Does the board of directors affect cash holdings?
A study of French listed firms

Sabri Boubaker[*]
Champagne School of Management, Groupe ESC Troyes, France
&
IRG, Université Paris Est, France
sabri.boubaker@groupe-esc-troyes.com
[*] *Corresponding author*

Imen Derouiche
DEFI, ESSEC Tunis, Tunisia
imen.derouiche@essec.rnu.tn

Duc Khuong Nguyen
IPAG Lab, IPAG Business School, France
duc.nguyen@ipag.fr

Abstract

Prior studies show that agency conflicts are important in explaining corporate financial policies and that the board of directors is central to corporate governance. In this study, we examine the role of this governing body in the accumulation of cash reserves. Using a sample of 597 French listed firms during 2001–2007, we find that firms with boards deemed to be effective in mitigating agency problems—that is, those appointing independent directors and splitting chief executive officer and chair positions—accumulate less cash reserves than those with less effective boards. Moreover, two-tier boards are more efficient in mitigating the agency costs of free cash flow, leading to less corporate cash hoarding. These findings support the idea that agency conflicts influence cash management policy and that effective boards of directors play an important disciplinary role in a concentrated ownership setting.

JEL classification: G31; G32

Keywords: Board of directors; Agency costs; Corporate governance; Cash holdings

1

1. Introduction

Over recent years, there was a remarkably increase in the corporate cash holdings of firms worldwide. Bates et al. (2009) note that U.S. industrial firms have more than doubled their cash-to-assets ratios during the period 1980–2006. The phenomenon of building up large cash reserves is not, apparently, limited to the United States and seems to have spread to other large industrialized countries. For instance, Iskandar-Datta and Jia (2012) document that cash resources are important for French and Japanese firms, which accounted for, respectively, 9.6% and 13.9% of total assets during 1981–2008.

In this regard, the question of what drives large corporate cash holdings is rapidly becoming a prime concern for practitioners as well as for academics. From a theoretical perspective, cash hoarding mainly originates from transaction costs and precautionary motives (Keynes, 1936). A source of financial independence, cash holdings ostensibly enable the development of an overall expansion policy without apparent cost. Alternative financing schemes using external resources would be expensive, owing to transaction costs and asymmetric information (Myers and Majluf, 1984). That is, firms with considerable cash resources can use these internal funds to take advantage of all available profitable growth opportunities. Moreover, available cash resources can help firms maintain their operations independent from external interference, as well as finance the acquisition of specific assets needed in uncertain and difficult economic environments.

Keeping a large quantity of cash inside the firm can, however, be conducive to inefficiencies in the management of corporate resources, given that these liquid assets are readily accessible to those who control the firm. More specifically, the availability of cash in excess of that needed for the firm's regular activities exacerbates the risk of the misappropriation of these funds by large shareholders who possess discretionary power over the firm's investment decisions (Jensen, 1986). This can be the case when agency conflicts pit controlling shareholders against minority shareholders.

Fama and Jensen (1983) highlight the importance of internal disciplinary mechanisms, particularly the board of directors, in corporate governance. Interestingly, the positive theory of agency posits that increases in shareholder value result partly from a strong monitoring by the elected directors. The board's effectiveness is then assessed by its ability to align management and shareholder interests to reduce potential losses in firm value (Jensen and Meckling, 1976). Since board directors have direct access to a variety of information concerning the firm's strategic management, they can adequately monitor the firm's performance and ensure a certain quality of the information disclosed to the markets. Kim et al. (2007) note that the board's monitoring role is highly dependent on the quality of the legal context and the level of protection for minority share-

holders in the country. More importantly, an effective board of directors must be able to thwart the opportunistic behavior of any controlling shareholder with substantial discretionary power to limit the agency costs associated, among other things, with "idle" cash holdings. It follows that strengthening the board of directors is a way to improve the management of the firm's resources in general and its cash holdings in particular.

In this article, we revisit the topic of corporate cash holdings in an agency framework by addressing the effectiveness of the board of directors regarding the cash holdings of French firms. We particularly focus on major board attributes that have been shown to influence the quality of board monitoring, namely, chief executive officer (CEO) duality leadership (i.e., the CEO is also the chair of the board of directors), board structure (i.e., a one-tier versus a two-tier board system), and board independence, as well as board busyness and size.

The French context provides an interesting setting to examine the disciplinary role of the board of directors. The ubiquitous presence of firms with a concentrated ownership structure in France can harm directors' fiduciary duties due to the notable influence of controlling shareholders over board functioning. Furthermore, Djankov et al. (2008) categorize the French legal context as strongly favoring the expropriating of minority shareholders through self-dealing transactions. Such transactions are typically favored by the accumulation of discretionary cash within the firm; thereby the board of directors' quality appears to be important in altering corporate cash policy.

Based on a sample of 3,239 observations of 597 French listed firms during 2001–2007, we document that the level of cash is strongly tied to the degree of board effectiveness. Notably, board characteristics that are deemed to exacerbate agency costs—such as CEO duality leadership—are found to be associated with high levels of corporate cash holdings. However, adoption of a two-tier board system as well as more independent boards and busier boards lead to a reduction of these holdings as a way to mitigate the agency costs of free cash flow. We also find that strong boards cause cash holdings to be lower in family-controlled firms than in other types of firms, suggesting that board monitoring is particularly effective when expropriation is more likely.

Our research contributes in several ways to the corporate finance and governance literatures. First, it contributes to the empirical literature on corporate cash management by shedding light on agency reasons for building up cash balances, rather than commonly held precautionary and transaction costs motives. Our evidence of the relevance of agency relationships for cash holdings in firms with concentrated ownership structures can likely be extended to other corporate policies, thus contributing to a better understanding of those structures.

Second, our work extends a growing body of research related to the board of directors' effectiveness by exploring cash holding decisions with respect to the boards' main characteristics.

The works of Ozkan and Ozkan (2004) and Harford et al. (2008), among other related studies, examine this issue in the United Kingdom and the United States, respectively, but do not report that the boards affect the level of cash, possibly because such contexts already offer strong protection for minority investors. Unlike these studies, we document a significant "board effect" on the cash held by French firms, which accentuates the importance of internal governance mechanisms in such instances. French firms, which are characterized by concentrated ownership and poor minority shareholder protection, provide a unique setting for the investigation of these effects.

Third, to the best of our knowledge, this is the first study to explore the degree of board effectiveness in managing cash by considering the structure of the board of directors as well as its busyness. Both board characteristics are rarely studied in the governance literature, despite being potentially relevant for agency costs. Most importantly, French boards turn out to be very advantageous for exploring the agency implications of the board of directors' structure, to the extent that France is among the rare countries that give firms the option to adopt either a one-tier or a two-tier system.

The remainder of this article is organized as follows. Section 2 reviews and substantiates the theoretical studies that underlie our research hypotheses. Section 3 describes the sample data and presents the empirical model. The results are reported in Sections 4 and 5, while Section 6 presents robustness checks. Section 7 concludes the article.

2. Literature review and hypothesis development

2.1 Corporate cash holdings and agency problems

The pioneering studies of Kim et al. (1998) and Opler et al. (1999) on the optimum level of cash holdings initiated a vast empirical literature on the determinants of corporate cash management. In the majority of cases, these determinants are the results of a trade-off between the costs and benefits of cash hoarding and the pecking order theory of financing, which suggests that internal funds are the most favored and least costly source of financing. The availability of these funds allows firms to minimize their exposure to capital markets, which often involve a variety of transaction costs and problems related to asymmetric information (Myers and Majluf, 1984). Ferreira and Vilela (2004) document that, in the European Union, where capital markets are not as well developed as in the United States, firms predominately have large cash holdings, owing to the difficulties surrounding their access to external financing. Pinkowitz and Williamson (2001) find that firms that are in a position to obtain credit from banks and thus have fewer financial constraints display lower levels of cash holdings. More recently, Drobtez et al. (2010) showed that

firms with important growth potential tend to increase their cash holdings when information asymmetry is high.

Moreover, the incomplete nature of contracts and their less than rigorous enforcement, mainly due to the limited rationality of the agents and the inability of all parties to foresee all possible contingencies, are a potential source of agency problems, especially those between controlling and minority shareholders. These problems mostly arise from the discretionary power of the controlling shareholders over the firm's cash resources, particularly those over and above the normal needs of the operating cycle. Specifically, the theory of free cash flow developed by Jensen (1986) suggests that excess cash holdings are liable to be squandered on projects with negative net present value, to artificially inflate the size of the firm without correspondingly increasing the wealth of its shareholders. The availability of large cash holdings also increases a firm's financial flexibility while avoiding the disciplinary constraints exerted by capital markets. Large cash holdings are even more detrimental to shareholder wealth when potential investment opportunities are too few to exhaust all available internal funds.

Seen in this light, large cash holdings can provide controlling shareholders with more opportunities to engage in opportunistic activities to obtain private benefits and increase personal wealth.[1] In support of this view, recent related literature documents the importance of corporate governance quality on firm cash holdings. For example, Harford et al. (2008) find that cash-rich firms undertake unprofitable acquisitions when the prevailing governance mechanisms are ineffective. Dittmar et al. (2003) show that firms located in countries with poor minority shareholder protection have twice the cash holdings of their counterparts in countries that provide good protection for investors, regardless of the level of development of their financial markets. The authors attribute their finding to the potential existence of more severe agency problems in environments that offer fewer protections for minority shareholders. This argument underlines the importance of agency costs inherent in holding excessive amounts of cash and thereby rules out the alternative hypothesis of the existence of financial constraints. In a similar vein, Kalcheva and Lins (2007) argue that poor protection for shareholders combined with less effective governance is often associated with high levels of cash holdings. Dittmar and Mahrt-Smith (2007) explain that better governance quality reduces the risk of managerial misappropriation of available cash, which increases the contribution of additional cash holdings to firm value.[2] The present research is centered on the

---

[1] Chrysler, for instance, waged a proxy fight with Kirk Kerkorian in 1995 over restrictions on keeping huge amounts of cash within the firm.

[2] Several empirical studies investigating the determinants of cash holdings, such as those of Opler et al. (1999) and Kim et al. (1998), fail to show that the level of corporate cash reserves depends on the extent of agency conflicts. This can be explained by the fact that these studies were conducted in the U.S. context—characterized

effectiveness of the board of directors regarding cash holdings in a context dominated by firms with concentrated ownership.

2.2 Effectiveness of the board of directors and corporate cash holdings

Boards of directors must meet certain requirements regarding their structure and composition to properly discharge their responsibilities. Relevant empirical studies find that the effectiveness of boards of directors depends on the attributes of these governing bodies that affect the extent of agency costs.

2.2.1 Duality of CEO and board chair

The quality of board monitoring can be assessed in light of the leadership structure of the board of directors (Brickley et al., 1997). Agency theory advocates argue that combining the CEO and chairman roles adversely affects the extent to which board members can discharge their fiduciary duty (Fama and Jensen, 1983; Jensen, 1993). It seems that CEO duality matters for board effectiveness because CEOs—compared to other board directors—are particularly well positioned to acquire special knowledge about the firm (Daily and Dalton, 1997). Accordingly, the willingness of CEOs to entrench themselves may lead them to capitalize on critical information that is needed to properly assess management quality. In this situation, withholding information strengthens the discretionary power of CEOs, especially those who simultaneously serve as chair of the board of directors (Brockmann et al., 2004). As a result, CEO duality is likely to limit the scope of monitoring carried out by the board, such that actions arising from managerial opportunism may go undetected (Lipton and Lorsch, 1992; Goyal and Park, 2002).

Empirical studies related to CEO duality report strong evidence that combining the CEO and chairperson roles impairs the board's monitoring function. Kim et al. (2009) find that diversification strategies are more likely to destroy firm value when the CEO chairs the board of directors. With respect to disclosure policy, Gul and Leung (2004) show that dual leadership structures are associated with fewer voluntary disclosures. They explain that corporate opacity is arguably more favorable to the entrenchment of CEOs who also chair boards of directors.

It then follows that boards chaired by the CEO should be less effective in limiting managerial discretion over corporate resources, especially regarding the use of cash held by firms with concentrated ownership. A likely implication is that combining the CEO and chair roles encourages the controlling shareholders to keep substantial amounts of idle cash reserves at their disposal. Taken together, these arguments lead to our first hypothesis.

---

by a strong corporate governance system—where the scope of managerial opportunism to engage in the inefficient use of cash resources is reduced.

H₁: The levels of cash holdings are higher for firms in which the CEO is also the chair of the board of directors.

H_1: The levels of cash holdings are higher for firms in which the CEO is also the chair of the board of directors.

2.2.2 Structure of the board of directors

In France, firms can adopt either a one-tier management system (board of directors) or a two-tier management system with an executive board (only executive directors) and a supervisory board (only non-executive directors). Studies that explore the implications of board systems from an agency perspective are rare, given that the vast majority of countries restrict firms to only one management system. The two-tier model has the advantage of allowing for a stricter separation between the management and supervisory functions, as opposed to the one-tier model (Krivogorsky, 2006). Aste (1999) also argues that the mix of executive and non-executive directors on one-tier boards typically hinders its active and independent monitoring of managerial actions. Choosing to separate management and supervisory functions therefore seems to lead to better governance quality (Millet-Reyes and Zhao, 2010). Similarly, Faleye (2007) assesses that the risk of managerial entrenchment induced by the combination of CEO and chairman roles is less likely in firms with two-tier board systems. Roosenboom and Schramade (2006) consistently show that French initial public offering firms are more prone to adopt a unitary board system to increase the discretionary power of their managers. A likely implication is that the quality of board monitoring is better in two-tier board firms compared with one-tier board firms, which offer more opportunities for controlling shareholders to make inefficient use of the firm's cash resources. In a concentrated ownership environment, the adoption of a one-tier board structure increases the discretion of the controlling parties, who combine monitoring and management functions. In such instances, the amount of cash reserves likely to be diverted from the firm as private benefits of control is expected to be large. Therefore, we argue that cash holdings are lower in the presence of two-tier boards since monitoring is expected to be more effective in these firms. Our second hypothesis can then be expressed as follows.

H_2: The levels of cash holdings are lower in firms with a two-tier board system than in those with a one-tier board system.

2.2.3 Independence of the board of directors

The independence of directors is a key factor in the quality of monitoring exerted by the board of directors over management. Interestingly, unlike other kinds of board members, independent external directors are presumed to have completely objective oversight of executives since these directors have no financial interests in the firm other than the fees related to their directorship (Rosenstein and Wyatt, 1990; Adams et al., 2010). Their personal interests lie in enhancing their human capital, which is closely linked to their reputation as independent experts in

the market for directors (Fama and Jensen, 1983). In addition, competition among independent directors concerning the labor market and director compensation—often indexed to firm performance—encourages them to make every effort to monitor the actions of management (Yermack, 2004).

In the context of concentrated ownership, the presence of independent directors can strengthen the protection of minority shareholders, who have virtually no means of control over the firm (Kim et al., 2007). In this sense, Dahya et al. (2008) argue that independent boards are particularly effective in environments where the risk of expropriating outside investors is greater. Controlling shareholders should be less reluctant to reinforce board independence and are therefore more likely to increase their representation in the boardroom (Anderson and Reeb, 2004). In this regard, Yeh and Woidtke (2005) show that firm value decreases with the proportion of directors representing the interests of controlling shareholders of Taiwanese firms. The composition of boards can therefore be used to gauge the extent of agency costs, especially in a situation of concentrated ownership.

Considering that large cash holdings increase expropriation risk, firms with independent boards are expected to have lower cash levels. We therefore formulate our third hypothesis as follows.

H_3: The levels of cash holdings decrease with the independence of the board of directors.

2.2.4 Busyness of the board of directors

Grounded in agency theory, a recent body of board research highlights that the number of directorships held by board members, that is, board busyness, can signal the effectiveness of directors as monitors (Ferris et al., 2003; Fich and Shivdasani, 2006). The idea underlying this view is that holding multiple directorships outside the firm tends to deteriorate the quality of board monitoring because busy directors may not have sufficient time to adequately discharge their fiduciary responsibilities. In support of this view, Jiraporn et al. (2009) find that the more a director is involved in other duties, the greater the director's risk of missing board meetings due to overcommitment.

Overstretched directors on the board can be especially harmful when ownership is concentrated. Such ownership structures indeed favor a relatively high information asymmetry, allowing the controlling shareholders to conceal their egregious actions from other shareholders (Attig et al., 2006). Accordingly, a director's involvement in multiple positions makes the task of examining all the information provided at board meetings difficult and costly. In such a case, overstretched directors are forced to rely on information obtained from insiders, which can harm the

quality of their judgment of managerial actions. Along this line of reasoning, Ahn et al. (2010) emphasize the adverse agency effects of board busyness by showing that acquisitions tend to be value destroying in firms with busy boards. Chen and Chen (2012) also document that lower board busyness is strongly associated with better investment efficiency in diversified firms as a signal of less severe agency problems.

To the extent that board busyness is suggestive of sizable agency conflicts, permitting the discretionary use of firm resources, busy boards are expected to bring about large amounts of cash in the controlling shareholders' hands. This analysis leads us to formulate our fourth hypothesis as follows.

H_4: *The levels of cash holdings are higher in firms with busy boards.*

2.2.5 Size of the board of directors

The number of directors sitting on the board is deemed to shape the quality of board monitoring activities. Indeed, a board's ability to better monitor managerial behavior is chiefly based on ease of communication and cooperation in the boardroom, which itself depends on the number of directors. In essence, agency implications of board size are drawn from the organizational behavior research assuming that large groups imply considerable loss of productivity (Steiner, 1972). Such losses mainly arise from increased difficulties in coordinating the efforts of multiple individuals, as well as from slower decision making and more free riding in larger groups.

Although larger boards probably offer a broader pool of knowledge and skills, their organizational inefficiencies seem to be much more considerable, thus implying potentially important agency costs. Based on this insight, Lipton and Lorsch (1992) argue that small boards are conducive to high-quality monitoring tasks as an outcome of more efficient coordination between fewer directors. In the same vein, Jensen (1993) contends that the CEOs of firms with larger boards have more opportunities to dominate the board because numerous directors tend to favor "politeness and courtesy" over criticizing management decisions. In further support of this view, Yermack (1996) finds that the performance of U.S. firms is inversely related to board size. Eisenberg et al. (1998) also show that large boards are detrimental to the value of Finnish firms and Mak and Kusnadi (2005) document similar evidence for the firms in Singapore and Malaysia. Following this line of reasoning, Faleye (2004) underlines the lower propensity of firms with large boards to oust their CEOs or replace them with outsiders.

To the extent that small boards appear to curtail agency problems, the discretion of controlling shareholders over firm resources should be limited when boards have fewer members and vice versa. As a common channel for wealth expropriation, higher levels of cash are thus expected

to be kept in insiders' hands in firms with larger boards. We draw on this analysis to suggest that board size is positively related to the quantity of cash. We thereby develop the following hypothesis.

H5: The levels of cash holdings increase with board size.

3. Sample, data sources, and variables

This section presents the sample, data sources, and variables used in the empirical analysis.

3.1 Sample and data sources

Our sample consists of all the French listed firms included in the Worldscope database during 2001–2007. We exclude firms belonging to the financial industry and public utilities because of the special regulations governing the management of their cash resources. We also remove firms whose financial and governance data were not available. The final sample includes 3,239 observations from 597 firms. We extract financial data from the Worldscope database. Data on ownership structure and the characteristics of boards of directors were manually gathered from annual reports available on the websites of Euronext Paris and the *Autorité des Marchés Financiers*.[3]

3.2 Model specification

To test our research hypotheses, we supplement the model of Opler et al. (1999) on the determinants of corporate cash holdings with a set of proxies for board of director characteristics (*BOARD*). The board characteristics that increase agency costs are expected to have a positive effect on cash holdings, while those mitigating these costs are expected to reduce the level of cash. We also consider the ownership of the largest shareholder (*OWN*) as a control variable because, from an agency perspective, cash holdings can be affected by the financial interests of this dominant shareholder. Given the possibility that the relation between ownership and cash holdings is non-linear, the regression includes the variable *OWN,* as well as its squared term. The board and ownership variables enter as their lagged terms to put into perspective their historical value and their effects on future decisions about cash holdings. The final model specification to be tested is thus the following.

$$ADJCASH_{i,t} = \beta_0 + \beta_1\ BOARD_{i,t\text{-}1} + \beta_2\ OWN_{i,t\text{-}1} + \beta_3\ OWN_{i,t\text{-}1}{}^2 + \beta_4\ SIZE_{i,t} + \beta_5\ MB_{i,t} + \beta_6\ RD_{i,t}$$
$$+ \beta_7\ CF_{i,t}\ + \beta_8\ NWK_{i,t} + \beta_9\ CFVOL_i + \beta_{10}\ LEV_{i,t} + \beta_{11}\ CAPEX_{i,t} + \beta_{12}\ DIV_{i,t} + \alpha_i + \mu_t + \varepsilon_{i,t}\ ,$$

---

[3] The *Autorité des Marchés Financiers* is the French equivalent of the U.S. Securities and Exchange Commission.

where *ADJCASH* is the adjusted cash holdings. It is an industry-adjusted measure of cash-to-net assets ratio based on Campbell's (1996) industry classification. Net assets are total assets less cash and marketable securities. *BOARD* is a proxy of the five "board of directors" characteristics: *CEO_DUAL* is CEO duality leadership. This is a dichotomous variable that equals 1 if the CEO is also the chair of the board, and 0 otherwise. *BD_STRUC* is board structure. This is a dichotomous variable that equals 1 if a firm adopts the two-tier board system and 0 if it adopts the one-tier board system. *BD_INDEP* is board independence. It is the number of independent directors divided by the total number of directors on the board. *BD_BUSY* is board busyness. It is the number of directors holding more than two directorships outside the firm divided by the total number of directors on the board. *BD_SIZE* is board size. It is the natural logarithm of the total number of directors on the board. *OWN* is cash flow rights of the largest shareholder. *SIZE* is firm size. It is the natural logarithm of total sales (in thousands of euros). *MB* is market-to-book ratio. It is measured by the sum of market value of equity and book value of liabilities divided by the book value of total assets. *RD* is the research and development expenses scaled by net assets. *CF* is cash flow, measured by operating income minus interest minus taxes, scaled by net assets. *NWK* is net working capital and measured by current assets minus current liabilities minus cash, scaled by net assets. *CFVOL* is cash flow volatility, measured as the standard deviation of cash flow-to-net assets for the past five years. *LEV* refers to the financial leverage, measured as the ratio of total debt to total assets. *CAPEX* is capital expenditure, measured as the ratio of capital expenditure to net assets. *DIV* refers to dividends, measured as the ratio of dividends to total assets. α_i and μ_t refer to firm- and time- fixed effects, respectively. i and t are subscripts of firm and time, respectively. We estimate our baseline model using a fixed effects approach. All the financial variables are winsorized at the 1% and 99% levels to eliminate the effects of outliers. A description of the variables used in this study is provided in the Appendix.

The dependent variable *ADJCASH* is a measure of cash holdings adjusted for the industry effect, given that cash levels are strongly dependent on the firm's industry (Harford et al., 2008). Thus, we first calculate the yearly median level of cash held by all the firms in a sector with respect to Campbell's (1996) industry classification.[4] The variable *ADJCASH* is then computed as the difference between the firm's ratio of cash to net assets and the median level of this ratio for the firm's industry, where net assets are measured as total assets less cash and marketable securities.

We include the following control variables.

---

[4] Sample firms are broadly classified into 11 industries (Campbell, 1996). This classification is advantageous because it provides a sufficient number of observations for each of the 11 industries.

Firm size (SIZE). There seems to be no consensus in the cash literature on the effects of firm size on cash levels. Miller and Orr (1966), among others, argue that these holdings should be lower in large firms because of economies of scale. Central to this view is the notion that large organizations can make highly accurate forecasts, which allows them to minimize their cash balances. Other contrary arguments indicate that larger firms should hold more cash because of their greater need to finance more growth opportunities (Opler et al., 1999).

Market-to-book ratio (MB). Given that increased growth opportunities imply greater financing needs, the availability of more cash within a firm allows it to avoid the additional cost of raising external finance (Myers and Majluf, 1984). Increased level of growth opportunities should then be accompanied by larger corporate cash holdings.

Research and development expenses (RD). We use this variable to estimate the costs of financial distress according to Opler et al. (1999). The higher the risk of distress, the more firms are prone to protect themselves, particularly by mobilizing greater amounts of cash.[5]

Cash flow (CF). According to pecking order theory, an increase in cash flow should increase cash holdings; however, according to trade-off theory, it should decrease cash holdings.

Net working capital (NWK). We use this variable to gauge a firm's self-financing capability, excluding cash. A substitute for liquid assets, the net working capital should be negatively related to corporate cash holdings (Kim et al., 1998).

Cash flow volatility (CFVOL). We employ this variable to proxy for the uncertainty of internal fund fluctuations. The greater this uncertainty, the more necessary it becomes to create cash reserves, implying a positive relation between corporate cash holdings and cash flow volatility.

Leverage (LEV). This variable is expected to negatively affect corporate cash holdings, in that available liquid funds are generally used to repay debt.

Capital expenditure (CAPEX). An increase in capital expenditure can arguably result in a reduction in levels of cash, since cash would be the preferred source of financing. Hence, we expect a negative relation between corporate cash holdings and capital expenditure.

Dividends (DIV). We predict a negative relationship between the level of cash and dividends, since the distribution of cash dividends should reduce available cash holdings.

---

[5] Admittedly, the variable *RD* can alternatively capture growth opportunities, which also yields a positive effect of research and development expenses on cash holdings.

4. Descriptive statistics and univariate tests

Table 1 presents the descriptive statistics for the sample firms. The results show that, on average, the CEO is also the chair of the board of directors in 72.17% of cases and that the two-tier-board system is adopted by only 25.25% of the sample. These findings are not surprising, given that French firms are characterized by a large presence of controlling shareholders, advocating less separation between management and monitoring functions. The proportion of independent directors on boards is, on average, 22.47%. Independent members dominate the board, in numbers, for about 30% of the sample. Moreover, boards are busy in nearly half of the firm–year observations. Board members holding more than two directorships outside the firm represent, on average, 60% of all directors, which reveals the tendency of directors of French firms to have multiple directorships. The average size of boards is between six and seven, indicating that in France firms tend to adopt relatively small boards. Note that 77.78% of the sampled firms are family controlled, consistent with related studies in the French context (e.g., Boubaker, 2007).

In our sample, average industry-adjusted cash holdings comprise 4% of net assets while the median level is close to zero. This proportion varies from -2.27% for firms in the 25th percentile to 4.36% for firms in the 75th percentile. As for other firm characteristics, we note that, on average, firms exhibit a log of sales (a proxy for firm size) of 11.952 and an average market-to-book ratio of 1.934, which is consistent with related studies in the French context. The average firm spends 1.18% and 5.43% of net assets on research and development activity and capital expenditures, respectively. The generated cash flow represents, on average, 6.47% of net assets, with a relatively high volatility of 4.22%. The firms in our sample hold an average proportion of 9.73% of net assets in the form of net working capital and allocate, on average, only 1.07% of this to dividend distribution.

Table 2 presents the pairwise correlation coefficients between the different variables. The significant positive correlation between the dependent variable *ADJCASH* and *CEO_DUAL* is consistent with our hypothesis that cash holdings should be larger in firms featuring CEO duality leadership. The negative correlations of *ADJCASH* with *BD_STRUCT* and with *BD_INDEP* are also in conformity with our expectation that firms with two-tier boards and those with more independent boards should hold less cash. However, the negative correlation between *ADJCASH* and *BD_BUSY* is contrary to the predicted effect of board busyness on cash. As for board size, it does not seem to significantly influence cash levels. The variables related to a firm's financial characteristics generally show their expected signs. In particular, cash holdings are negatively correlated to firm size, net working capital, leverage, and capital expenditure, while cash is positively correlated to growth opportunities and risk of default. Given the presence of strong correlations be-

tween the different independent variables, we compute the variance inflation factor scores for each independent variable. These scores range from 1.02 to 1.43, indicating that multicollinearity is not a concern.[6]

Table 3 presents the results of univariate tests for differences in corporate cash holdings. Thus, for each explanatory variable, we perform a *t*-test for mean differences and a Wilcoxon rank test for median differences in cash holdings. Panel A reports the univariate analysis for the groups of firms, partitioned each time according to a board characteristic. The corresponding results suggest that firms with CEO duality hold significantly more cash than firms without CEO duality. This finding is consistent with the prediction that combining CEO and chairman roles jeopardizes monitoring, thus increasing cash holdings. Firms adopting a two-tier board structure are found to have significantly lower cash holdings than those with one-tier boards, supporting the notion that two-tiered boards offer better monitoring. The univariate tests also show that firms with high proportions of independent directors and busy directors on the board hold less cash than when these proportions are low. That is, board independence and board busyness seem to be negatively related to the level of cash, in conformity with the results of the correlation test reported in Table 2. No significant differences in the levels of cash are observed with reference to board size. Panel B of Table 3 presents the results of the univariate analysis performed according to whether firm characteristics are below or above their mean and median levels. In support of the results of correlation tests, we find that cash holdings are larger in high-growth firms and in high-risk firms. Cash holdings are, however, lower in large firms, highly leveraged firms, firms generating important net working capital, and firms making large capital expenditures.

5. Results of the multivariate analysis

In this section, we conduct a multivariate analysis to examine the effectiveness of the board of directors regarding cash holdings. Table 4 presents the results of a fixed effect estimation of the different cash models. We estimate our regression by introducing, each time, a proxy variable representing a board characteristic (columns 1 to 5). The final regression includes all the variables of interest considered (column 6). In Table 5, we conduct additional analysis by considering the effect of family-controlled firms on the relation between the quality of boards of directors and corporate cash holdings.

The explanatory power of the estimated regressions seems fairly satisfactory. Their coefficients of determination (within R-squared) range from 18.82% to 19.34%.

---

[6] Lardaro (1993, p. 446) suggests that multicollinearity is not a serious concern as long as the variance inflation factor scores do not exceed 10.

Before examining the validity of our research hypotheses, we look at the control variables. Results from Tables 4 and 5 confirm the non-linearity of ownership of the largest shareholder. Thus, we find that *ADJCASH* is associated negatively with *OWN* but positively with *OWN²*, implying that cash holdings decline with ownership equity until a certain threshold, beyond which increase. Put differently, large shareholders having low ownership stakes seem to deter cash holdings because their interests tend to be aligned with those of minority shareholders in such instances. At relatively high levels of ownership, the entrenchment effect of large shareholdings makes insiders more inclined to accumulate cash for expropriation motives. This argument is drawn from the work of Morck et al. (1988) and Stulz (1988) on the agency costs of insider ownership.

With respect to the other control variables, the results show that firm financial characteristics generally have the expected effect on cash holdings. In particular, the firm size effect is negative, suggesting effects of economy of scale in large firms. Firms with higher growth opportunities and a higher risk of default have larger cash holdings since liquid reserves can buffer against an eventual shortage of other sources of financing. The net working capital generated is found to reduce the level of cash, thus confirming the substitutability of these internal funds. Cash is also shown to diminish with leverage and capital expenditure given that available liquid assets are typically used to repay borrowings and finance investments.

5.1 CEO duality leadership and corporate cash holdings

Column 1 of Table 4 shows how the level of cash is affected by CEO duality leadership. The results show that a firm whose CEO is also the chair of the board of directors is deemed to have larger cash holdings than when the two functions are held by different persons. Indeed, the coefficient of the variable *CEO_DUAL* is positive and statistically significant at the 1% level. This coefficient is also economically strong, given that the industry-adjusted cash ratio is 3.13% higher when the CEO serves as the board chair than when these positions are separated. Combining the roles of CEO and chairperson of the board seems to lead to large cash holdings, which confirms H_1, that hoarding cash is favored by CEO duality leadership.

Associated with greater agency costs, high levels of cash can promote insider expropriation activities in CEO duality firms owing to the CEO's influence over the board of directors. This appears to be particularly true in concentrated control structures, where the CEO is often a member of the controlling family or selected by the controlling entity. In this respect, Boubaker (2007) documents that in 85.79% of cases the management of listed French firms is entrusted to a member of the controlling family. Our sampled firms are family controlled in nearly 77% of cases (Table 1), making the CEO duality structure more likely.

In sum, higher cash holdings in firms with CEO duality may indicate that a lack of separation between the CEO's management and monitoring functions favors the accumulation of cash reserves. In such an agency setting, the built-up cash should increase the ability of controlling shareholders to obtain private benefits from firm resources at the expense of other shareholders.

5.2 Board structure and corporate cash holdings

In column 2 of Table 4, we introduce the variable *BD_STRUC* expressing whether the firm adopts a unitary board system for their board of directors or a two-tier board system, with a management board and a supervisory board. Our variable of interest exhibits a negative coefficient that is statistically significant at the 1% level. Cash holdings therefore tend to be lower in firms with two-tier boards than in those with one-tier boards, thus corroborating H_2. In terms of economic significance, when a board switches from the one-tier to the two-tier structure, all else being equal, the industry-adjusted cash ratio diminishes, on average, by 2.39%.

Overall, our results are consistent with the notion that the adoption of two-tier boards results in lower agency costs, thus reducing opportunities for building cash for expropriation motives. On the other hand, adopting the unitary board system appears to be associated with larger cash holdings owing to the high tendency of controlling shareholders to strengthen their power when they have the opportunity to do so. The one-tier board system rightly allows these shareholders to combine management and monitoring tasks by holding themselves or their representatives executive positions and board seats (Faccio and Lang, 2002; Anderson and Reeb, 2004).

5.3 Board independence and corporate cash holdings

To analyze the implication of board independence on corporate cash holdings, the variable *BD_INDEP* is included in the model specification in column 3 of Table 4. The results provide evidence that the quantity of cash diminishes with the proportion of independent members on the board. Indeed, the coefficient estimate of *BD_INDEP* presents a negative sign and is significant at the 5% confidence level. In terms of economic significance, a one standard deviation increase in the proportion of independent directors declines the industry-adjusted cash ratio, on average, by 0.3%, considering a standard deviation level of 0.2445 (Table 1). Thus, firms appear to experience significantly lower cash holdings when boards are more independent, supporting H_3. In other words, better monitoring by a more independent board of directors seems to reduce firm resources that are readily converted into private benefits. Our finding supports the notion that independent directors are less beholden to management and more diligent in limiting controlling shareholders' freedom of action and thereby the risks of expropriation of the available cash. Overall, we conclude that independent boards are effective with regard to the management of firm cash holdings.

5.4 Board busyness and corporate cash holdings

The effect of board busyness on corporate cash holdings is investigated in column 4 of Table 4. The results show that the sign of the variable *BD_BUSY* is negative and statistically significant at the 5% confidence level, indicating that cash holdings are lower in firms where board members are busier. In terms of economic significance, when board busyness decreases by one standard deviation, the ratio of industry-adjusted cash decreases, on average, by 0.4%, with a standard deviation of 0.2926 (Table 1). Our findings contradict the prediction of H_4, that board busyness increases the level of cash, consistent with ineffective monitoring by overstretched directors.

Although our findings contradict the prediction of such "busyness hypothesis," we can draw from the alternative "reputation hypothesis" to explain our results. Fama and Jensen (1983) and Carpenter and Westphal (2001), among others, argue that holding multiple directorships contributes to the development of a director's experience and expertise. That is, busier directors can be seen as being more competent and skillful. Based on this view, the extent of board busyness can be associated negatively with cash holdings as a signal that busy members on the board provide firms with valuable assistance, thus preventing the misuse of cash resources.

5.5 Board size and corporate cash holdings

Column 5 of Table 4 reports the results of board size implications on corporate cash holdings. The estimation of the regression including the variable *BD_SIZE* yields a non-significant positive coefficient for this variable. That is, the number of directors on the board does not appear to have any impact on the level of cash held by French firms. This result leads to reject H_5, assuming that the failure of large boards to provide effective monitoring over management increases cash resources. Board size is therefore unlikely to capture the extent to which boards of directors are effective in their oversight of management. The apparent absence of agency costs of board size is associated with a vast corporate governance literature suggesting that the number of board members does not matter, particularly in firms with small boards (Yermack, 1996).[7] Our sample firms are shown to have relatively small boards, with a median of six members (Table 1).

In the last column, column 6, of Table 4, we test the effects of introducing all the board variables considered in this analysis and find that the results remain qualitatively the same. Thus, the variables *CEO_DUAL*, *BD_STRUC*, *BD_INDEP*, and *BD_BUSY* continue to exhibit a significant coefficient, albeit at lower significance levels compared to when they are included separately. Similarly, the results confirm the insignificant effect of board size on corporate cash holdings.

---

[7] Yermack (1996) finds that the negative association between board size and firm value is not binding for firms with boards consisting of fewer than six members.

5.6 Controlling families, board characteristics, and corporate cash holdings

When a family wields substantial control over a firm, it can adopt self-interested behavior to extract private benefits at the expense of outside investors (La Porta et al., 1999). In addition, members of the controlling family are routinely involved in management, which bolsters the family's discretionary power in the absence of a clear separation between monitoring and management tasks (Anderson and Reeb, 2003). A strong board of directors is expected to challenge the controlling family's tendency toward discretionary cash holdings. To test this assumption, we construct a dummy variable, *FAMILY*, that equals one if the largest shareholder is a family and zero otherwise and we interact this variable with each of the board variables. Table 5 reports the results of the corresponding regressions. Statistically insignificant tests for board size are not tabulated for the sake of brevity.[8]

Interestingly, the signs of the standalone coefficients of our variables of interest remain unchanged. The evidence from column 1 of Table 5 indicates that the interaction term between *CEO_DUAL* and *FAMILY* is significantly positive, suggesting that cash holdings in firms where the CEO is also the chair of the board are larger in the presence of a controlling family. In terms of economic magnitude, firms with CEO duality leadership have 65.7% larger cash holdings when controlled by families than when they are not.[9] Our findings are consistent with CEO duality failing to prevent abnormally large cash holdings in family-controlled firms.

The results in columns 2 and 3 of Table 5 provide a different picture. The variables that interact *FAMILY* with *BD_STRUCT* and *BD_INDEP* exhibit negative significant coefficients. These findings suggest that the adoption of a two-tier board and high board independence cause family-controlled firms to have lower cash holdings than their counterparts. In terms of economic magnitude, firms adopting the two-tier board structure hold 65.54% less cash when controlled by families.[10] As for firms with independent boards, an increase in *BD_INDEP* by one standard deviation (0.2445; see Table 1) results in a marginal cash ratio that is 20% lower in family-controlled firms compared to non–family-controlled firms.[11] That is, the family's control does not seem to diminish the board of directors' quality. On the contrary, boards appear to be effective in limiting the amount of cash at the free disposal of controlling families. Board busyness is found to have no significant effect on the cash holdings of controlling families, as shown in column 4 of Table 5. The introduction of all board characteristics into the regression confirms the results discussed above, as shown in column 5 of Table 5.

---

[8] Results are available from the authors upon request.
[9] 65.72% = [(0.0248+0.0163)-0.0248)/0.0248].
[10] 65.54% = [(0.0447+0.0293)-0.0447)/0.0447].
[11] 19.95% = [(0.0163+0.0133*0.2445)-0.0163)/0.0163].

In summary, analysis of the effects of controlling families on the relation between board characteristics and corporate cash holdings provides additional insight into the effectiveness of the board of directors, especially when agency problems are more likely.

6. Robustness checks

In this section, we conduct several analyses to check the robustness of our results. First, we replace the industry-adjusted measure of cash holdings, *ADJCASH,* by the natural logarithm of the ratio of cash to net assets. We find that the effects of board of director characteristics on the level of cash are robust to the measure of cash used (column 1 of Table 6). Second, several studies, including that of Dittmar et Mahrt-Smith (2007), underline the possible endogeneity of growth opportunities to cash holdings. Similar to these authors, we use three-year sales growth as the instrument for growth opportunities and re-estimate our regression. The results remain qualitatively the same, except for the variable of board busyness, which becomes statistically insignificant (column 2 of Table 6). Third, cash holdings may be endogenous to certain firm characteristics, namely, capital expenditure, leverage, and dividends. To deal with this concern, we eliminate these variables and re-estimate our model (column 3 of Table 6). The results are the same as those reported previously. Fourth, we use dummy variables for board independence (*BD_INDEPDUMMY*) and board busyness (*BD_BUSYDUMMY*), each taking the value of one when more than half of the directors on the board are, respectively, independent and busy. We obtain virtually unchanged conclusions (column 4 of Table 6).

7. Conclusion

Numerous empirical studies based on the free cash flow hypothesis document a positive association between corporate cash holdings and the magnitude of agency costs (Dittmar et al., 2003; Harford et al., 2008). Central to this debate is the fact that insiders are provided with considerable latitude in diverting liquid assets for their own benefits. Our work extends this area of research by analyzing the hypothesis that board quality influences the level of cash held by firms with concentrated ownership structures.

Considering a sample of 3,239 observations of 597 French listed firms during 2001–2007, our results suggest that board of director characteristics affect levels of cash holdings. In particular, we find that assigning the functions of CEO and chair of the board to the same person results in increased cash reserves. We also find that adoption of a two-tier board system is accompanied by fewer cash holdings, whereas firms with more independent and busier directors on the board

tend to hold lower cash levels. Board size does not appear to significantly affect corporate cash holdings.

In further support of our findings, ancillary analysis indicates that strong boards of directors cause cash balances to be lower for family-controlled firms than for their non–family-controlled peers. These results suggest that a high-quality board can challenge a controlling family's impetus for discretionary cash holdings by reducing the volume of liquid resources at the family's free disposal.

Overall, our study provides additional evidence regarding the relevance of the disciplinary role of boards of directors in a concentrated ownership context. Specifically, an effective board should reduce opportunities for controlling shareholders to convert cash resources into private benefits. Agency problems seem to matter in explaining a firm's cash management policy. Our conclusions are consistent with the requirements of guidelines for good governance practices that stress the importance of the board of directors in improving the quality of firm governance.

References

Adams, R., Hermalin, B. & Weisbach, M. (2010). The role of boards of directors in corporate governance: A conceptual framework and survey. Journal of Economic Literature, 48, 58-107

Ahn, S., Jiraporn, P. & Kim, Y. (2010). Multiple directorships and acquirer returns. Journal of Banking and Finance, 34, 2011-2026

Anderson, R. & Reeb, D. (2004). Board composition: Balancing family influence in S&P 500 firms. Administrative Science Quarterly, 49, 209-237.

Anderson, R. & Reeb, D. (2003). Founding-family ownership and firm performance: Evidence from the S&P 500. The Journal of Finance, 58, 1301-1328.

Aste, L.J. (1999). Reforming French Corporate Governance: A Return to the Two-Tier Board?. The George Washington Journal of International Law and Economics, 32, 1-72.

Attig, N., Fong, W., Gadhoum, Y. & Lang, L. (2006). Effects of large shareholding on information asymmetry and stock liquidity. Journal of Banking and Finance, 30, 2875-2892.

Bates, T., Kahle, K. & Stulz, R. (2009). Why do US firms hold so much more cash than they used to? The Journal of Finance, 64, 1985-2021.

Boubaker, S. (2007). Ownership-control discrepancy and firm value: Evidence from France. Multinational Finance Journal, 11, 211-252.

Brickley, J., Coles, J. & Jarrell, G. (1997). Leadership structure: Separating the CEO and chairman of the board. Journal of Corporate Finance, 3, 189-220.

Brockmann, E.N., Hoffman, J.J., Dawley, D.D. & Fornaciari, C.J. (2004). The impact of CEO duality and prestige on a bankrupt organization. Journal of Management Issues, 16, 178-196.

Campbell, J. (1996). Understanding risk and return. Journal of Political Economy, 104, 298-345.

Carpenter, M.A. & Westphal, J.D. (2001). The strategic context of external network ties: Examining the impact of director appointments on board involvement in strategic decision making. Academy of Management Journal 44, 639–660.

Chen, S., S & Chen, I.,J. (2012). Corporate governance and capital allocations of diversified firms. Journal of Banking and Finance, 36, 395–409

Dahya, J., Dimitrov, O. & McConnell, J. (2008). Dominant shareholders, corporate boards, and corporate value: A cross-country analysis. Journal of Financial Economics, 87, 73-100

Daily, C. M. & Dalton D. R. (1997). CEO and board chair roles held jointly or separately: Much ado about nothing?. Academy of Management Executive, 11, 11-20.

Dittmar, A. & Mahrt-Smith, J. (2007). Corporate governance and the value of cash holdings. Journal of Financial Economics, 83, 599-634.

Dittmar, A., Mahrt-Smith, J. & Servaes, H. (2003). International corporate governance and corporate cash holdings. Journal of Financial and Quantitative Analysis, 38, 111-133.

Djankov, S., La Porta, R., Lopez-de-Silanes, F. & Shleifer, A. (2008). The law and economics of self-dealing. Journal of Financial Economics, 88, 430-465.

Drobetz, W., Grüninger, M. & Hirschvogl, S. (2010). Information asymmetry and the value of cash. Journal of Banking & Finance, 34, 2168-2184.

Eisenberg, T., Sundgren, S. & Wells, M. (1998). Larger board size and decreasing firm value in small firms. Journal of Financial Economics, 48, 35–54.

Faccio, M. & Lang, L. (2002). The ultimate ownership of Western European corporations. Journal

of Financial Economics 65, 365-395.

Faleye, O. (2004). Are large boards poor monitors? Evidence from CEO turnover. EFMA Basel Meetings Paper.

Faleye, O. (2007). Does one hat fit all? The case of corporate leadership structure. Journal of Management and Governance, 11, 239–259.

Fama, E. & Jensen, M. (1983). Separation of ownership and control. The Journal of Law and Economics, 26, 301-325.

Ferreira, M. & Vilela, A. (2004). Why do firms hold cash? Evidence from EMU countries. European Financial Management, 10, 295–319.

Ferris, S., Jagannathan, M. & Pritchard, A. (2003). Too busy to mind the business? Monitoring by directors with multiple board appointments. The Journal of Finance, 58, 1087-1111.

Fich, E., M & Shivdasani, A. (2006). Are busy boards effective monitors? The Journal of finance, 61, 689-724.

Goyal, V. & Park, C. (2002). Board leadership structure and CEO turnover. Journal of Corporate Finance, 8, 49–66.

Gul, F.A. & Leung, S. (2004). Board leadership, outside directors' expertise and voluntary corporate disclosure. Journal of Accounting and Public Policy, 23, 351–379

Harford, J., Mansi, S. & Maxwell, W. (2008). Corporate governance and firm cash holdings in the US. Journal of Financial Economics, 87, 535-555.

Iskandar-Datta, M.E. & Jia, Y. (2012). Cross-country analysis of secular cash trends. Journal of Banking and Finance, 36, 898–912.

Jensen, M. (1986). Agency costs of free cash flow, corporate finance, and takeovers. The American Economic Review, 76, 323-329.

Jensen, M. (1993). The modern industrial revolution, exit, and the failure of internal control systems. The Journal of Finance, 48, 831–880.

Jensen, M.C. & Meckling, W.H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. Journal of Financial Economics, 3, 305-360

Jiraporn, P., Davidson, W., DaDalt, P. & Ning, Y. (2009). Too busy to show up? An analysis of directors' absences. Quarterly Review of Economics and Financ,e 49, 1159-1171.

Kalcheva, I. & Lins, K. (2007). International evidence on cash holdings and expected managerial agency problems. Review of Financial Studies, 20, 1087-1112.

Keynes, J.M., (1936). The general theory of employment, interest and money. Harcourt Brace, London.

Kim, K., Al-Shammari, H., Kim, B. & Lee, S. (2009). CEO Duality Leadership and Corporate Diversification Behavior. Journal of Business Research 62, 1173–1180.

Kim, K., Kitsabunnarat-Chatjuthamard, P. & Nofsinger, J. (2007). Large shareholders, board independence, and minority shareholder rights: Evidence from Europe. Journal of Corporate Finance, 13, 859-880.

Kim, C., Mauer, D. & Sherman, A. (1998). The determinants of corporate liquidity: Theory and evidence. The Journal of Financial and Quantitative Analysis, 33, 335-359.

Krivogorsky, V. (2006). Ownership, board structure, and performance in continental Europe. International Journal of Accounting, 41, 176-197.

La Porta, R., Lopez-de-Silanes, F., Shleifer, A. &Vishny, R. (1999). Corporate ownership around

the world. Journal of Finance 54, 471-517.

Lardaro, L., (1993). Applied Econometrics. Harper Collins.

Lipton, M., & Lorsch, J. (1992). A modest proposal for improved corporate governance. Business Lawyer, 48, 59–77.

Mak, Y. & Kusnadi, Y. (2005). Size really matters: Further evidence on the negative relationship between board size and firm value. Pacific Basin Finance Journal, 13, 301–318.

Miller, M.H. & Orr. D. (1966). A model of the demand for money by firms. Quarterly Journal of Economics, 80, 413-435.

Millet-Reyes, B. & Zhao, R. (2010). A Comparison Between One-Tier and Two-Tier Board Structures in France. Journal of International Financial Management & Accounting, 21, 279-310.

Morck, R., Shleifer, A. & Vishny, R. (1988). Management ownership and market valuation: An empirical analysis. Journal of Financial Economics 20, 293–315.

Myers, S.C. & Majluf, N.S. (1984). Corporate financing and investment decisions when firms have information that investors do not have. Journal of Financial Economics, 13, 187–221.

Opler, T., Pinkowitz, L., Stulz, R. & Williamson, R. (1999). The determinants and implications of corporate cash holdings. Journal of Financial Economics, 52, 3-46.

Ozkan, A. & Ozkan, N. (2004). Corporate cash holdings: An empirical investigation of UK companies. Journal of Banking and Finance, 28, 2103-2134.

Pinkowitz, L. & Williamson,R. (2001). Bank power and cash holdings: Evidence from Japan. Review of Financial Studies, 14, 1059-1082.

Roosenboom, P. & Schramade, W. (2006). The price of power: Valuing the controlling position of owner–managers in French IPO firms. Journal of Corporate Finance, 12, 270-295.

Rosenstein, S. & Wyatt, J. (1990). Outside directors, board independence, and shareholder wealth. Journal of Financial Economics, 26, 175-191.

Steiner, I., D. (1972). Group Process and Productivity, New York: Academic Press.

Stulz, R. (1988). Managerial control of voting rights. Journal of Financial Economics 20, 25–59.

Yeh, Y. & Woidtke, T. (2005). Commitment or entrenchment?: Controlling shareholders and board composition. Journal of Banking and Finance, 29, 1857-1885.

Yermack, D. (1996). Higher market valuation of companies with a small board of directors. Journal of Financial Economics, 40, 185–212.

Yermack, D. (2004). Remuneration, retention, and reputation incentives for outside directors. The Journal of Finance, 59, 2281–2308.

Appendix
Variables' description

Variable	Definition
CEO_DUAL	CEO duality leadership. This is a dichotomous variable that equals 1 if the CEO is also the chair of the board, and 0 otherwise.
BD_STRUC	Board structure. This is a dichotomous variable that equals 1 if a firm adopts the two-tier board system and 0 if it adopts the one-tier board system.
BD_INDEP	Board independence. It is the number of independent directors divided by the total number of directors on the board.
BD_INDEPDUMMY	This is a dichotomous variable that equals 1 if more than half of directors on the board are independent and 0 otherwise.
BD_BUSY	Board busyness. It is the number of directors holding more than two directorships outside the firm divided by the total number of directors on the board.
BD_BUSYDUMMY	This is a dichotomous variable that equals 1 if more than half of the directors hold more than two directorships outside the firm, and 0 otherwise.
BD_SIZE	Board size. It is the natural logarithm of the number of directors on the board.
OWN	Cash flow rights of the largest shareholder.
FAMILY	This is a dichotomous variable that equals 1 if the largest shareholder is a family, and 0 otherwise.
CASH	Cash holdings. It is the natural logarithm of cash-to-net assets ratio; net assets are total assets less cash and marketable securities.
ADJCASH	Cash holdings. It is an Industry-adjusted measure of cash-to-net assets ratio, based on Campbell's (1996) industry classification.
SIZE	Firm size. It is the natural logarithm of total sales (in thousands of euros).
MB	Market-to-book ratio. It is the ratio of (market value of equity plus book value of liabilities) divided by the book value of total assets.
RD	Research and Development expenses scaled by net assets.
CF	Cash flow. It is measured as (operating income minus interest minus taxes) scaled by net assets.
NWK	Net working capital. It is measured as (current assets minus current liabilities minus cash) scaled by net assets.
CFVOL	Cash flow volatility. It is measured as the standard deviation of cash flow-to-net assets for the past five years.
LEV	Leverage. It is measured as the ratio of total debt to total assets.
CAPEX	Capital expenditure. It is measured as the ratio of capital expenditure to net assets.
DIV	Dividends. It is measured as the ratio of dividends to total assets.

Table 1
Descriptive statistics

This table presents the descriptive statistics of the used variables. *CEO_DUAL* is CEO duality leadership. This is a dichotomous variable that equals 1 if the CEO is also the chair of the board, and 0 otherwise. *BD_STRUC* is board structure. This is a dichotomous variable that equals 1 if a firm adopts the two-tier board system and 0 if it adopts the one-tier board system. BD_INDEP is board independence. It is the number of independent directors divided by the total number of directors on the board. BD_BUSY is board busyness. It is the number of directors holding more than two directorships outside the firm divided by the total number of directors on the board. BD_SIZE is board size. It is the natural logarithm of the number of directors on the board. The descriptive values of the raw variable are presented in Table 1 to elucidate its economic meaning. OWN is cash flow rights of the largest shareholder. FAMILY is a dichotomous variable that equals 1 if the largest shareholder is a family, and 0 otherwise. CASH is cash holdings, measured as cash-to-net assets ratio; net assets are total assets less cash and marketable securities. *ADJCASH* is an Industry-adjusted measure of cash-to-net assets ratio, based on Campbell's (1996) industry classification; net assets are total assets less cash and marketable securities. *SIZE* is firm size. It is the natural logarithm of total sales (in thousands of euros). *MB* is market-to-book ratio. It is the ratio of (market value of equity plus book value of liabilities) divided by the book value of total assets. *RD* is Research and Development expenses scaled by net assets. *CF* is cash flow. It is measured as (operating income minus interest minus taxes) scaled by net assets. *NWK* is net working capital. It is measured as (current assets minus current liabilities minus cash) scaled by net assets. *CFVOL* is cash flow volatility. It is measured as the standard deviation of cash flow-to-net assets for the past five years. *LEV* is leverage. It is measured as the ratio of total debt to total assets. *CAPEX* is capital expenditure. It is measured as the ratio of capital expenditure to net assets. *DIV* is Dividends. It is measured as the ratio of dividends to total assets.

Variable	Mean	Median	Standard Deviation	25th Percentile	75th Percentile
CEO_DUAL	0.721	1.000	0.459	0.000	1.000
BD_STRUC	0.252	0.000	0.434	0.000	1.000
BD_INDEP	0.224	0.176	0.244	0.000	0.400
BD_BUSY	0.602	0.666	0.292	0.000	0.818
BD_SIZE	6.752	6.000	3.542	4.000	8.000
OWN	0.415	0.400	0.250	0.205	0.606
FAMILY	0.778	1.000	0.415	1.000	1.000
CASH	0.082	0.049	0.129	0.025	0.092
ADJCASH	0.039	0.000	0.162	-0.022	0.043
SIZE	11.925	11.657	2.180	10.570	13.072
MB	1.834	1.370	1.553	1.061	1.921
RD	0.011	0.000	0.055	0.000	0.003
CF	0.064	0.078	0.138	0.040	0.120
NWK	0.097	0.088	0.254	-0.045	0.243
CFVOL	0.042	0.025	0.194	0.016	0.048
LEV	0.219	0.198	0.170	0.075	0.323
CAPEX	0.054	0.040	0.055	0.018	0.069
DIV	0.010	0.005	0.016	0.000	0.014

Table 2
Correlations

This table presents the coefficients of correlation between the various variables. *CEO_DUAL* is CEO duality leadership. This is a dichotomous variable that equals 1 if the CEO is also the chair of the board, and 0 otherwise. *BD_STRUC* is board structure. This is a dichotomous variable that equals 1 if a firm adopts the two-tier board system and 0 if it adopts the one-tier board system. *BD_INDEP* is board independence. It is the number of independent directors divided by the total number of directors on the board. *BD_BUSY* is board busyness. It is the number of directors holding more than two directorships outside the firm divided by the total number of directors on the board. *BD_SIZE* is board size. It is the natural logarithm of the number of directors on the board. *OWN* is cash flow rights of the largest shareholder. *ADJCASH* is cash holdings. It is an Industry-adjusted measure of cash-to-net assets ratio, based on Campbell's (1996) industry classification; net assets are total assets less cash and marketable securities. *SIZE* is firm size. It is the natural logarithm of total sales (in thousands of euros). *MB* is market-to-book ratio. It is the ratio of (market value of equity plus book value of liabilities) divided by the book value of total assets. *RD* is Research and Development expenses scaled by net assets. *CF* is cash flow. It is measured as (operating income minus interest minus taxes) scaled by net assets. *NWK* is net working capital. It is measured as (current assets minus current liabilities minus cash) scaled by net assets. *CFVOL* is cash flow volatility. It is measured as the standard deviation of cash flow-to-net assets for the past five years. *LEV* is leverage. It is measured as the ratio of total debt to total assets. *CAPEX* is capital expenditure. It is measured as the ratio of capital expenditure to net assets. *DIV* is Dividends. It is measured as the ratio of dividends to total assets. [a], [b], and [c] indicate two-tailed statistical significance at the 1%, 5%, and 10% levels, respectively.

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1 ADJCASH	1.000															
2 CEO_DUAL	0.046[a]	1.000														
3 BD_STRUC	-0.077[a]	-0.624[a]	1.000													
4 BD_INDEP	-0.088[a]	-0.067[a]	-0.034[b]	1.000												
5 BD_BUSY	-0.064[a]	-0.073[a]	-0.011	0.187[a]	1.000											
6 BD_SIZE	-0.010	-0.197[a]	0.171[a]	0.370[a]	0.117[a]	1.000										
7 OWN	-0.051	0.083[a]	0.007	-0.268[a]	-0.152[a]	-0.350[a]	1.000									
8 SIZE	-0.119[a]	-0.078[a]	0.069[a]	0.640[a]	0.323[a]	0.332[a]	-0.205[a]	1.000								
9 MB	0.467[a]	0.049[a]	-0.087[a]	-0.116[a]	-0.070[a]	-0.020	-0.046[a]	-0.202[a]	1.000							
10 RD	0.227[a]	0.002	-0.041[b]	-0.010	-0.005	0.139[a]	-0.139[a]	-0.147[a]	0.319[a]	1.000						
11 CF	0.001	-0.004	0.009	0.012	0.031	-0.007	-0.008	0.090[a]	-0.023	-0.030[c]	1.000					
12 NWK	-0.103[a]	0.036[b]	0.069[a]	-0.100[a]	-0.129[a]	-0.013	0.121[a]	-0.189[a]	-0.098[a]	0.106[a]	0.046[a]	1.000				
13 CFVOL	0.024	-0.028	-0.029[c]	-0.030	-0.071[a]	0.028[c]	-0.009	-0.115[a]	0.177[a]	0.002	0.009	-0.106[a]	1.000			
14 LEV	-0.190[a]	-0.053[a]	0.010	0.128[a]	0.100[a]	0.048[a]	-0.047[a]	0.192[a]	-0.138[a]	-0.133[a]	-0.012	-0.392[a]	0.027	1.000		
15 CAPEX	-0.039[b]	0.052	0.012[a]	-0.327	-0.079[a]	0.034[b]	-0.012	-0.039[b]	0.052[a]	-0.012	-0.327[a]	-0.079[a]	0.034[b]	-0.012	1.000	
16 DIV	0.014	-0.030[b]	0.015	0.040[a]	0.021	-0.001	0.032[b]	0.041[a]	0.123[a]	-0.014	0.026[c]	0.033[b]	-0.010	-0.030[b]	-0.017	1.000

Table 3
Univariate tests for differences in corporate cash holdings

This table presents the results of univariate *t*-tests and Wilcoxon rank tests for differences in corporate cash holdings according to whether board of directors' characteristics are above- or below-the median levels. For the dummy variables, we compare mean and median values of cash between the groups of firm with a value of 1 and 0 for the variables. Cash holding, *ADJCASH*, is an Industry-adjusted measure of cash-to-net assets ratio, based on Campbell's (1996) industry classification; net assets are total assets less cash and marketable securities. *CEO_DUAL* is CEO duality leadership. This is a dichotomous variable that equals 1 if the CEO is also the chair of the board, and 0 otherwise. *BD_STRUC* is board structure. This is a dichotomous variable that equals 1 if a firm adopts the two-tier board system and 0 if it adopts the one-tier board system. *BD_INDEP* is board independence. It is the number of independent directors divided by the total number of directors on the board. *BD_BUSY* is board busyness. It is the number of directors holding more than two directorships outside the firm divided by the total number of directors on the board. *BD_SIZE* is board size. It is the natural logarithm of the number of directors on the board. The *p*-value of difference from the *t*-test and medians tests of equality is reported in parentheses. [a], [b], and [c] indicate two-tailed statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Corporate cash holdings based on board characteristics

Board Characteristics		Below median	Above median	*p*-value of Difference
CEO_DUAL	Mean	0.025	0.043	(0.001)[a]
	Median	-0.004	0.002	(0.000)[a]
BD_STRUC	Mean	0.044	0.018	(0.000)[a]
	Median	0.001	-0.002	(0.013)[b]
BD_INDEP	Mean	0.045	0.027	(0.000)[a]
	Median	0.002	0.000	(0.011)[b]
BD_BUSY	Mean	0.053	0.029	(0.001)[a]
	Median	0.003	0.000	(0.007)[a]
BD_SIZE	Mean	0.046	0.035	(0.088)[c]
	Median	0.000	0.000	(0.340)

Panel B: Corporate cash holdings based on firm characteristics

Firm Characteristics		Below median	Above median	*p*-value of Difference
SIZE	Mean	0.049	0.025	(0.000)[a]
	Median	0.020	0.000	(0.000)[a]
MB	Mean	0.008	0.067	(0.000)[a]
	Median	-0.004	0.008	(0.000)[a]
RD	Mean	0.029	0.057	(0.000)[a]
	Median	-0.000	0.003	(0.000)[a]
CF	Mean	0.051	0.063	(0.1578)
	Median	0.007	0.011	(0.1681)
NWK	Mean	0.057	0.018	(0.000)[a]
	Median	0.003	-0.001	(0.000)[a]
CFVOL	Mean	0.040	0.035	(0.2811)
	Median	0.000	0.000	(0.3194)
LEV	Mean	0.062	0.013	(0.000)[a]
	Median	0.005	-0.002	(0.000)[a]
CAPEX	Mean	0.043	0.033	(0.036)[b]
	Median	0.010	0.008	(0.067)[c]
DIV	Mean	0.041	0.034	(0.1527)
	Median	0.000	0.000	(0.9960)

Table 4
Characteristics of the board of directors and corporate cash holdings

This table presents the results from fixed-effect regressions estimating the effects of board of directors' characteristics on corporate cash holdings. The dependent variable is *ADJCASH* (cash holdings). It is an Industry-adjusted measure of cash-to-net assets ratio, based on Campbell's (1996) industry classification; net assets are total assets less cash and marketable securities. *CEO_DUAL* is CEO duality leadership. This is a dichotomous variable that equals 1 if the CEO is also the chair of the board, and 0 otherwise. *BD_STRUC* is board structure. This is a dichotomous variable that equals 1 if a firm adopts the two-tier board system and 0 if it adopts the one-tier board system. *BD_INDEP* is board independence. It is the number of independent directors divided by the total number of directors on the board. *BD_BUSY* is board busyness. It is the number of directors holding more than two directorships outside the firm divided by the total number of directors on the board. *BD_SIZE* is board size. It is the natural logarithm of the number of directors on the board. *OWN* is cash flow rights of the largest shareholder. *SIZE* is firm size. It is the natural logarithm of total sales (in thousands of euros). *MB* is market-to-book ratio. It is the ratio of (market value of equity plus book value of liabilities) divided by the book value of total assets. *RD* is Research and Development expenses scaled by net assets. *CF* is cash flow. It is measured as (operating income minus interest minus taxes) scaled by net assets. *NWK* is net working capital. It is measured as (current assets minus current liabilities minus cash) scaled by net assets. *CFVOL* is cash flow volatility. It is measured as the standard deviation of cash flow-to-net assets for the past five years. *LEV* is leverage. It is measured as the ratio of total debt to total assets. *CAPEX* is capital expenditure. It is measured as the ratio of capital expenditure to net assets. *DIV* is Dividends. It is measured as the ratio of dividends to total assets. The *t*-statistics are reported in parentheses below the estimated coefficients. [a], [b], and [c] indicate the statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
$CEO\_DUAL_{(t-1)}$	0.031					0.018
	(4.37)[a]					(2.48)[b]
$BD\_STRUC_{(t-1)}$		-0.023				-0.015
		(-2.66)[a]				(-1.67)[c]
$BD\_INDEP_{(t-1)}$			-0.016			-0.015
			(-2.34)[b]			(-2.14)[b]
$BD\_BUSY_{(t-1)}$				-0.014		-0.017
				(-2.03)[b]		(-1.68)[c]
$BD\_SIZE_{(t-1)}$					0.002	-0.000
					(0.25)	(-0.30)
$OWN_{(t-1)}$	-0.038	-0.037	-0.039	-0.038	-0.038	-0.045
	(-1.66)[c]	(-1.65)[c]	(-1.71)[c]	(-1.68)[c]	(-1.66)[c]	(-1.96)[c]
$OWN^2_{(t-1)}$	0.054	0.055	0.054	0.054	0.053	0.065
	(2.04)[b]	(2.06)[b]	(2.03)[b]	(2.02)[b]	(2.01)[b]	(2.45)[b]
$SIZE$	-0.013	-0.013	-0.014	-0.014	-0.014	-0.012
	(-3.54)[a]	(-3.60)[a]	(-3.70)[a]	(-3.68)[a]	(-3.55)[a]	(-3.15)[a]
MB	0.028	0.029	0.028	0.028	0.028	0.029
	(14.47)[a]	(14.43)[a]	(14.33)[a]	(14.35)[a]	(14.40)[a]	(14.45)[a]
RD	0.241	0.237	0.234	0.235	0.235	0.266
	(7.16)[a]	(7.05)[a]	(6.94)[a]	(6.98)[a]	(6.99)[a]	(7.70)[a]
CF	-0.006	-0.006	-0.006	-0.006	-0.006	-0.006
	(-2.93)[a]	(-2.94)[a]	(-2.91)[a]	(-2.88)[a]	(-2.87)[a]	(-3.09)[a]
NWK	-0.150	-0.149	-0.151	-0.150	-0.150	-0.151
	(-11.57)[a]	(-11.53)[a]	(-11.62)[a]	(-11.57)[a]	(-11.55)[a]	(-11.70)[a]
$CFVOL$	0.023	0.026	0.024	0.026	0.025	0.026
	(1.36)	(1.51)	(1.41)	(1.51)	(1.47)	(1.51)
LEV	-0.078	-0.081	-0.083	-0.081	-0.082	-0.075
	(-3.94)[a]	(-4.05)[a]	(-4.15)[a]	(-4.04)[a]	(-4.09)[a]	(-3.76)[a]
$CAPEX$	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010
	(-2.79)[a]	(-2.80)[a]	(-2.81)[a]	(-2.80)[a]	(-2.78)[a]	(-2.88)[a]
DIV	-0.288	-0.280	-0.276	-0.262	-0.268	-0.279
	(-1.62)	(-1.57)	(-1.55)	(-1.47)	(-1.50)	(-1.56)
Intercept	0.161	0.193	0.197	0.199	0.160	0.171
	(3.29)[a]	(3.97)[a]	(4.05)[a]	(4.10)[a]	(3.01)[a]	(3.48)[a]
Observations	3,239	3,239	3,239	3,239	3,239	3,239
R-squared	18.82%	18.35%	18.40%	18.36%	18.23%	19.34%

Table 5
Family firms, characteristics of the board of directors and corporate cash holdings

This table presents the results from fixed-effect regressions estimating the effects of family firms on the relationship between board of directors' characteristics and corporate cash holdings. The dependent variable is *ADJCASH* (cash holdings). It is an Industry-adjusted measure of cash-to-net assets ratio, based on Campbell's (1996) industry classification; net assets are total assets less cash and marketable securities. *CEO_DUAL* is CEO duality leadership. This is a dichotomous variable that equals 1 if the CEO is also the chair of the board, and 0 otherwise. *BD_STRUC* is board structure. This is a dichotomous variable that equals 1 if a firm adopts the two-tier board system and 0 if it adopts the one-tier board system. *BD_INDEP* is board independence. It is the number of independent directors divided by the total number of directors on the board. *BD_BUSY* is board busyness. It is the number of directors holding more than two directorships outside the firm divided by the total number of directors on the board. *BD_SIZE* is board size. It is the natural logarithm of the number of directors on the board. *OWN* is cash flow rights of the largest shareholder. *FAMILY* is a dichotomous variable that equals 1 if the largest shareholder is a family, and 0 otherwise. *SIZE* is firm size. It is the natural logarithm of total sales (in thousands of euros). *MB* is market-to-book ratio. It is the ratio of (market value of equity plus book value of liabilities) divided by the book value of total assets. *RD* is Research and Development expenses scaled by net assets. *CF* is cash flow. It is measured as (operating income minus interest minus taxes) scaled by net assets. *NWK* is net working capital. It is measured as (current assets minus current liabilities minus cash) scaled by net assets. *CFVOL* is cash flow volatility. It is measured as the standard deviation of cash flow-to-net assets for the past five years. *LEV* is leverage. It is measured as the ratio of total debt to total assets. *CAPEX* is capital expenditure. It is measured as the ratio of capital expenditure to net assets. *DIV* is Dividends. It is measured as the ratio of dividends to total assets. The *t*-statistics are reported in parentheses below the estimated coefficients. [a], [b], and [c] indicate the statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)
CEO_DUAL$_{(t-1)}$	0.024				0.022
	(3.09)[a]				(2.70)[a]
CEO_DUAL$_{(t-1)}$ *FAMILY*	0.016				0.018
	(1.80)[c]				(1.82)[c]
BD_STRUC$_{(t-1)}$		-0.044			-0.034
		(-2.80)[a]			(-2.12)[b]
BD_STRUC$_{(t-1)}$ *FAMILY*		-0.029			-0.042
		(-1.75)[c]			(-2.39)[b]
BD_INDEP$_{(t-1)}$			-0.016		-0.012
			(-2.14)[b]		(-1.67)[c]
BD_INDEP$_{(t-1)}$ *FAMILY*			-0.013		-0.033
			(-1.70)[c]		(-1.80)[c]
BD_BUSY$_{(t-1)}$				-0.008	-0.008
				(-1.67)[c]	(-1.67)[c]
BD_BUSY$_{(t-1)}$ *FAMILY*				-0.002	-0.002
				(-0.43)	(-0.42)
FAMILY	-0.014	-0.012	0.000	-0.003	0.026
	(-1.34)	(-1.16)	(0.09)	(-0.30)	(1.54)
OWN$_{(t-1)}$	-0.039	-0.039	-0.038	-0.038	-0.035
	(-1.71)[c]	(-1.71)[c]	(-1.66)[c]	(-1.68)[c]	(-1.54)
OWN²$_{(t-1)}$	0.055	0.057	0.049	0.049	0.061
	(2.09)[b]	(2.13)[b]	(1.84)[c]	(1.85)[c]	(2.31)[b]
SIZE	-0.013	-0.014	-0.013	-0.013	-0.013
	(-3.56)[a]	(-3.74)[a]	(-3.62)[a]	(-3.59)[a]	(-3.38)[a]
MB	0.028	0.028	0.030	0.030	0.033
	(14.38)[a]	(14.42)[a]	(14.68)[a]	(14.72)[a]	(15.96)[a]
RD	0.242	0.236	0.228	0.232	0.256
	(7.19)[a]	(7.01)[a]	(6.79)[a]	(6.90)[a]	(7.52)[a]
CF	-0.006	-0.006	-0.006	-0.006	-0.005
	(-2.93)[a]	(-2.85)[a]	(-2.92)[a]	(-2.87)[a]	(-2.45)[b]
NWK	-0.150	-0.150	-0.151	-0.150	-0.157
	(-11.59)[a]	(-11.60)[a]	(-11.67)[a]	(-11.54)[a]	(-12.17)[a]
CFVOL	0.024	0.025	0.026	0.026	0.024
	(1.40)	(1.46)	(1.52)	(1.50)	(1.40)[a]
LEV	-0.078	-0.078	-0.084	-0.081	-0.076
	(-3.91)[a]	(-3.90)[a]	(-4.20)[a]	(-4.05)[a]	(-3.76)[a]
CAPEX	-0.009	-0.010	-0.010	-0.010	-0.010
	(-2.78)[a]	(-2.78)[a]	(-2.87)[a]	(-2.83)[a]	(-2.84)[a]
DIV	-0.283	-0.258	-0.256	-0.276	-0.259
	(-1.64)	(-1.44)	(-1.43)	(-1.54)	(-1.45)
Intercept	0.169	0.163	0.189	0.188	0.138
	(3.40)[a]	(3.22)[a]	(3.81)[a]	(3.71)[a]	(2.67)[a]
Observations	3,239	3,239	3,239	3,239	3,239
R-squared	18.93%	18.50%	18.98%	18.68%	19.44%

Table 6
Characteristics of the board of directors and corporate cash holdings: robustness checks

This table presents the results of some robustness checks of the effects of board of directors' characteristics on corporate cash holdings. *CEO_DUAL* is CEO duality leadership. This is a dichotomous variable that equals 1 if the CEO is also the chair of the board, and 0 otherwise. *BD_STRUC* is board structure. This is a dichotomous variable that equals 1 if a firm adopts the two-tier board system and 0 if it adopts the one-tier board system. *BD_INDEP* is board independence. It is the number of independent directors divided by the total number of directors on the board. *BD_INDEPDUMMY* is a dichotomous variable that equals 1 if more than half of directors on the board are independent, and 0 otherwise. *BD_BUSY* is board busyness. It is the number of directors holding more than two directorships outside the firm divided by the total number of directors on the board. *BD_BUSYDUMMY* is a dichotomous variable that equals 1 if more than half of the directors hold more than two directorships outside the firm, and 0 otherwise. *BD_SIZE* is board size. It is the natural logarithm of the number of directors on the board. *OWN* is cash flow rights of the largest shareholder. *SIZE* is firm size. It is the natural logarithm of total sales (in thousands of euros). *MB* is market-to-book ratio. It is the ratio of (market value of equity plus book value of liabilities) divided by the book value of total assets. *RD* is Research and Development expenses scaled by net assets. *CF* is cash flow. It is measured as (operating income minus interest minus taxes) scaled by net assets. *NWK* is net working capital. It is measured as (current assets minus current liabilities minus cash) scaled by net assets. *CFVOL* is cash flow volatility. It is measured as the standard deviation of cash flow-to-net assets for the past five years. *LEV* is leverage. It is measured as the ratio of total debt to total assets. *CAPEX* is capital expenditure. It is measured as the ratio of capital expenditure to net assets. *DIV* is Dividends. It is measured as the ratio of dividends to total assets. The *t*-statistics are reported in parentheses below the estimated coefficients. [a], [b], and [c] indicate the statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
$CEO\_DUAL_{(t-1)}$	0.014	0.015	0.018	0.022
	$(2.49)^b$	$(2.10)^b$	$(2.47)^b$	$(3.04)^a$
$BD\_STRUCT_{(t-1)}$	-0.012	-0.015	-0.015	-0.016
	$(-1.67)^c$	$(-1.65)^c$	$(-1.67)^c$	$(-1.76)^c$
$BD\_INDEP_{(t-1)}$	-0.010	-0.016	-0.015	
	$(-1.80)^c$	$(-2.21)^b$	$(-2.09)^b$	
$BD\_INDEPDUMMY_{(t-1)}$				-0.030
				$(-1.73)^c$
$BD\_BUSY_{(t-1)}$	-0.016	-0.006	-0.008	
	$(-2.06)^c$	(-0.64)	$(-1.84)^c$	
$BD\_BUSYDUMMY_{(t-1)}$				-0.008
				$(-1.72)^c$
$BD\_SIZE_{(t-1)}$	-0.000	0.001	0.000	-0.001
	(-0.74)	(0.80)	(0.08)	(-0.83)
$OWN_{(t-1)}$	-0.014	-0.042	-0.038	-0.022
	(-0.80)	$(-1.84)^c$	(-1.64)	$(-0.98)^c$
$OWN^2_{(t-1)}$	0.045	0.059	0.062	0.062
	$(2.10)^b$	$(2.19)^b$	$(2.31)^b$	$(2.35)^b$
$SIZE$	-0.018	-0.012	-0.010	-0.008
	$(-5.33)^a$	$(-3.12)^a$	$(-2.78)^a$	$(-2.00)^b$
MB	0.024	0.004	0.026	0.029
	$(14.07)^a$	$(3.51)^a$	$(12.89)^a$	$(14.39)^a$
RD	0.244	0.281	0.265	0.238
	$(9.04)^a$	$(8.24)^a$	$(7.89)^a$	$(7.09)^a$
CF	-0.003	0.009	-0.002	-0.007
	$(-1.68)^a$	(0.33)	(-1.01)	$(-3.58)^a$
NWK	-0.147	-0.154	-0.128	-0.153
	$(-14.14)^a$	$(-11.61)^a$	$(-10.51)^a$	$(-11.71)^a$
$CFVOL$	0.013	0.037	0.017	0.031
	(0.94)	$(2.03)^b$	(0.99)	(1.82)
LEV	-0.101	-0.085		-0.080
	$(-6.22)^a$	$(-4.25)^a$		$(-3.98)^a$
$CAPEX$	-0.005	-0.008		-0.009
	$(-2.06)^a$	$(-2.44)^b$		$(-2.75)^a$
DIV	-0.434	0.040		-0.337
	$(-3.06)^a$	(0.23)		$(-1.89)^c$
Intercept	0.149	0.213	0.130	
	$(3.31)^a$	$(4.30)^a$	$(2.63)^a$	
Observations	3,239	3,239	3,239	3,239
R-squared	20.73%	11.38%	16.04%	18.53%