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Monetary Policy, Corporate Financial Composition and Real Activity

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The Central Bank of the Republic of Turkey

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by

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Abstract

This paper addresses two fundamental questions about monetary policy, credit conditions and corporate activity. First, can we relate differences in the composition of debt between tight and loose periods of monetary policy to firm characteristics like size, age, indebtedness or risk? Second, do differences in companies' financial compositions matter for real activity of firms such as inventory and employment growth? The paper offers some evidence from firms in the UK manufacturing sector which suggests the composition of debt differs considerably with characteristics such as size, age, debt and risk, it also shows a significant effect from financial composition and cash flow to inventory and employment growth.

Keywords: Monetary Policy, Inventory Investment, Employment, Firm Type

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1. Introduction

In 1991 at the bottom of the UK recession 61% of all debt held by small firms was short-term debt, and the majority was bank loans. As conditions improved over the 1990s bank loans as a share of all finance obtained outside the firm fell, while the ratio of short-term to total debt increased to around 75%. Small firms it seems were more dependent on bank finance than larger firms in the recession, although some would have received no external finance from banks at all. As conditions improved small firms obtained more external finance, but even in the better times small firms were only able to obtain 65-70% of the increase in resources that large firms could obtain from banks for a similar degree of improvement in their net worth. In other words, the sensitivity of lenders to indicators of net worth was much lower for small firms than for larger firms. A similar story could be told for young firms, and firms with above average debts and risk.[2]

These characteristics indicate the changing financial composition of firms' balance sheets at different stages of the monetary and economic cycle, but it also differences with the characteristics of the firm. But why should these compositions change? To some extent this may be a feature of the changing demand conditions, with implications for investment and employment, but it may also be a feature of the financial environment – the monetary climate and the credit conditions facing firms at these times. The changing composition of corporate finance provokes several questions. First, can we relate differences in the composition of debt between tight and loose periods of monetary policy to firm characteristics like size, age, indebtedness or risk? We would need to control for the effects of the economic cycle to do so, and we follow a methodology employed in an earlier study which identifies the contributions of the economic cycle, the monetary cycle and firm-specific characteristics on financial composition. Second, do differences in companies' financial compositions matter for real activity of firms such as inventory and employment growth? Some evidence is emerging to suggest that access to external finance influences inventory investment (Guariglia, 1999, Small 2000, Huang 2003) and employment (Nickell and Nicolitsas 1999) among UK firms. Although this paper is squarely addressed towards

[2] Data are drawn from the FAME database provided by Bureau van Dijk, which is described in more detail in section 3 of this paper.

the experience of the United Kingdom, further research on the behaviour of other financially developed economies would be a useful extension to research.[3]

1.1 The Modgiliani-Miller theorem

According to the Modigliani-Miller theorem, which asserts that a firm cannot increase its value by changing the composition of its liabilities, changing compositions of credit on the balance sheet should not matter for real activity, nor should the source of finance be of any consequence to the firm. Marginal investment decisions should depend only upon the expected rate of return on a project relative to some 'constant' average cost and not on the source of finance. There should be no preference between internal sources of funds from retained earnings and finance from sources external to the firm. Therefore the distinction between intermediated bank finance and market finance from the sale of corporate bonds and equity should be irrelevant.

In reality, however, preferences exist between types of finance and the Modigliani-Miller theorem only holds when capital markets are perfect. Myers and Majluf (1984) indicate that in an imperfect world firms have preference orderings over alternative sources of finance which rank internal sources, based on retained earnings, above external sources, such as trade credit, bank borrowing, and non-bank finance. The hierarchy of finance derives from the additional costs associated with external sources of finance that can be pecuniary or non-pecuniary, i.e. price and non-price terms and conditions, which external providers of finance attach to credit provision. These give rise to an 'external finance premium', which must be paid to secure credit from sources outside the firm. This is the basis for preferences towards internal, rather than external finance and towards lower cost market finance rather than bank finance.

Theoretical attempts to justify the existence of the external finance premium have focused on agency costs associated with asymmetric information in the credit market. Under imperfect information, borrowers have a better idea of their likelihood of defaulting on a loan than do lenders, and this creates agency costs with the possibility of adverse selection and moral hazard, (see Jaffee and Russell, 1976, Stiglitz and Weiss, 1981). Adverse selection arises from the unobservable risks that lenders incur when they use the price of borrowing to ration credit. The higher costs of borrowing increases the proportion of risky firms that seek credit since the higher

[3] Some research on the Euro zone has begun to compare the experiences in various economies (see Angeloni *et al.* 2003, Bond *et al.* 2003, Chatelain *et al.* 2003.

costs of borrowing can only be met by those investors with high returns and the associated high risks. Hence an attempt to ration credit using a pricing mechanism can backfire. Moral hazard, on the other hand, arises from the unobservable objectives of the firm and the incentives that asymmetric information creates for firms to conceal their true performance. Firms may disguise their actual returns from investing borrowed funds in order to avoid repayment of the loan, or alternatively they may engage in more risky projects than the lender would choose (if the lender could observe the choice made by the firm) in order to make higher returns. Once again higher rates on loans may create unintended consequences for the lender.

To counter the adverse effects of asymmetric information through adverse selection and moral hazard, banks have developed as specialist institutions with the capability to overcome these problems through their ongoing depositor-lender relationships with firms. They can match their liability structure to the term to maturity of loans and gather information on the financial background of companies (see Leland and Pyle, 1977; Fama, 1985; Himmelberg and Morgan, 1995). This reduces the exposure of banks to costs incurred through adverse selection (see Diamond, 1984) it can also minimize the likelihood that borrowers will default when they are in a position to pay back the loan because the banks have superior information than the market about financial health from the close relationship they forge with borrowers. Banks are potentially able to use these advantages over arms length lenders in credit markets to offer credit to borrowers who might be excluded from other forms of external finance. However, these forms of credit from banks come at a price, since the banks must cover their costs of maintaining a close relationship with firms.

1.2 Structure of the paper

This paper explores the relationship between monetary policy, the interactions between borrowers and lenders in the credit market, and the real decisions of firms exhibited by inventory investment and employment responses.

We offer a brief review the literature on the credit channel, demonstrating the development of the methodology over the last decade. Here we do not attempt to be all encompassing but we highlight the important themes. The starting point is the effort to distinguish between supply-side and demand-side responses in credit markets to monetary tightening. If we can control for demand-side influences any remaining influences can be attributed to changes in supply responses giving a clear picture about

the relationship between the creditor and the borrower. The use of ratios of different types of credit to total credit allows composition effects to be explored in financial structure, while identifying the shifts in composition with the supply side (c.f. Kashyap *et al.* 1993, Oliner and Rudebusch, 1996). The use of disaggregated, firm-level data has allowed for the heterogeneity of financial circumstances to filter through into these results. Previous results based on aggregated data were limited in this regard since they could only report the average response of the 'representative' firm, even though firms differed considerably in terms of size, liquidity, risk, and so on.

1.3 Purpose, method and findings

An exploration of the links between monetary policy tightening, the financial composition, and the real investment and employment responses of firms is the purpose of this paper. The reported results give an indication of the direction of change of the composition of finance and of the real decisions from a panel of 16,000 UK manufacturing firms over the period 1990-1999. Our sample includes periods of tight and loose monetary policy and an episode of credit market tightening.

The findings we report indicate a substantial response to monetary policy in the composition of corporate finance as rates are tightened, implying that the extent to which the Modigliani-Miller theorem is violated is substantial. This indicates that the 'external finance premium' is sizeable, which motivates the financial accelerator mechanism as a driver of cycles in real variables. Not only is the effect noticeable, but the impact of monetary policy is asymmetric. The far reaching effects of monetary policy tightening affect all firms but they affect small, risky and indebted firms far more than others. These firms are the ones that are most constrained by tightening monetary policy operating through credit supply channels.

We find that the growth rates of inventory investment and employment are also affected by the composition of corporate finance as monetary policy tightens or loosens. We focus on inventory investment and employment growth as indicators of real activity that are relatively responsive over a medium-term horizon. While many studies have considered fixed-term investment, the horizon is much longer for this type of investment than for inventory investment or for employment. Since it depends on the firm's own assessment of future prospects, which is not only difficult to measure but creates its own complications as documented in Bond *et al.* (2004), it is

more straightforward to concentrate on inventory investment and employment growth. In all probability these real decisions are likely to be highly positively correlated.

2. The Development of the Methodology

2.1 The credit channel, bank lending, and balance sheets

The traditional mechanisms by which monetary policy affects real activity operate directly through the impact of interest rates, expectations about future interest rates or inflation, asset values and exchange rates. As far as firms are concerned the direct effect of a change in interest rates weakens their balance sheets by increasing short-term interest payments on existing debt which reduces their cash flow. The higher cost of borrowing and the rejection of marginally unprofitable projects reduces investment levels. This mechanism operates even in a perfectly efficient capital market.

When there are credit market imperfections, however, the credit channel becomes operative. Whilst the monetary transmission mechanism has traditionally focused on the endogenous supply of liquidity at an interest rate determined by the central bank, which refers to the *liabilities* side of the banking sector's balance sheet, the credit channel operates through the banks' *asset* side. The credit view is supported by the twin-pillars of the balance-sheet channel and the bank-lending channel. In other words the balance sheet channel and the bank lending channel are two mechanisms by which the influence of monetary policy can operate through credit supply.

The balance sheet channel indicates that business cycles may be propagated to the extent that the state of firms' balance sheets affects their ability to borrow from external sources of various types. The crucial link is between the availability of funds and a borrower's net worth. The true worth of a firm is not known under imperfect information and therefore indicators of creditworthiness such as cash flow, profitability and previous loan history are used by financial markets or financial intermediaries as measures of financial health. Monetary policy changes can be propagated and amplified through the credit channel as the reduction in cash flow, and the present discounted value of assets for collateral, reduces access to funds for future investment. Endogenous credit cycles and accelerator effects generate cycles in real variables as a result of credit market imperfections c.f. Kiyotaki and Moore (1997).

The bank lending channel focuses exclusively on bank loans as a distinct component of external finance since for some firms they are the primary source of loanable funds. The effects of a monetary contraction are magnified by the reduction

in loans supplied by banks (see Gertler and Gilchrist, 1994, Kashyap, Stein and Lamont, 1994) which amplifies the demand-side effects on expenditure decisions of the private sector. The extent to which the bank lending channel is important depends on the substitutability between internal and external sources of funds and between bank lending and other forms of external finance. Under certain circumstances firms may resort to borrowing from banks (even at a higher rate of interest) if they cannot obtain funds elsewhere. Small and medium sized firms in particular may be unable to access other markets for funds and therefore will be dependent on banks for external sources of funds (see Kashyap and Stein, 1993; Gertler and Gilchrist, 1994; Bernanke and Gertler, 1995). The absence of available substitutes gives rise to dependence on sources of funds from banks and imparts a particular leverage from bank lending to real activity. Hence, the bank lending channel is an extension of the argument that banks are special.

These arguments provide the theoretical basis for the transmission of monetary policy shocks to the corporate sector via the credit channel, but their impact, and the duration of the cycles they may create, is an empirical matter.

2.2 Evidence of credit channels on financial composition

The empirical evidence for the credit channel is difficult to assess. Measures of financial health and the tightness of the credit market have demand-side as well as supply-side effects. Some researchers have used aggregate data to determine the importance of the credit channel. The bulk of the empirical studies are addressed to the United States, where a well-developed commercial paper market offers an alternative (non-bank) source of funds for corporations. But other studies have been carried out on Japanese firms, which draw loans from insurance companies as the main form of non-bank financing (see Hoshi *et al*., 1993), and firms in European countries, where bank finance is the main source of external finance (see Schantarelli, 1995, Sauve and Scheuer, 1999, Allen and Gale, 2000, Angeloni *et al.* 2003, Bond *et al.* 2003, Chatelain *et al.* 2003)

A representative example of such a study using aggregate data from the United States is the paper by Bernanke and Blinder (1992). This research confirms that bank lending to firms contracts after a lag at times of monetary policy tightening as measured by the spread of the Fed Funds over Treasury Bill rates and by dummies variables indicating recessionary conditions based on ‘Romer dates’ (Romer and

Romer, 1990), which are derived from the careful reading of Fed minutes using the so-called 'narrative' approach.[4] There are, however, significant difficulties when interpreting aggregate data since they do not discriminate between demand- and supply-side effects on adjustments to credit balances. Since a positive correlation between bank loans and indicators of economic activity could arise from the demand side as well as from the supply side, these studies are inconclusive about the evidence for a supply-side theory such as the credit channel. They can only document the impact of monetary policy on corporate credit in total.

2.2.1 Demand versus supply effects

Attempts to resolve the identification of the credit channel led researchers to identify robust indicators of monetary policy shifts that allowed them to separate demand and supply effects. Comparison of the 'mix' of bank lending to total external funding at points when there were monetary contractions, rather than the aggregate values of bank lending and other credit, helped to distinguish whether changes to credit obtained from banks and other sources arise from contractions in demand or reductions in supply (see Kashyap, Stein and Wilcox, 1993 and Oliner and Rudebusch, 1996). Demand-side influence is thought to affect both numerator and denominator, leaving the ratio unchanged if the magnitude of the changes is broadly equal, while supply-side influences will lead to a noticeable effect on the numerator alone.

Kashyap, Stein and Wilcox (1993) use a simple framework in which a loans market provides funds for investment activity. Firms face a loan supply from banks that is driven by monetary policy, but is cushioned to some extent by banks' adjustment of their portfolios on the asset side of their balance sheets. An alternative

[4] The use of Romer dates has been widespread in dating business upturns and downturns. Besides the use of Romer dates in Bernanke and Blinder (1992), they are used by Gertler and Gilchrist (1994). The methodology of the Romers based on the reading of FOMC minutes to identify periods when Federal Reserve policy switched to a tougher stance against inflation gave rise to the so-called Romer dates. , the economy experienced a substantial decline in production and employment. The Romers interpret their findings as strong evidence for the effect of monetary policy on real economic activity. More recent investigations of monetary policy have taken a very different approach to the data, but they have reached broadly similar conclusions. A common methodology is to try to identify "monetary policy shocks" where variations in monetary policy cannot be predicted by conventional economic variables. While the literature has not agreed on the means to identify such shocks, the identification of "monetary policy shocks" which cause output and inflation to vary can be used as an alternative to Romer dates to explore the impact on the supply of credit.

source of finance is provided through commercial paper issue. Loans and commercial paper are imperfect substitutes to banks and firms. Firms must decide on the mix between loans and paper. The model can be summarized as follows:

$$\frac{dL}{dM} = \alpha^* \frac{dI}{dM} + I \frac{d\alpha^*}{dM} \qquad (1)$$

$$\frac{dP}{dM} = (1-\alpha^*) \frac{dI}{dM} + I \frac{d\alpha^*}{dM} \qquad (2)$$

$$\frac{d\alpha^*}{dM} = F' \frac{d(r_l - r_p)}{dM} \qquad (3)$$

where *L, P, M, I,* α^*, r_l and r_p denote loans, commercial paper, money supply, investment, the mix, lending rate and paper rate, respectively. The model yields the following insight: the impact of a change in the monetary stance on supply of loans and paper is a function of the mix, and the impact on the mix is a function of the wedge between lending and paper rates (given assumptions of imperfect substitutability between loans versus paper as bank assets and corporate liabilities, the wedge is non-zero).

Equation (1) implies that changes to bank lending can arise from two sources. Changes to the level of investment and to the mix between bank and non-bank finance can both cause bank lending to change as monetary policy alters. Equation (2) shows that a monetary change has the opposite effect on commercial paper finance, so that a reduction in money supply reduces investment and thus the demand for all source of finance as well as paper finance, but the demand for paper finance may increase as a result of substituting paper finance for loan finance. The proposition that monetary policy affects the desired composition of finance (the desired mix being given by α^*) if the paper and loans are not perfect substitutes can be observed from equation (3).

Kashyap, Stein and Wilcox (1993) test the impact of tight monetary policy in the US on the ratio (mix) of bank loans to the sum of commercial paper and bank loan using aggregate data. Monetary policy tightness is determined with reference to 'Romer dates' mentioned previously, the Federal Funds rate and the spread between rates on Federal Funds and Treasury paper. Their empirical evidence for the US shows that tight monetary policy leads to a shift in the firms' external finance from the bank loans towards commercial paper. The decline in bank credit can be ascribed to a reduction in the bank loan supply rather than reduction in the demand for the

bank loans because the ratio is not dependent on demand-side influences. The fact that there is also an increase in the volume of the commercial paper issuance relative to total short-term external finance offers support for the bank lending channel. This result implies that bank loans, commercial paper and other form of finance that are liabilities of firms must be imperfect substitutes.

2.2.2 Dealing with firm heterogeneity

Criticism of this result has been raised because the use of aggregate data does not allow for the impact of heterogeneity between firms. A significant contribution that allows for types of firms in a disaggregated setting can be found in Gertler and Gilchrist (1994), which analyses the different responses of small versus large manufacturing firms to monetary policy in an imperfect financial environment. In their paper, they consider evidence on the importance of the financial propagation mechanism for aggregate activities as a result of monetary shocks. Interest rate increases weaken firms' balance sheets by increasing short-term interest payments on debt (reducing cash flow) and by lowering the value of collateral assets that constrain the borrowers' spending. They also work indirectly as the deterioration of the balance sheet leads to a drop in firms' spending, and as sales in general fall this further reduces their ability to borrow. The timing of these mechanisms accords with the empirical evidence for US economy which shows that the decline in the credit volume and economic activities generally coincide after a 6-9 month period following the tightening of monetary policy. The study emphasises a substantial decline in the activity of small firms during a period of tight monetary policy (mainly due to falling inventory demand), and it is noticeable that the responses of the small and large firms to monetary policy differs considerably. Small firms rely proportionally more heavily on information-intensive financing, that is, they use more bank finance relative to mean manufacturing industry, and generally do not issue so much commercial paper. The informational frictions that increase the cost of external finance apply mainly to younger firms with a high degree of idiosyncratic risk, and to the firms that are not well collateralised. Small firms rely on intermediary credits, while large firms generally use direct credits, including equity, public debt, and commercial paper. The financial constraints are likely to bind for small-scale firms during the recessions rather than in boom periods. Prior to recessions the growth of short-term debt for large firm rises before declining as the recession sets in.

Oliner and Rudebusch (1996) also use firm level data to exploit the heterogeneity of firm responses, raising their point as a 'comment' on the aggregate data study by Kashyap *et al.* (1993). The points raised and the response from Kashyap formed a major debate over the methodology of testing for evidence of the credit channel. Oliner and Rudebusch argue that the Kashyap et al.'s methodology was flawed in two respects: it used aggregate data that could not distinguish between large and small firms, and it relied on an identification procedure for determining supply responses to monetary policy shocks based on the relative movement of bank loans and commercial paper, but only large firms issued commercial paper. This led Oliner and Rudebusch to conclude that Kashyap *et al.* could not distinguish shifts in the relative importance of bank loans and commercial paper for small firms because small firms issued negligible amounts of commercial paper. Their solution to these two flaws was to use disaggregated data that allowed small and large firms to be distinguished from each other, and to redefine the mix to include all types of non-bank debt. The conclusions were that there is no evidence that monetary policy reduces the bank loan supply relative to non-bank finance, but a broad credit channel can be confirmed, functioning through informational asymmetries faced by all types of borrowers. They argue that it is the larger firms rather than the small firms, who rely more on bank finance, and that these issue commercial paper during the contraction.

This set their results at odds with those of Kashyap *et al.* (1996) who argue that even if Oliner and Rudebusch were correct, the reallocation of funds away from smaller firms towards the large firms would not work against the bank lending channel. Kashyap *et al.* (1996) argue that the results in Oliner and Rudebusch (1996) are unsurprising for small firms since the modified mix variables on which the results hinge are meaningless for small firms that have almost no other types of debt except bank debt, while for large firms the results are not comparable (since the measure of the mix differs between the original paper and the comment). What is not in doubt is the existence of different responses to monetary policy according to firm size, and the reply from Kashyap et al (1996) concedes this point

In section 3 and 4 we discuss the impact across a wider range of heterogeneities for UK firms. There are some differences in the nature of corporate finance between the US and the UK that used to be taken into account – such as the lack of a deep commercial paper market in the UK, but the principle of taking ratios of different sources of finance to evaluate the supply response to monetary tightening and

loosening can be applied by examining firms' short-term debt relative to total debt or their total debt to current liabilities over the monetary policy cycle for different types of firms.

2.3 Real decisions – investment, inventories and employment

2.3.1 Theoretical models

The asymmetric information argument which develops a relationship between access to external finance and indicators of net worth, creditworthiness and collateral assets also generates endogenous cycles in real variables. The paper by Kiyotaki and Moore (1997) is a classic statement of this relationship. Hubbard (1994) and Bernanke, Gertler and Gilchrist (1996) indicate that there is an external finance premium, which increases with declining net worth of the borrower, and this in turn affects investment, employment and production.

Using a more general version of the model of Kashyap *et al.* (1993) we can illustrate the point. We can define a simple model of the demand for a real variable by $R = R_d(Y,k)$, where $R = I, H, N$ equates to investment, inventory investment or labour demand. The demand for each real variable is dependent on the business cycle and therefore is sensitive to income, Y, and is also sensitive to the cost of external finance, k. Since external finance is obtained from the market and from banks in proportions (1- α) and α, we can define the cost of external finance as[5]:

$$k = r_p + \alpha^*(r_l - r_p) - f(\alpha^*) \qquad (4)$$

Here α^* is the optimal proportion of bank to market finance, and $f(\alpha^*)$ is a relationship indicating the benefits of a relationship between the bank and the firm, increasing in the proportion of credit obtained from banks, α^*.

Changes in the real variable are then given by the relationship $dR = R_y dy + R_k dk$ and the resulting equation for the determinants of changes to investment gives:

$$dR = R_y dy + R_k dr_p + R_k \alpha^*(dr_l - dr_p) \qquad (5)$$

[5] The cost of capital reflects the cost of obtaining funds from two sources: bank loans and commercial paper markets according to their respective interest rates. Here $f(\alpha^*)$ is a relationship indicating the benefits of a relationship between the bank and the firm, increasing in the proportion of credit obtained from banks, α^*. Kashyap *et al*. (1993) use this simplified arrangement to reflect the cost of capital as a weighted average, but this is controversial since Stiglitz (1973) argues that we need to focus on the marginal source of funds, not a weighted average. The pecking order of finance which is central to Fazzari *et al*. (1988) has a similar implication.

The third term on the right hand side is a product of the financial mix and the change in the spread between loan and paper rates of interest. It disappears when loans and commercial paper are perfect substitutes, leaving the changes in income and the commercial paper rate of interest as the sole determinants of changes in real activity. When loans and paper are imperfect substitutes, the hypothesis that financial composition affects real decisions can be tested by adding the share of bank loans in total short-term finance (the mix variable) as an independent variable into an investment equation in addition to interest rate variable in a framework of heterogeneous firms.

2.3.2 Evidence from indicators of real activity

Substantial evidence has accumulated to show that investment and inventories are affected by the financial circumstances that firms face (c.f. Fazzari, Hubbard and Petersen (1988), Gertler and Gilchrist, 1994, Carpenter *et al.* 1998, Hall *et al*. 1999, Bond *et al.* 2003, Chatelain *et al.* 2003). In the US there is a large literature that estimates the impact of financial constraints on fixed capital and inventory investment by firms beginning with the seminal article by Fazzari, Hubbard and Petersen (1988) (FHP hereafter). After determining whether firms were likely to be financially constrained on the basis of their size, dividend payouts and capital structure FHP establish whether this characteristic determines how sensitive firms are to the supply of internal funds measured by cash flow. The highest sensitivities to cash flow are found for firms categorized as financially constrained, and this is taken to indicate that financial constraints were binding in this case. Other studies following the same methodology as summarized by Hubbard (1998) draw similar conclusions.

This important paper is not without its critics. A weakness of the FHP approach is that financially constrained firms are identified with the endogenous variable dividend payouts. It is suggested that firms with low dividend payouts are financially constrained and should show sensitivity in investment equations to cash flow. An alternative route for identification is by way of institutional characteristics, and there are several papers that follow this approach, including Hoshi *et al.* (1991), who find investment of 24 Japanese firms that are not part of a financial group or 'keiretsu' are more sensitive to cash flow that 121 other firms they examine that are affiliated to keiretsu. Povel and Raith (2004) also identify firms as financially constrained or unconstrained on the basis of the internal funds at their disposal. Their

view is that firms with negative internal funds will be more sensitive to cash flow and firms with positive internal funds. Cleary et al (2004) uses current assets less current liabilities and inventories over capital, and Guariglia (2004) uses the coverage ratio as an alternative measures of internal funds for the same purpose of identifying firms likely to be sensitive to cash flow.

More recently Kaplan and Zingales (1997, 2000) have argued that the classification adopted by FHP on the basis of the dividend payout tends to assign firms incorrectly. Using more detailed information in financial statements from annual reports to classify the same firms over an identical sample period into three categories 'financially constrained', 'possibly financially constrained ' and 'not financially constrained', they find financially constrained firms have the *lowest* sensitivity of investment to cash flow. On a larger data set, Cleary (1999) also finds that the most constrained firms have the lowest sensitivity. FHP have responded to this accusation by suggesting that the extra information in manager's annual reports are subjective and potentially self-serving interpretations rather than objective statements of fact about the financial position of a firm.

Although Kaplan and Zingales (1997) and Cleary (1999) might appear to contradict FHP it is consistent to conclude from their work that distressed firms have reduced cash flow sensitivity. It then follows that for severely constrained firms the relationship proposed by FHP might be reversed. Besides this argument, there are other reasons to be cautious in interpreting cash flow sensitivity as indicating financing constraints before establishing whether cash flow forecasts future profitability or sales growth (see Bond and Cummins, and Bond *et al*. 2004). Investigation of the impact of the mix of finance that the firm obtains on investment and employment is less dependent on these weaker parts of the argument.

On theoretical grounds there are further critiques of the FHP approach. A small but significant literature makes the point that cash flow may mis-measure investment opportunities. This point is addressed in empirical studies by Hubbard and Kashyap (1992), Gilchrist and Himmelberg (1995), Erickson and Whited (2000), Cooper and Ejarque (2003), Carpenter and Guariglia (2003)**.** Very recently some recent papers question from a theoretical perspective whether the cash flow coefficient is informative about credit constraints e.g. Aydogan (2003), Abel and Eberly (2004).

Recent evidence from Guariglia (1999), Small (2000) and Vermeulen (2002) shows that these effects on real variables can also be found in European countries.

Guariglia (1999) considers UK manufacturing firms in a panel spanning 1968-1991. The firms are classified into financially constrained firms and those that are unconstrained. Using the coverage ratio, the short-term debt to sales ratio, and the leverage ratio to indicate the balance sheet position of firms, and a dummy variable to indicate the stage of the monetary cycle (broadly recessions and expansions), these variables are interacted in order to establish the sensitivity of inventory investment to financial conditions. The results indicate that inventories of the constrained firms are more sensitive to financial conditions than those of the unconstrained firms. A similar conclusion is found by Small (2000) over the period 1977-94 for quoted UK firms drawn from Datastream.

Vermeulen (2002) takes data from the BACH database for manufacturing firms for four large EU countries, Germany, France, Italy and Spain for the period 1983-1997, separating them into different industries and firm sizes (small, medium and large). Identifying the behaviour of the cycle using industrial production data, he then considers the effects of financial health in 'downturns' and 'out of downturns'. Financial health is measured using ratios of total debt to total assets, short-term debt to current assets, short term debt to total debt and the coverage ratio in much the same way as Guariglia (1999). The results indicate that small firms are much more affected by the four measures of financial health in periods of downturns than medium or large firms, although some medium sized firms with weak balance sheets are susceptible in downturns.

In general firms that are financially constrained, or are small firms and therefore likely to be financially constrained, have greater sensitivity to financial conditions than larger or unconstrained firms. This being the case, if the financial structure of the firm is affected by monetary policy conditions to a greater degree according to heterogeneous characteristics such as size, riskiness and indebtedness, and if investment in stock or fixed capital are affected likewise, then the financial choices of firms will have real implications. The remainder of the paper documents the qualitative influence of firm-specific characteristics on financial composition, inventory investment and employment decisions for UK firms over the monetary policy cycle.

3. Data

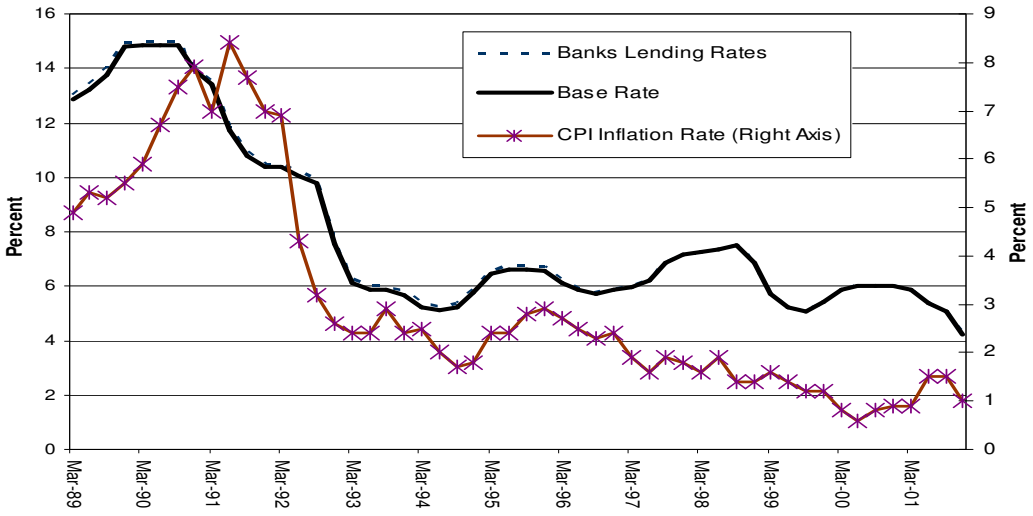
The purpose of the remainder of this paper is to tease out the effects of monetary policy on firms according to their type using ratios similar to Kashyap *et al.* (1993) and GMM estimations of the real effects of these compositions and financial constraints following Nickell and Nicolitsas (1999), Bond *et al.* (2003). We do this by observing the composition of corporate finance during periods of monetary policy tightness and looseness. We then evaluate the response (if any) of real variables to the financial composition after controlling for monetary policy and other influences on real activity.

The basis for our empirical work is the large database of corporate finance and activity provided by the FAME database through Bureau van Dijk. The FAME database covers all UK registered companies offering up to 11 years of detailed information for about 500,000 large, small and medium sized UK companies. The great advantage of this database is the large number of firms that are covered, the diversity of their characteristics, the relatively long time span of the panel overlapping a full monetary cycle with tight and loose periods of policy, and the coverage of unquoted as well as quoted firms. This last characteristic distinguishes the data from other sources for the UK such as *Datastream* since they do not hold data on unquoted firms.

3.1 Measuring monetary policy

Our sample contains a tight and a benign period of monetary policy in the United Kingdom corresponding, respectively, to the tightening of 1990-92, where interest rates were increased in order to meet the exchange rate driven objective of monetary policy, and the period 1993-99, where the objective of monetary policy was inflation targeting, and interest rates were reduced as inflation fell to low levels by recent standards. Our measure of the monetary policy stance is the level of the rate of interest set by the Bank of England (the repo rate), which is comparable to the Fed Funds rate used in US studies as the preferred indicator of monetary conditions by Bernanke and Blinder (1988, 1992), Kashyap *et al*. (1993), Gertler and Gilchrist (1994), and Oliner and Rudebusch (1996). Figure 1 indicates the behaviour of the interest rates and inflation over the sample period.

Figure 1: Interest and Inflation Rates in the UK



3.2 Sampling procedure and firm-specific characteristics

The FAME database covers all UK registered companies offering 11 years of detailed information for large, small and medium sized UK companies, where size is defined in Table 1.

Table 1: Definitions of Small and Medium Sized Firms

Criteria	Small Sized Companies	Medium Sized Companies
Turnover	Maximum £2.8 million	Maximum £11.2 million
Balance Sheet	Maximum £1.4 million	Maximum £5.6 million
Number of Employees	Max 50	Max 250

Source: DTI web page.

We construct a sample of 16,000 manufacturing firms from the FAME Database extracted by satisfying two of the following three criteria:

- Firms whose activity is classified as manufacturing according to the 1992 SIC UK Code in England, Scotland, Wales and Northern Ireland.[6]

[6] For the majority this activity is their primary activity but for 940 firms (5.7 percent of the total sample manufacturing is a secondary activity.

- Firms that were established prior to 1989 and were still reporting in years 1999 and 2000.[7]

We take particular interest in the specific characteristics of the firms in our sample since we wish to determine the behaviour of firms according to their 'type'. We identify four features with sub-categories as follows: size - small, medium and large firms; risk - risky and secure firms; debt - indebted and not-indebted firms; and age - young and old firms. Previous studies have tended to address one or possibly two of these categories, the most commonly chosen being size. However, there are reasons to think that many of these characteristics are important and we should control for as many as possible without exposing ourselves to the problems of multicollinearity. These four measures are chosen as some of the most important characteristics that affect a firm's access to external finance.

We divided firms into size categories based on criteria given in Table 1 where firms should satisfy at least two criteria to be classified into a group.

Risk assessments are provided by the QuiScore, a measure produced by Qui Credit Assessment Ltd that evaluates the likelihood of company failure in the twelve months by giving a number in the range 0 to 100. The analysis is based on current conditions and on post mortems of failed companies. The range may be considered as comprising five distinct bands, the details of which are reported in Table 2. Firms in bands one and two are relatively secure, while firms in band four are four times as likely to fail as the firms in band three, and are risky. Firms in band five are almost certain to fail unless they take immediate action to remedy the situation. We assess relatively risky firms (those in bands four and five) against relatively secure firms (in band one and two).

[7] In fact, only 3 percent of the firms in the manufacturing industry stopped reporting during the period 1990-1999. This may have stemmed either from a failure of the company or because the company was exempted from reporting its performance for a period according to the DTI rules. The sample is not a balanced panel because it has some attrition.

Table 2: The QuiScore Measure of Risk

Band Name	Score	Band Description
The Secure Band	81-100	Companies in this sector tend to be large and successful public companies. Failure is very unusual
The Stable Band	61-80	Again company failure is a rare occurrence and will only come about if there are major company or marketplace changes.
The Normal Band	41-60	The sector contains many companies that do not fail, but some that do.
The Unstable Band	21-40	Companies in this band are on average four times more likely to fail that those in the Normal Band.
The High Risk Band	0-20	Companies in the High-Risk band are unlikely to be able to continue trading unless significant remedial action is undertaken.

Source: QuiScore Assessment Ltd.

Gearing of the firm is defined as the ratio of total loans to shareholder funds. This measure of indebtedness can be used to determine those firms that are 'highly-indebted' or 'low-indebted'. We determine these as the firms that have a level of gearing in the highest or lowest quartile of the gearing distribution, respectively.

Using the year of incorporation for all firms we classify firms by their age so that those incorporated before 1975 are called 'old' while those incorporated between after 1975 but before the beginning of our sample are called 'young' firms. This measure is relative and the cut off date is arbitrary, but it defines those firms that have been in existence for a long period compared to those that are relatively new.

The distribution of firms across size categories in our sample and the number of reported firms by year are shown in Figure 2. The number of medium and large firms grew over the sample period parallel to increase in the number of firms that reported balance sheet items while the number of small firms grew in the early 1990s but declined by mid 1990s.

Figure 2: Distribution of the Firms Across Size Based on Balance Sheet

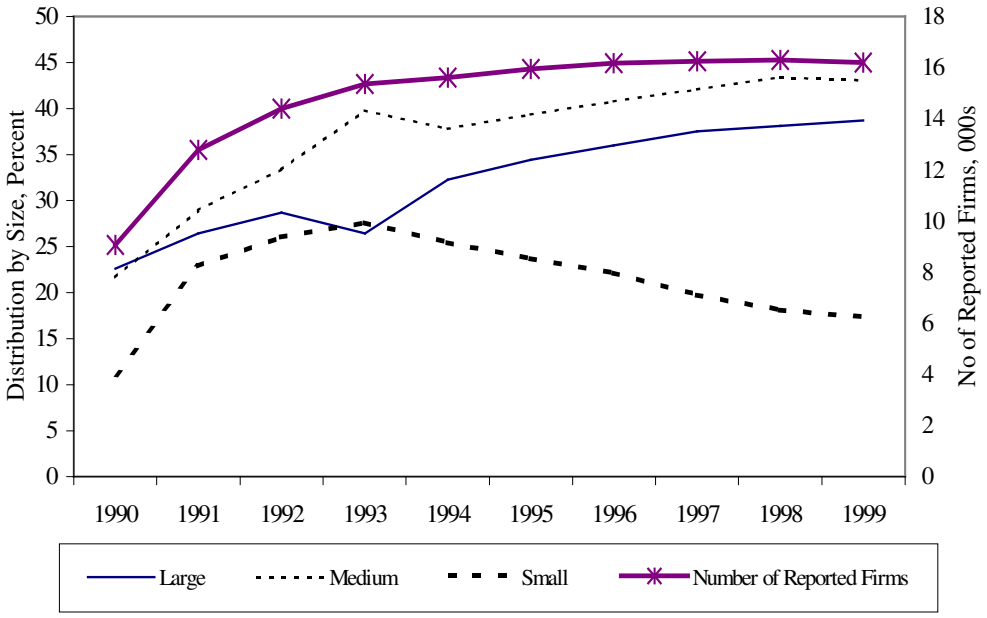


Figure 3 records the distribution of firms across QuiScore bands which highlights the impact of the recession in the early 1990s on the firms' financial health. As we might expect the shares of the firms in the fourth and fifth bands are higher during the recession (white column) than during the recovery period (shaded column), the share of the firms in the secure and stable bands are higher during the upswing period. In other words, in our sample we have more risky firms during the recession than during a recovery. Other priors can be confirmed with our sample. For example, large and old firms have on average higher ratings than small and young firms, which have inadequate collateral assets and no track record. The small and the young are more likely to be subject to financial difficulties in the period of slowing down, and this is reflected in the QuiScore.

Figure 3: Distribution of Firms Across QuiScore

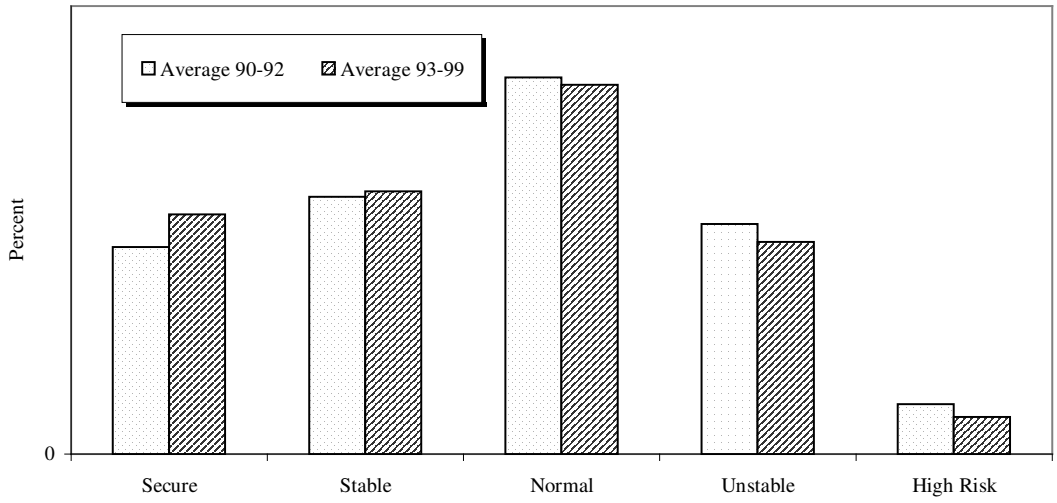
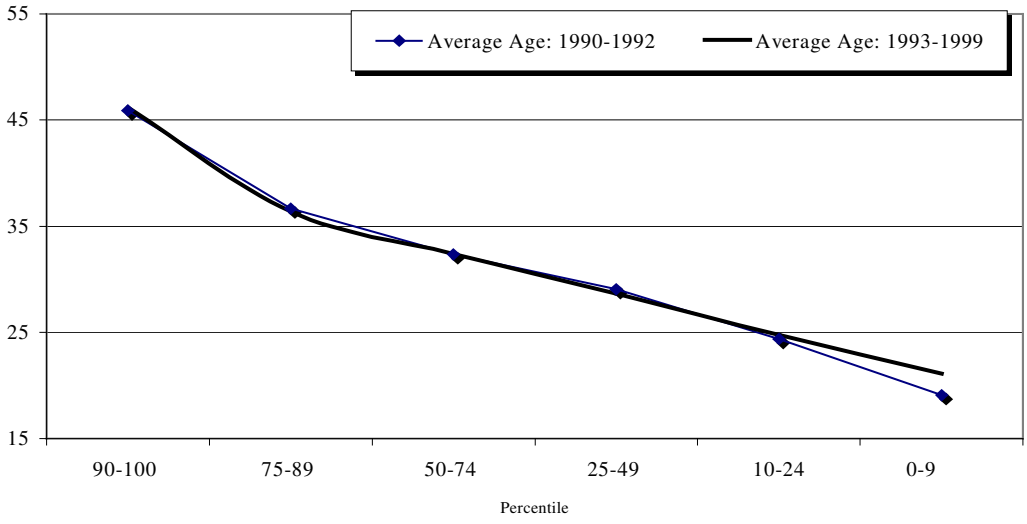


Figure 4 shows the average age of the firm by size in the tight and the loose monetary policy periods. It is clear from the distribution that to some extent the larger firms are also the older firms, and that the distribution changes little according to the monetary cycle. The only change that is discernible is a slight reduction in the average age of very small firms, otherwise the two lines for each stage in the monetary cycle lie almost exactly on top of each other.

Figure 4: Average Age Across Firm Size in Monetary Cycle



3.3 *The composition of corporate finance*

The data that we examine includes data on all types of debt obtained by firms, which is split into short-term and long-term debt, and into bank and non-bank loans. In the study of US firms by Kashyap *et al.* (1993) they compare the ratio of bank loans to bank loans plus commercial paper, but in the UK, where there is not a significant commercial paper market, the more relevant consideration is the ratio of short-term to longer term debt from bank and non-bank sources. Therefore we consider the short-term debt relative to total debt, where short-term debt refers to the debt with the maturity of one year while long-term debt has a maturity more than a year. The evidence in Figure 5 shows that while short-term debt is made up of a variety of components including bank overdrafts, short term-group and director loans, hire purchase, leasing and other short-term loans, it is predominantly but not exclusively bank finance for small and medium sized enterprises (SMEs). This is important in the context of the debate between Kashyap *et al.* (1993, 1996) and Oliner and Rudebusch (1996) since our ratio or mix variable measures the relative movement of bank loans to other forms of finance – and it is important that the other forms of finance should show some movement otherwise the advantage of taking ratios is lost for the identification exercise. In this paper we focus on short-term and long-term debts and on total versus current liabilities which are broad measures of the total debts owed by firms. Total liabilities is made of short-term debt, trade credit and total other current liabilities that include some forms of finance resembling commercial paper or bonds, long term debt and other long-term liabilities. Our measures of financial composition for the firm indicate the maturity mix of the debt between short-term and long term debt, and the relationship between short-term debt which is mainly but not exclusively bank loans and other forms of debt from non-bank sources.

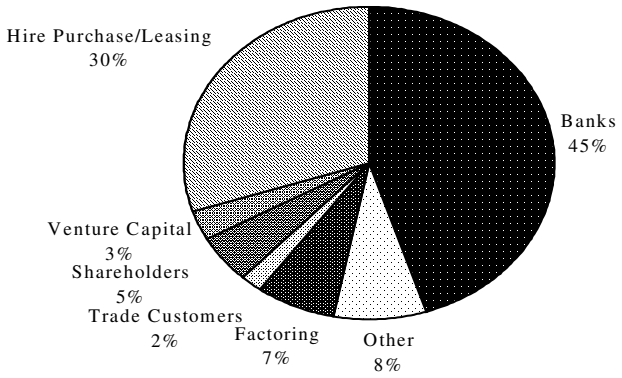
Table 3: Distribution of Firm Liabilities

	Percentiles of the distribution					
	0-10 Perc.	**10-24 Perc.**	**25-49 Perc.**	**50-74 Perc**	**75-89 Perc.**	**90-100 Perc.**
1990-1992 Average (1)						
Current Liabilities	85.88	84.21	81.56	79.35	75.80	61.08
Trade Creditors	27.00	27.41	32.22	31.11	28.02	23.69
Short Term Loans & Overdrafts	21.42	20.11	25.15	30.26	31.58	21.81
Total Other Current Liabilities	37.45	36.70	24.19	17.98	16.20	15.58
Long Term Liabilities	14.12	15.79	18.44	20.65	24.20	38.92
Long Term Debt	10.49	11.35	13.20	15.24	17.34	21.40
Total Other Long Term Liab.	3.64	4.44	5.24	5.41	6.85	17.52
1993-1999 Average (2)						
Current Liabilities	82.72	84.84	81.77	81.01	78.13	62.85
Trade Creditors	20.46	21.42	25.59	25.94	22.57	13.28
Short Term Loans & Overdrafts	31.82	24.50	26.97	31.43	33.77	25.92
Total Other Current Liabilities	30.44	38.91	29.20	23.64	21.79	23.65
Long Term Liabilities	17.28	15.16	18.23	18.99	21.87	37.15
Long Term Debt	13.50	10.39	13.80	15.10	17.38	21.44
Total Other Long Term Liab.	3.78	4.78	4.44	3.89	4.50	15.71
Ratios (1)/(2)						
Current Liabilities	1.04	0.99	1.00	0.98	0.97	0.97
Trade Creditors	1.32	1.28	1.26	1.20	1.24	1.78
Short Term Loans & Overdrafts	0.67	0.82	0.93	0.96	0.94	0.84
Total Other Current Liabilities	1.23	0.94	0.83	0.76	0.74	0.66
Long Term Liabilities	0.82	1.04	1.01	1.09	1.11	1.05
Long Term Debt	0.78	1.09	0.96	1.01	1.00	1.00
Total Other Long Term Liab.	0.96	0.93	1.18	1.39	1.52	1.11

The distribution of these liabilities is reported in Table 3 for the early 1990s when monetary policy was tight and in the subsequent loose period; these episodes

coincided with a period of recession and recovery in the UK economy. This means that tabulated averages cannot give an unambiguous indication of the changing financial composition of firms due to credit channel effects because they cannot determine that part of the adjustment that results from the cycle and that which results from monetary policy changes.[8]

Figure 5: Sources of external finance for small and medium-sized firms, 1995-1997



Four stylised facts are uncovered from the sample. First, small firms tend to use more short-term finance and current liabilities constitute a larger part of the total liabilities for small firms than for large firms. Banks may have avoided extending long-term funds to firms who are poor in terms of collateral and track record, and if this is the case then it suggests net worth is a determinant of external finance composition. It may also indicate that smaller firms were more adversely affected by the cycle than larger firms. Second, the average short-term debt constitutes a larger proportion of current liabilities in the second period compared to the first period. The shift in the short-term debt finance between these time periods is more significant for small firms than for medium sized or large firms. This result may confirm the fact that tight monetary policy leads to a lower level of short-term debt finance for all firms but the reduction in the short-term debt finance is more severe for small and weak firms in terms of collateral. Alternatively, it may be a reflection of the fact that small firms are more severely affected by the cycle than medium or larger firms. Third, small firms

[8] Our later analysis using panel regressions controls for the cycle and this allows us to identify the changes with monetary policy effects operating through the credit channel.

shifted to other short-term liabilities such as trade credit and other current liabilities to compensate for the decline in the short-term bank loans in the first period. This is documented in greater detail in Mateut *et al.* (2005). The increase in the short-term non-bank liabilities relative to short-term debt is generally claimed as evidence of a bank lending channel (Kashyap *et al*., 1993), while the difference in the composition of short-term liabilities across firms size can be considered as evidence of the broad credit channel once the effect of the cycle have been taken into account (Oliner and Rudebusch, 1996). Fourth, although average long-term debt increases gradually with the firm size, the increase in the other long-term liabilities increased very sharply implying that large firms have greater flexibility in raising funds from non-bank sources.

3.4 Cross Variable Correlations

In Table 4 we record the cross variable correlations between our three independent variables that indicate the financial composition of firms in our sample, and their characteristics given by gearing, age, real asset holdings, risk score and collateral assets. There is a relatively low correlation between the explanatory variables suggesting that the information each variable contains is independent of the information in other variables used to explain the variation in the ratios in tight and loose periods of monetary policy. The mild positive correlation between the short-term debt to total debt ratio (STD/TD) and the negative correlation between total debt to total liabilities ratio (TD/TL) and many of the explanatory variables such a gearing, age and real assets in the tight period reflects the tendency for firms to obtain more short-term debt in total debt during tight periods of monetary policy. The opposite signs in the loose period shows that these tendencies are reversed when policy eases. A better risk score has a consistent positive effect on both ratios in both periods, while having more collateral assets increases total debt to total liabilities but reduces short term debt to total debt ratios in both periods.

Table 4: Correlation Coefficients across Variables (p-values in the parenthesis)

Tight Period								
	STD/CL	TD/TL	STD/TD	GEAR	AGE	RASSET	SCORE	COL
STD/CL	1.00							
TD/TL	0.84	1.00						
	(0.00)							
STD/TD	0.01	0.00	1.00					
	(0.24)	(0.53)						
GEARING	0.24	0.28	0.00	1.00				
	(0.00)	(0.00)	(0.93)					
AGE	0.00	-0.03	0.07	-0.05	1.00			
	(0.97)	(0.00)	(0.00)	(0.00)				
REAL ASSETS	0.01	0.20	0.03	0.03	0.32	1.00		
	(0.17)	(0.00)	(0.00)	(0.00)	(0.00)			
RISK SCORE	-0.01	-0.39	-0.07	-0.30	0.21	0.09	1.00	
	(0.11)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)		
COLLATERAL	0.01	0.15	-0.22	-0.01	0.07	0.10	0.01	1.00
	(0.03)	(0.00)	(0.00)	(0.06)	(0.00)	(0.00)	(0.01)	
Loose Period								
	STD/CL	TD/TL	STD/TD	GEAR	AGE	RASSET	SCORE	COL
STD/CL	1.00							
TD/TL	0.79	1.00						
	(0.00)							
STD/TD	0.05	-0.08	1.00					
	(0.00)	(0.00)						
GEARING	0.22	0.24	-0.02	1.00				
	(0.00)	(0.00)	(0.00)					
AGE	0.00	0.00	0.01	-0.03	1.00			
	(0.27)	(0.36)	(0.04)	(0.00)				
REAL ASSETS	0.02	0.20	-0.06	0.03	0.30	1.00		
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)			
RISK SCORE	-0.06	-0.34	-0.06	-0.31	0.16	0.04	1.00	
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)		
COLLATERAL	0.00	0.13	-0.30	-0.02	0.07	0.09	0.05	1.00
	(0.89)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	

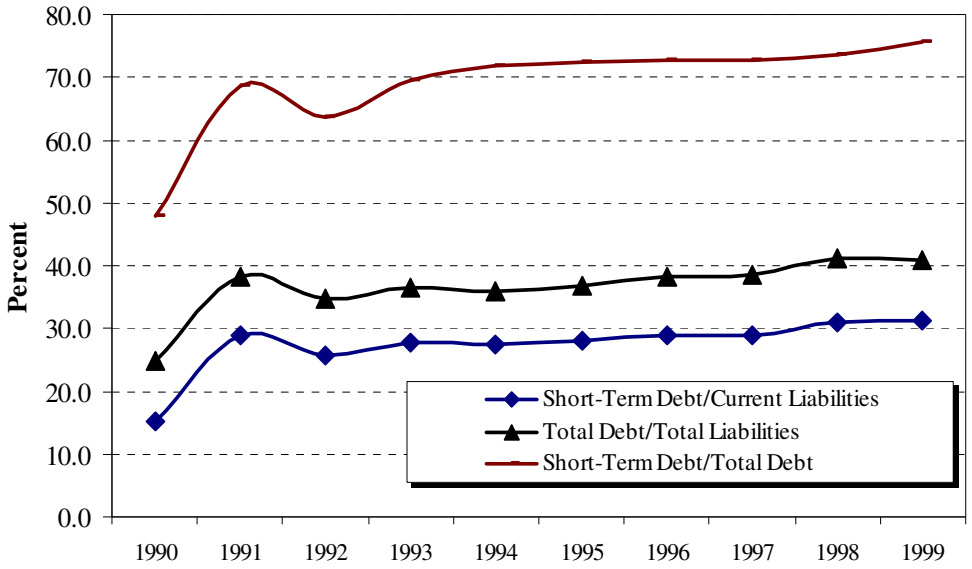
Note: STD = short term debt, TD = total debt, TL = total liabilities, CL = current liabilities.

3.5 The empirical approach

We consider the financial composition of firms' balance sheets based on ratios corresponding to short-term debt to total debt and total debt to total liabilities. The former ratio allows us to make inferences about access to market finance versus bank finance while the latter indicates the overall availability of external debt (i.e. total

debt). We observe from the time series of the average values of these ratios that during the early 1990s the financial composition varied significantly from the later period of looser monetary policy and economic expansion.

Figure 6: Financial Mixes for All Firms



These are the ratios we seek to explain in our initial set of estimates before we examine whether the ratios have explanatory power for real investment in inventories and employment. Our assessment focuses on the response of financial composition to interest rates after conditioning on other potential influences such as the economic cycle and year effects. We differentiate between firms according to asset size, credit rating, solvency, indebtedness and age, therefore we can determine whether monetary policy tightening influences firms' according to their type. We can then conclude whether monetary policy has asymmetric effects for different types of firms.

We specify our empirical model for explaining firms' financial composition using the following function.

$$MIXi=f(BRATE, MPR_p, BRATE*TYPE_j, BRATE*TYPE_j*MPR_p, BRATE*MPR_p, TYPE_j, RASSET, SCORE, AGE, COL, GEAR, GDP, YEARD)$$

where *MIXi* refers to the three different ratios STD/TD, TD/TL and STD/CL that we use to investigate the financial composition of firms, indexed 1, 2, 3. The explanatory variables *BRATE*, *MPR*, *TYPE*, *RASSET*, *SCORE*, *AGE*, *COL*, *GEAR*, *GDP*, and *YEARD* denote the Bank of England's base rate, the monetary regime dummies, the firm type dummies, real assets, the credit score, the age of firms, the ratio of tangible

assets to total assets, the gearing ratio, the GDP growth rate and year dummies respectively. $BRATE*TYPE_j$, $BRATE*TYPE_j*MPR_p$, and $BRATE*MPR_p$ are interaction terms that capture the impact of firm types and monetary regime periods.

Two-time period dummies are assigned to reflect two different monetary policy regimes, MPR_p, namely tight monetary policy period of 1990-1992, *TP*, loose monetary policy period of 1993-1999, *LP*, respectively.

TP= 1 if t=1990-1992 *LP =1 if t=1993-1999*

= 0 otherwise *= 0 otherwise*

Firm type dummies *(TYPE)* consist of eight different binary variables reflecting eight different firm characteristics i.e. small, large, risky, secure, young, old, highly indebted, and less indebted. We could use only one dummy for each firm characteristic, namely size, rating, age, and indebtedness (as in case of monetary regime dummy) to carry out our regressions but instead we use two dummies for each firm type to capture the reactions of firms in the upper and lower tails of the distribution. For example, for the size we carry out estimations by using interactions for both small and large firms as we do not intend to measure the reactions of the middle-sized firms. This method enables us to identify the reaction of firms in the tails of firm distribution for a particular type of firms.

$TYPE_j = 1 \quad j = 1 \ldots.8$ *and zero otherwise*

$BRATE*TYPE_j$, $BRATE*TYPE_j*MPR_p$ and $BRATE*MPR_p$ are the interaction terms that are vitally important for this study. They enable us to make inferences about the impact of monetary policy on firm's financial behaviour considering different monetary policy regimes and firm heterogeneities. Interaction terms in the first group show the extent to which the impact of monetary policy differs across firms with different characteristics, while the second group is made up of interaction terms that consider both monetary policy regime and firm characteristics interacted with the monetary stance variable. The third group identifies the impact of monetary policy across the tight policy regime period.

The *interactions terms approach* enables us to have a more parsimonious model with a larger sample size and thus greater degrees of freedom. Interaction of monetary policy stance with firm type, *BRATE*TYPE*, or with both firm type and sub-periods $BRATE*TYPE*MPR_p$ do the same job as splitting the data into sub-samples.

Using this method we expect to find that there is a relationship between the monetary stance variable and financial composition, after controlling for firm-specific

characteristics, if there is a credit channel of monetary policy. When monetary policy tightens, we should find along with the earlier literature that credit supply also tightens, and for certain types of firms this will be reflected in changing compositions of finance at such times compared with more benign periods when monetary policy is looser.

For our second question relating to the financial composition and the cash flow of the firm to real activity measures we use a different model:

$$GINV_t = f(GINV_{t-2},\ GINV_{t-3},\ GS_{t-2},\ GS_{t-3},\ MIX_{t-2},\ MIX_{t-3},\ CF_{t-2},\ CF_{t-3},\ RINVS_{t-2},\ RINVS_{t-3}\ MIX_{t-2}*TYPE_j,\ MIX_{t-3}*TYPE_j,\ CF_{t-2}*TYPE_j,\ CF_{t-3}*TYPE_{jj})$$

where *GINV* is the dependent variable the growth in inventories, *GS* is the growth in sales, *MIX* is the financial composition measure, *CF* is cash flow and *RINVS* is the ratio of inventories to sales. The *MIX* and *CF* variables are interacted with the firm type as defined above. First differences of GDP growth, the interest rate, some firm-specific characteristics, and individual year dummies, are added to the instrument set. The model is dynamic and we implement the *Arellano-Bond GMM* two step estimator, which requires the choice of a set of instrumental variables made up of suitable lags of the dependent variable, endogenous (or predetermined) variables and the first difference of exogenous variables. We use lags of predetermined variables and the lagged dependent variables as instruments to obtain consistent estimates and we impose the following linear moment restrictions $E[(\varepsilon_{it} - \varepsilon_{i,t-1})Z_{i,t-j}]$ for $j= 2,3,$ $t=1991, \ldots, 1999$ where $Z_{i,t-j}$ is the instrumental variables matrix.

We use two lags of the dependent variable, in addition to other endogenous (or predetermined) and exogenous variables as explanatory variables in the model[9]. The specification of the econometric model is verified by examining whether serial autocorrelation can be found in the residuals and the whether the Sargan test rejects the overidentifying restrictions.

The dynamic equation for employment growth is similar and is defined as

$$GEMP_t=f(GEMP_{t-2},\ GEMP_{t-3},\ GS_{t-2},\ GS_{t-3},\ MIX_{t-2},\ MIX_{t-3},\ CF_{t-2},\ CF_{t-3},\ GRTA_{t-2}\ \ GRTA_{t-3}\ GW_{t-2},\ GW_{t-3}\ MIX_{t-2}*TYPE_j,\ MIX_{t-3}*TYPE_j,\ CF_{t-2}*TYPE_j,\ CF_{t-3}*TYPE_{jj})$$

[9] Bond (2002) suggests that too many instruments may result in over-fitting biases especially in small samples. A restricted set of instruments that is obtained by deleting columns for the least informative instruments, generally very early lags of instruments, produce more coherent estimates for long time series. For the models that include endogenous variables, over-fitting problem leads to biased estimates.

where *GEMP* is the dependent variable the growth in employment, *GRTA* is the growth in the capital stock and GW the growth in wages. All other variables are similar to the inventory equation. First differences of GDP growth, the interest rate, some firm-specific characteristics, and individual year dummies, are added to the instrument set.

In this second set of estimates we investigate the dynamic response of investment and employment to indicators of firm type such as size, age, riskiness etc, but also to the monetary policy conditions, demand conditions proxied by sales, and to the financial choices of the firms. If there are real effects of monetary policy, these will be captured to some degree by the impact of monetary stance on investment and employment decisions of firms, and firm-specific factors will also play a part. If there is additional influence from the financial composition of the balance sheet then this will provide strong evidence that financial structure of the balance sheet has an impact for real decisions. We can also establish whether firms that are likely to be credit constrained show sensitivity in inventory investment and employment equations to cash flow according to firm types.

4. Results

Our first set of results in Table 5 indicates the response to a one percentage point change in the interest rate during the tight period of monetary policy for each of the financial ratios – short-term lending to current liabilities, and short-term debt to total debt. Types of firms that are likely to be credit constrained will have negative and significant responses to interest rate tightening while those that are constrained have positive responses to the same interest rate increase. The table shows that the types of firms that might be more vulnerable such as small, risky, young and indebted types of firms typically have significant negative signs for both ratios, with a few exceptions, while large, secure, older and less indebted firms have significant positive signs. This gives a clear indication that the former type of firms on the upper row of the table experience a reduction in short-term debt relative to total debt when interest rates increase and are more likely to be credit constrained in some respects than the firms in the lower row, adjusting the composition of their finances as a consequence.

Table 5: Response in financial ratios to interest rates by type of firm

Type	**Small**	**Risky**	**Young**	**High Debt**
Response in STD/CL	-0.036***	-0.016	-0.038***	-0.003***
Response in STD/TD	-0.083***	-0.005	-0.090%***	0.041***
Type	**Large**	**Secure**	**Old**	**Low Debt**
Response in STD/CL	0.035***	0.001***	0.012***	0.015***
Response in STD/TD	0.105**	-0.018*	0.047***	-0.083***

Notes: the responses in each case report the response in the financial ratio to a 1% increase in the interest rate in the tight period of monetary policy and its significance level. STD = short-term debt, CL = current liabilities, TD = total debt. Significance is indicated by *** (1%), ** (5%), * (10%).

The fact that small, risky, young and high debt firm responses have negative signs indicates that they reduce their short-term debt in current liabilities and in total debt as interest rates increase. This is consistent with the hypothesis that some of the small and young firms are excluded from the short-term debt market in periods of tight monetary policy. Large, secure, old and low debt firms typically increase their short-term debt relative to current liabilities and total debt in tight periods of monetary policy. The thinking here is that although the cost of borrowing has increased for all types of debt for these types of firms, they gain greater access to shorter-term debt compared to longer-term debt, because suppliers are more likely to prefer to lend short in tightening conditions. In one respect the firms are constrained (they cannot access as much long-term debt as they would like) but these firms can access short-term debt.

The extent to which firms become more sensitive to increases in interest rates as policy shifts from a loose stance to a tight stance is indicated in Table 6. This table presents the ratio of the responses in tight versus loose periods of monetary policy when interest rates increase by a percentage point. We use the measure of short-term to total debt to indicate the extent to which firms adjust the composition of their liabilities on the balance sheet. Small firms and young firms stand out as particularly sensitive during tight periods of monetary policy, because they have high ratios, compared with large and old firms, which are in excess of five times the sensitivity in loose periods. The differences in the responses between tight and loose periods are not so stark for risky versus secure firms or highly indebted versus low debt firms.

Table 6: Relative responses to interest rates in periods of tight and loose policy by type of firm

Type	**Small**	**Risky**	**Young**	**High Debt**
Relative response in STD/TD	5.19	2.50	5.50	2.00
Type	**Large**	**Secure**	**Old**	**Low Debt**
Relative response in STD/TD	1.50	3.00	1.47	1.00

Notes: the responses in each case report the relative response in ratio of short-term debt to total debt with a 1% increase in the interest rate in the tight period versus the loose period of monetary policy. STD = short-term debt, TD = total debt.

In Table 7 we report the excess sensitivity of firms according to their type in tight periods of monetary policy. The figures show the degree to which comparable firms differ in their responses to interest rates according to several characteristics by adjusting their financial composition as interest rates increase in tight periods. The fact that all the responses are greater than one indicates that there is excess sensitivity to interest rates among the more vulnerable types of firms namely small, risky, young, and indebted firms.

Table 7: Excess sensitivity of the response in financial ratios by type of firm in tight periods of monetary policy

Comparison	**Small v. Large**	**Risky v. Secure**	**Young v. Old**	**High Debt v. Low Debt**
Response in STD/CL	1.90	1.03	1.65	1.28
Response in TD/TL	1.08	1.14	1.00	1.64

Notes: the excess sensitivities are the relative responses in tight periods of monetary policy by types of firms that are comparable. STD = short-term debt, CL = current liabilities, TD = total debt, TL = total liabilities.

Our second set of results report the responses of real activity variables such as the growth in inventory investment and in employment to changes in the financial composition of the firms' balance sheet after controlling for monetary conditions, demand effects and firm-specific characteristics. Table 8 summarises the findings by reporting the sign and significance of the response to the ratio of short-term debt to current liabilities. With exceptions of large firms the responses are positive and highly significant for both the growth of inventories and growth of employment. This suggests that firms are sensitive to the composition of their balance sheets and respond to changes in the balance sheet that are brought about by monetary policy through the

credit channel. It is worth pointing out also that these effects are detected after controlling for the impact of monetary policy on inventory and employment growth through interest rates.

A further supporting argument for the importance of credit conditions on real activity of firms is the significant positive effect of cash flow. If firms are not credit constrained they should not be sensitive to cash flow since they are not solely dependent on internal funds. In the results we report we find that for all firms cash flow is important.

Table 8: Response of real activity to financial composition and cash flow

Financial Composition				
	Small	**Risky**	**Young**	**High Debt**
Response in inventory growth	0.345***	0.086***	0.167***	0.247***
Response in employment	0.467***	0.085***	0.159***	0.098***
	Large	**Secure**	**Old**	**Low Debt**
Response in inventory growth	-0.058***	0.278***	0.296***	0.231***
Response in employment	-0.008***	0.088*	0.069**	0.139***
Cash Flow				
	Small	**Risky**	**Young**	**High Debt**
Response in inventory growth	0.036***	0.025***	0.032***	0.025***
Response in employment	0.126**	0.043***	0.009***	0.037***
	Large	**Secure**	**Old**	**Low Debt**
Response in inventory growth	0.007***	0.038***	0.005***	0.040***
Response in employment	0.018*	0.073***	-0.004***	0.046***

Notes: the responses in each case report the magnitude and significance of the response of real activity variables to the ratio of bank loans to current liabilities, and to the measure of cash flow. Significance is indicated by *** (1%), ** (5%), * (10%).

Our results for the United Kingdom relate to the period of loosening monetary policy and general expansion after an episode of recession. The findings indicate a positive relationship between the ratio of short term debt to current liabilities and real activity variables such as the change in inventory investment and employment. We can therefore confirm the procyclical relationship between inventory investment and short-term debt identified in Bernanke, Gertler and Gilchrist (1996). Kashyap, Stein and

Lamont (1994) also find a positive relationship between changes to inventories and financial constraints, but their US study implies this is binding mainly for tight periods of monetary policy. Our results on employment growth also match those of Nickell and Nicolitsas (1999), who find that financial pressure has a direct impact on employment by firms. Since we find a positive correlation between employment growth and access to external finance we confirm their result in a later sample.

5. Conclusions and future directions

The results reported above indicate that for the United Kingdom there is strong evidence of a change in the composition of corporate financial structure over the course of the monetary policy cycle. This changing structure in turn affects the real activities of firms measured by inventory investment and employment growth. This is a confirmation of other studies using UK panels from earlier sample periods such as Bond and Meghir (1994), Guariglia (1999), Nickell and Nicolitsas (1999), Small (2000) and Bond *et al.* (2003) to name but a few. The question we need to address in conclusion is whether this is a representative result that applies to other countries. The most intensively studied economy, the United States, seems to have a comparable experience as results from Bernanke and Blinder (1988, 1992), Fazzari et al (1988), Kashyap *et al.* (1993), Gertler and Gilchrist (1994), document. However, there are reasons to be more cautious about other economies with differing financial structures and industrial organisations such as Japan and the eurozone countries.

The first reason to explore more widely to investigate the response of financial composition to the monetary policy cycle and the behaviour of real activity to financial liability structure is that the response is determined to some degree by the financial system in each country. Financial systems deal differently with the asymmetric information problem from country to country. It is possible that firms in more market-oriented financial systems, such as the United States and the United Kingdom, show greater evidence of changing financial composition because the markets in a wider range of financial liabilities are more developed and are accessible without prohibitive barriers to entry. This may manifest itself in lesser sensitivity to cash flow and the financial composition in employment and investment equations than for more relationship based (bank oriented) economies. Allen and Gale (2000) indicate that there are significant influences on credit and financial composition from the structure of the financial system. The United States and the United Kingdom are

identified as a more market-based systems in which firms raise the majority of their finance from retentions and a greater part of the remainder from market sources as opposed to loans. Germany and France by contrast raise much less finance from internal sources, and rely more heavily on banks: the percentages of funds obtained from banks in Germany and France is roughly double that of the US and the UK. Equity market capitalisation as a percentage of GDP is far higher in the UK than in Germany, and corporate control is exercised by the financial markets rather than banks. A study of investment in fixed capital in Belgium, France, Germany and the UK by Bond *et al*. (2003) shows different sensitivities to cash flow from countries along the organisational spectrum[10]. The financial system argument infers that the arrangement of financial systems may offer incentives and constraints on the adjustment of balance sheets that creates the differences in the responses of financial composition, inventory investment and employment across countries.

A second possible reason to be cautious about the interpretation of our results is that firm and industry level characteristics may be correlated, and specific to a particular sample or country. We condition for firm-specific effects such as size, age, risk and debt and find that financial composition varies with one or more of these characteristics. Technically, there could be some circularity in the reasoning here since - as Eichenbaum (1984) pointed out - it is difficult to know whether a firm is financially constrained because it is small, or small because it is financially constrained. Risky firms are often high debt firms, while secure firms are low debt firms, but other than these related attributes (and the expected negative correlations between old and young, small and large firms etc) the correlations between variables should be low. For our sample we find that the correlation between size and other characteristics is low, and there are no two characteristics that have a correlation greater than 0.46 in absolute terms. Although we might expect size to be correlated with other characteristics that indicate firms are less likely to obtain external finance, we find that not all small firms have other adverse characteristics from the point of view of gaining access to external finance. Nevertheless the impact of scale, riskiness, indebtedness in an absolute sense on the behaviour of firms in particular samples or countries.

[10] Bond *et al.* (2003) take the financial system to be an important consideration in explaining cross-country differences in cash flow sensitivity, although they are careful to state that other factors might be the cause of the differences, and state that more research is needed.

Third, the effects of industrial structure may have a distinct influence on the sample composition and may be responsible for the results for particular countries. Should the industrial composition change, then the responses of the country over the monetary cycle may be more or less pronounced. Recent evidence documents that differences in industry characteristics are important determinants of investment sensitivity to cash flow. For example Dedola and Lippi (2004) and Peersman and Smets (2004) have found industries differ widely in terms of characteristics such as the capital-intensity or borrowing capacity and that these features then affect the sensitivity of investment to indicators of credit constraints. These differences between industries are powerful enough to dominate the differences between countries.

These reasons act as a prompt to further research on a range of other countries where these features can be measured and their influence documented. Responses in financial liabilities and real activity may be driven by deep features of the financial system and the firm or industrial composition of country samples, but only further research will find out the extent that these issues matter. Some research by Angeloni *et al.* (2003), Bond *et al.* (2003), Chatelain *et al.* (2003) has begun to make comparisons between countries in the eurozone. What seems to be evident at the present is that for more market based economies such as the United States and the United Kingdom, where access to external finance from market sources is widespread, the composition of finance varies over the monetary policy cycle and significant variation in the growth of inventory investment and employment results.

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