leverage after a monetary shock? Second and third, how do firms adjust their bank loans, both short- and long-term? Finally, what is the role of trade credit, being an important source of short-term non-bank credit? Hence, we analyse the monetary policy impact on four debt ratios:

- Total debt to total assets, *DEBT*. This is a common, overall measure of leverage.
- Short-term bank loans to total assets, *STBANK*, as our main focus is on the special role of bank loans.
- Long-term bank loans to total assets, *LTBANK*.
- Trade credit to total assets, *TRADE*. This is a component of working capital, which in the literature receives a lot of attention for its substitutability with bank debt in general and, more specifically, in relation to monetary contraction (Meltzer, 1960; Petersen and Rajan, 1997).

Specifically, we wish to test whether elements of the credit view and the relationship lending view can be found in the borrowing responses of the firms to monetary policy shocks. We therefore employ the heterogeneity between firms with respect to their legal form. We already noted (in Section 3) that private firms are more dependent on banks for external finance than public firms are. We argued that this difference reflects the informational opaqueness of private firms relative to public firms. We will use the opposite predictions by the bank lending channel and the relationship lending channel regarding the differential borrowing responses to monetary policy shocks of private and public firms to identify the monetary transmission mechanism. We estimate a model of the type:

$$\begin{aligned} Y_{ijt} = {} & \alpha_1 MPI_{jt-1} + \alpha_2 MPI_{jt-1} \cdot LF_{ij} + \alpha_3 MPI_{jt-1} \cdot LF_{ij} \cdot BB_{jt} + \alpha_4 MPI_{jt-1} \cdot BB_{jt} \\ & + \alpha_5 LF_{ij} + \alpha_6 BB_{jt} + \alpha_7 X_{ijt} + \alpha_8 + e_{ijt} \end{aligned} \tag{2}$$

Y_{ijt} = one of the above mentioned debt ratios of firm i in country j in year t;
MPI_{jt-1} = monetary policy indicator for country j in year $t-1$, for which we use the three month (inter-bank) money market interest rate, which is common in the literature (Angeloni *et al.*, 2003) and is not suffering from discrete jumps as in the central bank rate; we use a one-year lag as is found to be relevant in most of the literature (Angeloni *et al.*, 2003);
LF_{ij} = dummy variable for the legal form of firm i in country j; one dummy PR_{ij} which is 1 for private firms and 0 for public firms and another dummy $QUOTED_{ij}$ which is 1 for quoted firms and 0 for unquoted firms;
BB_{jt} = bank-basedness indicator for country j in year t;
X_{ijt} = a set of conditioning variables, explaining capital structure choices of firm i in country j in year t;
$\alpha_1, \ldots, \alpha_7$ are coefficients and α_8 the intercept to be estimated, and e_{it} is the residual.

We thus use the short-term interest rate as the indicator of the monetary stance. An increase in the short-term interest rate is considered to be a monetary tightening. The interest rate channel predicts a negative impact of changes in the short-term interest rate on debt, short-term bank loans, and trade credit, hence a negative value for α_1. The coefficient α_5 allows for different debt structures for different legal forms of firms. Coefficient α_6 denotes the impact of the nature of

financial systems on corporate balance sheets. It is, for instance, likely that firms in bank-based economies rely more on long-term bank loans. Coefficient α_2 represents the differential effect of monetary policy for different legal types of firms. We include two dummy variables, one for private firms PR_{ij}, and another for quoted firms, $QUOTED_{ij}$, respectively. Using the interaction between the monetary policy indicator and the legal dummy variables can shed some light on the identification of changes in demand for corporate debt. Finally we interact this interaction term with BB_{jt} to allow for different effects of the interaction between monetary policy indicators and legal types in market- or bank-based economies. Our priors with respect to the monetary policy indicator and the interaction terms are as follows:

- MPI_{jt-1}: The traditional money view on monetary policy transmission focuses on the interest rate channel. A monetary policy induced rise of the short-term interest rate reduces both interest sensitive investment spending and the corporate demand for short-term (bank) debt. However, this interest rate channel can have different implications for debt titles of varying maturity. It is probable that short-term debt will be reduced after a monetary policy induced short-term interest increase, but the impact on long-term loans is ambiguous. If the long-term interest rate does not increase due to the monetary policy shock, long-term loans become a relatively attractive source of finance. As explained in Section 2, the broad credit view encompasses the bank lending and the balance sheet channels (Bernanke and Gertler, 1995) that both enhance the negative initial effects of monetary policy tightening. According to the lending channel monetary policy tightening constrains the supply of bank credit, which exerts an additional negative effect for bank-dependent firms. Hence, for short-term loans all channels lead to the expectation of a negative coefficient α_1 of the monetary policy indicator. For long-term loans, however, the expected sign of this coefficient is ambiguous.
- $MPI_{jt-1}{}^{*}PR_{ij}$: the interaction term of the monetary policy indicator with the private firm dummy has been included to capture the possibility that private firms adjust their capital structures after a monetary policy shock in a different way than public firms do. As argued in Section 3, private firms are more opaque and hence more bank dependent than public firms. According to the bank lending channel, it is to be expected that private firms be affected more when a monetary contraction leads to a decreasing supply of credit. In that case coefficient α_2 is expected to be negative, at least for short-term bank debt and probably also for long-term debt. For trade debt the coefficient needs not be negative when these firms succeed in replacing the drop in bank loan supply by taking on more trade credit. Consequently, the sign of the coefficient of total debt is unpredictable. The lending relationship view gives opposite predictions. Assuming that private firms benefit from relationship banking as well as public firms, it could be the case that the supply of bank credit to private firms is sustained, despite a monetary contraction, so that private firms can hold on to their use of bank debt, provided that they are ready to pay a higher interest. If public firms are not ready to pay more, diminish their demand for bank loans, and switch to other forms of finance that are not influenced by monetary policy, the sign of the coefficient of the interaction term would be positive instead of negative, especially for bank debt. Hence, a lower interest rate sensitivity of bank borrowing for private firms than public firms could be an indication of relationship lending. There is a problem with this interpretation, however. Lower interest rate sensitivity of private firms could just reflect their lack of non-bank funding alternatives. In order to control for this, we add the following interaction term:
- $MPI_{jt-1}{}^{*}PR_{ij}{}^{*}BB_{jt}$: this term interacts the differential monetary policy impact by legal form with the financial system of the country of residence. If relationship lending diminishes the interest rate sensitivity of bank lending to private firms we expect the effect to be stronger in

bank-based economies than in market-based economies. Hence, in that case we expect to find a positive sign for α_3.

- $MPI_{jt-1}{}^{*}QUOTED_{ij}$: For the interaction term of the monetary policy indicator with the quotation dummy variable the reasoning goes analogously. Quoted firms are mostly very large public firms which comply with the relatively severe disclosure and capital requirements that are conditional for acquiring quotation on the stock exchange. Therefore, we assume that our earlier argumentation for the public firms in terms of easier access to the public capital markets holds *a fortiori* for quoted firms. (We do not interact MPI_{jt-1} and BB_{jt} with $QUOTED_{ij}$, because of lack of non-zero observations.)
- $MPI_{jt-1}{}^{*}BB_{jt}$: monetary shocks in bank-based economies can have a different impact on corporate financial structures than in market-based economies irrespective of the type of firm. It is likely that the interest rate elasticity of short-term bank loans in bank-based economies is lower than in market-based financial systems. All firms can move easier to public capital in market-based systems.

We include conditioning variables X_{ijt} to control for idiosyncratic effects on capital structure decisions. These are explanatory variables that are often used in the literature to explain corporate debt ratios, namely: interest expenses *INT*, the presence of tangible assets *TAN* and intangible assets *INTAN*, firm size *SIZE*, depreciation *DEPR*, and earnings before interest and taxes *EBIT* (see Harris and Raviv, 1991; Rajan and Zingales, 1995; Ramb, 2000; Wanzenried, 2002 for similar choices of sets of conditioning variables). Ramb (2000), who uses the same data source (AMADEUS) as we do, finds that the impact of legal form (private or public firms; quotation) on the determinants of capital structure is small for most countries. Hence, we do not have to differentiate the control variables by legal form. All control variables are expressed as ratios to total assets, except firm size, which is defined by the logarithm of total assets. Our priors with respect to the expected signs of the coefficients of the control variables follow from the corporate capital structure literature.

- *INT*: interest expenses may be an indicator of financial distress and/or imply the presence of a large debt tax shield. Both interpretations lead to an expected negative sign of the coefficient of interest expenses in the debt relations. Higher debt leads to higher interest expenses though. Hence, endogeneity problems affect the sign of the coefficient of *INT* (see hereafter).
- *TAN*: tangible assets represent presence of collateral, which makes access to debt easier (so a positive coefficient).
- *INTAN*: intangible assets denote lower collateral value (a negative coefficient). Titman and Wessels (1988) show that firms with a relatively high proportion of intangible assets have lower debt ratios. Intangible investment is also considered to be a proxy of high growth opportunities for the firm. High growth options should, according to agency theory, negatively influence the use of debt, and hence also imply a negative sign for this coefficient. In our sample there is no correlation between *TAN* and *INTAN* (correlation coefficient is –0.05).
- *SIZE*: large firms are better known to the outside investors and likely to be well diversified so that they have fewer asymmetric information problems and run lower business risks, respectively: its coefficient should be positive.
- *DEPR*: a high depreciation rate implies the presence of large non-debt tax shields, making the use of debt tax shields relatively redundant (hence a negative coefficient).
- *EBIT:* according to the pecking order theory (Myers, 1984) firms prefer internal finance to external finance including debt. High earnings enable firms to finance their investment largely

with retained earnings, so that substantial debt finance is not necessary. So the coefficient of *EBIT* is expected to be negative.

5. Results

Before presenting our estimation results, we discuss two econometric issues. First, the error term, e_{ijt}, in Equation 2 consists of a time-invariant error component u_{ij} plus an idiosyncratic error term v_{ijt}, hence: $e_{ijt} = u_{ij} + v_{ijt}$. We can assume u_{ij} to be fixed or random. We tested for fixed versus random effects using a Hausman specification test: a fixed effects specification is to be favoured. Secondly, some of the explanatory variables are likely to be endogenous, notably interest expenses *INT*. Clearly, a high debt ratio causes interest payments to be high. An instrumental variables panel data estimator should therefore be applied. We use the two-stage-least-squares fixed-effects (or within) estimator (Baltagi, 1995). The ratio of cash to total assets and the ratio of stocks to total assets are used as additional instruments.

Before we estimate the model it is informative to explore the covariation of our core variables a bit further (Table 4). First, the correlations between the total debt ratio and its components are all positive, although the correlation with long-term bank debt is rather weak. Second, trade debt appears to be negatively correlated with bank debt, both short-term and long-term, which suggests that bank and trade debt might be substitutes (cf. Mateut *et al.*, 2003). Third, it is noteworthy that the signs of the correlations of *TAN*, *INTAN*, *SIZE* and *DEPR* with total bank debt, short-term bank debt, and trade debt are opposite to the correlations with long-term debt (we skip firm, country, and time indices from now on). Hence, we expect long-term bank debt to respond differently to the conditioning variables. Finally, note that *INT* is indeed highly correlated with both *DEBT* and *STBANK*, which was the reason for using instruments in the estimation as mentioned before.

Table 5 gives the results of the estimation of Equation 2. Before focusing on the monetary policy effects, let us first discuss briefly the results for the control variables. Most of these firm-specific capital structure determinants are highly significant and have the expected signs. As explained above we expect a negative impact of interest expenses *INT* on the demand for corporate debt, since *INT* may be an indicator of financial distress. On the other hand higher debt coincides with higher interest rate payments. Table 5 shows that probably the latter effect dominates, since *INT* affects the debt ratio, short-term bank loans and trade credit positively, despite the use of instruments in the estimation. Apparently, the level of the debt service was not a constraining

Table 4. Correlation coefficients

	DEBT	*STBANK*	*LTBANK*	*TRADE*
DEBT	1.000			
STBANK	0.345	1.000		
LTBANK	0.188	−0.125	1.000	
TRADE	0.420	−0.170	−0.274	1.000
INT	0.371	0.404	0.209	−0.053
TAN	−0.115	−0.032	0.374	−0.350
INTAN	−0.053	−0.030	0.143	−0.119
SIZE	−0.156	−0.005	0.101	−0.387
DEPR	−0.100	−0.108	0.177	−0.180
EBIT	−0.229	−0.117	−0.068	−0.086

Table 5. 2SLS Within estimation results: monetary policy indicator interacted with firm type and financial system indicator

Y_{it} =	$DEBT_{it}$	$STBANK_{it}$	$LTBANK_{it}$	$TRADE_{it}$
INT_{it}	3.971*	2.409*	−0.138	1.653*
	(15.29)	(7.38)	(0.24)	(6.51)
TAN_{it}	−0.128*	−0.139*	0.239*	−0.186*
	(14.84)	(13.24)	(13.58)	(21.65)
$INTAN_{it}$	−0.225*	−0.071*	0.120*	−0.211*
	(14.16)	(3.70)	(4.39)	(13.57)
$SIZE_{it}$	0.067*	0.045*	0.030*	−0.011*
	(33.23)	(15.99)	(8.13)	(5.51)
$DEPR_{it}$	−0.302*	−0.224*	−0.163*	−0.067*
	(12.61)	(7.88)	(3.32)	(2.81)
$EBIT_{it}$	−0.397*	−0.379*	−0.160*	−0.089*
	(36.72)	(24.37)	(10.58)	(8.47)
MPI_{t-1}	**−0.145**	**−1.246***	**0.407***	**−0.732***
	(1.60)	(10.68)	(2.80)	(7.96)
$MPI_{t-1}{}^{*}PR_i$	**−0.254**	**0.240**	**0.292**	**−0.029**
	(1.54)	(1.27)	(0.08)	(1.74)
$MPI_{t-1}{}^{*}PR_i{}^{*}BB_t$	**0.010***	**−0.004**	**0.000**	**0.011***
	(2.74)	(0.91)	(0.09)	(2.97)
$MPI_{t-1}{}^{*}QUOTED_i$	**0.114**	**0.146**	**0.199**	**−0.145**
	(0.87)	(0.96)	(0.57)	(1.10)
$MPI_{t-1}{}^{*}BB_t$	**−0.002**	**0.022***	**−0.002**	**0.008***
	(1.07)	(8.53)	(0.57)	(3.78)
PR_i	−0.112	0.667	3.354	0.220
	(0.14)	(0.72)	(1.92)	(0.27)
BB_t	0.033	−0.192*	0.322*	−0.071*
	(1.05)	(5.05)	(6.75)	(2.26)
INTERCEPT	0.492*	0.121*	−0.151*	0.386*
	(46.07)	(9.65)	(7.66)	(36.04)
R^2	0.095	0.150	0.073	0.069
Number of obs.	81,734	70,509	35,084	82,499
Number of firms	22,782	21,295	14,922	22,929

Note: *t*-values are given within parentheses below the coefficients; *denotes their statistical significance at the 5% level or higher. Country suffixes are omitted for ease of exposition.

factor during the sample period, which in fact was characterized by relatively low and decreasing nominal interest rates. *TAN* and *INTAN* are mostly fixed assets, which need long-term finance, i.e. finance by investment loans or equity and not finance by short-term loans or lines of credit. *SIZE* has a positive impact on all debt types, but a negative one on trade credit. Small-sized firms apparently make more use of trade debt than large firms. Although the transaction motive for the use of trade credit is probably important for firms of all sizes, the financing motive may be particularly important for small businesses, because they are more likely to be rationed by commercial banks than large firms are (Meltzer, 1960). Depreciation *DEPR* and earnings before interest and taxes *EBIT* have negative signs as expected.

Our main focus is on the effects of monetary policy. As explained in Section 4, we are especially interested in the empirical evidence of the credit channel and the relationship lending channel.

It is conceivable that relationship lending can function like an extended internal capital market (Kashyap *et al.*, 1993) and thus reduce the sensitivity of bank loans to interest rate changes for some groups of firms. In order to identify the relationship channel from the credit channel, we include a control variable for relationship lending. As mentioned in Section 4, we use the extent to which countries may be grouped according to whether they have a bank-based or a market-based financial system as an indicator of the supply argument. We expect that the relationship lending channel is more relevant in bank-based systems and therefore firms' demand for debt, but especially bank loans, should be less interest rate elastic. Hence, we focus on the coefficients of *MPI* and especially its cross-terms with the legal form dummy variable *PR* and its interaction with the financial system indicator *BB*.

From the estimated coefficients of *MPI* (Table 5) we conclude first that the signs of the coefficients of *MPI* are significant and negative in the equations for short-term bank debt and trade debt, but significantly positive in the equation for long-term bank loans (the coefficient of *MPI* is also negative for total debt, but not significant). The opposite signs of the coefficients for short- and long-term debt imply that, after a short-term interest rate increase, firms switch from short- to long-term bank debt. This maturity restructuring effect with respect to bank loans is likely to follow from the relative price increase of short-term bank loans. This presumes that a rise in the monetary policy interest rate is passed through to the price of long-term bank loans to a smaller degree than to the price of short-term bank loans. In general, we can confirm the basic interest rate channel.

We next turn to the parameter estimates of the cross-term MPI^*PR, which are in all four cases insignificant. This suggests that the legal form in itself is not a distinctive factor for the impact of monetary policy on firms' financing decisions. In any case, we do not find statistical evidence of a credit channel (in which case the coefficient of MPI^*PR would have to be significantly negative). However, the coefficient of the interaction term MPI^*PR^*BB is significant and positive in the equations for total debt and trade debt, although its magnitude is relatively small. This implies that when, for example, the monetary stance gets tighter, contraction of the use of total debt and trade debt is smaller for private firms in bank-based economies than it is for public firms in market-based economies. So we find somewhat mixed evidence for the credit view. We do not find substantial evidence of the bank lending channel, since the interaction term MPI^*PR is not significant in the equations for short- or long-term bank loans. The interaction term MPI^*BB is significantly positive for short-term bank loans, though. Thus, while we cannot find conclusive evidence of the bank lending channel, we do find an influence of the financial system indicator *BB* on short-term loans. In fact, the coefficient estimates for the cross-term MPI^*BB, which are significant and positive for short-term bank debt and trade debt, imply that, irrespective of the legal form of the firms, the negative monetary policy reactions of their uses of these debt categories are less pronounced in bank-based economies than in market-based economies. This evidence offers some support to the relationship lending channel, especially in the case of short-term bank loans. Finally, the coefficients of the cross-term $MPI^*QUOTED$ are insignificant in all equations, implying that quotation does not seem to matter (in the following we do not further discuss the insignificant results for *QUOTED*).

5.1 Sub-samples

We re-estimate the equations for sub-samples by firm size and leverage, respectively (Tables 6a and 6b). The reason for this exercise is to investigate whether there are differences in financing behaviour between small and large firms and between high-leveraged and low-leveraged firms,

Table 6a. 2SLS within estimation results for large and small firms: selected MPI coefficients with firm type and financial system indicator

Y_{it} =	$DEBT_{it}$	$STBANK_{it}$	$LTBANK_{it}$	$TRADE_{it}$
Large firms (top 33 percentile with respect to *SIZE*)				
MPI_{t-1}	**−0.508***	**−0.980***	**0.027**	**−0.723***
	(2.50)	(4.51)	(0.98)	(5.26)
$MPI_{t-1}{}^{*}PR_i$	**0.593**	**−0.427**	**1.086**	**0.727***
	(1.46)	(1.15)	(1.53)	(2.69)
$MPI_{t-1}{}^{*}PR_i{}^{*}BB_t$	**−0.011**	**0.009**	**−0.019**	**−0.014***
	(1.26)	(1.13)	(1.28)	(2.22)
$MPI_{t-1}{}^{*}BB_t$	**−0.001**	**0.018***	**−0.010**	**0.009***
	(0.31)	(4.08)	(1.63)	(2.91)
Number of firms	7916	7471	5621	7975
Small firms (bottom 33 percentile with respect to *SIZE*)				
MPI_{t-1}	**0.197**	**−1.039***	**−0.338**	**−0.276**
	(1.13)	(3.84)	(1.01)	(1.22)
$MPI_{t-1}{}^{*}PR_i$	**−1.444***	**0.094**	**−0.465**	**−1.545***
	(5.03)	(0.22)	(0.51)	(4.14)
$MPI_{t-1}{}^{*}PR_i{}^{*}BB_t$	**0.041***	**0.007**	**0.008**	**−0.038***
	(6.18)	(0.70)	(0.46)	(4.40)
$MPI_{t-1}{}^{*}BB_i$	**−0.007**	**0.015***	**0.020***	**−0.003**
	(1.76)	(2.33)	(2.00)	(0.62)
Number of firms	6237	5745	3848	6290

Note: *t*-values are given within parentheses below the coefficients; *denotes their statistical significance at the 5% level or higher. Country suffixes are omitted for ease of exposition.

respectively. Small firms generally have less easy access to public capital markets than large firms and their higher bank dependence could imply that their use of bank debt is relatively sticky (note that the private/public firm dichotomy does not already account for differences in firm size, as was mentioned in Section 3). As for leverage, generally high-leveraged firms run a greater risk of financial distress than low-leveraged firms and consequently may be hit more severely by an interest rate rise. This could mean that their debt usage would shrink, especially if a credit channel is at work. If, on the other hand, high leverage means more relationship lending, their use of debt may be relatively insensitive to interest rate changes. For reasons of space, Tables 6a and 6b give the estimated coefficients only for *MPI* and the three interaction terms with the legal form dummy variable *PR*, the financial system indicator *BB*, and the product of the two, respectively (the results for the control variables are qualitatively comparable to Table 5).

The first two sub-samples consist of the top 33 percentiles and the bottom 33 percentiles of the company size distribution, respectively. We measure size (*SIZE*) by the log of total assets. The coefficient of *MPI* is significant and negative in the total debt equation (the first column) for the sub-sample of large firms. This indicates that an increase in the short-term interest rate leads to a significantly smaller use of debt. The cross-terms are insignificant in this equation; hence neither legal form nor financial system seems to matter for large firms' debt financing response to monetary policy. For small firms *MPI* is not significant in the total debt equation, but the interaction terms *MPI***PR* and *MPI***PR***BB* are. They are negative and positive, respectively. These results indicate that especially small private firms use less debt after a monetary tightening,

Table 6b. 2SLS within estimation results for high- and low-leveraged firms: selected MPI coefficients

Y_{it} =	$DEBT_{it}$	$STBANK_{it}$	$LTBANK_{it}$	$TRADE_{it}$
High-leveraged firms (top 33 percntile with respect to *DEBT*)				
MPI_{t-1}	**0.215***	**−1.111***	**0.199**	**−0.033**
	(2.39)	(5.26)	(0.61)	(0.19)
$MPI_{t-1}{}^{*}PR_i$	**−0.453***	**0.188**	**−0.043**	**−0.698***
	(3.33)	(0.64)	(0.54)	(2.60)
$MPI_{t-1}{}^{*}PR_i{}^{*}BB_t$	**0.012***	**−0.004**	**0.009**	**0.020***
	(3.73)	(0.54)	(0.56)	(3.14)
$MPI_{t-1}{}^{*}BB_t$	**0.001**	**0.027***	**0.008**	**0.000**
	(0.48)	(5.64)	(0.90)	(0.19)
Number of firms	8800	8468	5117	8968
Low–leveraged firms (bottom 33 percentile with respect to *DEBT*)				
MPI_{t-1}	**0.371**	**−0.702***	**0.665***	**−0.745***
	(1.09)	(2.79)	(2.65)	(4.01)
$MPI_{t-1}{}^{*}PR_i$	**0.239***	**1.442***	**−0.040**	**1.123***
	(2.72)	(2.31)	(0.50)	(2.36)
$MPI_{t-1}{}^{*}PR_i{}^{*}BB_t$	**−0.046***	**−0.027***	**0.010**	**−0.022***
	(2.37)	(2.01)	(0.60)	(2.11)
$MPI_{t-1}{}^{*}BB_t$	**−0.038***	**0.000**	**−0.024***	**0.000**
	(4.12)	(0.08)	(3.04)	(0.02)
Number of firms	5468	4828	3825	5459

Note: t-values are given within parentheses below the coefficients; *denotes their statistical significance at the 5% level or higher. Country suffixes are omitted for ease of exposition.

although somewhat less so in bank-based economies. This is consistent with the credit channel and the relationship lending channel. The equation for short-term debt shows a relatively strong and statistically significant negative effect of an increase in the short-term interest rate on the use of short-term debt for both sub-samples of large and small firms. The magnitude of the coefficient is not significantly different between the different groups of firms. This confirms the interest rate sensitivity of short-term bank debt found earlier for the whole sample. The type of firm remains an unimportant factor in the short-term bank debt equation for both sub-samples. Hence, there is not much evidence of a bank lending channel here. As for long-term debt, the maturity substitution effect that was observed for the whole sample (Table 5), is no longer significant in the estimations for the sub-samples by firm size (i.e. the *MPI* coefficients are no longer significant in the long-term debt equation). Finally, the combination of the coefficients of *MPI* and *MPI***PR* in the trade debt equation for these sub-samples imply that large public firms and small private firms decrease their use of trade debt, while large private and small public firms hold on to it. Summarizing, Table 6a reconfirms that there is evidence of the broad credit view and the relationship lending channel, but not for the bank lending channel.

The third and fourth sub-sample consists of the top 33 percentiles and the bottom 33 percentiles of the leverage distribution, respectively (Table 6b). Leverage is measured by total debt over total assets (*DEBT*). The combination of the re-estimated coefficients of *MPI* and the cross-term *MPI***PR* in the total debt equation imply that high-leveraged private firms decrease their use of debt after a monetary contraction, whereas low-leveraged private firms increase it. Apparently,

highly indebted firms face higher agency costs than low-leveraged private firms, and therefore have to consolidate their debt structures during a monetary contraction. This is consistent with the credit view. Interestingly, high-leveraged private firms bring back their leverage somewhat less strongly in bank-based economies than in market-based economies (see the positive *MPI*PR*BB* term). This could suggest some effect of relationship lending. Turning to the bank credit equations, the strong and negative reaction of the use of short-term bank debt is again confirmed, that is for both high-leveraged and low-leveraged firms. Again, this negative effect is stronger for high-leveraged firms than for low-leveraged firms. Legal form is relevant for low-leverage firms: low-leveraged public firms reduce their use of short-term loans after a monetary contraction, whereas low-leveraged private firms increase it. High-leveraged firms in bank-based economies are a little less interest rate sensitive than their equivalents in market-based systems, which is consistent with relationship lending. The use of long-term debt increases after a short-term interest rise only significantly for low-leveraged firms. Apparently, the switch from the relatively more expensive short-term debt towards long-term debt is only feasible for low-leveraged firms. Finally, the use of trade debt decreases after a short-term interest rate rise, but only significantly for high-leveraged private and low-leveraged public firms. Table 6b again confirms that there is support to the broad credit view, little evidence for the bank lending channel, and some indication for relationship lending.

5.2 Business Cycle Effects

In a separate analysis we alternatively control for the phase of the business cycle, in order to determine whether there are differential effects of monetary policy dependent on the state of the economy. Our sample period contains one recession year, 1993, which stands out in the data (in this particular year the average level of sales is significantly lower than the sample average). We interact the monetary policy variable with a recession dummy variable *REC*, which takes on the value of one in 1993 and is otherwise zero. In formal terms, the financial system indicator *BB* in Equation 2 is replaced by the recession dummy variable *REC*. Table 7 gives the results. In general, the outcomes confirm the earlier evidence. We find significant and negative effects of the short-term interest rate on all the debt categories (now also for total debt) except long-term debt where the effect is again positive. Interestingly, the coefficient of the cross-term *MPI*REC* is significant in all equations except in the short-term debt equation. Hence, it generally matters for the monetary policy effect on firms' financial decisions whether the economy is in a recession or not. The coefficient of *MPI*REC* is positive in the total debt equation. Its magnitude exceeds the coefficient of *MPI*, which implies that the effect of monetary policy on firms' total debt financing is asymmetric over the business cycle. In the long-term debt equation this cross-term is also opposite in sign to the (positive) *MPI* coefficient, but it does not exceed it, meaning that the switch to long-term funding is smaller during recessions. In a recession a flat yield curve might prevent private banks to supply long-term funds. This cross-term is significant and negative in the trade debt equation, suggesting that the drop in the use of trade credit after a rise in the short-term interest rate is larger during recessions. It should be noted that the short sample period makes it hard to draw firm conclusions on the effect of the business cycle on firms' financing choices. Finally, the cross-terms with the legal form dummy variables *PR* and *QUOTED* are not significant, except in the equation for trade debt. This suggests that the business cycle is a more important factor for the firms' financing responses to monetary policy than the identification of the type of the firm.

Table 7. 2SLS within estimation results: monetary policy indicator interacted with business cycle indicator and financial system indicator

Y_{it} =	$DEBT_{it}$	$STBANK_{it}$	$LTBANK_{it}$	$TRADE_{it}$
INT_{it}	3.944*	2.366*	−0.102	1.695*
	(15.28)	(7.36)	(0.18)	(6.66)
TAN_{it}	−0.126*	−0.141*	0.233*	−0.190*
	(14.36)	(13.09)	(13.80)	(21.61)
$INTAN_{it}$	−0.220*	−0.076*	0.114*	−0.218*
	(13.64)	(3.93)	(4.30)	(13.74)
$SIZE_{it}$	0.067*	0.044*	0.028*	−0.012*
	(31.53)	(15.23)	(7.26)	(5.73)
$DEPR_{it}$	−0.306*	−0.213*	−0.200*	−0.055*
	(13.93)	(8.25)	(4.33)	(2.50)
$EBIT_{it}$	−0.395*	−0.374*	−0.155*	−0.094*
	(35.51)	(23.58)	(10.07)	(8.58)
MPI_{t-1}	**−0.211***	**−0.410***	**0.589***	**−0.287***
	(4.42)	(6.52)	(4.49)	(5.98)
$MPI_{t-1}{}^{*}PR_i$	**0.082**	**0.017**	**−0.108**	**0.126***
	(1.59)	(0.27)	(0.97)	(2.39)
$MPI_{t-1}{}^{*}PR_i{}^{*}REC_t$	**0.033**	**0.000**	**0.054**	**0.050***
	(1.48)	(0.02)	(1.06)	(2.28)
$MPI_{t-1}{}^{*}QUOTED_i$	**0.128**	**0.180**	**0.173**	**−0.143**
	(0.98)	(1.19)	(1.01)	(1.08)
$MPI_{t-1}{}^{*}REC_t$	**0.344***	**−0.107**	**−0.426***	**−0.195***
	(7.12)	(1.80)	(3.00)	(3.96)
PR_i	−0.083	1.671	4.678*	−0.654
	(0.11)	(1.82)	(2.77)	(0.82)
REC_t	−0.041*	0.013	0.043*	0.011*
	(7.73)	(1.94)	(2.96)	(1.96)
INTERCEPT	0.504*	0.050*	−0.040*	0.353*
	(62.86)	(4.56)	(2.92)	(43.52)
R^2	0.099	0.150	0.062	0.074
Number of obs.	81,809	70,574	35,134	82,574
Number of firms	22,813	21,323	14,944	22,960

Note: *t*-values are given within parentheses below the coefficients; *denotes their statistical significance at the 5% level or higher. Country suffixes are omitted for ease of exposition.

6. Conclusions

In this paper we analyse changes in the financing behaviour of firms in response to monetary policy shocks. Our focus is on the differential responses of various types of firms: private versus public, listed versus non-listed, large versus small, high versus low leverage, resident in bank-based versus market-based economies. Our sample consists of these types of firms for the EMU-11 and the UK for the period 1990–1997. Our paper is on the interface between the literature on corporate capital structure and monetary transmission, where the latter involves the broad credit view, the bank lending channel, and the so-called relationship lending channel.

The main conclusions of the analysis are the following:

- There is evidence of the broad credit view, especially when looking at sub-samples by firm size and leverage. Small private firms use less debt after a monetary tightening, although somewhat less so in bank based economies. High-leveraged private firms bring back their leverage after a monetary contraction (private firms less so in bank based economies), while low-leveraged firms do not.
- The differential effects for bank-based versus market-based economies are indicative for the relationship lending channel. Firms in bank-based economies typically are less sensitive to interest rate changes than firms in market-based systems.
- Whereas there is a strong interest rate channel for short-term bank loans, there is little evidence in favour of the bank lending channel.
- Firms switch from short- to long-term loans after a short-term interest rate increase, especially low-leveraged firms.
- It matters for the monetary policy effect on firms' financial decisions whether the economy is in a recession or not.

Overall, we do find evidence of the credit view, but the bank lending channel receives less empirical support than the relationship lending channel. This result asks for more research into the interaction of the bank lending and the relationship lending channels, which requires a broader availability of relationship indicators. Furthermore, we find differences in monetary effects on corporate financing decisions between countries. This heterogeneity appears to relate to differences in market structure, especially whether an economy is bank based or market based. These findings may have relevant implications for monetary policy.

Our study reveals a number of items for future research. First, as we only included limited-liability companies in our sample (in the form of public and private firms), it would be interesting to extend this analysis to non-limited liability firms. We would expect the effects of monetary policy shocks to be stronger for such small businesses. Another issue is the exact dynamics of the impact of monetary policy. This would ask for higher frequency data than the annual dataset available to us.

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Note

[1] To give some examples of public and private firms, respectively, for the larger EMU countries: 'SA' and 'SARL' in France, 'GmbH' and 'AG' in Germany, 'SpA' and 'Srl' in Italy, 'SA' and 'SL' in Spain, 'Plc' and 'Ltd' in the UK, and 'NV' and 'BV' in the Netherlands.

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