DEBT MATURITY AND THE CHARACTERISTICS OF OWNERSHIP STRUCTURE: AN EMPIRICAL INVESTIGATION OF UK FIRMS

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ABSTRACT

This work investigates the relationship between short-term debt and the characteristics of ownership on a sample of 700 UK non-financial listed firms for the period 1991-2001. The reported results suggest that there is a significant U-shaped relationship between short-term debt and managerial ownership, particularly significant when we take into account the larger bankruptcy risk in high-leverage firms. Moreover, we provide evidence of a significant negative relation between short-term debt and large external shareholding. Our results tend also to support the hypothesis that the identity of non-managerial shareholders matters in debt maturity choices. Finally, the analysis reveals that a large presence of banks among creditors facilitates the access for firms to long-term credit, but this effect may be moderate when firms deal with multiple banks.

JEL Classification: G32, G34

Key words: debt maturity structure; ownership and control structure; panel data; GMM

[♠] I would like to thank Antoine Faure-Grimaud, Jana Fidrmuc and all the participants to the Corporate Finance, Corporate Governance, and Political Economy - CFS *Summer School* 2004 for useful suggestions on an earlier version of this paper. I am also grateful to Roberto Mura and Samuel Lee for their very valuable hints; Paola Dongili, Diego Lubian, Aydin Ozkan and Angelo Zago for helpful comments. Financial support by the ESRC (Economic and Social Research Council) and the University of Verona is gratefully acknowledged. All errors remain my own.

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1. INTRODUCTION

This work empirically investigates whether equity agency costs can explain debt maturity decisions for UK firms. In particular, a number of theoretical studies on equity agency costs support the view that short-term debt may play a relevant role in mitigating agency costs between managers and shareholders.

Debt maturity decisions can also be interpreted by other competing theories that take into account the typical agency costs of debt, such as underinvestment problems (Myers, 1977; Barnea et al., 1980), costly (re)negotiation (Titman and Wessels, 1988; Whited, 1992), signalling problems and reputation in the market (Flannery, 1986; Diamond, 1991) as well as corporate taxes (Kane et al., 1985). The main prediction of most of these theoretical studies is that short-term debt is more effective than long-term debt in mitigating debt agency costs. Previous empirical literature finds that the determinants of debt maturity structure are consistent with more than one conclusion of such theories (e.g., Barclay et al., 1995; Stohs and Mauer, 1996; Ozkan, 2000; Johnson, 2003).

The underlying assumption of all these studies is the perfect alignment between managers and shareholders interests (Myers, 1977). Nonetheless, from the equity agency costs literature we derive that managers are self-interested and may take decisions within the firm to maximize their own utility function (Jensen and Meckling, 1976). This idea makes it possible to formulate a distinctive set of predictions which have not been explicitly and fully addressed in previous works on debt maturity choices, with the exception of Kim and Sorenson (1986) and, more recently, Datta et al. (2005).

Under the hypothesis of costly agency relations between managers and shareholders, corporate finance literature has traditionally indicated different control mechanisms for mitigating these conflicts, some of which are related to the corporate ownership and control structure, such as managerial ownership and large shareholders (Jensen and Meckling 1976; Stiglitz, 1985; Shleifer and Vishny, 1997), while others are related to corporate policies, such as capital structure decisions (Jensen, 1986). Among the latter, some theoretical works have showed that short-term debt could either force managers "to disgorge funds that they might otherwise use to make unprofitable but empire building investments" (Hart and Moore, 1995) or be an efficient monitoring device for lenders

(Rajan and Winton, 1995; Stulz, 2000), although one of its main disadvantages is to increase the liquidity risk.

The view developed by a number of empirical studies on corporate decisions is that, by trading all these control mechanisms off, managers make sure to efficiently minimize agency costs within the firm in order to provide market participants with signals of favourable performance prospects and have, in turn, positive returns on their own investment in the firm (Crutchley et al., 1999; Bathala et al., 1994).

Our first contribution to the literature is to test whether short-term debt and ownership features are alternative control mechanisms and whether management seeks a trade-off between them in order to mitigate agency conflicts inside the firm and maximize its own utility.

One crucial aspect we take into account in our analysis is managerial ownership and, in particular, our distinguishing feature is to test whether a non-linear relationship exists. To the extent that managers have sufficient ownership to be aligned to shareholders interests (Jensen and Meckling, 1976), this might prevent them from using short-term debt as a signal of their commitment not to expropriate firm resources. This is because, if agency costs within the firm were already under control through the alignment mechanism of managerial shareholding, then issuing more short-term debt would increase the liquidity risk costs in the managerial utility function. It would be more likely for managers, thus, to lose not only their investment in the firm holding, but also their job, as underlined by Friend and Lang (1988). In such circumstances, then, they would prefer to lengthen the maturity of debt. Nonetheless, higher levels of managerial ownership may tend to exacerbate the risk of managerial entrenchment and, therefore, the expropriation of investors. In order to avoid these costs which may result in lower market value of the firm or credit rationing, managers would, then, prefer to trade them off against higher costs of liquidity risk by issuing more short-term debt. Short-term debt would, thus, be a signal to the market of the effort by corporate managers to mitigate potential agency costs. The relation between short-term debt and managerial ownership would therefore be U-shaped. This prediction is not in line with either Kim and Sorenson (1986) or Datta et al. (2005) studies which, reaching opposite conclusions, suggest a linear relationship only.

In order to corroborate our hypothesis, we further investigate the extent to which liquidity and bankruptcy risk are crucial in the managerial decision process. We predict that such non-monotonic relation is more significant in highly levered firms and, at each level of ownership, managers would tend to issue more long-term debt in such firms rather than in less levered ones. So, we isolate firms which are more likely to be exposed to the liquidity risks to verify whether the predicted relationship is in fact stronger in this case.

In addition, we examine whether other ownership characteristics, such as the presence of large external shareholders and bank creditors, may be significantly correlated with short-term debt. Moreover, we explore the possibility that different categories of shareholders, such as financial companies (investment companies, pension funds, insurance or bank owners) and non-institutional shareholders (individuals and non-financial corporations) may have a different impact on maturity decisions, given their different incentives and ability to monitor managers.

Our analysis is conducted on a sample of UK non-financial listed firms over the period 1991-2001, which represents our work's other original contribution to corporate finance literature.

First, we hand-collected detailed information on both ownership and corporate governance characteristics on an annual basis for a sample of 1100 UK non-financial listed companies for the period 1991-2001. Thanks to the availability of panel data for both economic and ownership variables, we are able to adopt a partial adjustment model to analyse the relation between short-term debt and ownership characteristics. Following Ozkan (2000) and Antoniou et al. (2004), we assume that firms cannot adjust immediately to changes in their target debt maturity structure. There may be some delays for firms in adjusting their long-run maturity structure due to high adjustment costs, such as, for instance, costly (re)negotiation with external lenders. So, the actual level of short-term debt might be different from the desired one. We analyse the partial adjustment model adopting the GMM estimation methodology, which also has the advantage over other techniques of being able to deal with potential endogeneity and individual heterogeneity problems.

Second, the existing empirical analyses on UK firms, limited in comparison with US-based studies, explore debt maturity decisions only from the debt agency costs perspective

without considering the implications derived from manager-shareholder conflicts. Ozkan (2000, 2002) provides evidence of a positive relation between long-term debt, low growth opportunities and asset maturity, while there is only limited evidence of an inverse relation between debt maturity and higher future earnings. Cross-country analyses report evidence of a significant positive relation between long-term debt and asset maturity, leverage and growth opportunities for the UK and Italy (Schiantarelli and Sembenelli, 1997) and for the UK, France and Germany (Antoniou et al., 2004).

The results reported in our work suggest a significant connection between short-term debt and several ownership and control structure features. In particular, we find a significant U-shaped relationship between short-term debt and managerial ownership. Furthermore, our analysis reveals that this relation is particularly significant for highly levered firms and shows a downward-shift interpreted as the result of the impact that higher bankruptcy risk may have in the managerial decision process. Additionally, we provide evidence of a significant relation between short-term debt and large external shareholders. A higher concentration of large, non-managerial shareholding seems to be inversely related to short-term debt. Moreover, the results indicate that the identity of large shareholders matters in determining maturity structure decisions. There is evidence of a negative relation between short-term debt and non-institutional investors, suggesting that individuals and non-financial corporations may monitor managerial behaviour more actively than financial institutions do. Also, in terms of a higher level of bank debt, investments by large creditors (such as banks), seem to lengthen the maturity of debt, while the need to provide effective monitoring actions when firms have several bank creditors, makes short-term debt more expedient.

As far as firm-specific characteristics are concerned, it is reported that leverage, size and corporate growth opportunities have a significant impact on debt maturity. Finally, significantly positive adjustment factors account for the presence of relevant dynamic effects in the determination of corporate debt maturity.

The paper is organized as follows. In the next section we develop the main hypotheses tested in the regressions. In section 3 we present data and methodology. Section 4 reports the summary statistics and regressions results. Conclusions are in section 5.

2. HYPOTHESES

In this section we develop the hypotheses that we will test in our empirical model. Specifically, we analyse the role of short-term debt in the managerial decision process as an alternative instrument for mitigating the agency costs between managers and shareholders. In addition, we discuss the hypotheses derived from the theoretical models on debt maturity related to the literature on the agency costs of debt, signalling and tax issues.

2.1 Managerial ownership

In their seminal work, Jensen and Meckling (1976) maintain that managers tend to invest more than shareholders would, because of the higher perks and benefits they can enjoy even from negative present value projects. They also show that managerial ownership in the firm can help to align managerial incentives with shareholders' interests, forcing managers to bear the financial consequences of their expropriating actions and thereby mitigating some conflicts of interest. Jensen (1993) argues that "many problems arise from the fact that neither managers nor non-manager board members typically own substantial percentages of their firm's equity".

Nonetheless, since Demsetz and Lehn (1985) and Fama and Jensen (1983), a growing body of studies have drawn attention to another non-negligible effect of increasing managerial ownership. Increasing voting power and effective control over the firm may result in management expropriating firm resources and entrenching itself (Stulz, 1988; Jensen, 1993). A number of empirical works provide evidence of a non-linear relation between performance and managerial ownership on the basis of these two competing effects, even if a consensus on the shape of this relation has not been reached (for a recent review of these studies see Becht et al., 2003).

In our work we also expect a non linear relation between maturity decisions and managerial ownership and, in particular, a U-shaped relation between short-term debt and managerial shareholding.

In the line of Hart and Moore (1995) and Stulz (2000) arguments we derive that short-term debt may effectively refrain managers from dissipating firm resources. Nonetheless, to the extent that ownership helps to align managers and shareholders, using

the additional instrument of short-term debt to reduce conflicts already under control would be inefficient as it would exacerbate high liquidity and/or bankruptcy risks. This would in turn increase the likelihood for managers to lose their investment in the firm shareholding and their job positions.

Under the assumption that managers prefer to maximize their own utility, they would, thus, tend to reduce such costs by lengthening the maturity of debt. In other words, we make the hypothesis that there is a trade off between the two control mechanisms of short-term debt and managerial ownership. At low levels of managerial ownership, the relation with short-term debt is expected to be negative.

On the other hand, at high levels of managerial ownership, an entrenchment effect could prevail and increase the expropriation risk for external investors. Perceiving the higher risk of expropriation, rational investors would ascribe a lower value to a firm with weak monitoring actions in place and would be less willing to supply capital. Anticipating this, management would issue more short-term debt in order to signal its commitment of keeping the risk of expropriation under control and reducing potential agency costs inside the firm against a higher risk of liquidity problems. So, at higher levels of managerial ownership, the relation with short-term debt would become positive.

In order to corroborate our hypothesis, we further investigate the extent to which liquidity and bankruptcy risk are crucial in the managerial decision process. Since Friend and Lang (1988), a strand of corporate finance literature illustrates the fact that if managers lose their shares and job at bankruptcy, they may desire to use a suboptimal amount of debt in order to reduce the bankruptcy risk implicit in higher debt levels. In addition, Diamond (1991) demonstrates that firms with high liquidity risk (low credit quality) are expected to choose longer maturity than those with low liquidity problems (high credit quality). Consequently, a downward shift in the U-shaped curve may be expected for high-leverage firms as managers will tend to lengthen the maturity of debt in order to reduce the likelihood of liquidity and bankruptcy costs. In addition, we predict that the non-linear relation between short-term debt and managerial ownership would be more pronounced in highly levered firms, because of greater liquidity and/or bankruptcy risk in action.

We define short-term debt (*MAT*) as the ratio of loans repayable within one year to total debt. Moreover, we argue that the shares by executive directors are a better proxy for measuring managerial ownership (*MAN)* and its impact on maturity decisions, since the executive directors are, in fact, responsible for all corporate decisions and their wealth in terms of stakes in the firm can influence their decisions on maturity debt.

2.2 Large external shareholders

In order to investigate the potential impact of equity agency costs in determining debt maturity decisions, we also consider other forms of control related to ownership concentration by large external shareholders. As Stiglitz (1985) and Shleifer and Vishny (1997) argue, large shareholders may have greater incentives to be involved in the control process than smaller ones because they can more easily bear the high fixed costs of collecting information on management behaviour thanks to the large proportion of resources invested in the firm. In general, when control rights are concentrated in the hands of few investors with extensive cash flow rights, a concerted action is easier than when control rights are dispersed. Similar conclusions are reached by Zeckhauser and Pound (1990), who argue that the mere presence of a large shareholder often acts as a signal to the market that managers are less able to expropriate firm's resources, avoiding the need for managers to increase debt level as a signal. In line with these arguments, we would expect that higher ownership by non-managerial shareholders results in a lower proportion of short-term debt in the capital structure of firms.

In our work, we use two different measures of large external shareholders, *BLOCK* and *LARGEST*. *BLOCK* is the sum of all large external shareholders that hold more than 5% of the shares in each company. An alternative measure for the concentration of large external shareholders is also *LARGEST* which is equal to the ownership of the first largest non-managerial shareholder.

Furthermore, we argue that the distinction of outside shareholders on the basis of their identity does matter, because financial institutions on the one hand, and corporations and individuals on the other, might face different incentives and costs in monitoring managerial behaviour and this could,

in turn, imply a different influence on debt maturity decisions. In the following section, we discuss the hypotheses related to the heterogeneity of non-managerial shareholders.

2.3 Financial Institutions

Since 1963, investment trusts, insurance companies and pension funds have progressively increased their holding in listed UK equities at the expenses of the direct holdings by individuals (Stapledon, 1996) [1]. As reported in Table 2, institutional investors own most of the outside shareholding over the entire decade.

Nonetheless, their involvement in the business activities of corporations has been much lower than might be expected. A lot of criticism has arisen against the apparent low activism of institutional investors during the 90s and their scarce participation in voting processes (Cadbury Report, 1992; Hampel, 1998; Faccio and Lasfer, 2001, among others). This may be due, for example, to the disparity between the costs and benefits of monitoring. In terms of benefits, an institutional investor owns less than 7% of the average firm shares. However, monitoring costs are in general high due to the lack of expertise in non-financial business and a lack of knowledge of the sector where a firm operates. Moreover, problems of coordination and lack of resources to monitor all the firms included in its portfolio are other good reasons for an institutional investor not to participate in the general or extraordinary meetings of firms in which it holds shares. As a result, the incentives for being an active investor rapidly decline.

However, in order to understand how the corporate governance system works in the UK, it is necessary to take into account the well-developed network of informal communication among institutional investors within "London's Square Mile". Whenever possible, in fact, English institutional investors prefer to deal with managers "in the shadows", working "behind the scenes" (Black and Coffee, 1994; Short and Keasey, 1997) with a willingness to compromise. Some recent surveys report an increase in the average level of voting (Mallin, 2001), while Short and Keasey (1999) show some marginally

[1] One of the main causes of this phenomenon was the massive increase in funds available to the institutions for investment since World War II. Another reason was the new disposition of insurance companies and pension funds towards equities since the 1960s due to the concern of institutions to protect their investment during the high inflation period and the higher performance of equities than gilts and cash. (Stapledon, 1996).

positive influence of institutional shareholders on firm performance. Goergen and Renneboog (2001) also provide some evidence of a positive relation between institutional shareholding and investments.

The null hypothesis tested in our work is that the mere presence of large financial institutions as shareholders may not provide an effective monitoring on managerial behaviour. What tends to happen is that short-term debt is issued in order to signal the effort of keeping manager-shareholder conflict under control in the market.

We define *INSTIT* as the sum of the shares held by investment companies, insurance and banks in each firm; while *LARGE INSTIT* is the holding of the first largest shareholder be it an institutional investor, insurance company or bank.

2.4 Non-institutional investors

In comparison with institutional investors, non-financial corporations and individuals hold fewer shares in the UK market. Nonetheless, in the average firm a non-institutional investor owns more stakes than a financial shareholder and there is only one non-financial owner for more than three institutional investors (see Table2), which may reduce the coordination problems for this category of shareholders. Indeed, it is more likely that a single individual (or a non-financial company) will have a less diversified investment portfolio than an investment company. A greater involvement by individuals (or non-financial companies) in firm holding may increase incentives to monitor managerial behaviour more actively.

Besides, monitoring costs might be further moderated in cases where non-financial corporations have more expertise and knowledge in monitoring another non-financial company. Some authors find that for UK firms, non-financial shareholders seem to be more active and influential than financial ones in instigating changes (and board turnovers) at high levels of management (Lai-Sudarsanam, 1997) in firms where performance is declining (Franks et al., 2001); in addition, they seem able to stimulate investment spending when there is a high level of free cash flow in the company (Goergen and Renneboog, 2001).

In this work, we test the hypothesis that higher ownership concentration by non-institutional shareholders may result in better monitoring activity by firm managers.

Consequently, we expect there to be a negative relationship between short-term debt and non-financial shareholding.

As in the previous hypothesis, we consider the case of non-financial shareholders as a group and as a largest shareholder. We define *EXTERNAL* as the sum of the shares held by corporations and individuals; while *LARGE EXTERNAL* is the holding of the first largest shareholder whether it is a non-financial company or an individual.

2.5 Large creditors

As argued in finance literature, large creditors have greater potential to be active monitors of managerial behaviour because of their large interests in the firm (Shleifer and Vishny, 1997). Among creditors, banks are the main group for UK firms in terms of both short and long-term debt (Table3 Panel B).

The monitoring role by banks and, more generally, by financial intermediaries has long been debated with controversial and conflicting conclusions.

Part of current literature argues that in an economic system with efficient financial intermediaries and efficient stock markets, the problem of monitoring borrowers' behaviour can be endogenously solved thanks to the capacity of competitive intermediaries to collect information, banks in particular, (Campbell and Kracaw, 1980; Diamond, 1984) and/or the ability of liquid stock markets to produce and distribute information (Grossman, 1976; Grossman and Stiglitz, 1980). The direct implication of such theories is that a developed banking sector and/or large stock markets should facilitate access to external finance and increase the ability of firms to obtain long-term credit (Caprio and Demirgüc-Kunt, 1997).

On the other hand, it is argued that, depending on the level of banking competition or the perceived accuracy of financial information, an imperfectly informed bank imposes more restrictive conditions on loans (for instance, higher interest rates or short-term debt instead of long-term debt) in order to select and better monitor the firms it lends to (Diamond, 1991).

The role of banks may be particularly interesting for the UK for a number of reasons. The UK is one of the most advanced economies in the world in terms of the activity, size and efficiency of its financial sector (Levine, 2002). Some evidence also suggests that

creditor intervention is the main source of corporate reorganization for UK firms in disciplining management in poorly performing companies (Franks et al., 2001).

Nonetheless, the English banking system seems to be less competitive than the US system, as highlighted by the Cruickshank Report (2000) on the level of competition among the English banks during the last decade.

The hypothesis we test in our model is that English banks do actively monitor managerial behaviour in the firms they lend to. As a consequence, they do actually facilitate firms' access to long-term finance, reducing the need for managers to issue more short-term debt as a signal that agency conflicts inside the company are being mitigated. An inverse relation is expected between short-term debt and the ratio of bank debt to total debt (*BK*), which is a proxy of the investment made by banks in the firms.

More insight on the relationship between short-term debt and bank creditors is offered by considering the number of banks which have provided a firm with credit. As Diamond (1984) argues, the monitoring incentives for each bank may decrease as the number of banks the firm deals with increases, because problems of free riding are more likely to arise. Additionally, banks will be less willing to monitor due to their expectations of shorter lending relationship because of a greater perceived probability of the firm switching banks (Ang et al., 2000).

In line with these arguments, we hypothesize that the more banks a firm uses as creditors the higher the proportion of short-term debt will tend to be. We define *NBK* as the natural logarithm of the total number of banks with which the firm has lending agreements.

2.6 Control variables

In our regressions we take into account other factors that might have a systematic impact on debt maturity choice.

From contracting-cost theory (Myers, 1977; Barnea et al., 1980) we know that, with outstanding debt in its capital structure, the benefits from a profitable investment project are split between debtholders and shareholders. In some states of nature, the benefits accruing to debtholders do not give normal returns to shareholders. Hence, the incentive to reject positive net present value projects (causing underinvestment problem). With higher growth opportunities

available, the conflict between debtholders and shareholders becomes greater. One solution proposed by Myers (1977) is to shorten the maturity of debt. So, we expect a positive relation between short-term debt and growth opportunities. As in previous empirical studies, we adopt the ratio of market value of total assets to book value of total assets (*MTBV*) as a proxy for growth opportunities, where market value of total assets is defined as the book value of firm's assets plus the difference between the market value and the book value of equities.

Another implication of contracting-cost theory regards firm size. It is argued that larger firms are less exposed to the agency costs of debt. Moreover, they have easier access to capital markets than smaller firms (Titman and Wessel 1988) and can also guarantee long-term debt with substantial collateral. As a result, the relation between short-term debt and firm size is negative. In our work, *SIZE* is defined as the natural logarithm of total assets in 1991 prices.

Finally, Myers (1977) argues that in order to deal effectively with agency problems between shareholders and bondholders, debt and asset maturity should be matched. This would avoid any transfer of wealth from shareholders to debtholders during the life of any given investment. So, a negative relation between short-term debt and asset maturity (*ASSMAT*) is expected to result. *ASSMAT* is defined as the ratio of total fixed assets to annual depreciation, where total fixed assets represent the net total of land and buildings, plant and machinery, construction in progress and other fixed assets.

According to liquidity risk theory (Diamond, 1991), which states that liquidity risk increases with leverage, firms with higher leverage (*LEV*) are expected to use, *ceteris paribus,* less short-term debt in order to reduce the risk of suboptimal liquidation. We define *LEV* as the ratio of total debt to total assets.

From signalling theory (Diamond, 1991; Flannery, 1986) we derive that in order to signal their quality to the market, firms will make use of debt maturity structure. In particular, because of the costs of rolling over short-term debt, only high-quality firms tend to issue short-term debt in order to signal their quality to the market. The implication is that there is a directrelation between short-term debt and firm quality (*QUALITY*). As a proxy for *QUALITY* we use the growth rate of earnings, defined as the difference between the pre-tax profits in $t+1$ and the pre-tax profits in t divided by the pre-tax profits in t.

Finally, some studies (Brick and Ravid, 1985; Kane et al., 1985) demonstrate the impact of the tax system on debt maturity choice. In particular, Kane et al. (1985) develop a model in which optimal debt maturity is determined by a trade-off between the tax advantage of debt and bankruptcy per period and debt issue flotation costs. In order to spread refinancing costs over a longer period, the firm lengthens debt maturity as flotation costs increase. Firms lengthen the maturity as the tax advantage of debt decreases in order to ensure that the remaining tax advantage of debt is not less than amortized flotation costs. A positive relation with short-term debt is expected. Nonetheless, it would be the case that taxes may be irrelevant if optimal leverage and debt maturity are chosen simultaneously (Lewis, 1990). As a measure for taxation we use the total tax ratio, defined as total tax charge divided by pre-tax profits.

3. DATA AND METHODOLOGY

As discussed earlier, the second main contribution of our work to this field of literature is the original panel of ownership. Because data were not available in machine-readable form, we hand-collected detailed information on the characteristics of both ownership and corporate governance from a sample of 1100 UK listed non-financial companies for the period 1991-2001 (Marchica and Mura, 2005).

Ownership data mainly comes from the *Price Waterhouse Corporate Register* (Dec. issue). Additionally, we used the *London Stock Exchange Official Yearbook* which contains a brief "company history" report for each firm listed every year and various information concerning market composition. An alternative source of information was the Companies House, which is a free online resource facility. Both these sources provide, besides other information, the changes in name and the legal status of companies (bankruptcy, liquidation, receivership, delisted, listed). This was essential to retrieve information on firms regarding the earlier years of the last decade.

Accounting data and market value of equity are provided by *Datastream*. The final panel data was constructed as follows. We excluded all the firms with any missing economic variables and with any missing observations regarding the variables we chose to use in our models for the sample period analysed. Then, we excluded all utilities (firms providing public

services such as electricity, water, gas and telephone), because of obvious differences in their accountability for debt items together with differences in their corporate governance structures. Next, we discarded all the firms with extreme values for the considered variables. Finally, we kept all the firms for which we had at least six consecutive years of observations. The structure of the panel is shown in Appendix 1. The result is an unbalanced panel of 625 firms with more than 5600 observations.

Most of the works which analyse debt maturity decisions or the relationship between leverage and characteristics of ownership adopt static models implying that firms can adjust immediately to changes in their debt maturity targets or leverage structures. In our analysis, instead, as in the studies by Ozkan (2000) and Antoniou et al. (2004), we assume that there may be some delays for firms in adjusting their debt maturity structure owing, for instance, to likelihood that there will be a certain degree of (re)negotiation with external lenders. So, the actual level of short-term debt might not coincide with the desired one. Thanks to the availability of panel data both for economic and ownership variables, we can use a partial adjustment model in order to control for this adjustment process and investigate the potential relation between short-term debt and the specific characteristics of ownership structure. The model that we adopt is as follows:

$$y_{it} = \alpha y_{it-1} + \sum_{k=1}^{k} \beta_k x_{it} + \eta_i + \eta_t + \nu_{it} \qquad i = 1,2.....N; t = 2,3,.....T \qquad (1)$$

where y_{it} is an observation of a certain level of short-term debt (*MAT*) for firm *i* in period *t*, y_{it-1} is the observation of *MAT* for the same firm in the previous period, η_i is an unobserved firm specific time-invariant effect, η_t is a firm-invariant time specific effect and, finally, v_{it} is a disturbance term which is assumed to be serially uncorrelated with mean equal to zero. Firm specific effects, η_i, allow for heterogeneity in the means of y_{it} across individuals and reflect qualitative characteristics that make each firm different from the others, such as market reputation, quality of management, but also the features of the industry where the firm operates. Time specific effects, η_t, on the other hand, refer to some macroeconomic events that can influence all firms. If we assume values of η_i to be stochastic, this will mean that they are correlated to the lagged dependent variable y_{it-1} and that they have non-zero

covariances with x_{it}. This implies, in turn, that OLS coefficients, α and $\sum_{k=1}^{k}\beta_i$, are inconsistent and the estimates of α are biased upwards due to the fact that the variable y_{it-1} is positively correlated with the error term, defined as ($\eta_i + v_{it}$).

Using Within Group (WG) estimators helps to solve this inconsistency because it eliminates η_i by transforming the original observations as deviations from the time mean of each variable. Nonetheless, this transformation introduces, in turn, a correlation between the transformed lagged dependent variable and the transformed error term through the pair terms y_{it-1} and $\frac{-}{v_{it-1}}{T-1}$ and $\frac{-}{y_{it}}{T-1}$ and v_{it}. This inconsistency doesn't vanish if a larger number of firms are considered so WG estimators are also inconsistent and α is heavily biased downwards.

The fact that these two estimators are biased in opposite direction is useful because they set lower and upper boundaries needed to properly evaluate a candidate consistent estimator that will lie in between (Bond, 2002).

A more efficient method to estimate model (1) was developed by Arellano-Bond (1991). Instead of using the WG estimators, they apply first-differencing transformation (FD), which eliminates the unobserved firm effect, η_i, and doesn't introduce all the realizations of the disturbances in the error term. There is still correlation between the transformed lagged dependent variable, $\Delta y_{it-1} = y_{it-1} - y_{it-2}$, and the transformed error term, $\Delta v_{it} = v_{it} - v_{it-1}$, through terms y_{it-1} and v_{it-1}, but now consistent estimates of α can be obtained with instrumental variables that are both correlated with Δy_{it-1} and orthogonal with Δv_{it}. Given this assumption and the absence of serial correlation of the disturbances v_{it}, the first available instrument for Δy_{it-1} is y_{it-2} (or Δy_{it-2} as stated by Anderson-Hsiao, 1982). The higher efficiency of Arellano-Bond estimators over the Anderson-Hsiao method is due to the application of the Generalized Method of Moments procedure (GMM), that is, the inclusion of all available moments of the lagged dependent variable and of the other regressors in the instrument set to estimate model (1).

The validity of the instruments used to estimate our model can be tested using the standard GMM test for overidentifying restrictions or the Sargan test. The null hypothesis of this test is the orthogonal condition of the instruments with respect to the disturbances,

$H_{0Sargan}$: $E\,(z`\,\Delta v_{it}) = 0$ , where $z`$ is the instrument set matrix. The rejection of $H_{0Sargan}$ casts doubts for the validity of the instruments used in the model. The set of valid instruments used in our estimations are chosen on the basis of the assumptions on the correlation between x_{it} and v_{it} and tested using Difference Sargan tests.

4. RESULTS

4.1 Summary of Statistics

In comparison with Continental European countries, such as Italy, Belgium or Germany, ownership concentration in UK firms is low[2]. From Table 1, Panel A we can see that more than 58% of holding in English companies is dispersed (*FLOAT*), that is, it is below the threshold of 3%[3]. Moreover, Panel B shows that less than 2% of firms have a largest shareholder owning the majority of shares with a decreasing trend over time. In addition, although not reported here, our data show that the average number of shareholders with more than 3% of shares is about 10. These facts are a clear indication of the dispersion of the UK market.

Nonetheless, from the parlance of the City we derive that "overweighted institutions", or institutions expected to take the lead role in shareholder intervention, are considered those holding more than 3.5% of shares in a company (Black-Coffee, 1994). To the extent that most of the undisclosed shareholding is constituted by "atomistic owners", we need to redefine the concept of ownership concentration for UK firms relative to their "disclosed" holding. This means, in turn, that a monitoring role for large non-institutional shareholders can be envisaged even when large shareholders own only a small amount of stakes (Leech, 2000).

In this perspective, the statistics of *LARGEST* (Panel A) show that the average holding of the largest non-managerial shareholder is about 11% and increasing in the second half of the 90s; furthermore, in most of the companies the largest non-managerial owner holds at least 10% of stakes and there is a clear trend of an increasing number of firms with the first largest owning more than 20% of shares (Panel B).

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[2] There is evidence showing that in Italy 88% of manufacturing companies in 1994 have a large shareholder owning the majority of stakes (Bianchi *et al.*, 1997); in Belgium 93% of listed companies have a single owner with at least 25% of shares (Renneboog, 2000); in Germany 85% of large quoted firms have a shareholder with at least 25% of stakes (Franks and Mayer, 2001).

[3] Until 1989 the requirement to disclose share blocks was 5% and further reduced to 3% from 1990 on. However, the Corporate Register for 1991 edition keeps the disclosure threshold at 5%.

As far as the figure *BLOCK* is concerned, it is worth noting in Table 1 Panel A that all non-managerial shareholders with at least 5% of stakes increasingly constitute the majority of the "disclosed" holding. Panel B illustrates, also, that more than 40% of firms have at most 2 large non-managerial owners with more than 5% of shares, even though the proportion of firms with more than 3 blockholders is becoming gradually higher.

These figures support the hypothesis that even if ownership concentration in the UK has separate and distinct characteristics compared to other European countries, large external shareholders may have enough cash flow rights to actively monitor managerial behaviour.

Table 2, Panel A shows the composition of shareholders by identity. Executive ownership (*MAN*) decreases over time[4].

The prevalent group in terms of shareholding is represented by *INSTIT*, that is, investment companies, pension funds, insurances and banks. This differentiates the UK from US companies where most of the firms are owned by individuals (Black-Coffee, 1994)[5]. Even as largest shareholders (*LARGE INSTIT*), institutional investors are the most important category in UK firms. Moreover, only 9% of firms do not have any institutional investor as a shareholder, even though there is a small increase in this figure at the end of the period (see *INSTIT* in Panel B). Furthermore, as largest shareholder, an institutional investor owns at least 10% of shares in more than 30% of companies with an evident increase in the 10%-20% interval of holding between 1993 and 1998 (see *LARGE INSTIT* in Panel B).

In spite of the huge amount of stakes held by financial companies in the English market, their ownership is highly distributed among numerous investors. Figures in Panel B show that more than 60% of firms have more than 3 institutional investors as owners and 10% of companies have at least 7 institutional shareholders, probably supporting the

[4] This is in line with what Franks *et al.* (2003) show for UK firms over the last century. The reasons for this phenomenon indicated by the authors are related not to the sales of shares by directors in the secondary market, but instead to acquisitions, right issues and placings, in particular in the first half of the century.

[5] Although we can not directly compare our English data used here with the US one, because these are direct ownership data, the recent work of Gadhoum *et al.* (2004) on the ultimate ownership in the US shows that in 1996 about 37% of the all listed firms in the US market are controlled by families, while only 16% are owned by financial institutions.

hypothesis that higher coordination costs for financial institutions may act as a disincentive to effectively monitor managerial behaviour.

On the other hand, non-managerial shareholders (*EXTERNAL*) own a lower, but increasing, percentage of shares compared to institutional investors; the rise is more pronounced after 1996 (Panel A). In addition, even if a largest non-institutional shareholder (*LARGE EXTERNAL*) is present in only 20% of firms, in most cases this shareholder tends to hold at least 10% of stakes, as reported in Panel B. Moreover, the proportion of firms where the largest non-managerial shareholder holds from 10% to 30% of stakes increased in the second half of the decade (Panel B).

The figure for *EXTERNAL* in Panel B shows that in most of the firms examined there are only 2 external shareholders, while in only less than 1% of the companies, are there more than 7 non-institutional investors. This could support the statement that because of fewer coordination problems, non-institutional investors might face lower monitoring costs and, consequently, have greater incentives to control managerial behaviour.

Finally, Table 3 describes statistics for the economic variables. The values in Panel A are in line with the results reported in Ozkan (2000, 2002) for the period 1984-1996. *MAT* has a mean of 0.61, which means that 61% of total debt for the average firm includes debt with maturity within 1 year. The same argument applies to *BK*: about 58% of total debt for the average firm is constituted by bank debt. In detail, Panel B shows that for more than 60% of firms bank debt is the main type of debt in their capital structure. Furthermore, fewer than 17% of firms do not have bank debt among their sources of funding and this figure seems to decrease if we compare the data reported for the early 90s with those at the end of the period, making banks the largest creditors for UK non-financial firms over the entire decade.

4.2 Regression results

Table 4 presents three different estimation procedures: OLS in levels, Within Group and GMM where all the variables, both lagged dependent variables and regressors, are instrumented. For the GMM models, the estimation period is 1993-2001 due to the loss of two cross-sections for the construction of one lag for all variables and the first differentiation. For all the models we have 625 firms with 5620 observations, although usable observations vary according to the estimation method. We report six different tests

with the correspondent *p*-values: 1) Wald (joint) is a Wald test for the joint significance of the estimated coefficients which are asymptotically distributed as χ^2 under the null hypothesis of no relationship; 2) Wald (sector) is a Wald test for the joint significance of the industry dummies; 3) Wald (time) is a Wald test for the joint significance of the time dummies; 4) Sargan test of overidentifying restrictions, which are asymptotically distributed as χ^2 under the null hypothesis of no correlation between the instrument sets and the error term; 5) m_1 is the serial correlation test which is asymptotically distributed as standard normal *N(0,1)* under the null hypothesis of no first-order serial correlation; 6) m_2 is the serial correlation test under the null hypothesis of no second-order serial correlation. All the models were estimated using the Dynamic Panel Data (DPD)-programme written for PC-GIVE.

Table 4 shows the alternative procedures used to estimate the partial adjustment model for debt maturity decisions presented in the previous section. As predicted by the theory (Anderson and Hsiao, 1982), the OLS levels and WG estimates of the parameter α are biased in the opposite directions: upward for the OLS due to the presence of firm-specific effects and downward for the WG regression due to the correlation between the transformed lagged dependent variable and the transformed error term. The other columns report, on the other hand, GMM estimations where the estimated α is well below OLS and above WG estimations, as predicted by the theory.

The serial correlation tests in OLS and WG models show autocorrelation in the residuals. Nonetheless, following Bond (2002) argument, this fact needs not to indicate that our model (1) is misspecified, because the estimates of α and, hence, the estimates of the residuals are likely to be biased. In addition, the results of m_1 and m_2 in GMM models clearly evidence the absence of second order serial correlation[6]. Moreover, the results of the Sargan tests on the acceptance of the instruments used in the GMM models indicate the sign of the validity of the estimation procedure adopted in our work.

In order to choose the appropriate instrument set we take into account the fact that problems of endogeneity can affect all the regressors, as shocks that influence maturity decisions also affect leverage or bank debt decisions, for instance. Nonetheless, it seems reasonable to allow for a delay between the decision to change the debt maturity and its

[6] Serial correlation of order 1 is, in fact, induced by the first differentiation in the GMM model.

actual execution, as far as the impact of other regressors is concerned. In order to discriminate between these possibilities, we use the approach suggested by Arellano-Bond (1991). If X_{it} is assumed to be endogenous, then it is treated symmetrically as the dependent variable. So, the lagged value X_{it-2} will be a valid instrumental variable. If we make a stronger assumption that X_{it} is not correlated with v_{it}, then X_{it-1} is additionally available as a valid instrument for the first differenced equation in period *t*. These moment conditions are overidentifying restrictions and their validity can be tested by using the Difference Sargan test. If we denote as *S* the value of the Sargan test under the stronger assumption ("X_{it} predetermined") and *S'* under the weaker assumption ("X_{it} endogenous"), then $DS=S-S'$ is asymptotically distributed as a χ^2 and tests the validity of the additional instrument included in the set under the stronger assumption (Bond, 2002). In accordance with the values obtained from the Difference Sargan tests, the instrument set used in our specifications is equal to $[y_{it-2}, x_{it-2}, x_{it-1}]$.

In all the specifications adopting GMM methodology, the results reveal that the coefficient of the lagged short-term debt is positive and significantly different from zero. The adjustment coefficient λ is greater than 0.5, which seems to provide evidence that the dynamic nature of our model is not rejected and firms adjust their short-term debt relatively quickly in an attempt to reach the target for debt maturity. This could be explained either by the fact that the costs of adjustments are very low or the costs of being off-target are quite high.

4.2.1 Short-term debt and ownership characteristics

Table 4 reports results on the relationship between debt maturity decisions managerial ownership, large external shareholders and large creditors.

Our findings seem to provide some evidence that debt maturity decisions are interdependent with ownership and control characteristics, as a potential instrument that can serve to mitigate agency costs between managers and shareholders.

In all the estimated models (with the exception of two specifications in showed in Table 6), there is a significant U-shaped relation between managerial ownership and short-term debt, suggesting that for low values of their ownership, managers are already

considered aligned to shareholders interests and they don't issue more short-term debt when it is not strictly necessary, so as not to exacerbate liquidity risk problems.

On the other hand, increasing levels of manager stakes in the firm amplifies the risk of managerial entrenchment and investor expropriation. In order to reduce the likelihood of a decreasing market value of firm's stocks with negative repercussions on their own portfolio, managers tend to issue more short-term debt to signal to the market they are not resorting to expropriation.

Our findings diverge from the results of both Kim and Sorenson (1986) and Datta et al. (2005) for US firms, because they test only a linear relation between long-term debt and managerial ownership. Kim and Sorenson (1986) show that long-term debt is positively related to managerial ownership when managers own more than 25% of firm's shares; while Datta et al. (2005) find a positive relation between short-term debt and insider shareholding.

In other studies which have analysed the interdependence of capital structure and ownership characteristics as instruments for mitigating equity agency costs, as argued earlier, there is no explicit reference to the maturity structure of debt. Nonetheless, a number of studies define leverage as the ratio of long-term debt to total debt which complements our definition of debt maturity (MAT). To the extent that the parallel between our definition of debt maturity and their definition of capital structure holds, we find that our evidence is similar to that found in the works mentioned above. For instance, our finding of a significant U-shaped relation between managerial ownership and short-term debt is partly consistent with the conclusions reached by Friend and Lang's (1988). In fact, for publicly held corporations (those with low managerial ownership) in the New York Stock Exchange they find a significant positive relation between leverage (ratio of long-term debt to total debt) and ownership by the dominant managerial insider, while for closely held corporations (those with high managerial ownership) they find a negative relationship with leverage. Likewise, our results are also similar with the findings of Wansley et al. (1996) for US firms: for managerial ownership below 40% they report a positive impact on leverage (ratio of long-term debt to total debt), while higher levels of insider ownership reveal an opposite relationship.

For large external shareholders, the evidence in Table 4 seems to support predictions by Zeckhauser and Pound (1990). *BLOCK* is negatively related to short-term debt, but it is not significant. This might be due to the heterogeneous incentives of the external shareholders included in this variable.

Nevertheless, *LARGEST* is significantly negative. This seems to support the prediction that the first large external shareholder *per se* plays a significant role in monitoring managerial behaviour, thus acting as a substitute for the disciplinary role of short-term debt. Moreover, this result is consistent with the view that a major shareholder can credibly assure the market about the reduced agency costs in the firm without resorting to alternative instruments of capital structure.

4.2.2 Short-term debt and shareholder identities

To the extent that the incentives to monitor managers depend on the category of controlling shareholders, more insights on the relation between debt maturity decisions and external shareholders seem to emerge from Table 5.

We find evidence that the presence of individuals and/or non-financial corporations as large shareholders is inversely related to debt maturity and this may be interpreted as evidence that short-term debt and non-financial shareholders are substitute monitoring instruments. Non-financial shareholders may have incentives to monitor managerial behaviour and this may be a strong indication for the market that agency costs inside the firm are kept under control. So, issuing more short-term debt as an alternative monitoring instrument would cause an inefficient increase in liquidity risk. It seems that results are significantly consistent with our hypothesis when we consider this category of shareholders as a largest non-managerial owner (*LARGE EXTERNAL*), while the relation with non-managerial shareholders as a group (*EXTERNAL*) is positive, but not significant.

On the other hand, we fail to detect a significant relation between institutional investors and debt maturity decisions in both models. Moreover, there is also some inconsistency in the signs of the estimated coefficients for *INSTIT* and *LARGE INSTIT*. Although insignificant, the positive sign of *INSTIT* is in line with our null hypothesis: institutional investors seem not to play an active role in the business activities of firms and

this increases the need for alternative monitoring instruments to curb managerial expropriation, as the positive relation in column 1 shows. Nonetheless, when we isolate the largest non-managerial owner, the negative sign of the estimated coefficient of *LARGE INSTIT* could indicate that even a financial institution may give external lenders a marginally positive signal of some monitoring action taking place inside the firm reducing short-term debt issues (column 2). We could explain this inconsistency as an indication of the presence of high coordination costs when institutional investors are treated as a group, *INSTIT*, with greater incentives to free ride and less inclination to monitor corporate decisions.

4.2.3 Short-term debt and large creditors

As far as monitoring by large creditors is concerned, the presence of considerable investments by banks in the firm (*BK*) is significant and negative in all the estimated models as predicted by Diamond (1984): financial intermediaries and especially banks can benefit from economies of scale in obtaining information to discipline borrowers so that they can facilitate access to external finance, long-term credit in particular. This is in line with evidence presented by Cai et al. (1999) on the relation between bank monitoring and the maturity structure of debt.

Nonetheless, this effect can be moderated when firms deal with several banks (*NBK*). Two-bank lending involves lower monitoring (Carletti, 2004) leading to possibly higher agency costs. In such a situation, a greater proportion of short-term debt is the best instrument available both for the incumbent lenders to monitor firm's managers and for the firm to signal to potential lenders that there is a certain degree of commitment to keeping manager-shareholder conflicts under control. Another interpretation consistent with our results may be that the number of institutions from which the firm is borrowing is a function of the reliability of the firm itself. Therefore, "good" firms tend to have relationships with relatively few institutions, while bad ones have to resort to multiple loans, since banks may do not want to take all the risk of dealing with such firms alone. In the perspective of our work, the "bad" quality in terms of higher agency costs may increase the need to use short-term debt as an alternative monitoring instrument.

4.2.4 Managerial ownership and liquidity risk

In order to corroborate the hypothesis that liquidity and bankruptcy risk costs play a crucial role in determining corporate debt maturity, we investigate whether the increased risk of bankruptcy in highly levered firms will mean that the marginal effect of managerial ownership on short-term debt is in absolute value decreasing.

In order to do that, we calculate the average leverage of each firm across periods. Then, we divide the sample into two groups: high-leverage firms are those above the 55th percentile of the distribution of individual leverage for the entire sample (*UPLEV=1*); low-leverage firms are those below the 45th percentile of the distribution (*UPLEV=0*)[7]. As a robustness check, we also divided the sample on the basis of the average leverage of each sector, because leverage can be heavily influenced by differences across sectors. Thus, a firm is defined high-leverage if its individual leverage is higher than the average leverage of the sector it belongs to (*UPSECLEV=1*); otherwise it is defined as a low-leverage firm (*UPSECLEV=0*). Finally, we re-estimated our model for each sub-sample. Table 6 reports the results for the two sub-samples defined by *UPLEV* and *UPSECLEV*.

It evidences that at each level of managerial ownership, highly levered firms show lower levels of short-term debt than less levered companies. This tends to indicate that managers in highly levered firms lengthen the maturity of debt at any level of their ownership in order to reduce the risk of corporate bankruptcy and, consequently, minimize the higher costs of their undiversifiable portfolio. In addition, the non-linear relationship between managerial ownership and debt maturity seems stronger in those firms more sensitive to bankruptcy problems corroborating the idea that liquidity and bankruptcy costs play an important part in the managerial decision process.

Furthermore, results indicate that managers become entrenched at higher levels of ownership in highly levered firms. This could be interpreted as a consequence of the discipline role of leverage which might itself mitigate the agency costs inside the firm (Jensen, 1986; Zwiebel, 1996).

[7] For robustness purposes we also divided the sample using the 50th percentile and the median firm. Results don't change significantly.

Finally, as far as the dynamic effect is concerned, there is a considerable difference between the adjustments factors for high- and low-leverage firms, in particular in the first two specifications of Table 6. It seems that low-levered firms adjust more quickly which may indicate that adjustment costs are higher for firms with high leverage. One possible explanation might be that low-leverage firms are perceived by lenders as low-risk firms which could determine lower costs of (re)negotiation and, in turn, a quicker adjustment process than for highly levered firms.

4.2.5 Control variables

As far as the firm-specific determinants are concerned, we generally find that firms with higher growth opportunities tend to have less short-term debt. This finding is in contrast with the predictions and with what is reported by Kim-Sorenson (1986), Barclay-Smith (1995) and Barclay et al. (2003) and for the UK by Ozkan (2000; 2002). Nonetheless, it is in line with Stohs-Mauer (1996), Johnson (2003) and Datta et al. (2005) and for the UK firms with Schiantarelli-Sembenelli (1997) and Antoniou et al. (2004). This could be interpreted with the liquidity risk hypothesis: firms tend to issue more long-term debt in order to avoid inefficient liquidation of their riskier growth opportunities[8]. This interpretation seems to find some support if we also compare the coefficients of *MTBV* for high- and low-leverage firms in Table 6. When firms have higher liquidity risk, because of their high level of leverage, they tend to have a longer maturity in correspondence to higher growth opportunities. In other words, the estimated coefficients of *MTBV* for high-leverage firms are higher in absolute value than those for the low-levered firms. among the other contracting-costs predictions, larger firms seem to adopt more long-term debt, similarly to results found in previous empirical works. The asset maturity coefficient is in line with the predictions, but it is not significant as in Antoniou et al. (2004).

The liquidity risk hypothesis is supported by the significant results in all models of *LEV*, in line with Stohs-Mauer (1996) and Johnson (2003). Our study fails to find support for the signalling hypothesis that high quality firms use more short-term debt to signal their

[8] As suggested by Stohs-Mauer (1996), we run the same regressions for all the specifications without controlling for leverage, but we obtained the same results reported here.

quality, similarly to results reported in Ozkan (2002). Finally, we find little evidence of the relation between debt maturity and taxation, once again in line with results in Ozkan (2000) and Antoniou et al. (2004).

5. CONCLUSIONS

In this paper we empirically investigated the relationship between short-term debt and characteristics of ownership and control under the hypothesis that debt maturity may be interdependent with ownership structure as a potential instrument for mitigating manager-shareholder conflicts. We conducted our analysis on a sample of UK non-financial firms over the period 1991-2001.

Our work contributes to corporate finance literature in numerous ways. First, we extend the empirical literature on debt maturity structure by incorporating a distinctive set of predictions on several features of ownership and control as relevant determinants of debt maturity decisions. Furthermore, we offer a different perspective to the strand of literature that analyses the interdependence of alternative control mechanisms in reducing agency conflicts between managers and shareholders, because we explicitly investigate the role of debt maturity structure in mitigating such agency costs. Second, thanks to the availability of a panel data both for economic and ownership variables we are able to adopt a partial adjustment model to control for potential delays by firms in adjusting to their long-run maturity structures. The GMM estimation procedure also enabled us to deal with potential endogeneity and individual heterogeneity problems. Third, this study contributes to the existing literature in that it sheds more light on what has determined debt maturity decisions in English firms over the last decade.

The results reported show that there is a significant relation between short-term debt and ownership characteristics, probably suggesting a substitution effect between debt maturity and ownership structure in order to keep manager-shareholder conflicts under control. In particular, we find a significant U-shaped relationship between short-term debt and managerial ownership corroborating the hypothesis that managers seek a trade-off between the control mechanism of short-term debt and ownership in order to mitigate agency conflicts inside the firm at the least costs and maximize their own utility. Moreover,

the greater bankruptcy risk for highly levered firms determines a downward shift of the non-linear relation between insider ownership and maturity, because managers try to reduce the potential bankruptcy costs related to their undiversified investment in the firm, by lengthening the maturity of debt. Additionally, we provide evidence of a significant negative relation between short-term debt and large external shareholders. Our results seem also to support the hypothesis that the identity of non-managerial shareholders does matter in determining debt maturity structure: there is a significantly negative relation between short-term debt and non-institutional investors which may lead to the conclusion that individuals and non-financial corporations monitor managerial behaviour more actively than financial institutions do. Furthermore, our study reveals that the greater presence of banks among creditors in terms of higher level of bank debt facilitates the access of firms to long-term finance, while the need to provide effective monitoring actions when firms have several bank creditors calls for more short-term debt in the capital structure of companies.

Our analysis also reports that there are significant dynamic effects in the determination of firms' debt maturity. Finally, it is shown that leverage, size and corporate growth opportunities have a positive impact on debt maturity decisions.

Appendix 1

Panel data specification and structure of panel

The underlining assumption of a partial adjustment model for debt maturity structure is that firms have a debt maturity target (MAT^*_{it}) which is a function of K firm-specific characteristics, ($\Sigma\gamma_k x_{it}$) and a disturbance term, (u_{it}) .

$$MAT^*_{it} = \Sigma\gamma_k x_{it} + u_{it} \quad \text{(A1)}$$

Firms try to adjust their relations with different lenders such that their current debt maturity structure is closer to their target. This produces a partial adjustment process as follows:

$$MAT_{it} - MAT_{it-1} = \lambda\,(MAT^*_{it} - MAT_{it-1}) \quad \text{(A2)}$$

where MAT_{it} is the current debt maturity, $(MAT^*_{it} - MAT_{it-1})$ is the target change and λ is the adjustment factor or, in other words, what can effectively be adjusted.

If we substitute the function (A1) in the partial adjustment equation (A2) and include η_i and η_t, we obtain our model (1)

$$MAT_{it} = \alpha\, MAT_{it-1} + \sum_{k=1}^{k} \beta_k x_{it} + \eta_i + \eta_t + \nu_{it} \qquad \text{(A3)}$$

where now $\alpha = (1 - \lambda)$, $\beta_k = \lambda\gamma_k$ and $v_{it} = \lambda u_{it}$. From the estimated coefficient of the lagged dependent variable, thus, we derive the estimated adjustment factor λ for our sample. λ can take any value between 0 and 1. If $\lambda = 1$ there is an immediate adjustment ($MAT_{it} = (MAT^*_{it})$ which, in turn, means that either the costs of adjustments are very low or the costs of being off-target are pretty high; otherwise, if $\lambda = 0$, implying $MAT_{it} = MAT_{it-1}$, the costs of adjustments are so high that firms cannot change their actual debt maturity structure.

Table A1

Structure of panel

no. of records for each company	6	7	8	9	10	11					
no. of companies	43	76	125	88	50	243					
Years	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
number of observations	505	529	562	601	619	625	598	541	454	387	334

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Table 1
Concentration of shareholding in the sample of UK listed companies, 1991-2001

Panel A: Average shareholding (%) of largest non-managerial owner, sum of ownership of large shareholders with more than 5% stakes (BLOCK), sum of "undisclosed" ownership (FLOAT)

	1991*	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
LARGEST	9.70	10.19	10.56	10.58	10.69	11.01	11.08	11.52	11.06	12.38	11.87
BLOCK	21.96	23.45	23.89	21.71	22.08	22.97	24.25	24.77	25.85	25.71	24.49
FLOAT	63.67	54.79	54.33	59.50	59.52	59.50	58.44	58.01	57.19	58.49	58.96

Panel B: Percentage of firms with BLOCK by the number of large shareholders, and with largest non-managerial owner by size of holding

	1991*	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
BLOCK											
0	13.86	11.53	10.50	16.47	15.51	16.16	13.71	13.86	10.13	9.56	8.68
1—2	47.92	43.10	45.73	47.25	47.66	44.32	42.81	39.93	44.05	47.55	51.20
3—4	31.29	35.35	33.27	28.79	29.24	31.52	31.44	36.41	33.48	32.04	32.04
5—6	7.13	8.70	9.25	7.32	7.11	7.20	11.04	9.06	11.45	10.34	7.19
>7	0	1.32	1.25	0.17	0.48	0.80	1.00	0.92	1.32	0.52	0.90
LARGEST											
0	40.40	31.57	29.00	28.95	29.24	26.24	27.42	24.03	25.55	23.00	23.95
[0—10[	25.35	31.57	33.63	28.62	25.36	23.36	23.08	24.21	24.89	23.51	22.75
[10—20[	20.79	23.82	23.49	29.62	31.83	36.80	34.45	36.41	35.68	36.43	37.13
[20—30[	8.91	7.18	8.01	7.49	8.08	9.28	10.87	11.46	10.35	11.11	11.98
[30—50[	2.57	4.16	4.27	3.33	3.55	2.56	2.84	2.77	3.08	4.39	2.99
>50	2.18	1.70	1.60	2.00	1.94	1.76	1.34	1.29	0.88	1.55	1.20

* In 1991 our source of data still reported figures with a 5% threshold, so average shareholding by outsiders is not directly comparable to the following years.

Panel A shows the average holding for *LARGEST, BLOCK* and the extent of *FLOAT* during the period 1991-2001. Panel B includes the percentage of firms distributed either by the number of shareholders with more than 5% of shares (*BLOCK*) and by the percentage of shares held by the first non-managerial shareholder (*LARGEST*).

BLOCK is the sum of all large external shareholders with more than 5% of shares; *LARGEST* is the shares held by the first non-managerial shareholder; *FLOAT* is the sum of the undisclosed shareholding, below the official threshold.

Table 2
Composition of shareholders by identity in the sample of UK listed companies, 1991-2001

Panel A: Average shareholding (%) by owners identities

	1991*	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
MAN	14.09	12.17	11.45	10.56	10.06	9.06	8.85	8.61	8.71	7.81	8.22
INSTIT	13.49	22.99	23.66	20.98	21.25	23.00	23.47	24.19	24.01	23.69	21.78
EXTERNAL	8.75	10.06	10.56	8.96	9.18	8.44	9.25	9.20	10.09	10.01	11.05
LARGE INSTIT	5.24	6.20	6.11	6.61	6.84	7.48	7.56	7.84	7.36	7.67	7.36
LARGE EXTERNAL	4.41	3.97	4.36	3.96	3.83	3.53	3.52	3.68	3.70	4.71	4.51

Panel B: Percentage of firms with non-managerial owners by number of shareholders and identity, and with first large shareholder by size and identity of holding

	1991*	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
INSTIT											
0	28.71	8.70	4.80	10.32	8.89	9.28	8.53	7.58	9.25	11.63	11.98
1--2	47.92	27.03	25.44	33.28	32.79	31.52	30.43	32.72	28.85	29.46	32.63
3--4	20.20	28.54	29.54	29.95	33.60	28.64	30.43	26.25	33.48	30.49	29.64
5--6	3.37	21.36	23.49	18.30	14.54	20.64	19.90	22.18	18.50	18.60	17.07
>7	0	14.37	16.73	8.15	10.18	9.92	10.70	11.46	10.35	9.82	8.68
EXTERNAL											
0	53.27	44.23	41.81	47.25	45.56	46.72	41.47	42.51	42.29	43.67	41.02
1--2	40	40.83	39.15	39.93	39.74	40.80	41.47	43.99	41.19	41.60	39.82
3--4	6.34	10.96	13.88	9.65	11.15	9.76	12.88	10.17	14.10	11.89	14.97
5--6	0.40	3.02	3.74	2.66	2.91	2.24	3.34	2.96	1.98	2.07	2.99
>7	0.20	0.95	1.42	0.50	0.65	0.48	0.84	0.55	0.88	0.78	1.20
LARGE INSTIT											
0	60.40	49.72	48.22	48.25	46.85	43.04	43.81	42.88	45.15	45.99	46.41
[0—10[	20.79	27.60	28.65	22.63	20.19	19.20	18.23	18.11	19.38	17.31	17.66
[10—20[	14.46	17.96	18.68	23.46	26.49	31.36	30.77	31.42	28.85	29.72	29.34
[20—30[	2.57	2.08	2.67	3.83	4.36	4.96	5.85	6.28	5.51	4.65	4.79
[30—50[	1.19	2.08	1.60	1.16	1.78	0.96	1.00	1.29	1.32	1.81	1.20
>50	0.79	0.57	0.18	0.67	0.32	0.48	0.33	0.18	0.22	0.52	0.60
LARGE EXTERNAL											
0	80.40	82.04	81.32	80.87	82.55	83.20	83.61	81.33	80.84	77.00	77.54
[0—10[	4.55	3.78	4.80	5.82	5.17	4.16	4.85	6.10	5.51	6.20	5.09
[10—20[	6.34	5.86	4.63	6.16	5.17	5.44	3.68	4.99	6.83	6.72	7.78
[20—30[	6.14	5.10	5.16	3.66	3.72	4.32	5.02	5.18	4.85	6.46	7.19
[30—50[	1.39	2.08	2.67	2.16	1.78	1.60	1.84	1.48	1.76	2.58	1.80
>50	1.39	1.13	1.42	1.33	1.62	1.28	1.00	1.11	0.66	1.03	0.60

* In 1991 our source of data still reported figures with a 5% threshold, so average shareholding by outsiders is not directly comparable to the following years. Panel A shows the average holding for the main categories of shareholders: *MAN, INSTIT, EXTERNAL* and for *LARGE INSTIT and LARGE EXTERNAL* during the period 1991-2001. Panel B includes the percentage of firms distributed either by the number of institutional investors (*INSTIT*) and non-institutional investors (*EXTENAL*) and by the percentage of shares held by the first non-managerial shareholder when it is an institutional investor (*LARGE INSTIT)* and a non-

institutional (*LARGE EXTERNAL*). *MAN* is the total shares of ownership held by Executive Directors; *INSTIT* is the sum of the shares held by institutional investors, insurance and banks; *EXTERNAL* is the sum of the shares held by corporations and individuals*; LARGE INSTIT* is the shares held by the first non-managerial shareholder when it is either an institutional investor or an insurance company or a bank; *LARGE EXTERNAL* is the shares held by the first non-managerial shareholder when it is either a corporation or an individual.

Table 3
Descriptive statistics for economic variables

Panel A: summary of statistics for economic variables

Variable	Mean	Std. Dev.	Min	Max
MAT	0.61	0.34	0	1
BK	0.58	0.39	0	1
NBK	0.90	0.31	0	1.61
MTBV	1.60	0.98	0.30	9.73
LEV	0.16	0.13	0	0.94
ASSMAT	10.08	8.26	0.13	68.61
SIZE	11.19	1.80	5.74	18.03
QUALITY	-0.11	1.65	-14.93	10.99
TAX	26.25	14.70	-50	80

Panel B: Percentage of firms with bank debt by the proportion of bank debt to total debt(%).

BK	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**
0	18.42	18.34	19.57	19.97	19.06	17.12	18.06	15.53	17.84	17.57	16.47
[0—10[	3.76	4.35	3.74	4.16	4.20	4.80	4.35	6.47	5.51	6.20	6.29
[10—20[	4.16	3.78	3.38	3.83	3.55	5.12	3.51	4.25	4.41	4.65	3.59
[20—30[	4.95	4.35	4.45	3.49	3.88	2.88	3.85	3.88	4.19	2.84	2.99
[30—50[	7.92	6.99	8.72	9.98	10.18	9.28	8.36	9.24	6.83	6.98	4.49
[50—70[	9.11	11.72	10.14	9.82	10.18	11.04	10.37	10.35	11.45	8.01	11.38
[70—100]	51.68	50.47	50.00	48.75	48.95	49.76	51.51	50.28	49.78	53.75	54.79

Panel A reports the descriptive statistics for the economic variables, while Panel B shows the percentage of firms distributed on the basis of the proportion of bank debt on the total debt (*BK*) of their capital structure for the period 1991-2001. *MAT is* the ratio of loans repayable within one year to total debt; *LEV* is the ratio of total debt to total assets; *MTBV* is equal to the ratio of market value of total assets to book value of total assets, where market value of total assets is defined as the to book value of firm's assets plus the difference between the market value and the book value of equities; *SIZE* is defined as the natural logarithm of total assets in 1991 prices; *ASSMAT* is the ratio of total fixed assets to annual depreciation, where total fixed assets represent the net total of land and buildings, plant and machinery, construction in progress and other fixed assets; *QUAL* is the growth rate of earnings, defined as the difference between the pre-tax profits in t+1 and the pre-tax profits in t divided by the pre-tax profits in t; *TAX* is the total tax ratio, defined as total tax charge divided by pre-tax profits.

Table 4
OLS in level, Within Group and two-step robust GMM

		OLS		WG		GMM (1)		GMM (2)	
	Predicted signs	*Coeff.*	*p-values*	*Coeff.*	*p-values*	*Coeff.*	*p-values*	*Coeff.*	*p-values*
$MAT1_{t-1}$	+	0.63486***	0.00	0.35062***	0.00	0.46372***	0.00	0.44478***	0.00
MAN	-	0.00083	0.177	-0.00073	0.585	-0.00537**	0.025	-0.00574**	0.02
MAN2	+	0.00000	0.729	0.00001	0.449	0.00007*	0.063	0.00007*	0.06
BLOCK	-	0.00014	0.529	-0.00025	0.501	-0.00047	0.471		
LARGEST	-							-0.00180*	0.069
BK	-	-0.03081***	0.006	-0.05956***	0.002	-0.10921**	0.021	-0.09069*	0.058
NBK	+	-0.02194**	0.049	-0.00583	0.775	0.16849**	0.042	0.14638*	0.075
MTBV	+	0.00305	0.366	0.00244	0.698	-0.02410	0.145	-0.02323	0.174
LEV	-	-0.30651***	0.00	-0.39981***	0.00	-0.37344**	0.02	-0.34986**	0.028
ASSMAT	-	-0.00283***	0.00	-0.00125	0.261	-0.00068	0.729	0.00007	0.973
SIZE	-	-0.01808***	0.00	-0.07060***	0.00	-0.09105**	0.052	-0.09768**	0.04
QUALITY	+	-0.00302	0.103	-0.00255	0.198	0.00339	0.333	0.00265	0.448
TAX	+	-0.00075***	0.001	-0.00040	0.144	-0.00048	0.182	-0.00051	0.159
No. of firms		625		625		625		625	
No. of obs		5620		5620		5620		5620	
Wald (joint)		6607(12)***	0.00	597.8(12)***	0.00	203.4(12)***	0.00	182.2 (10)***	0.00
Wald (sector)		33.571(12)***	0.00						
Wald (time)		170.9(10)***	0.00	8.291(9)	0.505	8.957(9)	0.441	9.658(9)	0.379
Sargan test						141.0(159)	0.845	145.2(159)	0.777
m1		-4.589***	0.00	-2.896***	0.00	-10.62***	0.00	-10.40***	0.00
m2		2.291**	0.00	-3.880***	0.00	1.086	0.277	0.9072	0.364

MAT is the ratio of loans repayable within one year to total debt; *MAN* is the total shares of ownership held by Executive Directors. As far as the independent variables are concerned,*MAN2* is the square of *MAN*; *BLOCK* is the sum of all large external shareholders with more than 5% of shares; *BK* is the bank debt equal to the ratio of total bank debt to total debt; *NBK* is the natural logarithm of the total number of banks which have lending relationships with the firm; *LARGEST* is the shares held by the first non-managerial shareholder; *LEV* is the ratio of total debt to total assets; *MTBV* is equal to the ratio of market value of total assets to book value of total assets, where market value of total assets is defined as the to book value of firm's assets plus the difference between the market value and the book value of equities; *SIZE* is defined as the natural logarithm of total assets in 1991 prices; *ASSMAT* is the ratio of total fixed assets to annual depreciation, where total fixed assets represent the net total of land and buildings, plant and machinery, construction in progress and other fixed assets; *QUAL* is the growth rate of earnings, defined as the difference between the pre-tax profits in t+1 and the pre-tax profits in t divided by the pre-tax profits in t; *TAX* is the total tax ratio, defined as total tax charge divided by pre-tax profits. GMM, in columns (1) and (2), is the model in the first differences with levels dated [t-2] of the dependent variable, *LEV, BK, NBK and SIZE* and [t-1, t-2] of *MAN, MAN2, BLOCK, LARGEST, MTBV,ASSMAT,TAX,QUALITY* as instruments. In all models time dummies are included. Asymptotic standard errors robust to heteroskedasticity are used in the estimations. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 5
Identities by external shareholders

		(1)		(2)	
	Predicted signs	*Coeff.*	*p-values*	*Coeff.*	*p-values*
$MAT1_{t-1}$	+	0.44608***	0.00	0.42874***	0.00
MAN	-	-0.00492**	0.039	-0.00480*	0.052
MAN2	+	0.00006*	0.081	0.00006*	0.09
INSTIT	+	0.00062	0.398		
EXTERNAL	-	-0.00092	0.205		
LARGE INSTIT	+			-0.00150	0.167
LARGE EXTERNAL	-			-0.00224***	0.05
BK	-	-0.09950**	0.041	-0.08083*	0.091
NBK	+	0.13139*	0.093	0.09944	0.204
MTBV	+	-0.02536	0.124	-0.02032	0.233
LEV	-	-0.40193***	0.01	-0.33290**	0.036
ASSMAT	-	0.00019	0.922	0.00054	0.792
SIZE	-	-0.10696**	0.022	-0.09203**	0.043
QUALITY	+	0.00230	0.506	0.00243	0.496
TAX	+	-0.00069*	0.061	-0.00050	0.172
No. of firms		625		625	
No. of obs		4370		4370	
Wald (joint)		182.7(13)***	0.00	165.8(13)***	0.00
Wald (time)		7.443(9)	0.591	12.26(9)	0.199
Sargan test		169(176)	0.635	173.5(176)	0.540
***m1*:**		-10.17***	0.00	-10.15***	0.00
***m2*:**		0.8933	0.372	0.7512	0.453

MAT is the ratio of loans repayable within one year to total debt; *MAN* is the total shares of ownership held by Executive Directors;*MAN2* is the square of *MAN*; *INSTIT* is the sum of the shares held by institutional investors, insurance and banks; *EXTERNAL* is the sum of the shares held by corporations and individuals*; LARGE INSTIT* is the shares held by the first non-managerial shareholder when it is either an institutional investor or an insurance company or a bank; *LARGE EXTERNAL* is the shares held by the first non-managerial shareholder when it is either a corporation or an individual; *LEV* is the ratio of total debt to total assets; *MTBV* is equal to the ratio of market value of total assets to book value of total assets, where market value of total assets is defined as the to book value of firm's assets plus the difference between the market value and the book value of equities; *SIZE* is defined as the natural logarithm of total assets in 1991 prices; *ASSMAT* is the ratio of total fixed assets to annual depreciation, where total fixed assets represent the net total of land and buildings, plant and machinery, construction in progress and other fixed assets; *QUAL* is the growth rate of earnings, defined as the difference between the pre-tax profits in t+1 and the pre-tax profits in t divided by the pre-tax profits in t; *TAX* is the total tax ratio, defined as total tax charge divided by pre-tax profits. GMM2, in columns (1) and (2), is the model in the first differences with levels dated [t-2] of the dependent variable, *LEV* and *SIZE* and [t-1, t-2] of *MAN, MAN2, INSTIT, EXTERNAL, LARGE INSTIT and LARGE EXTERNAL, MTBV, ASSMAT, TAX, QUALITY* as instruments. In all models time dummies are included. Asymptotic standard errors robust to heteroskedasticity are used in the estimations. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 6
High and low leverage firms

		UPLEV= 1		UPLEV= 0		UPSECLEV= 1		UPSECLEV= 0	
	Predicted signs	*Coeff.*	*p-values*	*Coeff.*	*p-values*	*Coeff.*	*p-values*	*Coeff.*	*p-values*
$MAT1_{t-1}$	+	0.45169***	0.00	0.40648***	0.00	0.43439***	0.00	0.41330***	0.00
MAN	-	-0.00613**	0.028	-0.00302	0.262	-0.00658**	0.032	-0.00350	0.184
MAN2	+	0.00007**	0.048	0.00004	0.324	0.00007*	0.091	0.00004	0.29
BK	-	-0.05807	0.436	-0.07712	0.13	-0.03771	0.575	-0.09324	0.063
NBK	+	0.19875**	0.021	0.01402	0.908	0.28479***	0.001	0.01174	0.9
LARGEST	-	-0.00126	0.42	-0.00020	0.891	-0.00118	0.405	0.00002	0.987
MTBV	+	-0.04027**	0.031	-0.02175*	0.089	-0.05379**	0.025	-0.02401	0.136
LEV	-	-0.21283	0.195	-0.71031***	0.007	-0.29414*	0.062	-0.73849***	0.008
ASSMAT	-	-0.00178	0.449	-0.00106	0.816	-0.00032	0.893	-0.00253	0.4
SIZE	-	-0.12552***	0.003	-0.09407***	0.057	-0.14468***	0.001	-0.11375**	0.036
QUALITY	+	-0.00033	0.93	-0.00204	0.63	0.00007	0.986	-0.00220	0.56
TAX	+	-0.00071	0.142	-0.00047	0.441	-0.00074	0.121	-0.00043	0.449
No. of firms		326		289		305		320	
No. of obs		2157		2167		2127		2243	
Wald (joint)		93.71(12)***	0.00	117.2(12)***	0.00	96.39(12)***	0.00	125.3(12)***	0.00
Wald (time)		11.83(9)	0.223	5.663(9)	0.773	10.00(9)	0.35	4.306(9)	0.89
Sargan test		153.3(159)	0.612	156.1(159)	0.55	148.1(159)	0.722	159.7(159)	0.469
***m1*:**		-6.607***	0.00	-7.224***	0.00	-6.540***	0.00	-7.473***	0.00
***m2*:**		1.64	0.11	-0.6280	0.530	1.577	0.115	-0.3891	0.697
Tp		46.132		43.789		49.994		32.083	
λ adjust. Factor		0.54831		0.59352		0.56561		0.58670	

MAT is the ratio of loans repayable within one year to total debt; *MAN* is the total shares of ownership held by Executive Directors; *MAN2* is the square of *MAN; BK* is the bank debt equal to the ratio of total bank debt to total debt; *NBK* is the natural logarithm of the total number of banks which have a lending relationship with the firm; *LARGEST* is the shares held by the first non-managerial shareholder; *LEV* is the ratio of total debt to total assets; *UPLEV* is a dummy equal to 1 if the individual leverage is higher than the 55^{th} percentile of the distribution of the individual leverage for the entire sample and equal to zero if the individual leverage is below the 45^{th} percentile of the distribution; *UPSECLEV* is a dummy equal to 1 if the individual average leverage is higher than the average leverage level of the sector which a firm belongs to, and equal to zero otherwise; *MTBV* is equal to the ratio of market value of total assets to book value of total assets, where market value of total assets is defined as the to book value of firm's assets plus the difference between the market value and the book value of equities; *SIZE* is defined as the natural logarithm of total assets in 1991 prices; *ASSMAT* is the ratio of total fixed assets to annual depreciation, where total fixed assets represent the net total of land and buildings, plant

and machinery, construction in progress and other fixed assets; *QUAL* is the growth rate of earnings, defined as the difference between the pre-tax profits in t+1 and the pre-tax profits in t divided by the pre-tax profits in t; *TAX* is the total tax ratio, defined as total tax charge divided by pre-tax profits. GMM, in all the specifications, is the model in the first differences with levels dated [t-2] of the dependent variable, *LEV, BK, NBK and SIZE* and [t-1, t-2] of *MAN, MAN2, LARGEST, MTBV, ASSMAT, TAX, QUALITY* as instruments. In all models time dummies are included. Asymptotic standard errors robust to heteroskedasticity are used in the estimations.
* significant at 10%; ** significant at 5%; *** significant at 1%