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Abstract

This paper contributes to the literature by introducing the nexus between financial constraints and the capital-labour uptake and by considering the capital-labour ratio to overcome the problems that have plagued investment literature -regarding the investment-cash flow sensitivity of constrained and unconstrained firms- that have focused only on investment ignoring employment decisions. The inclusion of the employment along with the capital can provide clear evidence about firms' decisions on their allocation of funds between capital and labour. To detect any possible variation in our results across firms we use a sample of 17,350 quoted and unquoted UK firms over the period 1994-2004 and we estimate it applying panel data techniques. It is shown that balance sheet indicators such as leverage and cash flow result in lower K/L ratio, while the collateral ratio has a positive effect on the K/L ratio. In addition, when we differentiate the effects of the firm-specific characteristics across firms that are more or less financially constrained, we find that the former category exhibits a lower capital-labour ratio. Lastly, our results indicate that monetary policy shocks have an effect on the K/L ratio of more constrained firms.

1. Introduction

The analysis of the determinants of firm financial behaviour has long been a key research field in microeconomics**.** A growing number of theoretical and empirical studies have shown that the financial positions of firms are important for their fixed investment and employment decisions under imperfect financial markets. More specifically, Fazzari, Hubbard, Petersen (1988) (hereafter FHP) investigate the impact of cash flow on investment arguing that cash flow tends to have a bigger effect on the investment of firms more likely to face financial constraints. This evidence is taken at face value for the existence of financial constraints. Debate over the investment cash-flow sensitivity has been fueled by the work of Kaplan and Zingales (1997) (hereafter KZ). Contrary to previous research, KZ's results strongly suggest that firms that appeared less financially constrained exhibit significantly greater investment-cash flow sensitivities than firms in the more constrained group. Adding to this debate, Pratap (2003) shows how a dynamic model of firm investment with financial constraints and non-convex costs of adjustment of capital can explain these two facts. He argues that a high sensitivity of investment to cash flow is an indicator of financial constraints, however investment may be insensitive to cash flow for a subset of constrained firms due to non-convexities in the adjustment cost. On the other hand, Cantor (1990) and Sharpe (1994) investigate the role of financial constraints and firm specific characteristics on firms' employment behavior in economic downturns. They show that small and highly indebted firms experience greater volatility in their employment over the business cycle. Nickell and Nicolitsas (1999) and Benito and Hernando (2002) examine the effect of financial pressure on firms' employment decisions and find evidence of large effects of financial pressure on employment. Lastly, in a dynamic model of labour demand, Rendon (2001) show that in an environment of imperfect capital and imperfect labour markets, firms use more temporary contracts instead of permanent to relax financial constraints.

Although the relevance of financial constraints on firms' investment and employment decisions has been examined thoroughly, the literature has ignored the impact of capital market imperfections on firm-level capital-labour (K/L) ratio. This is surprising given that funds could be allocated differently when firms have to consider capital and labour simultaneously rather than independently. This evidence leads to the following questions. How do firm-specific characteristics and financial constraints affect the choice of firms' K/L ratio? Is there evidence of an heterogeneous K/L uptake amongst firms? In examining diagrammatically rich data of UK manufacturing firms for the period 1994-2004 we show that constrained and unconstrained firms use a different level of K/L ratio. In fact, small firms face a lower capital-labour ratio in contrast with large firms. How different uses of capital-labour ratio between constrained and unconstrained firms are explained? In this paper, it is argued that it is the financial position of firms and the capital market imperfections that drive the heterogeneous capital-labour uptake among firms.

Recent evidence suggests that financially constrained firms employ less capital (Garmaise, 2006). Garmaise develops a theoretical model of the optimal capital and labour management strategies for firms to undertake given the limited access to credit. He predicts that financially constrained firms will exhibit declining labour productivity over time, will have lower capital-labour ratios and will allow more employee autonomy and production in groups. The predictions of his model are confirmed also empirically[1]. However, he doesn't examine the firm-level K/L ratio in depth, neglecting a number of factors -such as the firm-specific characteristics, the monetary policy stance and financial constraints based on firms' financial health- that could affect firms' decisions on K/L ratio.

Having identified the gap in the literature, we seek to fill it by considering a new dimension of financial constraints and firms' financial choices. In particular, we focus on the nexus between financial constraints and firm-level K/L ratio with emphasis on different types of firms[2]. The contribution of the paper to the literature is twofold. First, we examine the behaviour of constrained and unconstrained firms in the UK regarding their decisions on K/L ratio. Given that a firm's choice to use either capital or labour largely depends on its financial position, financial constraints become a central element. It is a common knowledge that external funds determine capital investment up to a point. On the other extreme, internal sources is the key ingredient for labour investment. Hence, it is of particular interest to examine how constrained and unconstrained firms allocate their total funds on K/L ratio when decisions on capital and labour have to be taken simultaneously. Second, the advantage of our approach is not only that we introduce the employment to check how firms allocate their funds on K/L ratio, but also we avoid the problems that have plagued previous empirical investment studies that have focused only on investment thus ignoring employment decisions[3].

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[1]Owner's characteristics, indices for the bank concentration and rejections of owner's loan applications are considered as proxies for financial constraints.

[2] Firms are classified to more or less financially constrained using a wide range of criteria. There are quite a number of alternative approaches attempting to achieve this separation based on criteria such as the dividend payout ratio (Fazzari et al., 1988), size and age (Devereux and Schiantarelli, 1990, Carpenter et al, 1994, Gertler and Gilchrist, 1994) and collateral ratio (Carpenter and Petersen, 2002; Almeida and Campello, 2004; Guariglia and Mateut, 2006).

[3] The investment model cannot give us a straight answer on the FHP (1987) and KZ (1997) debate on the investment-cash flow sensitivity.

Whereas the existing evidence on investment cannot provide a definitive answer, our approach makes a further prediction. To make our point clear we consider the following example. Under the assumption of constant returns to scale (CRS), we examine the decisions of firms on their allocation of internal funds between capital and labour. For financially unconstrained firms the capital-labour ratio should remain constant as their sales increase. Constrained firms by definition can not invest optimally in capital[4]. For the latter group of firms the capital-labour ratio will decline. Both cases are consistent with a positive correlation between investment and cash flow. However, in the first case there is a zero correlation between cash flow and the capital-labour ratio while in the second case the correlation is negative.

Thus on the question that arises from the above example as to which of the two firms can be characterized as a financially constrained, the investment model cannot give us a definitive answer since a positive correlation between capital and internal funds can be interpreted either way (FHP (1988) and KZ(1997) debate). Nevertheless, the introduction of the capital-labour ratio can help us to overcome this problem and make a more precise characterization between constrained and unconstrained firms.

The FAME data set is utilized to find proxies for capital market imperfections and a variety of financial variables as firm-specific characteristics[5]. The advantage of using such a rich financial data is that it allows us to test empirically Garmaise's (2006) theory and to compare our results on financial constraints with the existing literature (FHP (1988), KZ (1997)). Additionally, our analysis addresses the effect of monetary policy indicators-described by interest burden, on firms' capital-labour ratio decisions. To our knowledge, this is the first study to present evidence of a link between capital-labour ratio and firm-specific characteristics under imperfect capital markets.

Our results show that firm-specific indicators are important determinants for firm's decision on capital-labour ratio. Further, when firms are divided into more and less financially constrainted, it is found that firms with limited access to financial markets exhibit a lower capital-labour ratio compared to the unconstrained firms. In addition the capital-labour ratio of constrained firms was found to be more sensitive to monetary policy than capital-labour ratio of unconstrained firms. In particular, firms were found to decrease K/L due to substantial debt service obligations.

[4] This will be the case if capital investment is lumpy as suggested in the investment literature

[5] One appealing feature of these data is that the majority of firms are relatively small and not publicly traded, therefore more likely to face financial constraints.

The remainder of the paper is laid out as follows. In section 2 we provide a brief analysis of the hypotheses used to form the basis of our empirical work. Section 3 illustrates a preliminary data analysis and presents our classification schemes. In section 4 we present our baseline specifications and our econometric methodology. In section 5 we discuss the estimation results while in section 6, some robustness tests are presented. Section 7 concludes.

2. Testable Hypotheses

The theoretical foundation of this paper comes from Garmaise (2006), who provides theoretical and empirical evidences for the capital-labour decisions of financially constrained and unconstrained firms. However, he studies mainly the worker-firm relationship, putting much less emphasis on the capital-labour decisions of firms. This discussion leads us to the formulation of our first hypothesis.

Hypothesis 1A: Firms facing financial constraints cannot buy capital. They can only hire labour.

Hypothesis 1B: Unconstrained firms can buy capital and hire labour, however capital is the preferred investment for them.

Financial status is a vague term for describing firms' net worth and a number of balance sheet indicators have been used in the literature as measures of financial healthiness (see Bond and Van Reenen (2006), for a survey). Guided from the theoretical and empirical literature on firms' financial constraints, we propose the following hypothesis.

Hypothesis 2: Balance sheet indicators should be important determinants on firms' decisions on their allocation of internal funds between capital and labour.

As noted in the introduction, investment empirical studies have focused only on investment- cash flow sensitivities ignoring employment decisions. Based on the inclusion of employment along with the capital and the presence of capital market imperfections we propose the following hypothesis.

Hypothesis 3: Financially constrained firms exhibit a higher K/L - cash flow sensitivity compared to the unconstrained group.

An important aspect of this study is the consideration of a monetary shock and its effect on the K/L ratio. Motivated by Mojon *et al.* (2002) who find that changes in the level of interest rates have an impact on firms' investment, we want to examine whether this holds for the K/L ratio. The next hypothesis can be formulated as follows.

Hypothesis 4: Capital-labour ratio should be more sensitive to monetary policy for constrained firms that face high interest payments.

3. Classification Schemes and data analysis

This section illustrates the sample separation criteria along with a descriptive and graphical presentation of the data. The data are presented in primarily graphical form to illustrate variation in the cross-sectional distributions of outcomes and how these have varied over time. This provides a precursor to the more formal analysis of how capital-labour ratio, of various types of companies, responds to financial constraints.

3.1. Sample Separation Criteria

To depict responses of firms to capital market imperfections, we first have to partition them according to whether they are more or less likely to face financial constraints. Following the bulk of the literature we create three different binary variables which reflect six different firm characteristics i.e small, large, young, old, bank dependent and non bank dependent firms, using the 25 percent cut-off value. We then allow firms switch across firm categories over time [6].

Our first separation scheme is an indicator of the firm's bank-dependence, called the *mix*. It is defined as the ratio of the firm's short-term debt to its total debt and it was introduced by Kashyap *et al.* (1993)[7]. The *mix* attempts to measure the extent to which a firm has to finance itself short term rather than long term and is therefore related to its access to long term finance. The higher the *mix*, the more bank-dependent is a firm. Thus, it is more likely this firm to be characterized as a constrained firm. We create a dummy $MBANK_i$, which is equal to 1 if firm i's *mix* is in the top 75% of the distribution of the mixes of all firms belonging to the same industry as firm *i* in year *t* and equal to 0 otherwise.

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[6] For this reason, our empirical analysis will focus on firm-years rather than simply firms. See Bond and Meghir (1994), Kaplan and Zingales (1997), Guariglia and Schiantarelli (1998), and Guariglia (2000) for a similar approach.

[7] Oliner and Rudebusch (1996) and Peersman and Smets (2005) used a closely related variable (short term debt / total short term debt) in their test for the presence of a bank lending channel of transmission of monetary policy and subsequently used by Guariglia and Mateut (2006).

Our second scheme is based on the firms' real total assets. We generate a dummy variable, $SMALL_{it}$, which is equal to 1 if firm i's real assets for firm *i* is in the bottom 75% of the distribution of the real assets of all firms operating to the same industry as firm *i* in year *t* and equal to 0 otherwise. Gertler and Gilchrist (1994) used this variable as a proxy for capital market access for the manufacturing sector[8]. It would be expected small firms to face a different K/L ratio compared to their large counterpart.

In the last scheme, firms are classified according to their age in order to measure the importance of a track record. An old established firm is more likely to have access in the capital market compared to a young and growing firm. Hence, it is more likely young firms to face problems of asymmetric information[9]. Therefore, we create the dummy $YOUNG_{it,}$ which is equal to 1 if age for firm *i* is in the bottom 75% of the distribution and equal to 0 otherwise.

3.2. Data Description and Graphical Analysis

We construct our data set from the profit and loss, balance sheet and cash flow data gathered by Bureau Van Dijk Electronic Publishing in the FAME database. The data set includes a majority of firms which are not publicly traded. This is an appealing characteristic of the data set as it allows our measures of capital market imperfections to display a wide degree of variation across observations in our sample. Having data on private as well as public companies is particularly valuable in our case, as the private companies are generally the smallest, youngest, and most bank dependent firms. They are therefore more likely than public companies to face financing constraints.

Our sample is limited only to firms that operate in the manufacturing industry and we provide information on financial accounts and ratios for *17,350* UK manufacturing firms for the years 1994-2004. We impose the restriction that the firm has at least 3 consecutive time-series observations per company, with the number of years of observations on each firm varying between 3 and 10. This produces an unbalanced sample of manufacturing companies. By allowing for both entry and exit the use of an unbalanced panel partially mitigates potential selection and survivor bias. Since some firms do not report most of the years, we start our empirical analysis with *14,700* firms. Finally, to control for the potential influence of outliers, observations in the variables that have very large dispersion are excluded[10].

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[8] Bougheas *et al.* (2005) and Guariglia and Mateut (2006) based their group classification on the firm's total real assets.
[9] This classification criterion has been employed in the past by a number of researchers (Devereux and Schiantarelli (1990), Carpenter *et al* (1994), Gertler and Gilchrist (1994)).
[10] See appendix for outliers.

We now turn to the graphical illustration of the data. It is really important to depict the variations of the variables that the capital-labour ratio consists of (capital stock, number of employees). This is to confirm that our econometric results are not driven only by changes in capital. In other words, we want to see whether both capital and labour change across time. Comparing Figures 1 and 2, we observe that both capital and labour follow the same pattern across time. They both exhibit an increasing trend although capital is rising at a higher pace during the mid to late 90's.

Next the distribution of the capital-labour ratio, leverage, collateral, cash flow and interest burden are considered for constrained and unconstrained firms. Figure 3 indicates that the K/L ratio evolves differently across groups. In particular, the K/L ratio for small firms varies between 0.15 and 0.25 across years while the K/L ratio for large firms is consistently higher with the lowest value to be 0.15 and the highest to be 0.45. Leverage, which is defined as the ratio of total liabilities to firm's total assets , is depicted in Figure 4. It can be seen that small firms exhibit higher levels of debt compared to large firms. Figure 5 depicts the cash flow. It is clear, that small firms have a higher cash flow position in contrast to large firms perhaps indicating that financially constrained firms feel the pressure to maintain a positive cash flow cushion under capital market imperfections. The ratio of tangible assets over firm's total assets (collateral ratio) for small and large firms is illustrated in Figure 6. We observe that the level of collateral for small firms is higher compared to large firms' collateral level. One would expect large firms to have high collateral ratios since they can access capital markets without restrictions. However, Berger and Udell (1998) found evidence that riskier firms are more likely to pledge collateral to access the debt financing. Finally, Figure 7 indicates, that small firms pay statistically and economically a significantly higher average interest on their debt than large firms.

Overall, the above graphical analysis indicates that small firms characterized by a relatively high use of debt and stronger cash flow are associated with lower levels of K/L ratio. This can be seen as very preliminary evidence in favour of the hypothesis of the different impact of market imperfections on the K/L ratio. A very similar picture emerges by examining the descriptive statistics in Table 1.

4. Methodology

This section describes the empirical approach and presents the baseline models. We first state our main hypothesis: financial constrained firms are likely to have lower capital-labour ratio compared to their unconstrained counterparts.

We estimate the following static linear model:

$$y_{it} = X_{it}\beta + F_{it}\gamma + e_{it} \qquad (1)$$

where i =1,2,…,N refers to a cross section of firms, t =1,2,…,T refers to time period. y_{it} and X_{it} are the dependent variable and the vector of non financial explanatory variables for the firm i and year t, respectively. In particular, the dependent variable is the log of capital-labour ratio $(K/L)_{it}$, where K is the replacement value of firm's capital[11] and L is the number of employees. The vector of non financial variables consists of $PRICE_{it}$, the log of real price – the ratio of industry variable user cost of capital to firm level wages- and $SALES_{it}$, the log of real sales. F_{it} denotes the vector of financial variables for the firm i and year t. e_{it} is the error term made up of five components: ψ_i is firm-specific component, ψ_t is a time-specific component, ψ_j is an industry-specific component, ψ_{jt} is an industry specific component which varies across time and lastly ε_{it} is an idiosyncratic component[12].

We estimate the model taking a *Within Group* (*WG*) estimation approach, which treats ψ's as a firm-specific disturbance and assumes that explanatory variables and ψ's are correlated. The decision between *WG* and *RE* hinges on whether there is correlation between the individual effects and the included regressors. For this purpose we conduct the Hausman specification test (Hausman, 1978). The null hypothesis is rejected indicating that the fixed effects estimator is more appropriate in estimating our model[13]. Furthermore, to support the choice of the *WG* estimation technique, we cannot assume strict exogeneity of our regressors and firm-specific variables such as leverage, cash flow and collateral should not be treated as exogenous variables. However *WG* estimator may be affected by the endogeneity bias. For this reason the model is also estimated using the Static *First-Differenced GMM*[14] estimate which considers both the endogeneity bias and the unobserved heterogeneity problems.

The set of financial variables that we incorporate in our model is in line with the existing empirical literature. More precisely, we define $COLLATERAL_{it}$ as the ratio of tangible assets

[11] The replacement value of capital stock is calculated using the perpetual inventory formula (Blundell *et al*.,1992; Bond and Meghir, 1994). See Appendix for more details.
[12] Firms are allocated to one of the following nine industrial groups: metal and metal goods; other minerals and mineral products; chemicals and man made fibres; mechanical engineering; electrical and instrument engineering; motor vehicles and parts, other transport equipment; food, drink and tobacco; textiles, clothing, leather and footwear and others (Blundell *et al.*, 1992)
[13] If the model is correctly specified and if individual effects are uncorrelated with the independent variables, the fixed effect and the random effect estimators should not be statistically different.
[14] The Arellano, Bond (1991) GMM estimation was carried out in *Stata* 9.2 (Roodman, 2005).

to total asset. A large body of previous research points out the importance of collateral for debt finance[15]. Moreover, we employ $LEVERAGE_{it}$ which is defined as the ratio of total liabilities to total assets. Following Heisz and LaRochelle-Cote (2005) we expect that high leverage firms i.e the financially vulnerable firms that face high agency costs and have high levels of capital constraints, will postpone their capital investment. Consequently, we would expect a low K/L ratio for these firms.

The last balance sheet indicator that we include in our specification is $CASH\ FLOW_{it}$. Following Benito and Hernando (2002) we define cash flow as the sum of after tax profit and depreciation normalized by the total assets of the company. Earlier studies show that the activities of more constrained firms depend on the internal funds such as cash flow (Benito and Hernando, 2002; FHP, 1988; Gilchrist and Himmelberg, 1995). Therefore, we would expect a negative relationship between cash flow and K/L ratio for the more constrained group of firms.

To explore the sensitivity of firms K/L ratio stemming from the interaction between imperfect capital markets and firm-specific characteristics, we employ several dummy variables. The dummy vector (D_{it}) is interacted with the vector of financial variables (F_{it}) in our baseline specification.

$$y_{it} = X_{it}\beta + F_{it}\gamma D_{it} + e_{it} \qquad (2)$$

The dummy vector consists of three different binary variables reflecting six different firm characteristics i.e small, large, young, old, more bank dependent, less bank dependent.

5. Results

5.1. The nexus between Firm-Specific Characteristics and the K/L ratio.

In previous work, Benito and Hernando (2002) stress the importance of firm's balance sheet indicators on fixed investment decisions, inventory investment, or employment. We seek to test whether firm's balance sheet indicators are important determinants of the K/L ratio for UK firms.

The set of explanatory variables consist of real variables, namely the logarithm of price and the logarithm of sales, and three financial variables: the leverage ratio, the collateral ratio and the cash flow ratio. We mainly focus on the estimation results for the financial variables.

[15] Bester (1985, 1987) shows that collateral can be used as a signaling device to separate high-risk from low-risk borrowers and as an incentive device to confront problems of moral hazard. Assets that are more tangible, sustain in fact more external financing because tangibility increases the value that can be recaptured by creditors in case of borrower's default (Nilsen, 2002; Almeida and Campello, 2004).

Results are presented in Table 2[16]. The coefficient on the control variable *PRICE* has a negative and highly significant effect on the dependent variable. More precisely, a 1% increases in *PRICE* results a 0.592% decrease in capital-labour ratio. *SALES* exert a negative impact on K/L. Firms with high *SALES* face a lower K/L ratio compared to those with low *SALES.* The result is a negative correlation between *SALES* and K/L ratio.

Turning to the analysis of the financial variables, the results indicate a significant effect of the control variables on K/L ratio. In particular, the coefficient on *CASH FLOW* exerts a negative and significant impact on the K/L ratio illustrating that firms have to decrease their K/L ratio. The coefficient of *LEVERAGE* has a negative and significant impact on the dependent variable. Since debt variables capture the indebtedness position of the firm and its financial healthiness, an increase in firm's debt limit decreases the capital-labour ratio. Finally, *COLLATERAL* exhibits a positive and highly significant coefficient stressing the importance of the ratio of tangible assets to total assets. This ratio is an important indicator of collateral available to support borrowing. The results obtained from this specification are consistent with the preliminary evidence of section 3 and are of particular importance in shaping the view that firm-specific characteristics such as leverage, collateral and cash flow are important determinants of the K/L ratio.

Nevertheless, the estimates obtained using the *WG* estimator may be affected by endogeneity bias. In column 2 of Table 3 we present the results of the Static *First-Differenced GMM* estimator which takes the unobserved heterogeneity and the endogeneity biases into account. The estimated coefficients on the explanatory variables are almost identical with those obtained using the *WG* estimator. The *J* statistic has a significance of 0.161 and the *m2* statistic shows no sign of second order serial correlation of the residual[17]. Both tests suggest that the instruments are valid and that there is no sign of mis-specification in the model.

5.2. Capital Market Imperfections, Firm-Specific Characteristics and the K/L ratio

Next we test whether various types of firms with different balance sheet positions have an heterogenous K/L ratio. In other words, we want to examine - under the assumption that labour and capital are perfect substitutes- whether more constrained firms with weak balance sheets are likely to face a lower K/L ratio compared to their counterparts, indicating the

[16] All standard errors are robust to cluster (industry) correlation to account for the fact that we have industry level variables in a firm level variable regression (Williams, 2000; Wooldridge, 2002 pp.411). This may lead to under-estimated standard errors if correlation of the error term induced by the macro-variables is not taken into account (Moulton, 1990).

[17] The *J* statistic is the Sargan/Hansen test for overidentifying restrictions and the *m2* statistic tests for the second order autocorrelation of the residuals in the first-differenced equation.

substitution of capital with labour across firms. The specification in terms of the K/L ratio capital-labour ratio can help to overcome the problems that have plagued previous empirical studies[18]. In contrast to previous studies we don't only look at the investment- cash flow relationship but we consider simultaneously the role of capital and labour on firms' decisions and their variations with the balance sheet characteristics by explicitly making the distinction between constrained and unconstrained firms[19]. To examine our main hypotheses we divide firms to more and less constrained using different classification criteria such as size, age, bank dependency and estimate (2).

Table 3 reports the results from the interaction between firm type dummies and financial variables. The first financial variable is the profitability indicator *CASH FLOW*. *CASH FLOW* has been used in previous studies to reflect firm's internal funds between constrained and unconstrained firms. However, these studies were not able to give us a definitive answer on the distinction between constrained and unconstrained firms since a positive correlation between capital and internal funds can be interpreted either way[20]. By considering firms' employment decisions we use the K/L ratio and we seek an answer on the distinction between constrained and unconstrained firms.

Now turning to our results, the *WG* estimations are presented in the first three columns of Table 3. The coefficients on *CASH FLOW* are negative and statistically significant not only for constrained firms but also for large and less bank dependent firms. However, it is likely that the *WG* estimator suffers from endogeneity bias. When we estimate our model using the *First-Differenced GMM* estimator the results (columns 4, 5, 6) change dramatically. The group of unconstrained firms exhibits a zero correlation between cash flow and the capital-labour ratio while for the constrained group of firms the correlation is negative. When a firm faces difficulties in obtaining external finance its employment should be more sensitive to the availability of its internal funds. Constrained firms can not invest optimally in capital due to some technological impediment to adjusting capital quickly (this will be the case if capital investment is lumpy as suggested in the investment literature[21]) thus the firm will satisfy demand using labour more intensively.

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[18] FHP(1988), KZ(1997) debate.

[19] As it was emphasized in the introductory part the investment model cannot give us a straight answer on the FHP (1987, KZ(1997) debate.

[20] FHP (1988) find that more financially constrained firms exhibit significantly greater investment-cash flow sensitivities than firms that appeared more financially constrained, on the other hand KZ (1997) find the opposite result. Firms that appeared less constrained have a greater investment-cash flow sensitivity.

[21] Plant-level investment is likely to be 'lumpy' from year to year due to the discrete nature of some capital purchases such as new structures or large pieces of equipment. These plant-level effects may translate into 'lumpiness' at the firm-level if the plant is large relative to the firm.

From an econometric point of view, the abovementioned result indicates that the *WG* estimator suffers from endogeneity bias. Overall, the result postulates a decline in constrained firms' capital-labour ratio. This finding, in contrast with the investment financing literature, provides us with a more precise distinction between constrained and unconstrained firms.

Next, we observe that the coefficients of *LEVERAGE* exhibit a negative and significant sign for constrained firms, which is not the case for their unconstrained counterparts. The coefficients of *LEVERAGE* retain their significance even when we perform the *First-Differenced GMM* estimation method. This result is consistent with the view that higher levels of debt may deter creditors from offering further credit for firms that are vulnerable, meaning a limited access on external finance for constrained firms. It is a stylized fact that firms have to raise external finance in order to finance their investment projects. However, when a firm is highly indebted it's extremely difficult and expensive to obtain outside finance. Thus the higher the debt burden, the higher is the cost of external finance. Cantor (1990) and Calomiris, Orphanides and Sharpe (1994) find that increases in leverage at the firm level are associated with increased volatility in capital expenditures. In other words, highly leveraged firms have to postpone their fixed investment.

Turning to the *COLLATERAL* variable, the estimated coefficients have a positive sign, which is significant at the one percent level for both constrained and unconstrained firms. These results are in line with Berger and Udell's (1990) findings that collateral is an important factor, reducing the riskiness of a loan by giving the financial institution a claim on a tangible asset. Although, the coefficients are higher for constrained firms the tests of equality of coefficients on collateral point out that the effects of the collateral are the same across different group of firms. Overall, the *J* and *m2* tests do not indicate any problems with the specification of the model and the choice of the instruments.

Summarizing our results, we find that balance sheet variables are important determinants of K/L ratio only for constrained firms. In particular, the *WG* and the Static *First-Differenced GMM* estimates provide us with evidence that firms that face a different degree of capital market imperfections substitute capital with labour. In other words, small, young and more bank dependent firms that have limited access in debt market exhibit greater sensitivities regarding the capital-labour ratio. More importantly, we avoid the problems of previous studies by clearly distinguishing between constrained and unconstrained firms and we find that cash flow has a bigger effect on constrained firms.

5.3. Interest Burden, Financial Constraints and the K/L ratio

Interest burden is used as an indicator for the monetary policy and is defined as the ratio of interest payments to total debt. The major advantage of this ratio is that it allows us to examine the impact of monetary policy on different types of firms. Some firms are more likely to incur a high interest payment relative to their total debt because they are financially weak and risky with low levels of collateral[22]. Although this indicator is not controlled exogenously by the Bank of England (it is endogenous in the sense that it reflects the financial conditions of firms as well as the interest rate), it does provide evidence about the extent of the asymmetric information problem in the financial transactions given firm heterogeneity (Bougheas *et al.*, 2005).

We choose to use the firm-specific apparent interest rate in order to exploit its cross-sectional information and to examine whether constrained firms that pay a higher cost for their external debt, face a lower K/L ratio. According to the theory of the financial accelerator (Bernanke *et al.*, 1999), the interest paid by firms with weak balance sheets should react more to monetary policy shocks than the interest paid by firms with strong balance sheets. For this purpose we interact firm type dummies with the interest burden variable. The results are reported in Table 5.

In column 1, 5 of Table 4 we present the estimates of the augmented -by the interest paid by firms'- equation (1). The coefficients on the control variables and the balance sheet indicators remain statistically and economically significant. We can see that the coefficient on *ID* is negative and highly significant: interest burden clearly have information about differences in payment obligations among firms embedded in it. It also appears that the K/L ratio responds negatively and strongly to firm-specific apparent interest rate, indicating that firms with high *ID* face a lower K/L ratio compared to those with low *ID*.

Next we report the results from the interactions between firm type dummies and the interest burden. Columns 2, 3, 4 report the estimates obtained using the *WG* estimator. Overall, we do not find compelling evidence that the interest rate cost of small firms reacts stronger than that of large sized firms. However, when we apply the *First-Differenced GMM* estimator (that takes into account the endogeneity and heterogeneity biases) the estimated results differ significantly from those obtained using the *WG* estimator. The coefficients associated with the interacted interest burden show strong evidence that K/L ratio of

[22] Kashyap and Stein (1994) show that small and medium sized firms may be unable to access other markets for funds and therefore have a certain dependence on banks for external sources of funds while Mojon *et al.* (2002) find that the interest rate paid by small firms is on average higher than that paid by larger firms.

constrained firms is more sensitive to the interest burden than K/L ratio of unconstrained firms. Moreover, the results support the validity of the instruments and the absence of the second-order serial correlation. From that we can see that the *WG* estimator is seriously affected by the endogeneity bias.

One main implication can be highlighted from our results. Constrained firms do pay a higher cost for their external debt and they have to alter their K/L ratio due to the high interest payment obligations. According to the *First-Differenced GMM* estimation results, capital-labour ratio is found to be more sensitive on the monetary policy for constrained firms.

6. Robustness Checks

We present various robustness tests in order to reinforce our previous results. Firstly, we want to examine whether our results remain persistent when we employ a dynamic estimation. Secondly, to test the robustness of the cash flow results, we regress the specification excluding the distressed firms[23]. Finally, we replace capital stock with fixed assets.

6.1. Dynamic Estimation of the main models

We employ a dynamic estimation to examine whether firms' decisions on K/L ratio change during the years. The rational of estimating our models in a dynamic panel data setting, can be attributed to the fact that both financial markets and labour markets are imperfect. Given the speed and the time of capital and labour adjustment, we estimate our models employing a dynamic approach.

All our variables retain their significance in most of the cases while the results support the validity of the instruments and the absence of second-order serial correlation. The main findings from the Dynamic *First-Differenced GMM* estimations (Tables 5, 6) are in line with those reported in section 5. It is confirmed that firm-specific characteristics such as leverage, collateral and cash flow are important determinants of the K/L ratio. More precisely, under the assumption that capital and labour are perfect substitutes our findings support the prediction that constrained firms substitute capital with labour showing that those firms are typically less capital intensive. Moreover, the results on cash flow and the K/L relationship are statistically and economically significant pointing out the negative correlation between cash flow and K/L ratio and clearly indicating the distinction between constrained and unconstrained firms. Also, the capital-labour ratio was found more sensitive to monetary

[23] Allayannis and Mozumbar (2004) use negative cash flow observations as a proxy for distressed firms.

policy for constrained firms confirming that financial accelerator phenomena play an important role in the transmission mechanism of monetary policy for the UK.

6.2. Negative Cash-Flow observations and the K/L ratio

Evidence from our data and our econometric estimations suggest that *CASH FLOW* has a negative effect on capital-labour ratio for constrained firms. To examine whether our findings on cash flow-K/L ratio relationship are driven by the fact that a firm is in sufficiently bad shape, we follow Allayannis' and Mozumbar's (2004) technique. They investigate the role of negative cash flow observations on investment decisions estimating investment models including positive cash flow observations and all the cash flow observations interchangeably[24].

Table 7 presents the estimates of equation (2) when only positive cash flow observations are included. The coefficients associated with the cash flow variable are now much higher for constrained firms. These evidences reveal that the cash flow results for constrained firms obtained in table 4, are not affected by the inclusion of the distressed firms (proxied by negative cash flow). In fact, they strongly support the importance of *CASH FLOW* for the constrained entrepreneurs in connection with the capital-labour ratio.

6.3. An Alternative Measure of Capital Stock

Since part of our analysis depends on the capital-labour ratio, it is important to check whether our results hinge on how finely we construct capital. Up to this point we have used replacement value of capital stock as the firm's capital. However, the use of the perpetual inventory formula leads to a substantial loss of observations in our sample.

Taking into consideration the peculiarity of the replacement value of capital stock, we replace this variable with the fixed assets. Following Mackay and Phillips (2006) we define fixed assets as the sum of tangible assets, intangible assets, and investment and other fixed assets. After reestimating equation (1), (2) and the augmented – by the interest paid by firms'- equation it can be shown that results remain largely unchanged compared with those obtained using the replacement value of capital stock as our preferred capital variable. Results are presented in Tables 8, 9. Thus, these findings provide assurance that our main results are robust to the use of replacement values of capital stock.

[24] Distressed firms as proxied by negative cash flow observations have lower investment-cash flow sensitivities than non-distressed firms (Allayannis and Mozumbar, 2004).

7. Conclusions

In this paper, we use a panel of a large number of UK manufacturing firms over the period 1994-2004. We estimate a model in which the ratio of capital to labour is the dependent variable. The first novel aspect of our study is that we examine the nexus between firm-specific characteristics and firms' decisions on capital-labour ratio. In particular, we study whether firm-specific characteristics such as leverage, collateral and cash flow affect firms' decision on capital-labour ratio. Another novel aspect of our work is that we test the impact of capital market imperfections and balance sheet indicators on K/L ratio. This allows us to measure the variability in the financial choices of firms given the financial constraints that firms face. Since a positive correlation between capital and internal funds can be interpreted differently in the investment-cash flow model we introduce the capital-labour ratio to overcome this problem[25]. Next, we consider the effects of monetary policy indicators on firms' capital-labour ratio for firms that face liquidity constraints and for firms that do not. Lastly, we evaluate the effects of cash flow on K/L ratio excluding distress firms.

Our results can be summarized as follows. First, we find that balance sheet indicators are important determinants of firm's capital-labour decisions. Second, when firms are classified on the basis of their different characteristics we find evidence that firms with a higher degree of capital market imperfections (more financially constrained) face a lower capital-labour ratio in contrast with the unconstrained firms. Third, the results indicate that financially constrained firms exhibit a higher K/L - cash flow sensitivity compared to the unconstrained firms. Fourth, we show that capital-labour ratio of constrained firms is more sensitive to the interest burden than K/L ratio of unconstrained firms postulating that constrained firms have to alter (significantly) their K/L ratio due to high interest payment obligations. Our results are robust to estimating our empirical models employing a Dynamic *First-Differenced GMM* approach, to excluding distressed firms from our sample and to replacing capital stock with fixed assets. The results strongly suggest that, it is the financial market imperfections and the limited access to capital markets for particular types of firms that make them to substitute capital with labour.

[25] FHP (1988) find that more financially constrained firms exhibit significantly greater investment-cash flow sensitivities than firms that appeared more financially constrained, on the other hand KZ (1997) find the opposite result. Firms that appeared less constrained have a greater investment-cash flow sensitivity.

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7 Appendix

7.1 Data Sources

The firm-level data that we use is the FAME database from Bureau Van Dijk. The source of the industrial-level data is the STAN OECD database.

7.2 Variable Construction

Firm-Level Variables

Replacement Value of Capital Stock (K): It is constructed using the traditional perpetual inventory method (Blundell *et al*., 1992; Bond and Meghir, 1994). Since the book values of fixed capital for the first year of observation for each firm are at historical prices we multiply the initial book value of fixed capital by a factor to account for historical inflation to get replacement values for the initial value of the capital stock. The capital (end of period) of future years is then obtained by the perpetual inventory formula. $K_{t+1} = (1-\delta)K_t + \frac{NI_{t+1}}{P_{it+1}}$

Employment (L): Total number of employees.

Total Real Sales (Sales): It is the log of total company sales, deflated by the GDP deflator.

Cash-Flow: It is defined as the sum of after tax profit and depreciation normalized on the total assets of the company, deflated by the GDP deflator.

Leverage: Is the ratio of total liabilities to real total assets.

Collateral: It is defined as the ratio of tangible assets to the real total assets.

Mix: It is defined as the ratio of the firm's short-term debt to its total debt.
Age: Date of Incorporation

Size: It is the log of company assets, deflated by the GDP deflator

Base rate: It is calculated by adding the percentage changes in the base rate to the previous year value starting from base year, 1994=100.

Average company wage (Wages): Total employee remuneration divided by number of employees.

User cost of capital (UC): Based on the contribution by Hall and Jorgenson (1967), we construct the user cost of capital following Mojon *et al.*(2002).

$$UC_{j,t} = \frac{P_{I,j,t}}{P_{j,t}} \left((1-\tau)i_t \frac{D_j}{D_j + E_j} + b_t \frac{E_j}{D_j + E_j} + \delta_j - (1-\delta_j) \frac{\Delta P_{I,jt+1}}{P_{I,t}} \right)$$

where j indicates the number of industries in the manufacturing sector and t the time period. $P_{I,j,t}$ and $P_{j,t}$ are the industry specific prices of investment goods and output. τ is the highest marginal tax rate on corporate profits, i_t is the base rate (we prefer to use the base rate rather than a firm specific interest rate), b_t are yields on benchmark public sector bonds of around 10 years maturity, δ_i is the average depreciation rate in the particular industry divided by the fixed assets. D_l/D_j+E_j and E_j/D_j+E_j are respectively the average percentage of debt finance and equity finance in the particular industry. $(1-\tau)i_t\ [D_j/(D_j+E_j)]+l_t[E_j/(D_j+E_j)]$ is the industry –specific required rate of return on capital and $(1-\delta_j)\ (\Delta P_{I,j,t+1}/P_{I,t})$ the capital gain on the fraction of capital left over after depreciation.

Price: User cost of capital divided by the average company wage.

Interest Burden (ID): Is the ratio of interest payments to total debt, deflated by the GDP deflator.

Deflators: The capital stock and fixed assets are deflated using the implicit price deflator for gross fixed capital formation. Other variables are deflated using the aggregate GDP deflator.

Outliers: We trim 0.5 percent of observations both from above and the below to remove the outliers for our main variables.

Industrial Variables

Price of Investment Goods ($P_{I,j,t}$): Is the gross fixed capital formation

Price of Output ($P_{j,t}$): Is the output.

8.3 Figures

Figure 1: Average Number of Employees

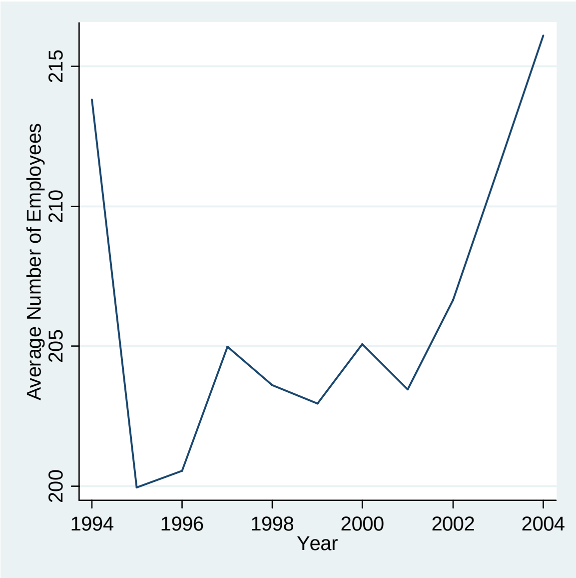


Figure 2: Average Capital Stock

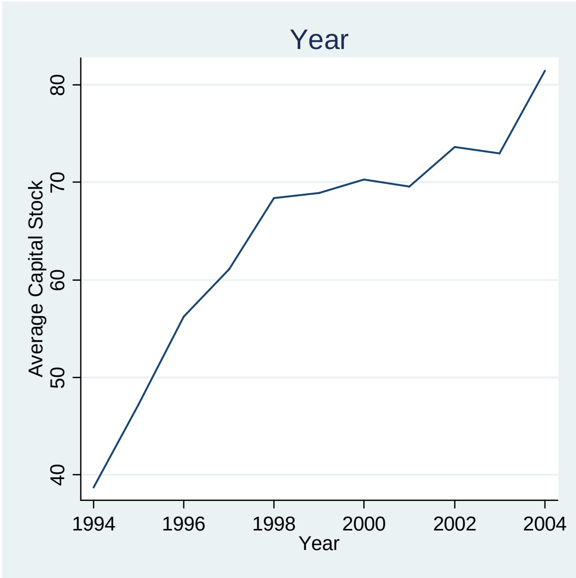


Figure 3: K/L ratio for Small and Large Firms

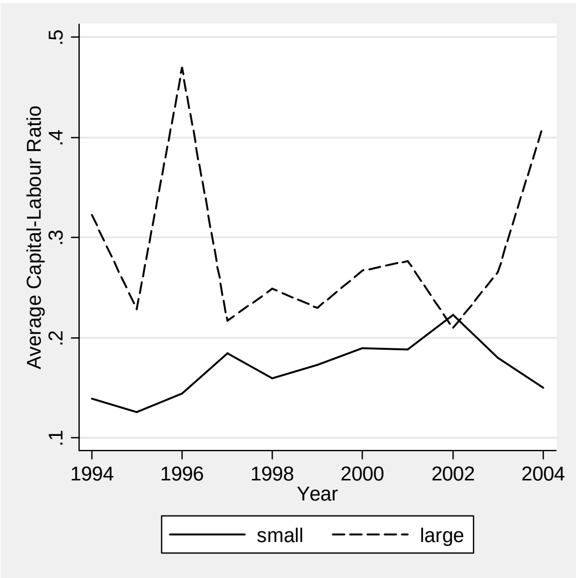


Figure 4:Leverage for Small and Large Firm

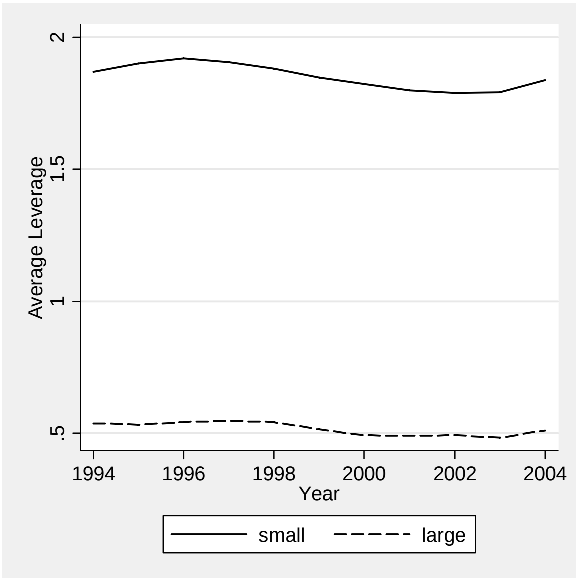


Figure 5: Cash Flow for Small and Large Firms

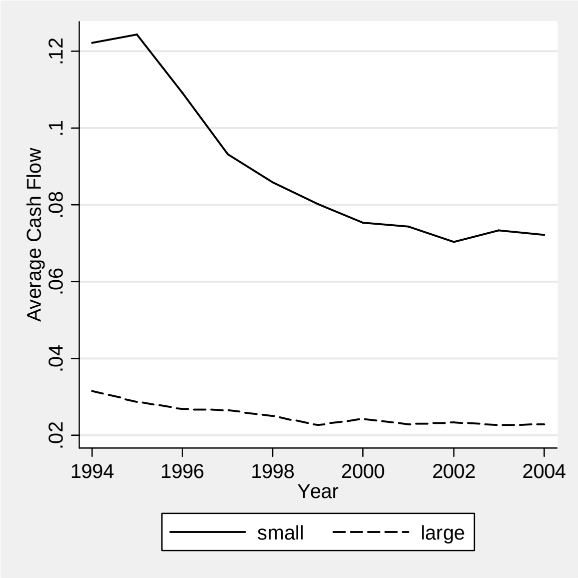


Figure 6: Collateral for Small and Large Firms

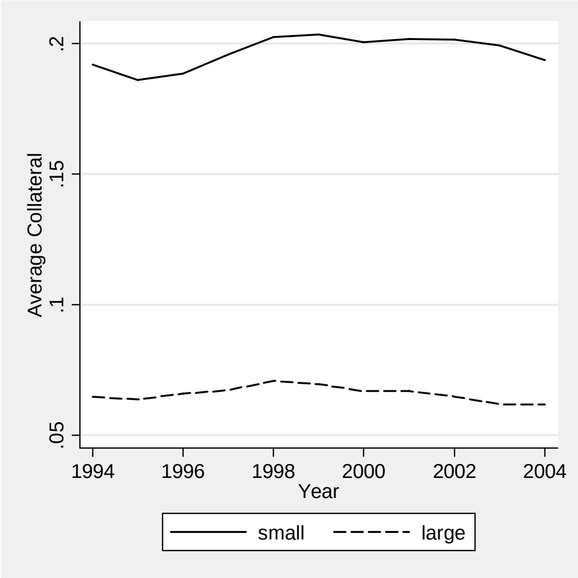
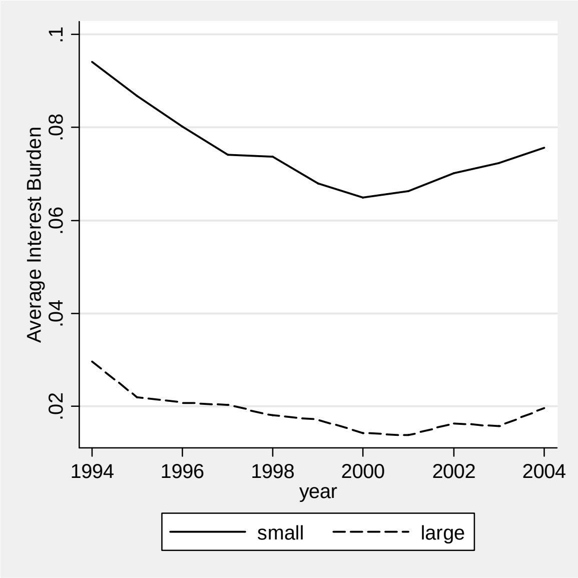


Figure 7: Interest Burden for Small and Large Firms



7.5. Tables

Table 1: Descriptive Statistics

	All firm-years (1)	$SMALL_{it}$ (2)	$LARGE_{it}$ (3)	$YOUNG_{it}$ (4)	OLD_{it} (5)	$MBANK_{it}$ (6)	$LBANK_{it}$ (7)
K/L_{it}	0.292	0.226	0.425	0.289	0.296	0.281	0.351
	(0.522)	(0.449)	(0.624)	(0.491)	(0.580)	(0.526)	(0.490)
$Price_{it}$	2.104	2.079	2.152	2.102	2.109	2.122	1.979
	(4.794)	(3.670)	(6.393)	(4.872)	(4.592)	(5.080)	(1.756)
$Sales_{it}$	199.182	78.559	385.864	171.748	275.302	195.810	225.615
	(384.573)	(96.298)	(552.447)	(347.578)	(463.898)	(383.119)	(395.104)
$Leverage_{it}$	15.702	17.041	11.317	16.747	12.558	16.211	12.177
	(14.347)	(15.210)	(9.854)	(15.214)	(10.745)	(14.806)	(9.948)
$Collateral_{it}$	26.469	26.262	27.151	25.948	28.019	25.407	33.639
	(17.430)	(17.506)	(17.163)	(17.566)	(16.927)	(17.119)	(17.821)
$Cash\ Flow_{it}$	0.112	0.121	0.089	0.118	0.098	0.115	0.097
	(0.171)	(0.183)	(0.128)	(0.182)	(0.138)	(0.174)	(0.150)
ID_{it}	0.092	0.100	0.068	0.094	0.085	0.095	0.080
	(0.208)	(0.215)	(0.186)	(0.211)	(0.199)	(0.220)	(0.162)
Observations	75267	48982	26183	54100	21162	65918	9322

Notes: The table presents sample means. Standard deviations are reported in parentheses. The subscript *i* indexes firms, and the subscript *t*, time, where t = 1994-2004. $SMALL_{it}$ which is equal to 1 if firm i's real assets for firm *i* is in the bottom 75% of the distribution of the real assets of all firms operating to the same industry as firm *i* in year *t* and equal to 0 otherwise. $YOUNG_{it}$ is equal to 1 for firms in the lower 75 percent of their age distribution in year *t*, and 0, otherwise. $MBANK_{it}$ which is equal to 1 if firm i's mix is in the top 75% of the distribution of the mixes of all firms belonging to the same industry as firm *i* in year *t* and equal to 0 otherwise. K/L_{it} is the firm's capital-labour ratio and $Price_{it}$ is the ratio of industry variable user cost of capital to firm-level wages.

Table 2: Firm-Specific Characteristics and the K/L ratio

Dependent variable: K/L_{it}	WITHIN GROUPS	GMM-DIF
$Price_{it}$	-0.592***	-0.558***
	(17.2)	(8.36)
$Sales_{it}$	-0.618***	-0.531***
	(31.2)	(4.10)
$Cash\ Flow_{it}$	-0.139***	-0.255**
	(3.50)	(2.09)
$Leverage_{it}$	-0.022**	-0.100***
	(2.55)	(5.53)
$Collateral_{it}$	0.026***	0.036***
	(30.2)	(4.93)
Constant	1.177***	
	(9.89)	
Observations	16456	10305
No of Firms	4597	2819
R-squared	0.54	
m1		-9.42
m2		0.137
Sargan		0.161
Instruments		t-1; t-2; t-3; Δt-1

Notes: The figures reported in parentheses are t-statistics in absolute values. * significant at 10%; ** significant at 5%; *** significant at 1%. Time dummies and time dummies interacted with industry dummies were included in all specifications. *m1* and *m2* are tests for first-order and second-order serial correlation in the first-differenced residuals, asymptotically distributes as N(0,1) under the null of no serial correlation. The *J* statistic is a test of the overidentifying restrictions, distributes as chi-square under the null of instrument validity.

Table 3: Effects of Firm-Specific Characteristics and the Capital Market Imperfections

Dependent variable: K/L_{it}	WITHIN GROUPS Size (1)	WITHIN GROUPS Age (2)	WITHIN GROUPS Bank Dependency (3)	GMM-DIF Size (4)	GMM-DIF Age (5)	GMM-DIF Bank Dependency (6)
$Price_{it}$	-0.595***	-0.594***	-0.591***	-0.596***	-0.555***	-0.581***
	(17.3)	(17.3)	(17.2)	(10.9)	(9.87)	(11.8)
$Sales_{it}$	-0.631***	-0.618***	-0.618***	-0.608***	-0.513***	-0.583***
	(32.4)	(31.1)	(31.2)	(6.10)	(5.12)	(7.62)
$Cash\ Flow_{it}*Dummy_{it}$	-0.091**	-0.169***	-0.116***	-0.194*	-0.353***	-0.186**
	(1.98)	(3.70)	(2.73)	(1.90)	(3.32)	(2.26)
$Cash\ Flow_{it}*(1-Dummy_{it})$	-0.118*	-0.046	-0.254***	0.108	0.039	-0.168
	(1.88)	(0.67)	(3.63)	(0.35)	(0.36)	(0.62)
$Leverage_{it}*Dummy_{it}$	-0.049***	-0.033***	-0.023***	-0.212***	-0.127**	-0.101*
	(5.40)	(3.24)	(2.68)	(3.53)	(2.01)	(1.95)
$Leverage_{it}*(1-Dummy_{it})$	0.041***	0.003	-0.020	-0.090	0.139*	-0.038
	(4.04)	(0.22)	(1.61)	(1.42)	(1.90)	(0.50)
$Collateral_{it}*Dummy_{it}$	0.025***	0.026***	0.026***	0.029***	0.038***	0.033***
	(28.0)	(26.4)	(29.7)	(7.52)	(5.84)	(6.46)
$Collateral_{it}*(1-Dummy_{it})$	0.028***	0.024***	0.027***	0.026***	0.018***	0.028***
	(28.0)	(15.0)	(26.2)	(8.49)	(2.81)	(4.44)
Constant	1.223***	1.208***	1.184***			
	(10.4)	(9.75)	(10.0)			
Observations	16456	16456	16456	10305	10305	10305
No of Firms	4597	4597	4597	2819	2819	2819
R-squared	0.55	0.54	0.54			
m1				-11.13	-9.89	-10.43
m2				0.099	0.155	0.236
Sargan				0.089	0.115	0.590
Instruments				t-1; t-2; t-3; Δt-1	t-1; t-2; t-3; Δt-1	t-1; t-2; t-3; Δt-1; Δt-2
F-test of equality of coef. on collateral	F-test=12.36 Prob>F=0.004	F-test=1.13 Prob>F=0.288	F-test=2.72 Prob>F=0.099	F-test=0.64 Prob>F=0.423	F-test=9.21 Prob>F=0.002	F-test=2.13 Prob>F=0.144

Notes: The figures reported in parentheses are t-statistics in absolute values. * significant at 10%; ** significant at 5%; *** significant at 1%. Time dummies and time dummies interacted with industry dummies were included in all specifications. D*ummy* is a dummy variable that represents $SMALL_{it,}$ $YOUNG_{i,}$ $MBANK_i$. $SMALL_{it,}$ is a dummy variable equal to 1 if the realassets for firm *i* is in the 75% bottom of the distribution in period *t* and equal to 0 otherwise. $YOUNG_i$ is a dummy equal to 1 if age for firm *i* is in the bottom 75% of the distribution and equal to 0 otherwise. $MBANK_{i,}$ which is equal to 1 if mix for firm *i* is in the top 75% of the distribution and equal to 0 otherwise. *(1-Dummy)* is a dummy variable that represents $LARGE_{it,}$ $OLD_{i,}$ $LBANK_i$. $LARGE_{it}$ is a dummy variable equal to 1 if the realassets for firm *i* is in the 25% top of the distribution in period *t* and equal to 0 otherwise. OLD_i is a dummy equal to 1 if age for firm *i* is in the top 25% of the distribution and equal to 0 otherwise. $LBANK_{i,}$ which is equal to 1 if mix for firm *i* is in the bottom 25% of the distribution and equal to 0 otherwise. *m1* and *m2* are tests for first-order and second-order serial correlation in the first-differenced residuals, asymptotically distributes as N(0,1) under the null of no serial correlation. The *J* statistic is a test of the overidentifying restrictions, distributes as chi-square under the null of instrument validity.

Table 4: Effects of Firm-Specific Characteristics and the Capital Market Imperfections interacted with the Interest Burden

Dependent variable: K/L_{it}	WITHIN GROUPS (1)	WITHIN GROUPS Size (2)	WITHIN GROUPS Age (3)	WITHIN GROUPS Bank Dependency (4)	GMM-DIF (5)	GMM-DIF Size (6)	GMM-DIF. Age (7)	GMM-DIF Bank Dependency (8)
$Price_{it}$	-0.616***	-0.616***	-0.617***	-0.616***	-0.563***	-0.597***	-0.596***	-0.586***
	(11.4)	(11.4)	(11.4)	(11.4)	(7.69)	(8.18)	(8.15)	(7.89)
$Sales_{it}$	-0.684***	-0.684***	-0.684***	-0.682***	-0.588***	-0.669***	-0.657***	-0.638***
	(27.1)	(27.0)	(27.1)	(27.0)	(6.29)	(6.71)	(7.18)	(7.17)
Cash $Flow_{it}$	-0.134***	-0.134***	-0.134***	-0.134***	-0.358***	-0.301***	-0.305***	-0.305***
	(2.69)	(2.69)	(2.66)	(2.70)	(3.51)	(2.84)	(3.16)	(3.07)
$Leverage_{it}$	-0.004	-0.004	-0.004	-0.003	-0.086***	-0.090***	-0.092***	-0.090***
	(0.37)	(0.37)	(0.37)	(0.27)	(3.26)	(3.33)	(3.38)	(3.39)
$Collateral_{it}$	0.027***	0.027***	0.027***	0.027***	0.025***	0.025***	0.025***	0.025***
	(23.6)	(23.6)	(23.5)	(23.7)	(5.65)	(5.55)	(5.76)	(5.90)
ID_{it}	-0.238***				-0.196***			
	(6.53)				(5.98)			
$ID_{it}*(Dummy_{it})$		-0.238***	-0.260***	-0.232***		-0.199***	-0.214***	-0.169***
		(5.59)	(5.54)	(6.37)		(4.98)	(4.94)	(5.97)
$ID_{it}*(1-Dummy_{it})$		-0.234***	-0.183***	-0.342***		0.276	0.162	-0.023
		(5.95)	(3.16)	(3.55)		(1.10)	(1.49)	(0.073)
Constant	1.515***	1.515***	1.511***	1.507***				
	(8.68)	(8.69)	(8.67)	(8.64)				
Observations	8951	8951	8951	8951				
No of Firms	3063	3063	3063	3063				
R-squared	0.59	0.59	0.59	0.59				
m1					-7.74	-7.57	-7.77	-7.76
m2					0.372	0.259	0.307	0.350
Sargan					0.052	0.047	0.076	0.057
Instruments					t-1; t-2; t-3; Δt-1	t-1; t-2; t-3; Δt-1	t-1; t-2; t-3; Δt-1	t-1; t-2; t-3; Δt-1

Notes: The figures reported in parentheses are t-statistics in absolute values. * significant at 10%; ** significant at 5%; *** significant at 1%. Time dummies and time dummies interacted with industry dummies were included in all specifications. *m1* and *m2* are tests for first-order and second-order serial correlation in the first-differenced residuals, asymptotically distributes as N(0,1) under the null of no serial correlation. The *J* statistic is a test of the overidentifying restrictions, distributes as chi-square under the null of instrument validity. Also see Notes to Table 3.

Table 5: Effects of Firm-Specific Characteristics and the Capital Market Imperfections: Dynamic GMM First-Differenced Estimation

Dependent variable: K/L_{it}	GMM-DIF (1)	GMM-DIF Size (2)	GMM-DIF Age (3)	GMM-DIF Bank Dependency (4)
$K/L_{i(t-1)}$	0.180***	0.198***	0.200***	0.215***
	(8.79)	(9.03)	(9.72)	(9.51)
$Price_{it}$	-0.689***	-0.736***	-0.762***	-0.745***
	(-11.1)	(-13.9)	(-14.6)	(-13.5)
$Sales_{it}$	-0.684***	-0.784***	-0.840***	-0.811***
	(-6.96)	(-10.3)	(-10.7)	(-10.0)
$Cash\ Flow_{it}$	-0.917***			
	(-3.34)			
$Cash\ Flow_{it}*Dummy_{it}$		-0.769***	-0.692***	-0.558**
		(-3.10)	(-3.16)	(-2.17)
$Cash\ Flow_{it}*(1-Dummy_{it})$		-0.590	0.362	-0.456
		(-1.60)	(1.34)	(-1.53)
$Leverage_{it}$	-0.079***			
	(-3.90)			
$Leverage_{it}*Dummy_{it}$		-0.095**	-0.074***	-0.076*
		(-2.03)	(-2.69)	(-1.94)
$Leverage_{it}*(1-Dummy_{it})$		-0.030	-0.025	-0.054
		(-0.56)	(-1.54)	(-0.93)
$Collateral_{it}$	0.038***			
	(8.41)			
$Collateral_{it}*Dummy_{it}$		0.022***	0.027***	0.024***
		(3.67)	(5.33)	(5.56)
$Collateral_{it}*(1-Dummy_{it})$		0.028***	0.030***	0.024***
		(5.29)	(5.84)	(4.81)
Observations	8314	8314	8314	8314
No of Firms	2360	2360	2360	2360
m1	-11.35	-12.86	-12.65	-12.28
m2	0.095	0.111	0.129	0.175
Sargan	0.065	0.084	0.082	0.134
Instruments	t-1; t-2; t-3;	t-1; t-2; t-3;	t-1; t-2; t-3;	t-1; t-2; t-3;
F-test of equality of coef. on collateral		F-test=4.34 Prob>F=0.037	F-test=0.22 Prob>F=0.636	F-test=0.03 Prob>F=0.873

Notes: All specifications were estimated using a Dynamic GMM first-differenced specification. The figures reported in parentheses are t-statistics in absolute values. * significant at 10%; ** significant at 5%; *** significant at 1%. Time dummies and time dummies interacted with industry dummies were included in all specifications. *m1* and *m2* are tests for first-order and second-order serial correlation in the first-differenced residuals, asymptotically distributes as N(0,1) under the null of no serial correlation. The *J* statistic is a test of the overidentifying restrictions, distributes as chi-square under the null of instrument validity. Also see Notes to Table 3.

Table 6: Effects of Firm-Specific Characteristics and the Capital Market Imperfections interacted with the Interest Burden: Dynamic GMM First-Differenced Estimation

Dependent variable: K/L_{it}	**GMM-DIF**	**GMM-DIF Size**	**GMM-DIF Age**	**GMM-DIF Bank Dependency**
	(1)	**(2)**	**(3)**	**(4)**
$K/L_{i(t-1)}$	0.152***	0.154***	0.150***	0.155***
	(7.37)	(7.42)	(7.33)	(7.30)
$Price_{it}$	-0.769***	-0.757***	-0.779***	-0.783***
	(8.69)	(9.82)	(8.39)	(8.72)
$Sales_{it}$	-0.875***	-0.861***	-0.899***	-0.909***
	(8.70)	(11.1)	(8.50)	(9.31)
$Cash\ Flow_{it}$	-0.433**	-0.406**	-0.302*	-0.322*
	(2.21)	(2.06)	(1.69)	(1.76)
$Leverage_{it}$	-0.070**	-0.070**	-0.071***	-0.069**
	(2.49)	(2.58)	(2.60)	(2.39)
$Collateral_{it}$	0.036***	0.035***	0.034***	0.035***
	(9.62)	(9.33)	(9.58)	(9.45)
ID_{it}	-0.149***			
	(3.30)			
$ID_{it}*(Dummy_{it})$		-0.197***	-0.249***	-0.145***
		(2.69)	(4.57)	(3.26)
$ID_{it}*(1-Dummy_{it})$		-0.066	-0.012	-0.138*
		(0.90)	(0.46)	(1.74)
Observations	3925	3925	3925	3925
No of Firms	1386	1386	1386	1386
m1	-8.62	-9.03	-8.24	-8.32
m2	0.296	0.307	0.273	0.276
Sargan	0.370	0.186	0.227	0.533
Instruments	t-1; t-2; t-3;	t-1; t-2; t-3;	t-1; t-2; t-3;	t-1; t-2; t-3;

Notes: All specifications were estimated using a Dynamic GMM first-differenced specification. The figures reported in parentheses are t-statistics in absolute values. * significant at 10%; ** significant at 5%; *** significant at 1%. Time dummies and time dummies interacted with industry dummies were included in all specifications. *m1* and *m2* are tests for first-order and second-order serial correlation in the first-differenced residuals, asymptotically distributes as N(0,1) under the null of no serial correlation. The *J* statistic is a test of the overidentifying restrictions, distributes as chi-square under the null of instrument validity. Also see Notes to Table 3, 4.

Table 7: Effects of Firm-Specific Characteristics and the Capital Market Imperfections: Excluding Negative Cash flow

Dependent variable: K/L_{it}	WITHIN GROUPS Size (1)	WITHIN GROUPS Age (2)	WITHIN GROUPS Bank Dependency (3)	GMM-DIF Size (4)	GMM-DIF Age (5)	GMM-DIF Bank Dependency (6)
$Price_{it}$	-0.607***	-0.606***	-0.604***	-0.532***	-0.567***	-0.609***
	(14.6)	(14.5)	(14.5)	(8.13)	(9.25)	(10.3)
$Sales_{it}$	-0.598***	-0.582***	-0.582***	-0.503***	-0.554***	-0.659***
	(26.8)	(25.8)	(25.9)	(4.90)	(6.29)	(7.33)
$Cash\ Flow_{it}*Dummy_{it}$	-0.540***	-0.658***	-0.584***	-0.540***	-0.738***	-0.456***
	(9.95)	(11.7)	(10.9)	(5.22)	(6.63)	(3.94)
$Cash\ Flow_{it}*(1-Dummy_{it})$	-0.547***	-0.429***	-0.731***	0.015	-0.045	-0.252
	(6.54)	(4.32)	(7.36)	(0.042)	(0.26)	(1.30)
$Leverage_{it}*Dummy_{it}$	-0.039***	-0.025**	-0.016*	-0.220***	-0.070**	-0.113***
	(4.22)	(2.42)	(1.83)	(5.90)	(2.34)	(5.49)
$Leverage_{it}*(1-Dummy_{it})$	0.040***	0.007	-0.009	-0.195***	0.143*	-0.084**
	(3.79)	(0.49)	(0.72)	(4.37)	(1.68)	(2.38)
$Collateral_{it}*Dummy_{it}$	0.026***	0.027***	0.026***	0.019***	0.033***	0.027***
	(27.9)	(26.3)	(29.9)	(5.02)	(5.18)	(5.27)
$Collateral_{it}*(1-Dummy_{it})$	0.028***	0.024***	0.027***	0.020***	0.022***	0.023***
	(28.9)	(15.2)	(26.5)	(7.78)	(3.20)	(4.39)
Constant	1.078***	1.004***	1.004***			
	(7.62)	(7.03)	(7.01)			
Observations	14053	14053	14053	7824	7824	7824
No of Firms	4274	4274	4274	2455	2455	2455
R-squared	0.58	0.57	0.57			
m1				-8.14	-8.37	-8.02
m2				0.320	0.416	0.452
Sargan				0.094	0.368	0.131
Instruments				t-1; t-2; t-3; Δt-1	t-1; t-2; t-3; Δt-1	t-1; t-2; t-3; Δt-1; Δt-2
F-test of equality of coef. on collateral	F-test=7.14 Prob>F=0.007	F-test=4.19 Prob>F=0.040	F-test=2.64 Prob>F=0.104	F-test=0.67 Prob>F=0.413	F-test=2.50 Prob>F=0.113	F-test=1.52 Prob>F=0.217

Notes: The figures reported in parentheses are t-statistics in absolute values. * significant at 10%; ** significant at 5%; *** significant at 1%. Time dummies and time dummies interacted with industry dummies were included in all specifications. *m1* and *m2* are tests for first-order and second-order serial correlation in the first-differenced residuals, asymptotically distributes as N(0,1) under the null of no serial correlation. The *J* statistic is a test of the overidentifying restrictions, distributes as chi-square under the null of instrument validity. Also see Notes to Table 3.

Table 8: Firm-Specific Characteristics and the K/L ratio: Fixed Assets- An alternative capital variable

Dependent variable: K/L_{it}	WITHIN GROUPS (1)	WITHIN GROUPS Size (2)	WITHIN GROUPS Age (3)	WITHIN GROUPS Bank Dependency (4)	GMM-DIF (5)	GMM-DIF Size (6)	GMM-DIF. Age (7)	GMM-DIF Bank Dependency (8)
$Price_{it}$	-0.582***	-0.584***	-0.583***	-0.583***	-0.499***	-0.534***	-0.529***	-0.485***
	(29.4)	(29.9)	(29.4)	(29.5)	(7.05)	(10.4)	(12.7)	(9.57)
$Sales_{it}$	-0.609***	-0.622***	-0.609***	-0.610***	-0.398***	-0.563***	-0.550***	-0.451***
	(44.1)	(45.7)	(44.1)	(44.1)	(2.74)	(5.28)	(6.48)	(4.26)
Cash $Flow_{it}$	-0.457***				-1.760***			
	(16.1)				(3.50)			
Cash $Flow_{it}$*$Dummy_{it}$		-0.361***	-0.471***	-0.444***		-0.140*	-0.204**	-0.238**
		(12.1)	(15.0)	(15.0)		(1.76)	(2.53)	(2.42)
Cash $Flow_{it}$*(1-$Dummy_{it}$)		-0.477***	-0.398***	-0.534***		-0.473	-0.082	-0.433
		(8.62)	(6.88)	(8.22)		(1.02)	(0.87)	(1.00)
$Leverage_{it}$	-0.085***				-0.057***			
	(12.9)				(3.19)			
$Leverage_{it}$*$Dummy_{it}$		-0.130***	-0.088***	-0.089***		-0.302***	-0.146***	-0.135***
		(18.3)	(11.1)	(13.4)		(5.20)	(3.12)	(2.74)
$Leverage_{it}$*(1-$Dummy_{it}$)		0.039***	-0.075***	-0.059***		-0.196***	-0.025	-0.083
		(4.37)	(6.66)	(5.88)		(2.67)	(0.41)	(0.98)
$Collateral_{it}$	0.032***				0.011**			
	(51.5)				(2.47)			
$Collateral_{it}$*$Dummy_{it}$		0.032***	0.034***	0.032***		0.023***	0.027***	0.024***
		(49.5)	(45.2)	(51.0)		(3.89)	(4.73)	(4.50)
$Collateral_{it}$*(1-$Dummy_{it}$)		0.035***	0.029***	0.032***		0.024***	0.018***	0.023***
		(47.3)	(25.6)	(43.4)		(5.69)	(3.33)	(3.46)
Constant	0.949***	0.995***	0.951***	0.953***				
	(11.7)	(12.4)	(11.7)	(11.7)				
Observations	52603	52603	52599	52603	32138	32138	32135	32138
No of Firms	10687	10687	10686	10687	7907	7906	7907	7907
R-squared	0.38	0.41	0.38	0.38				
m1					-6.61	-14.19	-14.38	-12.57
m2					0.042	0.031	0.053	0.051
Sargan					0.126	0.092	0.418	0.848
Instruments					t-1; t-2; t-3; Δt-1	t-1; t-2; t-3; Δt-1	t-1; t-2; t-3; Δt-1	t-1; t-2; t-3; Δt-1
F-test of equality of coef. on collateral		F-t=22.99 Pr>F=0.000	F-t=12.81 Pr>F=0.003	F-t=0.88 Pr>F=0.348		F-t=0.03 Pr>F=0.873	F-t=2.17 Pr>F=0.140	F-t=0.06 Pr>F=0.801

Notes: The figures reported in parentheses are t-statistics in absolute values. * significant at 10%; ** significant at 5%; *** significant at 1%. Time dummies and time dummies interacted with industry dummies were included in all specifications. *m1* and *m2* are tests for first-order and second-order serial correlation in the first-differenced residuals, asymptotically distributes as N(0,1) under the null of no serial correlation. The *J* statistic is a test of the overidentifying restrictions, distributes as chi-square under the null of instrument validity. Also see Notes to Table 3.

Table 9: Effects of Firm-Specific Characteristics and the Capital Market Imperfections interacted with the Interest Burden: Fixed Assets- An alternative capital variable

Dependent variable: K/L_{it}	**WITHIN GROUPS** (1)	**WITHIN GROUPS** Size (2)	**WITHIN GROUPS** Age (3)	**WITHIN GROUPS** Bank Dependency (4)	**GMM-DIF** (5)	**GMM-DIF** Size (6)	**GMM-DIF.** Age (7)	**GMM-DIF** Bank Dependency (8)
$Price_{it}$	-0.610***	-0.610***	-0.610***	-0.610***	-0.703***	-0.672***	-0.711***	-0.650***
	(-21.2)	(-21.2)	(-21.2)	(-21.2)	(-11.2)	(-10.1)	(-10.9)	(-10.0)
$Sales_{it}$	-0.659***	-0.660***	-0.659***	-0.660***	-0.844***	-0.790***	-0.846***	-0.763***
	(-36.7)	(-36.8)	(-36.7)	(-36.7)	(-7.40)	(-6.25)	(-7.08)	(-6.53)
Cash $Flow_{it}$	-0.379***	-0.374***	-0.378***	-0.382***	-0.873***	-0.927***	-1.012***	-0.689**
	(-9.02)	(-8.76)	(-8.96)	(-9.49)	(-2.96)	(-2.85)	(-3.35)	(-2.29)
$Leverage_{it}$	-0.069***	-0.069***	-0.069***	-0.069***	-0.054**	-0.197**	-0.218**	-0.064***
	(-7.41)	(-7.36)	(-7.39)	(-7.43)	(-2.52)	(-2.44)	(-2.56)	(-2.86)
$Collateral_{it}$	0.030***	0.030***	0.030***	0.030***	0.036***	0.032***	0.031***	0.036***
	(38.5)	(38.4)	(38.4)	(38.4)	(5.42)	(4.62)	(4.33)	(5.82)
ID_{it}	-0.385***				-0.231***			
	(-7.40)				(-5.42)			
ID_{it}*($Dummy_{it}$)		0.427***	-0.401***	-0.404***		-0.223***	-0.240***	-0.192***
		(-6.04)	(-5.73)	(-8.74)		(-4.73)	(-5.45)	(-4.23)
ID_{it} *(1-$Dummy_{it}$)		-0.224***	-0.343***	-0.272		0.542	-0.098	0.159
		(-5.25)	(-5.82)	(-1.58)		(1.29)	(-1.39)	(0.44)
Constant	1.256***	1.263***	1.259***	1.263***				
	(11.6)	(11.7)	(11.6)	(11.7)				
Observations	28141	28141	28141	28141	15032	15032	15032	15032
No of Firms	7491	7491	7491	7491	4739	4739	4739	4739
R-squared	0.45	0.45	0.45	0.45				
m1					-10.61	-10.83	-11.06	-10.49
m2					0.069	0.082	0.108	0.092
Sargan					0.220	0.095	0.209	0.194
Instruments					t-1; t-2; t-3; Δt-1	t-1; t-2; t-3; Δt-1	t-1; t-2; t-3; Δt-1	t-1; t-2; t-3; Δt-1

Notes: The figures reported in parentheses are t-statistics in absolute values. * significant at 10%; ** significant at 5%; *** significant at 1%. Time dummies and time dummies interacted with industry dummies were included in all specifications. *m1* and *m2* are tests for first-order and second-order serial correlation in the first-differenced residuals, asymptotically distributes as N(0,1) under the null of no serial correlation. The *J* statistic is a test of the overidentifying restrictions, distributes as chi-square under the null of instrument validity. Also see Notes to Table 3.