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Dividends: New evidence on the catering theory

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Abstract
This paper is built upon the predictions of the catering theory of dividends, and examines whether investors' sentiments exert significant influence on corporate dividend policy. To achieve this aim, we propose a dividend model that incorporates a variable at a firm-level proxing for the catering effect. The estimation of the model by using the Generalized Method of Moments provides interesting results. Consistent with the predictions of the catering theory, we find that companies in eurozone countries cater to their investors' sentiments. Additionally, other relevant findings show an interaction effect between catering and firm characteristics; particularly, liquid assets, investment opportunities and free cash flow. First, we find a catering effect only in firms with high liquid assets. Second, the positive effect of catering is only found in firms with valuable investment opportunities. Third, companies with higher levels of free cash flow cater more strongly to their investors' sentiments.
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I. Introduction

Corporate dividend policy has long been an issue of interest in the financial literature and, despite the vast research on the topic, it remains an open subject. In fact, since Miller and Modigliani (1961) irrelevance proposition, according to which dividend policies are all equivalent and there is no a particular policy that can increase shareholders' wealth in perfect capital markets, many scholars have tried to give alternative explanations for dividends in imperfect markets.

One of the most recent arguments that cast doubts on shareholders being indifferent about receiving dividends is based on the behavioural finance literature. According to behavioural finance, investors' psychological characteristics influence the conduct in financial markets, and investors' irrational behaviour limits the effectiveness of the arbitration actions. In fact, models of behavioural finance (see, for example, Jegadeesh, 2001) explain excess volatility and predictability of stock market prices by breaking with the complete rationality hypothesis underlying traditional finance. Within this context, some of the most prominent explanations (see Barberis, et al., 1998; Daniel, et al., 1998; Hong and Stein, 1999; among others) are based on investors' sentiments. Explanations for the tendency of paying dividends in equilibrium clientele theories were first provided by Miller and Modigliani (1961) and Black and Scholes (1974). This theory suggests that changes in dividend policies correspond with changes in investors' demand for dividends.

Furthermore, companies have become less likely to pay dividends than what could be expected according to the changes in their characteristics, namely size, profitability and growth opportunities. In fact, Fama and French (2001) find that the decline in the proportion of dividend-payer US firms is not satisfactorily explained by changes in their characteristics and, consequently, that the dividend decision does not become exhausted by the individual characteristics of each company. Several authors propose alternative explanations for this decline in the propensity to pay. For instance, Banerjee, et al. (2003) argues that transaction cost-based clientele effects account for a significant part of the decline in the propensity to pay dividends. Amihud and Li (2006) also document the phenomenon called "disappearing dividends" by Fama and French (2001) by means of the decrease in the information content of dividends since the mid 1970s, which makes firms less willing to incur in the costs associated with dividend signalling. DeAngelo, et al. (2004) base their explanation on the concentration of dividends in top payers among US companies, as well as on the decline in the frequency of special dividend payments over the last two decades. Finally, Ferris, et al. (2006) find that dividends have been disappearing during the late 1990s in the UK because of the lower magnitude of stock price reaction to announcements, which is consistent with the notion of diminishing information content of dividends.

An alternative explanation to the decline in the payment of dividends has its roots on the catering theory of dividends proposed by Baker and Wurgler (2004a). These authors provide empirical evidence that changes in the amount that companies pay on dividends can be explained by what they denominate “catering incentives”, that is, a measure of the market desire for dividend-paying stocks. The catering theory holds that firms adjust their dividend payouts largely in response to their investors’ demand for dividend-paying stocks. The growing interest in this new theory of dividends[1] suggests the need to better understand its implications and to integrate investors’ sentiments into dividend models. In fact, whether or not there is a catering effect on a firm’s payout ratio is, as far as we know, an unresolved question.

This paper relies on the assumptions of the catering theory, and is intended to empirically validate this strand of literature. This way, our paper provides advances to the dividend literature in two directions. First, we offer new evidence on the determinants of corporate dividend policy by focusing on the catering effect associated with investors’ sentiments. Second, we investigate how the dividend-catering relationship is moderated by certain firm characteristics, such as the level of liquid assets, the investment opportunities and the free cash flow.

To achieve this aim, we propose a new empirical approach that allows us to account for a measure of investors’ sentiments at a firm-level. Specifically, we use the error term of a valuation model to obtain a proxy for the catering effect on dividend payments. Assuming that a firm’s market value is mainly explained by its investment, financing and dividend decisions, our view is that the residual value captured by the error term of the valuation model should be a measure proxing for the firm’s investors’ sentiments. This variable capturing the catering effect is then entered into a dividend model built on the main contributions of previous research.

[1] Since Baker and Wurgler’s (2004a) seminal paper, there has been increasing research interest in the catering theory. For example, Lai (2004) relies on this theory to explain the well-documented ‘analyst bias’. He suggests that analysts are heavily influenced by investors, and he builds a theory showing how analysts cater to investors’ beliefs. Gemmill (2005) examines the split-capital closed-end funds in the UK, and he finds empirical support to the catering theory. Hoberg and Prabhala (2006) investigate the phenomenon of disappearing dividends and its catering explanation through the lens of risk.

The estimation of our dividend model by using the Generalized Method of Moments on a sample of firm's from eurozone countries provides interesting results. Consistent with catering arguments, our findings reveal that investors' sentiments significantly affect a firm's propensity to pay dividends and, as expected, this effect is positive. That is, investors' demand for dividend-paying stocks encourages firms to increase their payouts. Additionally, our study provides further evidence on the moderating role of certain firm characteristics on the relation between dividends and investors' sentiments. Specifically, we find that the investors' sentiments positively impact on dividends of firms with high liquid assets. Our results also reveal a positive catering effect only for firms with valuable investment opportunities. Finally, we show that the catering effect is significantly larger in firms with higher levels of free cash flow.

The remainder of the paper is organized as follows. The second section summarizes previous literature and empirical evidence on the traditional explanations of dividends as well as on the catering theory, and presents our hypotheses. Section 3 describes the data and variables used in our analysis. In Section 4 we present our model of dividends and discuss the estimation method. The results are discussed in section 5, and Section 6 highlights our conclusions.

2. Theories and hypotheses

In this section, we first summarize the main contributions of previous research to the debate on the determinants of dividend payments, and propose our hypotheses concerning these traditional theories of dividends. We next discuss the key arguments of the catering theory of dividends, which lead us to pose our hypothesis about the effect of a firm's investors' sentiments on its payout ratio.

2.1. Traditional theories of dividends

According to Jensen`s (1986) free cash flow theory, if a firm has cash flow no consumed by positive net present value (NPV) projects, it is better to return the cash in excess to shareholders in order to maximize their wealth and to reduce the possibility of these funds being wasted by managers in negative NPV projects. This theory thus predicts that higher free cash flow should lead to higher dividend payments in order to prevent firms from overinvesting[2]. The positive relationship between dividends and free cash flow is confirmed by, for instance, Chaplinsky and Niehaus (1993), and Holder, et al. (1998). More recently, DeAngelo, et al. (2004) show that overinvestment processes worsen in firms that accumulate high proportions of cash and distribute low dividends. In the same vein, Miguel, et al. (2005) document the role played by dividends in controlling for overinvestment processes in firms with high levels of free cash flow. Consistent with Jensen's theory and subsequent empirical evidence, the following hypothesis is posed:

Hypothesis 1: There is a positive relationship between a firm's free cash flow and its payout ratio.

Financial literature widely supports the role played by debt and dividends as agency-cost control mechanisms, by solving the conflict of interest between owners and managers (see Grossman and Hart, 1980 and Jensen, 1986 for debt; Rozeff, 1982 and Jensen, 1986 for dividends) as well as by mitigating asymmetries of information between firms and potential investors (see Ross, 1977 and Harris and Raviv, 1991 for debt; Lintner, 1956 and Bhattacharya, 1979 for dividends). This literature suggests that debt and dividends may be somehow related, although previous research is not unanimous about the way in which they are related. On the one hand, the search for a trade-off between costs and benefits leads to a substitution hypothesis based on the minimization of agency conflicts without duplicating efforts (Easterbrook, 1984; John and Senbert, 1998). In others words, this hypothesis holds that high leverage makes dividends less valuable, and vice versa[3]. On the other hand, the alternative hypothesis points to the complementary use of the different mechanisms as the most effective solution to a firm's inefficiencies, because none of them can be a satisfactory solution by itself without generating additional costs (Jensen, 1989)[4]. These two opposing arguments lead us to pose the two following alternative hypotheses about the relationship between debt and dividends:

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[2] The overinvestment hypothesis has been confirmed through different perspectives in, for instance, Devereux and Schiantarelli (1990), Lang, et al. (1996), Lamont (1997), Chen and Ho (1997), Chakraborty, et al. (1999), Del Brio, et al. (2003), Del Brio, et al (2003), and Morgado and Pindado (2003).

[3] Subsequent empirical evidence on the substitutability of debt and dividends as cash flow commitments can be found in Moh´d, et al. (1995, 1998) and for the Spanish case, in Lopez and Rodriguez (1999), and Lozano, et al. (2002).

[4] Consistent with this hypothesis, the results in Eckbo and Verma (1994) show a positive and significant relationship between debt and dividends and, more recently, Zwiebel (1996) and Douglas (2001) confirm that firm value is optimized only when debt and dividends are simultaneously used.

Hypothesis 2a: A negative relationship between a firm's leverage and its payout ratio is expected (considering debt as a substitute for dividends).

Hypothesis 2b: *A positive relationship between a firm's leverage and its payout ratio is expected (considering debt and dividends as complementary mechanisms).*

One of the most relevant studies on the determinants of dividends is the one by Lintner (1956). Lintner argues that firms seek to maintain stability of dividends, and he finds that a firm's earnings is probably the key factor to account for in order to get a stable dividend pattern. Accordingly, regular dividends represent an ongoing commitment to distribute cash and, more important, a commitment that managers are especially loathed to break (Lintner, 1956; Brav, et al., 2003). Consistent with Lintner's arguments, Benartzi, et al. (1997) find that changes in dividends are highly correlated with past and current changes in earnings. In the same line of reasoning, Allen, et al. (2000) argue that managers need to explain the reasons for its actions to shareholders, and need to base its explanations on simple and observable indicators, particularly the level of earnings. More evidence on earnings being a determinant of dividends can be found in, for instance, Nissim and Ziv (2001), Brav, et al., (2003), and DeAngelo, et al. (2004). Accordingly, we expect firms to adjust their payout ratios to sudden unexpected increases in earnings, and the following hypothesis is proposed:

Hypothesis 3: The higher the earnings the higher the payout ratio.

Consistent with recent literature (Allen and Michaely, 2002; Aivazian, et al., 2003), the nature of a firm's assets influences its dividend policy. Specifically, gross, regular and non-regular dividend payments are found to be positively related to asset tangibility on the basis that greater tangibility of a firm's assets facilitates its access to public markets, and it thus increases the likelihood that the firm adopts Lintner's pattern of dividend policy. Specifically, Aivazian, et al. (2003) show that the probability of a firm to pay dividends increases with the tangiability of its assets. Additionally, as Barclay, et al. (1995) point out, the nature of a firm's assets affects both its financing decision and its dividend policy. Firms with tangible assets can generally access the market for long term debt due to the existence of collateral and the subsequent ability to secure debt (Scott, 1977). One would therefore expect firms with a high proportion of tangible assets to be more leveraged, which in turn would affect dividend payments negatively if Hypothesis 2.a holds, or positively if Hypothesis 2.b is supported. Therefore, two alternative hypotheses concerning the effect of the nature of a firm's assets on its payout ratio should be posed:

Hypothesis 4a: Firms with a high proportion of tangible fixed assets have lower payout ratios (relying on the substitution effect predicted in Hypothesis 2.a).

Hypothesis 4b: Firms with a high proportion of tangible fixed assets have higher payout ratios (relying on the complementary effect predicted in Hypothesis 2.b).

Finally, a firm's size has been traditionally considered among the determinants of its dividend policy, and previous evidence seems to agree that larger firms pay higher dividends. There are several arguments justifying the positive relationship between size and payout ratios. For instance, larger firms enjoy a better access to the capital market and, consequently, are less financially constrained, which allows them to pay more dividends (see, for instance, Holder, et al., 1998; Lopez and Rodriguez, 1999; Twite, 2001). Additionally, larger firms are usually mature firms with limited growth opportunities that are prone to pay more dividends in order to avoid overinvestment (see, for instance, Barclay, et al., 1995). Accordingly, Fama and French (2001) show that the largest US companies have higher payout ratio. More recently, Denis and Osobov (2005) provide evidence of the positive relationship between the likelihood of paying dividends and size. This leads us to pose our next hypothesis:

Hypothesis 5: The larger the firm the higher the payout ratios.

2.2. The catering theory of dividends

The characteristics of the firms paying dividends (that is, their levels of free cash flow, leverage, earnings, tangible fixed assets and size) should not be separately analyzed from certain psychological components in that an important part of the decision to pay dividends may be due to a firm's desire of satisfying investors' expectations. This kind of psychological component of dividends is already account for by the clientele theory. For instance, Shefrin and Statman (1984) extend on the work by Thaler and Shefrin (1981) and develop the "behavioural life cycle" theory of dividends that relies on psychological reasons to explain why investors prefer dividends rather than capital gains. Feldstein and Green (1983) find that dividend policy is a consequence of investors' consumption needs. Allen and Michaely (2002) argue that the clientele effects are the very reason for the presence of dividends because, as found by Allen, et al. (2000), firms paying dividends attract relatively more institutions and perform better. Polk and Sapienza (2004), and Baker, et al. (2003) also rely on behavioural explanations when analyzing the clientele effect.

The fact is that theoretical and empirical dividend models are increasingly considering the principles of behavioural finance. Relying on behavioural arguments, Baker and Wurgler (2004a) develop a theory according to which firms cater to their investors' preferences[5], so that they pay dividends when dividend payers trade a premium and do not pay dividend when dividend payers trade a discount[6]. They find an answer as to why no consensus has been reached in the literature about dividends. Specifically, they argue that the dividend decision may be very important, but that it is even more important to base the direction of this decision on the prevalent/prevailing sentiment. This argument strongly supports this new theory – the catering theory of dividends – according to which investors have sentiments about dividends.

Providing empirical support to this theory, Baker and Wurgler (2004b) show that changes in the proportion that firms pay as dividends can be explained in terms of what they denominate "catering incentives", that is, a measure of the market desire for dividend-paying stocks. Specifically, they find a connection between the tendency to pay dividends and catering incentives. These authors use a market-level variable called the "dividend premium" as a proxy for the value that the market places on dividends (i.e., the premium that the investors are willing to pay for dividends-paying stocks). The impact of this variable on the decision to initiate dividend payments show that changes in a firm's dividend policy may capture the changes in investors' sentiment about paying firms related to their sentiment about non-paying firms. Based on this finding, they develop a behavioural model according to which the stock price premium carried by dividends-payers explains the decision to pay dividends or not[7].

[5] According to Baker and Wurgler (2004a), the catering theory and the clientele theory differ in that dividends had never been explored through the investors' sentiments before. Another difference is that the catering theory focalizes more on the global level of dividends as the result of the demand of shares that pay dividends.

[6] Long (1978) provides some early motivation for this catering application to corporate dividends. Allen and Michaely (2002) provide a comprehensive survey of payout policy research, in which catering arguments can also be implicitly found.

[7] See Li and Lie (2006) for additional evidence on dividend changes being dependent on the dividend premium.

Baker and Wurgler (2004b) measure the relative investors' sentiment about dividend-paying firms by means of the difference between the logarithm of the book-value-weighted average market-to-book ratio for dividend payers and the book-value-weighted average market-to-book ratio for non-payers. They find a positive relationship between the catering incentives, captured by the dividend premium, and the change in firms' propensity to pay dividends. Relying on this new view of dividends, we go a step forward and propose a measure of catering incentives at a firm-level (see Section 3.3 for more details about the construction of this variable). Therefore, our last hypothesis is as follows:

Hypothesis 6: A firm's payout ratio is positively driven by catering incentives.

3. Data and variables

3.1 Data

To test the hypotheses posed in the previous section, we use data from several eurozone countries. We have thus used an international database, Worldscope, as our source of information. Additionally, international data such as the growth of capital goods prices, the rate of interest of short term debt, and the rate of interest of long term debt, have been extracted from the Main Economic Indicators published by the Organization for Economic Cooperation and Development (OECD).

For each country we constructed an unbalanced panel of non-financial companies[8] whose information was available for a least six consecutive years from 1986 to 2003. This strong requirement is a necessary condition since we lost one-year data in the construction of some variables (see, for instance, Appendix C), we lost another year-data because of the estimation of the model in first differences, and four consecutive year information is required in order to test for second-order serial correlation, as Arellano and Bond (1991) point out. We need to test for the second-order serial correlation because our estimation method, the Generalized Method of Moments (GMM) is based on this assumption.

[8] We restrict our analysis to non-financial companies because financial companies have their own specificity.

Three of the twelve eurozone countries[9] have been excluded from our analysis for different reasons. As occurs in La Porta, et al., (2000), Luxembourg has been removed from our sample because there are just a few firms listed in Luxnembourg's stock exchange, and Greece because dividends are mandatory in this country. Finally, Finland had also to be excluded because no sample with the abovementioned requirement could be selected. The structure of the samples by number of companies and number of observations per country is provided in Table 1. As shown in Table 2, the resultant unbalanced panel comprises 635 companies and 6,451 observations. Using an unbalanced panel for a long period (18 years) is the best way to solve the survival bias caused because some firms could be delisted and, consequently, be dropped from database. Finally, Table 3 provides summary statistics (mean, standard deviation, minimum and maximum) of the variables used in the construction of the dependent and explanatory variables in our model, which we now proceed to describe.

3.2 Dependent variable

The dependent variable in our model is the payout ratio, which is a censured variable in that some firms pay dividends whereas others do not. Note that if we took into account only the companies paying dividends our results would be biased. To solve this problem we should predict the payout ratio by using an explanatory model for this variable. We follow the model provided by Auerbach and Hasset (2003) based on the equality of sources and uses of funds, and we obtain the following Tobit model that provides us with a prediction of the payout ratio for each period from 1986 to 2003:

$$CPR_{it} = \beta_0 + \beta_1(I/K)_{it} + \beta_2(CF/K)_{it} + \beta_3(\Delta B/K)_{it} + B_4(\Delta S/K)_{it} + \mu_{it}$$

(1)

with $PR_{it} = CPR_{it}$ *if* $CPR_{it} > 0$

$PR_{it} = 0$ if $CPR_{it} \leq 0$

where CPR_{it} is a latent variable only observed when it is positive, whereas we only know that it is negative in the remainder of the cases. The explanatory variables of the payout ratio are: investment (I_{it}/K_{it}), cash flow (CF_{it}/ K_{it}), increment of debt ($\Delta B_{it}/K_{it}$) and increment of shares ($\Delta S_{it} /K_{it}$). All the

[9] The eurozone currently comprises twelve countries: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxemburg, Netherlands, Portugal, and Spain.

explanatory variables are scaled by the replacement value of total assets (K_{it}), calculated as explained in Appendix A[10].

Taking into account that CPR_{it} follows a normal distribution with mean μ and variance σ_2, and letting

$$\beta_0 + \beta_1 (I/K)_{it} + \beta_2 (CF/K)_{it} + \beta_3 (\Delta B/K)_{it} + B_4 (\Delta S/K)_{it} + \mu_{it} = X'_{it}\beta$$

then the logarithmic likelihood function of our model is:

$$\ln L = \sum_{PR_{it}>0} -\frac{1}{2}\left[\ln(2\pi) + \ln\sigma^2 + \frac{(PR_{it} - X'_{it}\beta)^2}{\sigma^2}\right] + \sum_{PR_{it}=0} \ln\left[1 - \Phi\left(\frac{X'_{it}\beta}{\sigma}\right)\right]$$

where the first term picks up the observations for which $PR_{it}> 0$ (that is, observations for which the payout ratio is observable and, consequently, the density function is known), whereas the second term refers to the rest of the observations for which the payout ratio is unobservable, and we assume that the function Φ(.) is distributed as N (0, 1).

Table 4 provides the summary statistics (mean, standard deviation, minimum and maximum) of the payout ratios obtained by the maximum likelihood estimation of the Tobit model in (1). In addiction, the estimation of a Probit model including the same set of explanatory variables allows us to check the capacity of prediction of the model in (1). As shown in the last column of Table 4, the percentages of correct classification are similar to the ones reported in previous studies. Additionally, the last row of the table displays the summary statistics of the new variable, CPR_{it}, for which the problem of censure is already solved and will be the dependent variable in our model.

3.3. Explanatory Variables

According to the theories discussed in Section 2.1, the explanatory variables to be entered into our basic model are: free cash flow, leverage, earnings, tangible fixed assets and size. To capture the potential benefits of dividends as a mechanism to reduce the conflict of interests between owners and managers with respect to the allocation of the firm's free cash flow, our model incorporates a free cash flow index (FCF_{it}) obtained by interacting cash flow with the inverse of the investment opportunities[11]. We compute a firm's cash flow as $CF_{it}=NIAPD_{it}+DEP_{it}$, where $NIAPD_{it}$ denotes net income after

[10] The subscript *i* refer to the company and *t* refers to the period time.
[11] Details about the interpretation of this index can be found in Miguel and Pindado (2001).

preferred dividends, and DEP_{it} stands for the book depreciation expense. Investment opportunities are measured by means of Tobin's q, calculated as $q_{it}= (V_{it}+PS_{it}+MVLTD_{it}+BVSTD_{it})/K_{it}$, where V_{it} is the market value of common stock, PS_{it} is the value of the firm's outstandings preferred stock, $MVLTD_{it}$ stands for the market value of the long term debt (see Appendix B), and $BVSTD_{it}$ stands for the book value of short term debt.

To investigate whether there is a substitution or a complementary relationship between debt and dividends, the debt ratio also enters our model. The debt ratio is defined as $D_{it}=MVLTD_{it}/(V_{it}+PS_{it}+BVSTD_{it}+MVLTD_{it})$. We use in the numerator the long term debt since most of the arguments in financial theory are related to this type of debt (see, for instance, Miguel and Pindado, 2001 and, more recently, DeAngelo and DeAngelo, 2006).

To test Lintner's (1956) predictions about the relevance of a firm's earnings for its dividend policy we have included the firm's net incomes, NI_{it}, in our model, measured as $NI_{it}=(PI_{it}-ITX_{it})/K_{it}$, where PI_{it} stands for all income before taxes, and ITX_{it}, represent all taxes levied on a firm's income.

Finally, tangible fixed assets ($TANG_{it}$) are computed as the net book value of property, plant and equipment, scaled by the replacement value of total assets, and size (SI_{it}) is the natural logarithm of the replacement value total assets.

In accordance with the aim of our paper, our model incorporates a variable capturing investors' sentiments. This is our main contribution in that we propose the construction of a variable at a firm-level that proxy for this catering effect. The starting point for the calculation of this new variable is the following value model:

$$\left(V/K\right)_{it} = \alpha_0 + \alpha_1\left(I/K\right)_{it} + \alpha_2 D_{it} + \alpha_3\left(CDIV/K\right)_{it} + \varepsilon_{it} \qquad (2)$$

where I_{it} stands for investment (calculated as described in Appendix C), and $CDIV_{it}$ stands for common dividends. Assuming that a firm's market valuation is mainly explained by its investment, debt and dividend decisions, hence the error term, ε_{it}, captures what cannot be explained by these three financial decisions and, consequently, is our proxy for the firm's investors sentiments.

Table 5 provides the summary statistics of the resultant catering variable for all years, obtained by cross-sectionally estimating the model in (2). The last row of the table displays the summary statistics of the resultant catering variable, CAT_{it}, which will enter our dividend model.

4. Empirical model and estimation method

Using the dependent variable obtained as explained in Section 3.2, and the traditional explanatory variables described in Section 3.3, our basic model is as follows: $CPR_{it} = \gamma_0 + \gamma_1 FCF_{it} + \gamma_2 D_{it} + \gamma_3 NI_{it} + \gamma_4 TANG_{it} + \gamma_5 SIZE_{it} + \varepsilon_{it}$ (3)

where ε_{it} is the random disturbance.

The basic model in (3) can be easily extended to investigate the existence of the catering effect by including the variable CAT_{it}, leading to the following extended model:

$$CPR_{it} = \gamma_0 + \gamma_1 FCF_{it} + \gamma_2 D_{it} + \gamma_3 NI_{it} + \gamma_4 TANG_{it} + \gamma_5 SIZE_{it} + \gamma_6 CAT_{it} + \varepsilon_{it} \quad (4)$$

Our models have been estimated by using the panel data methodology. Two issues have been considered to make this choice. First, unlike cross-sectional analysis, panel data allow us to control for individual heterogeneity. This point is crucial in our study because the dividend decision is very closely related to the specificity of each company. Therefore, to eliminate the risk of obtaining biased results, we have controlled for such heterogeneity by modeling it as an individual effect, η_i, which is then eliminated by taking first differences of the variables. Consequently, the error term in our models, ε_{it}, has been splitted into four components. First, the above mencioned individual or firm-specific effect, η_i. Second, d_t measures the time-specific effect by the corresponding time dummy variables, so that we can control for the effects of macroeconomic variables on the dividend decision. Third, since our models are estimated using data of several countries, we have also included country dummy variables (c_i). Finally, v_{it} is the random disturbance.

The second issue we can deal with by using the panel data methodology is the endogeneity problem. The endogeneity problem is likely to arise in that the dependent variable (payout ratio) may also explain some of the explanatory variables. For instance, the payout ratio may explain leverage on the basis of the arguments used to justify the reverse causality (see Section 2.1). In fact, Jensen, Solberg, and Zorn (1992) and Mod'd, Perry, and Rimbey (1998), among others, document the existence of a signifficant effect of dividends on debt. Additioally, there are also reasons to expect size to be endogeneous, since, as Ferris, Sen, and Yui (2006) point out, large payers have continued to increase in size over the last ten years. Therefore, our models have been estimated by using instruments. To be exact, we have used all the right-hand-side variables in the models lagged from t-2 to t-6 as instruments.

Finally, we have checked for the potential misspecification of the models. First, we use the Hansen J statistic of over-identifying restrictions in order to test the absence of correlation between the instruments and the error term. Tables 6 and 7 shows that the instruments used are valid. Second, we use the m_2 statistic, developed by Arellano and Bond (1991), in order to test for lack of second-order serial correlation in the first-difference residual. Tables 6 and 7 show that there is no a problem of second-order serial correlation in our models (see m_2). Note that although there is first-order serial correlation (see m_1), this is caused by the first-difference transformation of the model and, consequently, it does not represent a specification problem of the models. Third, our results in Tables 6 and 7 provide good results for the following three Wald tests: z_1 is a test of the joint significance of the reported coefficients; z_2 is a test of the joint significance of the time dummies; and z_3 is a test of the joint significance of the country dummies.

5. Results

In this section we first present the results of our basic model in equation (3), which includes the explanatory variables that have been traditionally considered as determinants of a firm's payout ratio. We then extend this basic model by incorporating a variable capturing investors' sentiment into model (4). Finally, we test the implications of the catering theory by means some firm characteristics, particularly three, liquid assets, investment opportunities, and free cash flow.

5.1 Results of the basic and extended models

The results of the GMM estimation of our basic model in (3) are provided in the Column I of Table 6. Consistent with Hypothesis 1, the level of a firm's free cash flow positively affect its payout ratio. Hence consistent with Jensen's (1986) theory, we find that firms with higher levels of free cash flow are encouraged to pay more dividends as a way to restrain managers' discretion and prevent them from overinvesting. In agreement with Jensen (1989), the coefficient of leverage is positive and suggesting that debt and dividends are complementary agency-cost control mechanisms. Therefore, our evidence supports Hypothesis 2b according to which a new issue of debt requires a higher dividend payment in order to limit managerial discretion over the new funds and, consequently, avoid overinvestment in the firm. The positive relationship between a firm's earnings and its payout ratio predicted in Hypothesis 3 is confirmed by our results. Consistent with Lintner (1956), companies in our sample increase their payout ratios when their earnings rise in order to get a stable pattern of dividends and avoid dividend cuts. Regarding the nature of the firm's assets, and supporting the above-mentioned results about the complementary relationship between debt and dividends, Hypothesis 4b holds. That is, firms with more tangible fixed assets are more leveraged and, consequently, have larger payout ratios as a way to control the new funds. Finally, and also as expected, the positive coefficient on size supports Hypothesis 5, according to which larger companies pay higher dividends.

Column II of Table 6 presents the results of the GMM estimation of Model (4). As shown in this table, the signs of the coefficients of the variables included in the basic model remain identical once the catering effect, CAT_{it}, is entered into the model. In short, a firm's payout ratio is positively affected by its level of free cash flow, its leverage, its net income, its level of tangible fixed assets, and its size. Regarding the influence of a firm's investors' sentiments on its payout ratio, the positive coefficient of the catering variable confirms Hypothesis 6. Consistent with Baker and Wurgler (2004b), this finding highlights the link between the propensity to pay dividends and catering incentives. In other words, our result suggests that firms cater to their investors' preferences, so that they are more prone to increase payout ratios when investors exhibit preference for dividend-paying stocks.

5.2 The moderating role of some firm characteristics

Once the existence of a catering effect has been corroborated by our results, we go a step forward and investigate whether or not certain firm characteristics moderate this effect. We then propose a test of the moderating role played by three features – namely, liquid assets, investment opportunities and free cash flow. It is worth noting that, as far as we know, there is no prior evidence supporting this view, and providing empirical support to this issue is thus one of the major contributions of this paper. Despite the lack of previous evidence, there are strong arguments that lead us to argue that investors' preference for dividend-paying stocks change according to the above mentioned characteristics.

First, Pinheiro, et al. (2004) extend on the model by Fama and French (2001) by adding a measure of liquid assets, and they find that firms are more likely to pay dividends if they have more liquid assets. Furthermore, their results indicate that the decision to pay dividends depends directly on how much importance a firm's managers attach to shareholders' preferences and on the firm's level of liquid assets. This leads us to expect that a firm's liquid assets and its investors' sentiments about dividends could be somehow related. Specifically, we expect investors' preference for dividend-paying stocks to increase with a firm's liquid assets.

Second, it has been widely documented that dividends convey information about a firm's future prospects (see, for instance, Bhattacharya, 1979; John and Williams, 1985; Miller and Rock, 1985). According to signalling arguments, investors are optimistic about firms initiating or increasing dividends in that they interpret that such a decision means that there is valuable investment opportunities that guarantee the disposal of funds to be paid out in the future. Additionally, the managerial discretion associated with a high level of intangibles in the firm may make dividends more desirable for investors, as a way to control for such discretion. Overall, this leads us to expect investors' preference for dividends to be stronger for firms with valuable investment opportunities.

Third, as commented on in Section 2.1, the theory of Jensen (1986) proposes that dividends lessen the agency costs deriving from the conflict of interests between managers and owners with respect to a firm's free cash flow. This theory suggests a positive relationship between dividends and the level of free cash flow, a relation that is confirmed by the results presented in the previous section. Based on this result, and given the proved role of dividends in controlling for overinvestment processes, we expect investors' preference for dividends to be stronger for firms with high levels of free cash flow.

To investigate whether or not these firm characteristics moderate the catering effect, we propose the following model to be estimated:

$$CPR_{it} = \gamma_0 + \gamma_1 FCF_{it} + \gamma_2 D_{it} + \gamma_3 NI_{it} + \gamma_4 TANG_{it} + \gamma_5 SIZE_{it} + CAT_{it}(\gamma_6 + \lambda DV_{it}) + \varepsilon_{it} \quad (5)$$

where DV_{it} is a dummy variable constructed according to the firm's level of liquid assets, investment opportunities, and free cash flow. It is worth noting that in all cases whenever the dummy variable equals one and both parameters (γ_6 and λ) are significant, a linear restriction test is needed in order to know whether their sum ($\gamma_6+\lambda$) is significantly different from zero. The null hypothesis to be tested in these cases is the hypothesis of no significance, H_0: $\gamma_6+\lambda=0$.

Column I of Table 7 reports the results of the model including the interaction of catering with liquid assets[12]. In this case, DV_{it} takes value one if the firm's level of liquid assets is above the sample median, and zero otherwise. This way, the coefficient of the catering variable is γ_6 for firms with low levels of liquid assets (since DV_{it} takes value zero), and $\gamma_6+\lambda$ for firms with high levels of liquid assets (since DV_{it} takes value one). As shown in the table, there is no effect of a firm's investors' sentiments on its payout ratio when the firm has low liquid assets (γ_6 not significantly different from zero). However, the effect is positive and significant for firms with high levels of liquid assets ($\gamma_6+\lambda=\lambda=0.02325$, significantly different from zero), which confirms that, as expected, investors' preference for dividend-paying stocks increases with liquid assets. That is, our evidence suggests that investors' demand for dividends translate into higher payout ratios only in those firms with high liquid assets, whereas companies with low liquid assets do not seem to cater to their investors' preferences.

The interaction of the catering effect and investment opportunities is tested in the model presented in Column II of Table 7. In this model, DV_{it} takes value one if the firm's Tobin's q is higher than one, and zero otherwise. As shown in the table, the catering effect is negative in firms with non-valuable investment opportunities ($\gamma_6=-0.13649$), whereas this effect turns positive for firms with valuable investment opportunities ($\gamma_6+\lambda=0.04613$, significantly different from zero, see t). These results point out that the expected catering effect clearly manifests itself when there are future prospects in the firm, which grant managers the opportunity to exploit the potential divergence between inside and market expectations, and which make dividends more valuable to investors. In contrast, the non-valuable investment opportunities prevent firms from catering to their investors' sentiments about dividend-paying stock, probably because the lack of positive NPV projects may lead to not being able to maintain high payout ratios in the future.

Finally, we investigate the interaction between the catering effect and the free cash flow by estimating the model presented in Column III of Table 7. In this case, DV_{it} takes value one if the firm's free cash flow is above the

[12] This variable stands for money available for use in the normal operations of the firm, scaled by the replacement value of total assets. It represents the most liquid of all of the firm's assets.

sample median, and zero otherwise. As can be seen in the table, the coefficient of the catering variable is higher for firms with high levels of free cash flow ($\gamma_6+\lambda$=0.07584, significantly different from zero, see t) than for firms with low levels of free cash flow (γ_6=0.01104). Therefore, it seems that catering incentives (i.e., investors' preference for dividend-paying stocks) manifest more strongly in firms with high levels of free cash flow, in which dividends are much more valuable as agency-cost control mechanism. This evidence supports once more Jensen's (1986) theory.

Overall, this evidence provide an excellent robustness check for the results of the basic and extended models, since the sign of the coefficients of both the traditional explanatory variables and the catering variable remain identical once we control for the moderating role of certain firm characteristics.

6. Conclusions

This paper provides a test of the predictions of the catering theory of dividends by proposing a new approach for analysing the effect that investors' sentiments exert on corporate dividend policy. With this aim, a traditional dividend model is extended to incorporate an original measure of the catering effect at a firm-level, proxied by the error term of a market valuation model.

Our results show that investors´sentiments impact on the payout ratios in eurozone countries after controlling for traditional determinants of dividends, such as the free cash flow, leverage, earnings, tangible fixed assets and size. This finding seems to indicate that dividend policies are driven to some extent by investors' sentiments, thus revealing the desire of firms' managers to cater to such preferences. Therefore, our evidence provides empirical support to the existence of a physiological component in the decision to pay, as proposed by the catering theory.

Furthermore, our study contributes to understanding the implications of catering incentives for dividend policies by examining the moderating role played by certain firm characteristics. This idea has not been accounted for in prior studies, either theoretically or empirically, but our findings corroborate that the way in which investors appreciate dividend payments depends on the firm's liquid assets, investment opportunities and free cash flow. First, investors' preference for dividend-paying stocks translates into higher payout ratios only in those firms with high liquid assets. Second, investors' sentiment only positively impact on the payout ratio of firms with valuable investment opportunities, for which investors manifest stronger expectations about receiving higher dividends. Finally, a firm's free cash flow is a driving force behind investors' preference for dividend-paying stock, which is stronger in firms with higher levels of free cash flow in that dividends are probably much more valuable as a mechanism to avoid overinvestment.

APPENDIX A: REPLACEMENT VALUE OF TOTAL ASSETS

The replacement value of total assets is obtained as

$$K_{it} = RF_{it} + (TA_{it} - BF_{it})$$

where RF_{it} is the replacement value of tangible fixed assets, TA_{it} is the book value of total assets, and BF_{it} is the book value of tangible fixed assets. The latter two have been obtained from the firm's balance sheet and the first one has been calculated according to the proposals by Perfect and Wiles (1994):

$$RF_{it} = RF_{it-1}\left[\frac{1+\phi_t}{1+\delta_{it}}\right] + I_{it}$$

for $t>t_0$ and $RF_{it0}=BF_{it0}$, where t_0 is the first year of the chosen period, in our case 1986. On the other hand $\delta_{it}=D_{it}/BF_{it}$ and $\phi_t=(GCGP_t-GCGP_{t-1})/GCGP_{t-1}$, where $GCGP_t$ is the growth of capital goods prices extracted from the *Main Economic Indicators*, published by the Organization for Economic Cooperation and Development (OECD).

APPENDIX B: MARKET VALUE OF LONG TERM DEBT

The market value of long term debt, $MVLTD_{it}$, is obtained from the following formula

$$MVLTD_{it} = \left[\frac{1+l_{it}}{1+i_l}\right] BVLTD_{it}$$

where $BVLTD_{it}$ is the book value of the long term debt, i_l is the rate of interest of the long term debt reported in the *OECD-Main Economic Indicators* and l_{it} is the average cost of long term debt that is defined as $l_{it}=(IPLTD_{it}/BVLTD_{it})$, where $IPLTD_{it}$ is the interest payable on the long term debt, which has been obtained by distributing the interest payable between the short and long term debt depending on the interest rates. That is:

$$IPLTD_{it} = \frac{i_l\, BVLTD_{it}}{i_s\, BVSTD_{it} + i_l\, BVLTD_{it}} IP_{it}$$

where IP_{it} is the interest payable, i_s is the rate of interest of the short term debt, also reported in *Main Economic Indicators*, and $BVSTD_{it}$ is the book value of the short term debt.

APPENDIX C: INVESTMENT

Investment is calculated according to the proposal by Lewellen and Badrinath (1997) as follows:

Let FA_{it} be the gross book value of the tangible fixed assets of the period *t*, R_{it} the gross book value of the old assets retired during the year *t*, ABD_{it} the accumulated book depreciation for the year *t*, and BD_{it} the book depreciation expense corresponding to year *t*. Then we have the following equalities:

$$FA_{it}=FA_{it-1}+I_{it}-R_{it} \quad (A.1)$$

$$ABD_{it}=ABD_{it-1}+BD_{it}-R_{it} \quad (A.2)$$

If we solve Eq. A.2 for R_{it} and substitute it into *Eq*. A.1, we obtain A.3,

$$FA_{it}=FA_{it-1}+I_{it}+ABD_{it}-ABD_{it-1}-BD_{it} \quad (A.3)$$

Realigning terms, Eq. A.3 is transformed into expression A.4

$$FA_{it}-ABD_{it}=FA_{it-1}-ABD_{it-1}+I_{it}-BD_{it} \quad (A.4)$$

As $FA_{it}-ABD_{it}=NF_{it}$, i.e. the net fixed assets, the former equation can be rewritten more compactly as in Eq. A.5,

$NF_{it}=NF_{it-1}+I_{it}-BD_{it}$ (A.5)

From which we can obtain the value of investment:

$I_{it}=NF_{it}-NF_{it-1}+BD_{it}$ (A.6)

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Table 1

Structure of the samples by countries

Country	Number of companies	Percentage of companies	Number of observations	Percentage of observations
Germany	110	17.32	1,153	17.87
France	107	16.85	1,081	16.76
Netherlands	91	14.33	943	14.62
Spain	88	13.86	999	15.49
Belgium	83	13.07	907	14.06
Portugal	44	6.93	406	6.29
Ireland	42	6.61	435	6.74
Austria	38	5.98	309	4.79
Italy	32	5.04	218	3.38
Total	635	100.00	6,451	100.00

Data of companies for which the information is available for at least five consecutive years between 1986 and 2003 were extracted. After removing the first-year data, only used to construct several variables (see, for instante, Appendix C), the resultant samples comprise 110 companies (1,153 observations) for Germany, 107 companies (1,081 observations) for France, 91 companies (943 observations) for the Netherlands, 88 companies (999 observations) for Spain, 83 companies (907 observations) for Belgium, 44 companies (406 observations) for Portugal, 42 companies (435 observations) for Ireland, 38 companies (309 observations) for Austria and 32 companies (218 observations) for Italy.

Table 2
Structure of the panel

No. of annual observations per company	Number of companies	Percentage of companies	Number of observations	Percentage of observations
18	4	0.63	72	1.12
17	6	0.94	102	1.58
16	42	6.61	672	10.42
15	35	5.51	525	8.14
14	56	8.82	784	12.15
13	47	7.40	611	9.47
12	46	7.24	552	8.56
11	49	7.72	539	8.36
10	57	8.98	570	8.84
9	54	8.50	486	7.53
8	63	9.92	504	7.81
7	47	7.40	329	5.10
6	60	9.45	360	5.58
5	69	10.87	345	5.35
Total	635	100.00	6,451	100.00

Data of companies for which the information is available for at least five consecutive years between 1986 and 2003 were extracted. After removing the first-year data, only used to construct several variables (see, for instante, Appendix C), the resultant unbalanced panel comprises 635 companies (6,451 observations).

Table 3
Summary statistics

Panel A. Tobit model to solve dividends censure				
Variable	Mean	Standard deviation	Minimum	Maximum
PR_{it}	.38363	.34093	0.0000	1.0000
$(I/K)_{it}$	.05651	.08761	-1.14290	.66487
$(CF/K)_{it}$	.03952	.06031	-.72767	.40246
$(\Delta D/K)_{it}$	.01271	.10017	-1.74563	.64275
$(\Delta S/K)_{it}$	.00433	.02516	-.15017	.87898
Panel B.Value model to predict catering				
Variable	Mean	Standard deviation	Minimum	Maximum
$(V/K)_{it}$	.63668	.68147	.01405	9.2732
D_{it}	.09959	.10990	.0000	.82617
$(I/K)_{it}$	.05651	.08761	-1.14290	.66487
$(CD/K)_{it}$	.01399	.02217	0	.47295
Panel C. Catering model of dividends				
Variable	Mean	Standard deviation	Minimum	Maximum
FCF_{it}	.05140	.11449	-1.9768	1.1084
D_{it}	.09959	.10990	.0000	.82617
NI_{it}	.02834	.06211	-.78456	.52176
$TANG_{it}$	.28850	.18704	.00006	.98799
SI_{it}	12.6993	1.7785	8.4109	18.5011

PR_{it} denotes payout ratio, $(I/K)_{it}$ denotes investment, $(CF/K)_{it}$ is the cash flow, $(\Delta D/K)_{it}$ and $(\Delta S/K)_{it}$ stand for the increment of debt and shares, respectively, $(V/K)_{it}$ is the firm's value, D_{it} stands for the debt ratio, $(CD/K)_{it}$ denotes common dividends, FCF_{it} is the free cash flow, NI_{it} is the net income, $TANG_{it}$ denotes tangible fixed, assets and SI_{it} is the size.

Table 4
Summary statistics of the estimated payout ratios

Variable	Mean	Standard deviation	Minimum	Maximum	Correct classification
CPR86	.13018	.42393	-.57906	.72013	100.00
CPR87	.30365	.17033	-.37441	.53203	87.50
CPR88	.32129	.10967	.03271	.98574	83.66
CPR89	.32494	.08542	-.35601	.52085	85.31
CPR90	.38818	.07495	.05319	.68173	87.63
CPR91	.40585	.04784	.07295	.58586	84.68
CPR92	.45219	.13128	-.97013	.66520	82.51
CPR93	.40188	.25357	-4.1673	.98977	75.29
CPR94	.28988	.15638	-1.5087	.65421	77.16
CPR95	.30949	.14072	-1.3781	.72779	77.46
CPR96	.34289	.13198	-.84888	.77060	78.96
CPR97	.28807	.08769	-.47661	.46076	79.80
CPR98	.27967	.09732	-.64811	.50091	78.63
CPR99	.27442	.12663	-1.9449	.39907	77.27
CPR00	.27979	.06908	-.29269	.47720	76.36
CPR01	.38725	.15393	-1.0219	.94066	78.72
CPR02	.35177	.41456	-5.1497	.60144	78.45
CPR03	.35567	.22063	-2.2385	.89890	77.73
CPR total	.34023	.17056	-5.14974	.98977	

CPR03, for instante, is the payout ratio estimated by using a Tobit model for the year 2003 in order to solve the censure problem. Correct classification stands for the percentage of correct classification arising from a Probit model including the same set of explanatory variables.

Table 5
Summary statistics of the estimated catering variable

Variable	Mean	Standard deviation	Minimum	Maximum
CAT86	.0000	.00741	-.33190	.33741
CAT87	.0000	.04132	-.51434	2.7364
CAT88	.0000	.09847	-1.2738	3.9961
CAT89	.0000	.11973	-1.3468	4.4887
CAT90	.0000	.14999	-1.7954	7.5654
CAT91	.0000	.12923	-.638263	4.9983
CAT92	.0000	.10002	-.674895	3.1729
CAT93	.0000	.09917	-1.1421	2.6332
CAT94	.0000	.12363	-1.4792	4.4738
CAT95	.0000	.15705	-2.1455	7.9613
CAT96	.0000	.18841	-2.2141	5.2106
CAT97	.0000	.17873	-1.8571	5.4364
CAT98	.0000	.19392	-2.1252	6.9161
CAT99	.0000	.23339	-1.8219	8.1605
CAT00	.0000	.18831	-1.0222	7.6399
CAT01	.0000	.12530	-1.0556	4.6773
CAT02	.0000	.09525	-2.5362	3.4662
CAT03	.0000	.10524	-3.2830	3.7791
CAT total	.0000	.59634	-3.2830	8.1605

Note that the catering variable comes from the error term of an explanatory value model and thereby its mean is always zero.

Table 6
Estimation results of the basic and extended models

	I	II
Constant	-.05732* (.018832)	-.02273** (.01367)
FCF_{it}	.38534* (.01989)	.44124* (.01211)
D_{it}	.23181* (.01269)	.22471* (.00937)
NI_{it}	.22608* (.03379)	.07396* (.02011)
$TANG_{it}$	.21719* (.01167)	.21248* (.00925)
S_{it}	.01955* (.00165)	.01682* (.00121)
CAT_{it}		.01781 (.00103)
z_1	431.30 (5)	769.21 (5)
z_2	1277.31 (16)	2250.85 (16)
z_3	35.27 (8)	64.34 (8)
m_1	-3.41	-3.40
m_2	-1.24	-0.98
Hansen	428.51 (397)	505.19 (510)

The regressions are performed by using the panel described in Table 2. The variables are defined in Table 3. The rest of the information needed to read this table is: i) Heteroskedasticity consistent asymptotic standard error in parentheses. ii) *,** and *** indicate significance at the 1%, 5% and 10% level, respectively; iii) z_1, z_2 and z_3 are Wald tests of the joint significance of the reported coefficients, of the time dummies and of the country dummies, respectively, asymptotically distributed as χ^2 under the null of no significance, degrees of freedom in parentheses; iv) m_i is a serial correlation test of order i using residuals in first differences, asymptotically distributed as N(0,1) under the null of no serial correlation; v) Hansen is a test of the over-identifying restrictions, asymptotically distributed as χ^2 under the null of no correlation between the instruments and the error term, degrees of freedom in parentheses.

Table 7
Estimation results of the moderating role of certain firm characteristics

	I	II	III
Constant	.0484*** (.02764)	-.06136** (.02651)	.08452 (.02806)
FCF_{it}	.40301* (.01329)	.39978* (.01285)	.41178* (.01399)
D_{it}	.23441* (.01239)	.37364* (.01391)	.21581* (.01224)
NI_{it}	.10179* (.02114)	.13973* (.02194)	.05817* (.02238)
$TANG_{it}$	.27127* (.01118)	.27764* (.01167)	.25512* (.01145)
S_{it}	.02595* (.00220)	.03002* (.00219)	.02414* (.00227)
CAT_{it}	.00446 (.00273)	-.13649* (.00584)	.01104* (.00135)
$CAT_{it}DV_{it}$	.02325* (.00330)	.18262* (.00647)	.06480* (.06480)
T		25.07	14.75
z_1	618.18 (7)	586.61 (7)	411.58 (7)
z_2	1702.17 (16)	1674.44 (16)	1552.86 (16)
z_3	146.34 (8)	131.17 (8)	166.17 (8)
m_1	-3.39	-3.42	-3.39
m_2	-.80	-0.43	-1.09
Hansen	483.96 (502)	481.59 (502)	475.67 (502)

The regressions are performed by using the panel described in Table 2. DV_{it} is a dummy variable that takes the following values: a) 1 if the level of liquid assets is above the sample median, and 0 otherwise in Column I; b) 1 if Tobin's q is higher than unity, and 0 otherwise in Column II; c) 1 if the free cash flow is above the sample median, and 0 otherwise in Column III. The remainder of the variables is defined in Table 3. The rest of the information needed to read this table is: i) Heteroskedasticity consistent asymptotic standard error in parentheses. ii) *,** and *** indicate significance at the 1%, 5% and 10% level, respectively; iii) t is the t-statistic for the linear restriction test under the null hypothesis of no significance; iv) z_1, z_2 and z_3 are Wald tests of the joint significance of the reported coefficients, of the time dummies and of the country dummies, respectively, asymptotically distributed as χ^2 under the null of no significance, degrees of freedom in parentheses; v) m_i is a serial correlation test of order i using residuals in first differences, asymptotically distributed as N(0,1) under the null of no serial correlation; vi) Hansen is a test of the over-identifying restrictions, asymptotically distributed as χ^2 under the null of no correlation between the instruments and the error term, degrees of freedom in parentheses.