Private firms' cash holding decisions: The role of risk attitudes

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Key words: Cash holdings, Private firms, Financing Policies

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In this paper, we examine cash holding determinants using a large dataset of private firms from 15 European countries. Since, in this type of firms, there is an incomplete separation of the finances of key stakeholders from the finances of the firm, we complement the precautionary motive traditionally considered in the corporate finance literature, which typically takes the form of the hedging motive advocated by Acharya et al. (2007), with an attitudinal precautionary motive that takes into account stakeholders' risk attitudes and, in particular, their prudence and temperance. Under this motive, the firm-level demand for savings and cash-holding decisions is driven by determinants similar to those that drive the demand for savings by households and their holdings of cash. Our empirical results suggest that, in our sample of private firms, this novel precautionary motive naturally complements or even supplants the traditional one, which is hard to reconcile with evidence on a negative relation between cash holdings and both investment and leverage.

1. Introduction

The literature has devoted considerable attention to the precautionary motive as a key determinant of cash holdings, starting with Opler et al. (1999) and continuing with Ferreira and Vilela (2004), Ozkan and Ozkan (2004) and, more recently, Acharya et al. (2007), Han and Qiu (2007), Palazzo (2012), Bonaimé et al. (2014). The common trait of this literature is the emphasis on the possibility that the firm might find it difficult to raise finance to fund future investment opportunities, leading to a decision to hold cash to hedge this risk. Echoing the "cost of hedging instruments" considered by Opler et al. (1999), Acharya et al. (2007) have coined the expression 'hedging motive' to formalize this concept.

So far, however, the cash holding literature has focused almost exclusively on publicly listed companies, with notable but rare exceptions such as Bigelli and Sánchez-Vidal (2012), Akguc and Choi (2013), Gao et al. (2013). In our study, to alleviate this gap, we focus instead on private firms. We suggest a new precautionary motive based on the risk

attitudes of a class of influential stakeholders, to whom we collectively refer as the "representative insider" and whose preferences, as in Kimball (1993), are assumed to exhibit prudence and temperance, and show that cash accumulation by private firms includes their demand for cash balances. We refer to this novel explanation for firm-level cash holdings as the *attitudinal precautionary motive*. Under this motive, the firm demand for cash holding increases in the volatility of the representative insider's earnings and decreases in the skewness of their distribution.

All studies so far have neglected the role of stakeholders' risk attitudes as a determinant of cash holding decisions. Such omission, in the context of private firms, is important because, due to differences between personal and corporate taxation as well as incomplete contracting and other agency problems, influential stakeholders within such firms often come to view the latter as a vehicle for storing and transferring wealth over time and across contingencies, thereby giving rise to a firm-level demand for cash holdings driven by determinants similar to those that drive the demand for cash-like savings by households.

One key motivation for allowing for this attitudinal variant of the precautionary motive is that, in our sample of European firms, cash holdings are typically much lower than in US firms. For example, the average cash ratio in the sample of US firms considered by Bates et al. (2009) is more than double the average cash ratio in our sample (i.e., 23% instead of 9%). Cash holdings in our sample seem too low if their purpose is to hedge funding risk of future investment opportunities, which would require the more sizeable balances typical of

US firms[1], whereas it is not implausible that their level be large enough to hedge the representative insider's earning risk.

By restricting our attention to private firms, we avoid the heterogeneity in agency problems across private and public firms noted by Gao et al. (2013), which might interact in hard-to-model ways with the attitudinal precautionary motive. The choice of focusing on European firms is motivated by similar considerations, namely the aim to turn off heterogeneity in the legal and institutional framework, for which it would be difficult to control, while retaining sufficient variation in circumstances that drive cash holding decisions under our attitudinal precautionary motive, namely risk in the form of volatility and skewness of the distribution of the representative insider's earnings.

Our empirical results show that the negative association between cash holdings and the correlation between cash flows and investment funding needs, implied by the *hedging motive* (as formalized, for example, by Acharya et al. (2007)), cannot by itself fully explain variation of cash holdings in our sample of private firms. Consistent with the *attitudinal precautionary motive* that we propose, cash holdings are strongly negatively related to the skewness of the distribution of the firm earnings, proxied by the cross-sectional sample skewness of the return on assets (ROA) within the industry in which the firm operates, and this relation is robust to alternative choices of estimation method and control variables.

In addition, our findings corroborate known results with new empirical evidence, drawn from a large and multi-country dataset of firms. The existing literature on cash holdings

[1] Interestingly, Bates et al. (2009) note that, by the end of their sample, cash holdings at US firms have grown so much that they are large enough to repay all outstanding debt.

mainly focuses on US (e.g. Harford et al. 2008) and UK (e.g. Ozkan and Ozkan 2004) firms. Out of the studies that do not focus solely on firms from these two countries, the vast majority use data from single countries (e.g. García-Teruel and Martínez-Solano 2008 for Spain; Wu et al. 2012 for China) rather than an international sample of firms. In particular, our analysis of EU-15 firms extends and updates the coverage of European countries offered by the study by Ferreira and Vilela (2004), who base their analysis on 12 European countries and an earlier sample period. Finally, as already noted, the existing literature mainly refers to listed companies (e.g. Kim et al. 1998; Ferreira and Vilela 2004; D'Mello et al. 2008). In the spirit of Bigelli and Sánchez-Vidal (2012) – who, however, focus only on Italian companies – we concentrate our analysis on private companies. Therefore, by focusing on privately held companies in a wide cross-section of countries and industries, we help fill an obvious gap in the empirical literature.

The remainder of this paper is organized as follows. Section 2 more formally illustrates the attitudinal precautionary motive. Section 3 outlines our modelling strategy and estimation methodology. In Section 4, we provide details on the dataset and how we use it to construct the variables of interest, also discussing their relations under the cash holding motives under investigation. Sections 5 presents our baseline regression results. Section 6 is devoted to the estimation, as a robustness check, of the effect of a number of variables on the strength of the hedging motive and of our attitudinal precautionary motive. Section 7 provides some final remarks and draws together our conclusions.

2. The attitudinal precautionary motive

We refer to stakeholders who are in a position to influence the firm's decisions as the "*representative insider*" and to the other stakeholders, without control over the firm financial policies but with the ability to impose agency costs upon the firm, as the "*outsiders*". In practice, in many situations, the representative insider will be the controlling shareholder but, more generally, she should be viewed as a composite agent whose preferences may also reflect those of other influential stakeholders, such as key managers and even highly regarded employees. The outsiders include key employees, long-term suppliers, 'outsider' providers of capital (e.g., minority shareholders, providers of external equity, lenders), and any other agent who lacks control over the firm policies but is able to impose agency costs upon the firm.

We assume that the representative insider's preferences exhibit decreasing absolute risk aversion (DARA) and decreasing absolute prudence (DAP). DARA, as demonstrated by Kimball (1990), implies an increasing propensity to save in the face of uncertainty because of its link with prudence and the implications of the latter for the saving decisions. Specifically, prudence implies greater savings in response to an increase in the volatility of consumption possibilities or, in our context, the **standard deviation** of the firm **owner's earnings**. Importantly, however, it does not actually determine whether the additional savings are channeled towards risky or safe assets (represented, in the context of firms' financial policies, by internal financing of investment opportunities pertaining to the firm business and cash holdings, respectively). An increasing propensity to allocate savings to cash arises only if the representative insider's prudence is decreasing in wealth (Gollier

1996), as per our DAP assumption.[2] This point, in a different context, was made clear by Kimball (1992) and Kimball (1993), who emphasized that DARA and prudence, per se, "cause an agent to respond to a risk by accumulating more wealth" whereas it is DAP, and hence temperance, that induces the decision maker to allocate a greater fraction of savings to the safe asset, and thus to cash and cash-like holdings[3], in the presence of greater asymmetric risk. The latter, in our context, takes the form of **negative skewness** of the representative insider's earnings distribution (greater downside risk). The relation between savings, the decision to accumulate cash and the traits of risk attitudes corresponding to prudence and temperance, on the one hand, and moments of the earnings distribution (volatility and skewness), on the other hand, is illustrated more formally in the Appendix.

The posited characterization of the representative insider's preferences only implies a propensity to accumulate cash in the face of uncertainty. The representative insider will prefer to hold this cash within the firm rather than in personal means of storage, such as the personal bank account, under conditions that render the former choice more costly than the latter. These conditions, which amount to capital market imperfections and we assume to be faced by private firms, include *transaction costs* and *agency problems.*

Among the *transaction costs*, we include the difference between personal and corporate **taxation**. Corporate income tax must be paid on corporate earnings, typically at a flat rate

[2] The positive third derivative of utility is equivalent to a positive second derivative (convexity) of marginal utility while the negative fourth derivative of utility is the same as a negative third derivative of marginal utility (decreasing convexity). These conditions were subsequently linked to prudence and temperance, respectively, and ultimately to standard risk aversion (Kimball 1993). Additional details are provided in Appendix.

[3] As put by Kimball (1992), "any risk that leads to increased precautionary savings reduces", in the presence of temperance, "an agent's demand for risky assets both in absolute terms and as a fraction of total savings". See also Elmendorf and Kimball (2000).

and regardless of whether earnings are distributed or retained whereas personal taxation is levied only upon distributed earnings and is progressive. Therefore, at times when the marginal personal tax rate is higher than the corporate tax rate, the representative stakeholder prefers to store cash within the firm and wait to have it paid out when her marginal personal tax rate will be lower, which will happen when her income will be lower. This leads our posited prudent and temperant representative stakeholder, driven by a desire to smooth inter-temporal consumption possibilities, to accumulate cash balances within the firm when firm profitability is high and she expects the distribution of the firm earnings to exhibit negative skewness (i.e., pronounced downside risk).[4]

Among the *agency problems*, we include the signaling role of payout decisions (e.g., dividends) in the presence of information asymmetry and conflicts of interest among stakeholders (insiders and outsiders). We conjecture that withdrawing excess-cash is costly for the representative insider (e.g., controlling stakeholders) as it may send a signal to the outsiders (e.g., providers of debt capital, employees and suppliers and other key stakeholders) of limited commitment to the firm or, worse, insider information about poor prospects of the firm.[5]

These conditions, that imply an imperfect separation between her finances and those of the firm and render self-storage more costly than storage within the firm, are typical of private

[4] Also, when personal taxation is highly progressive, so that average tax rates in good times are high compared to average tax rates during bad times, the representative stakeholder (who has influence over cash management policies of the firm) has an incentive to pursue earnings under-reporting during good times and earnings over-reporting during bad times, so as to justify being paid dividends during the latter rather than during the former, storing cash within the firm in the meantime, consistent with findings of the literature on asymmetrically timed gain and loss recognition, such as in the study of Ball and Shivakumar (2006).

[5] In the formulation in Appendix, we may allow it to positively affect $\bar{\pi}_2$ in (A2)-(A3) as a consequence of a lower cost of capital brought about by the signal concerning the stakeholder's commitment to the firm, thereby allowing it to affect the cash holding decision.

firms, where key stakeholders are both heavily exposed to the firm policies and have considerable influence upon them.[6] These key stakeholders, who are natural candidates to play the role of the representative insider in our model, can influence the firm cash holding policies. They also have a strong incentive to do so, since their expected utility depends, in a non-marginal fashion, on the firm's ability to provide a steady earnings stream and, due to the above posited capital market imperfections, cannot simply withdraw excess-cash so as to undertake optimal self-storage.

We summarize the above considerations in the following proposition:

> **PROPOSITION I (P.I)**: Under capital market imperfections that include the difference between corporate and personal taxation and information asymmetry between the representative insider and the outsiders, and assuming that the representative insider is prudent and temperant, there is a positive relation between the stock of retained earnings (i.e., the stock of the firm's savings) and the representative insider's earnings **standard deviation** and a negative relation between the fraction of the stock of retained earnings allocated to cash holdings and the **skewness** of the distribution of the representative insider's earnings.

The implications of Proposition I for the cash holding ratio (the ratio of cash holdings to total assets) depend on the nature of the representative insider and on whether the firm can raise finance from outsiders. If the representative insider is an equity holder, her savings

[6] For example, equity ownership is typically in the hands of controlling shareholders who cannot hold a diversified portfolio and whose exposure to the policies of the firm is, therefore, not marginal. Similarly, management typically face a less active and deep labor market than comparable figures employed by listed companies, often due to skills that are more idiosyncratic in nature and/or to the lesser visibility of their employer (or perhaps even simply due to logistical factors, such as a more remote location).

are the share of the company equity, which coincide with retained *owner's* earnings. Therefore, if non-equity finance is kept constant (e.g., because it is costly to raise new debt), leverage decreases if her savings (retained owner's earnings) increase. Hence, by Proposition I and for given owner's earnings skewness (and, therefore, for a given fraction of savings allocated to cash holdings), greater owner's earnings volatility implies greater owner's earnings retention, a greater equity to asset ratio and, since the fraction of the equity allocated to cash depends only on skewness (which is held fixed), a greater cash holdings ratio (cash holdings to assets). Using the standard deviation and skewness of the firm return on equity (ROE) as a measure of volatility and skewness, respectively, of owner's earnings, we thus have the following corollary to Proposition I:

> **Corollary I (CP.I)** to Proposition I: Keeping non-equity finance constant, under the assumptions of Proposition I and assuming that the representative insider is an equity holder, the **cash holdings ratio** is positively related to the **standard deviation** and negatively related to the **skewness** of the distribution of the firm **ROE**.

If, however, it is possible to keep leverage constant at some optimal value, by increasing non-equity finance to match increases in retained owner's earnings, both the equity (the savings) to asset ratio and the fraction of the equity allocated to cash are constant if owner's earnings volatility is expected to increase but the skewness of their distribution is expected to stay unchanged. We thus have the following corollary to Proposition I:

> **Corollary II (CP.II) to** Proposition I: Under the assumptions of Proposition I, also assuming that the representative insider is an equity holder and keeping leverage

constant at some optimal value, the **cash holdings ratio** is independent of the **standard deviation** and negatively related to the **skewness** of the distribution of the firm ROE.

Both corollaries are formulated in terms of moments of the distribution of the firm ROE, which is more subject to accounting manipulation than the firm ROA (return on assets), especially in private firms and so is the valuation of assets relative to the valuation of equity and debt. We therefore wish to formulate the implications of Proposition I for the relation between the cash ratio and the standard deviation and skewness of the distribution of the firm ROA. To do so, we note that equity holders enjoy an asymmetric exposure to the volatility of the operating earnings of the firm in that equity is equivalent to a call option on the firm assets. As such, ceteris paribus, more volatility of the firm operating earnings actually implies a more positive skewness of the distribution of owner's earnings (which is why the value of equity is a positive function of asset volatility), as well as a less than proportional increase in owner's earnings volatility.[7] Therefore, greater values of both volatility and skewness of the distribution of ROA imply a more positive skewness of the distribution of ROE. As a consequence, while the implications of the skewness of the ROA distribution remain the same as the implications of the skewness of the ROE distribution in Corollary II, the implications of the standard deviation of ROA are different from those of the standard deviation of ROE and become indeterminate.[8] Hence, regardless of whether

[7] In this setup, equity volatility $\sigma(ROE)$ is, to first order, proportional to asset volatility, $\sigma(ROA)$, and the coefficient of proportionality is given by the delta (first derivative) of the firm equity with respect to the firm asset value. Assuming this delta can be approximated as the ratio of equity on asset ratio, E/A, equity volatility $\sigma(ROE)$ is then, to first order, $\sigma(ROE) \cong \sigma(ROA)\frac{E}{A}$.

[8] An increase of the volatility of the operating earnings distribution brings about both an increase of the volatility of the owner's earnings distribution, which influences savings and hence (keeping skewness constant) cash holdings positively, and also an increase of its skewness, which influences cash holdings

the firm can issue debt to match earnings retention, we have the following corollary to Proposition I:

> **Corollary III (CP.III) to** Proposition I: Under the assumptions of Proposition I, also assuming that the representative insider is an equity holder, the **cash holdings ratio** is negatively related to the **skewness** of the distribution of the firm ROA.

In any case, the traditional precautionary/hedging motive and our attitudinal precautionary motive are not mutually exclusive but, in principle, complementary in providing a more complete characterization of firm cash holding decisions. The precautionary motive traditionally considered by the corporate finance literature implies a positive association between cash holdings and measures of uncertainty over funding availability, such as a positive relation between cash holdings and cash flow volatility (e.g., Han and Qiu (2007) and Palazzo (2012)) and/or a negative relation between cash holdings and the correlation between cash flow and investment needs, as under the hedging motive implied by the model of Acharya et al. (2007). An association between cash holdings and uncertainty also originates under our attitudinal precautionary motive but the crucial measure of uncertainty that drives cash holdings is the (negative) skewness of the earnings distribution.

negatively (keeping volatility constant). The net effect depends on whether, the representative insider is more prudent or more temperant.

3. Econometric modelling and estimation strategy

To make inferences on the role of the attitudinal precautionary motive and its importance relative to alternative explanations, including the traditional precautionary (hedging) motive, we consider specifications of the following general model

$$y_{i,t} = \boldsymbol{x}'_{i,t}\boldsymbol{\beta} + v_i + u_{i,t} \qquad i = 1, 2, \dots, N; t = 1, 2, \dots, T \qquad (1)$$

where $y_{i,t}$, the dependent variable, represents a measure of cash holdings for firm i at time t, $\boldsymbol{x}_{i,t}$ is a vector of covariates, v_i denotes an unobservable time-constant firm effect, $u_{i,t}$ is an idiosyncratic error term, and $\boldsymbol{\beta}$ is a vector of regression coefficients.

The covariates include (a) determinants of cash holdings under our attitudinal precautionary motive, (b) determinants of cash holdings under the traditional precautionary/hedging motive, (c) determinants of cash holdings under both motives and (d) control variables implied by alternative explanations, including country and time dummies. The variables in (a) include mainly measures of earning risk, of firm profitability and of ownership concentration. The variables in (b) include mainly measures of investment funding risk and of the magnitude of the exposure to such risk, such as measures of the possible scale of future investment opportunities. The variables in (c) and (d) include variables that, according to both motives and alternative ones, respectively, have an effect on cash holdings. All the variables and the data used to construct them are described in detail the next Section, which also provides a discussion of the sign with which the associated coefficients are expected to enter the cash holding determination model in (1).

We consider both static and dynamic specifications of the model in (1). In static specifications, lagged values of the dependent variable are not included in $\boldsymbol{x}_{it}$ whereas, in dynamic models, $\boldsymbol{x}_{it}$ is extended to include such lags. The key difference between static and dynamic specifications is that, in the former, the estimated $\boldsymbol{\beta}$ coefficients can be interpreted as long-run effects whereas, in the dynamic models, the estimated coefficients are interpreted as short-run effects (Greene 2011; Verbeek 2012). In the dynamic models, partitioning $\boldsymbol{\beta}$ into a vector $\boldsymbol{\theta}$ of coefficients on the lags of $y_{i,t}$ and a vector $\boldsymbol{\gamma}$ of coefficients on the other elements of $\boldsymbol{x}_{it}$ as $\boldsymbol{\beta}' = [\boldsymbol{\theta}' \ \boldsymbol{\gamma}']$, the long-run effects are given by $\boldsymbol{\lambda} = \frac{1}{1-\boldsymbol{\theta}'\boldsymbol{e}}\boldsymbol{\gamma}$, where $\boldsymbol{e}$ is a conformable vector of ones. In a spirit similar to Wintoki et al. (2012), the key motivation for using a dynamic specification alongside the static models is the likely endogeneity of earning risk, and attendant reverse causality in the relation between cash holdings and earning risk, in that it is possible (and indeed likely) that, if accumulating a sufficient cash buffer were either impossible or too costly, prudent and temperant representative insiders would lead the firm, over time, to reduce the riskiness of its earnings, increasing their skewness, so as to reach a desirable combination of cash holding and earning risk.

We estimate specifications of (1) using several classes of panel data models, including Pooled OLS (P-OLS), Fixed Effect (FE-OLS), Random Effect (RE-GLS), two-step Arellano and Bond (1991) (DIFF-GMM), and two-step Blundell and Bond (1998) (SYS-GMM) estimators. We thus estimate both static (P-OLS, FE-OLS, RE-GLS) and dynamic (DIFF-GMM, SYS-GMM) panel data models. In static models, all covariates are assumed to be strictly exogenous. In this case, if the individual effects are independent of the explanatory variables, then all estimators are consistent and the RE estimator is the most

efficient. If the individual effects are not independent of some of the covariates, however, the FE estimator is the only one that is consistent. In dynamic models, the covariates treated as endogenous are instrumented by their own lags.[9]

4. Dataset and description of variables

We gathered all data for our analysis from the Bureau Van Dijk Amadeus database. Our initial sample comprised all private firms of the EU-15 area[10] over the period 2004-2011, for a total of 51,354 firms. Following Bigelli and Sánchez-Vidal (2012), we excluded from our database firms belonging to the financial industry and utilities because, in several European countries, they are subject to particularly stringent regulatory provisions on cash holdings. Excluding also firms reporting either no value for cash holdings or negative values for sales, assets or equity, the final sample is composed of up to 8 yearly observations on 34,646 firms for a total of 245,647 firm-year observations. Therefore, in (1), $T = 8$ and $N = 34{,}646$. A full breakdown of our dataset by year, country, and industry is provided in Table 1.

[Insert Table 1]

We used this dataset to construct our measure of cash holdings, $choa_{i,t}$ (i.e., the dependent variable in our analysis), as well as the covariates that we use to explain its variation in our sample (i.e., the elements of $\boldsymbol{x}_{i,t}$ in (1)). All the variables are listed in Table 2a, which

[9] To reduce the problem of instrument proliferation (Roodman 2009), we limit to one the number of lags used as instruments.
[10] The EU-15 area comprises the following countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, and United Kingdom.

provides also some descriptive statistics (mean, median and standard deviation). The construction of these variables is detailed next, along with a discussion of the motivation for their inclusion in our analysis. For the posited determinants of cash holdings under either motive (i.e., for all elements of $\boldsymbol{x}_{i,t}$ except those that play the role of mere control variables), we also provide a discussion of the expected sign of their relation with our measure of cash holdings, $choa_{i,t}$, which is the dependent variable in our context. Table 2b provides a synopsis of these expected signs.

[Insert Table 2a]

[Insert Table 2b]

4.1 Dependent variable

As a measure of **cash holdings**, the dependent variable in our analysis, we use the ratio of cash and cash equivalents to total assets and denote it by *choa*. Figure 1 presents a boxplot that visually represent the heterogeneity of cash holdings, as measured by $choa$, over time. Figure 2 plots the spatial distribution of the number of firms and cash holdings by country. While the countries with the greatest number of firms are concentrated in southern Europe, the countries with the greatest average cash holdings are concentrated in northern Europe.

[Insert Figures 1 and 2]

4.2 Determinants of cash holdings under the attitudinal precautionary motive

The two primary determinants of cash holdings under our attitudinal precautionary motive are two measures of **earning risk**, namely the standard deviation and skewness of the

distribution of the firm earnings. We proxy for these by the standard deviation, *sd*(*roa*), and skewness, *skew*(*roa*), respectively, of ROA (return on assets) across groups of firms formed by industry, country, and year. More precisely, we first clustered firms by industry and country and year and then we estimated *sd*(*roa*) and *skew*(*roa*) for each cluster. Notably, we focus on the volatility and skewness of the distribution of ROA, which is a proxy for the rate of return on the representative insider's wealth, rather than the volatility and skewness of the cash flow distribution, because the representative insider's marginal utility is, as detailed in Appendix, a function of the return on her wealth (as consumption growth depends on it). In turn, we use ROA as a proxy for the rate of return on the representative insider's wealth rather than ROE (return on equity) because of the lack of good quality data on the latter[11] and also because the representative insider could be a composite agent with preferences that reflect those of a multitude of stakeholders and their relative bargaining power and influence within the firm rather than just those of the equity holders, though those of the latter are likely prevalent. If the representative insider is indeed a composite one, reflecting the preferences of both equity holders and other key stakeholders (e.g., debtholders, managers, etc.), Proposition I implies that, under the attitudinal precautionary motive, the relation between *choa* and *sd*(*roa*) is positive and the relation between *choa* and *skew*(*roa*) is negative. If, however, the representative insider is an equity holder, Corollary III to Proposition I implies that, under the attitudinal precautionary motive, the relation between *choa* and *skew*(*roa*) is negative whereas the

[11] Owner's earnings are not reported and impossible to reconstruct for many firms in our dataset and, more generally, financial statements often offer a more reliable measure of operating earnings than owner's earnings.

relation with *sd*(*roa*) is indeterminate, in the sense that it depends on the relative magnitude of prudence and temperance, which we do not directly observe.

The rate of return on assets, defined as the ratio of EBIT minus tax to total assets, denoted by *roa*, is our measure of **profitability**. To capture the **operational efficiency** of the firm, which also should entail greater profitability and capture the latter in a manner that is less sensitive to earnings management (e.g., discretionary expense accrual so as to minimize tax liabilities), we use the ratio of sales to total assets, denoted by *soa*. As noted in Section 2, tax considerations imply that, under the attitudinal precautionary motive, cash holdings should be larger at more profitable firms and, at these firms, the motive itself should be stronger.

As a measure of **ownership concentration**, we use a dummy variable, *comm*, which is equal to one when a single shareholder owns more than 50% of the firm equity capital, and is otherwise equal to zero. We use this variable as a proxy for the strength, at the margin, of the tax considerations and of the insider-outsider information asymmetries and agency problems. Under the attitudinal precautionary motive, the relation of this variable with cash holdings is expected to be positive. Also, and perhaps more importantly, the attitudinal precautionary motive itself should be stronger for firms in which the entrepreneur has a greater share of the company equity. This is because a majority shareholder who exhibits DARA and DAP has both the incentive and the possibility to use the firm as a vehicle to store cash, so as to optimize her tax schedule and minimize agency costs arising from the information asymmetry suffered by non-insider stakeholders (by leaving her cash holdings within the firm as a pledge of commitment).

4.3 Determinants of cash holdings under the traditional precautionary/hedging motive

The primary determinant of cash holdings under the hedging motive proposed by Acharya et al. (2007) is the correlation between cash flows and future investment funding needs. To proxy for it, we use the correlation between the ratios cash flow on total assets (*cfoa*) and capital expenditures on total assets (*coa*), which we denote by *cor*(*cfoa,coa*), and complement it by a second variable, given by the correlation between *cfoa* and the square of *coa*, which we denote by $cor(cfoa,coa^2)$. We estimated *cor*(*cfoa, coa*) and $cor(cfoa, coa^2)$ in the same way we have estimated *sd*(*roa*) and *skew*(*roa*). The first of these two variables is meant to capture the ordinary hedging motive, and is the same as the one used by Acharya et al. (2007), whereas the second one is introduced to take into account the special challenge that might be posed by the financing of larger investments. Together, they are meant to capture **investment funding risk** (or funding risk, for short), which drives cash holdings accumulation under the traditional precautionary/hedging motive. If the model put forth by Acharya et al. (2007) holds, the relation of both variables with *choa* should be negative.

Apart from using *coa* to construct our (investment) funding risk variables, we also include it directly among the regressors, together with the ratio of intangible assets to total assets, which we denote as *ioa*, as a proxy for the **investment and growth** opportunities faced by the firm. As emphasized by Acharya et al. (2007), financially constrained firms with a large growth opportunity set have a greater incentive to save cash to finance future valuable investment opportunities, implying a positive association between cash holdings and prospective investment and growth. Therefore, under the hedging motive and assuming that investments are persistent (i.e., that high current investments predicts high investment

in the future) and the typical private firm is financially constrained, *choa* should be positively related to *coa* and *ioa*. By similar reasoning, these two variables should be positively related to the strength of the hedging motive.[12]

As a proxy for financial **leverage**, we use two variables: the first variable, denoted by *bol*, is the ratio of short term bank debt to total assets; the second variable, denoted by *ltdol*, is the ratio of long-term financial debt to total assets. The relation of these variables with cash holdings depends on whether outstanding financial leverage is seen as an indicator of the ability to raise debt or as an indicator of funding constraints. If outstanding debt is seen as a measure of the difficulty of raising further debt, cash holdings should be higher and the hedging motive itself more pressing (stronger) for firms with high debt. This is the perspective put forth by Acharya et al. (2007).[13] Notably, such argument does not apply to the attitudinal precautionary motive. Debt, especially in the form of bank debt, is a source of finance which is tightly monitored by the finance suppliers, who would not accept their funding to be parked in cash holdings simply to smooth the representative insider's consumption possibilities over time, even if they were ready to accept this as a form of hedging of investment funding risk. Therefore, while cash holdings and leverage should be positively related under the hedging motive (since financially constrained firm, wishing to

[12] Moreover, capital expenditures, when undertaken to acquire tangible assets, might generate borrowing capacity because the assets can be then pledged as debt collateral, thus reducing the need for cash reserves (Iskandar-Datta and Jia 2012 and Wu et al. 2012). If this is the case, which implies that the firm is not financially constrained and therefore that the hedging motive does not arise, *choa* should be negatively related to coa. Therefore, it is only in the presence of a strong hedging motive that we should observe the concurrent presence of high capital expenditure and high cash holdings. Conversely, a strong attitudinal precautionary motive would, if anything, weaken the positive association between cash holdings and investments and growth variables, because some of the inter-temporal smoothing of consumptions opportunities that motivates the holding of cash under this motive would be secured by the growth prospects of the firm.

[13] To the contrary, if outstanding debt is seen as an indicator of the ability to raise further debt in the future, its relation with cash holdings should be negative, especially in the case of banking debt. This is the perspective underpinning the widely held view of cash as "*negative debt*".

hedge future investment funding risk, would accumulate both debt and cash), the attitudinal precautionary motive has no implication for the sign of the relation between cash holdings and leverage.

To proxy for whether the firm can rely on a close **banking** relationship, we include a dummy variable, denoted by *bank*, that takes the value of one in the event that the country where the firm is based has a banking orientation and zero otherwise. In systems in which banks play a central role, firms tend to develop long-lasting banking relationships that, at times of cash shortages, can be relied upon, typically more so than capital markets (often more focused on short term measures of financial viability and inclined to abandon firms that experience difficulties). Therefore, in bank-oriented countries, the hedging motive should be less pressing since the possibility of relying on bank debt mitigates the risk of cash shortages, as noted by Ferreira and Vilela (2004) and more recently highlighted by Acharya et al. (2014). In this setup, bank credit lines would act as a substitute for cash holdings. To the contrary, under the attitudinal precautionary motive, the presence of a close banking relationship should not affect either cash holdings or the strength of the attitudinal precautionary motive. This is because, while a bank may accept to support the firm's investment programs through periods of temporary cash shortages, it would not be equally willing to sustain the consumption possibilities of the firm's stakeholders.

4.4 Determinants of cash holdings under both precautionary motives

To proxy for the **liquidity** of the firm assets, we use the variable *doa*, which denotes the ratio of trade receivables from clients and customers (trade debtors) to total assets. Under both precautionary motives, the relation of this variable with cash holdings should be

negative, as liquid assets can be quickly turned into cash and, therefore, can be used to overcome cash shortages.[14] To proxy for **trade credit**, we use the variable *col*, which is defined as debts to suppliers and contractors (trade creditors) to total assets. Though in principle of measure of financial leverage, its relation with $choa$ should be positive under both motives, since it measures a positive component of working capital that frees up cash and is a weakly monitored source of finance.

Most of the papers in the literature include the logarithm of total assets to take into account **size** effects. Since we have already rescaled by total assets all variables measuring firm cash flows and financial statement items, we use the logarithm of the number of employees, $ln(e)$, to control for any residual effect of size.[15] While firm size likely influences the strength of both information asymmetries and funding constraints, we do not expect a strong relation between *ln(e)* and cash holdings, nor a large effect on the strength of either the hedging motive or the attitudinal precautionary motive, because we already control for size through the noted rescaling of variables.

4.5 Control variables

The control variables are selected based on those considered by previous studies that focus on alternative explanations, including country and time dummies. To proxy for the essential characteristics of the **tax** system, we consider the corporate rate, *ctax*, and the

[14] The association between cash holdings and asset-side liquidity has often been found to be negative, as reported by (among others) Baskin (1987) and Ferreira and Vilela (2004), consistent with the possibility of viewing positive components of net working capital as cash substitutes (i.e., indicators of the ability to generate, when needed, additional funding).

[15] As a robustness check, we also estimated all models using the logarithm of total assets. Since results are qualitatively similar to those presented, we do not report them.

average personal tax rate, *ptax*, reported for each country by the KPMG's Corporate and Indirect Tax Survey 2010 (KPMG 2010).

As measures of the state of the **economic cycle**, we include the rate of return on country-specific market portfolios, *rm*, the annual inflation rate for each country, *inf*, and the annual growth rate of GDP at current market price for each country, *ggdp*. Data for *rm* are from Datastream; data for *inf* and *ggdp* are from Eurostat.

A further variable for which it is interesting to control is the **cost of capital**. It has so far received limited attention in the literature, with the notable exception of Palazzo (2012), even though several studies point out that this variable has a great impact on the entrepreneurial decision process, especially in private firms (Kerins et al. 2004; Pattitoni et al. 2013). The opportunity cost of capital, *ciara*, is estimated as the industry-country average opportunity cost of capital, using the method in Pattitoni et al. (2013). In applying this method, we first clustered firms by country and industry and used market data of listed comparable firms in the same country-industry cluster to estimate the unlevered opportunity cost of capital for each firm within the cluster.

5. Baseline empirical results

In Table 3, we report estimates of a static model (in the first column) and two dynamic model specifications (in the second and third columns) that include all candidate explanatory variables described in the previous section and summarized in Table 2a.[16] The

[16] Some of our independent variables are time-invariant, namely *comm*, *ctax*, *indtax* and *ciara*. In particular, *comm* and *ciara* are measured in 2011 and *ctax* and *indtax* is measured in 2010. Given that ownership

static model is estimated by FE-OLS whereas SYS-GMM is used for the dynamic models. The dynamic models include, among the covariates, two lags of the dependent variable. We estimate these models treating all such variables as endogenous, thus instrumenting them by their own lag, with the exception of time-invariant variables, of the economic cycle variables and, in the case of model [3] in the third column of the Table, also *sd*(*roa*), *skew*(*roa*), *cor*(*cfoa,coa*) and *cor*(*cfoa,coa*^{2}).[17] We do so because, though earning risk and funding risk are most likely endogenous, *sd*(*roa*), *skew*(*roa*), *cor*(*cfoa,coa*) and *cor*(*cfoa,coa*^{2}) are fixed for all firms belonging to the same industry and, therefore, it might be seen as prudent to treat them as exogenous at the level of the firm, though they likely remain endogenous at the level of the industry (e.g., if cash is scarce within an industry and either or both of the two precautionary motives are present, firms within the industry would reduce earnings and/or funding risk by changing their business strategy). We do not allow for interaction effects in the regressions considered in Table 3, leaving their analysis to the next Section. We do so for the sake of parsimony, also noting that such effects, just like any un-modelled endogeneity, are likely picked up, to some extent, by the lags of the dependent variable included in the dynamic models.

In the case of the static model, as shown in the Table, the estimated coefficients of both earning risk variables, *sd*(*roa*) and *skew*(*roa*), are in accordance with the attitudinal

structure, cost of capital and tax rates of firms in a country are relatively stable over time, we do not expect that this might lead to any significant bias in our results (see LaPorta et al. 2002; Ozkan and Ozkan 2004).

[17] The Arellano-Bond tests do not reject our models. The Sargan's tests of over-identifying restrictions, however, do. These rejections, while suggesting some caution in interpreting our results, might also be due to heteroscedasticity in the data, since in this case the Sargan test tends to be unreliable (Arellano and Bond 1991). The presence of heteroscedasticity is indeed likely to characterize our heterogeneous dataset of firms. This motivates our choice of using Windmeijer's finite-sample correction for the standard errors (Windmeijer 2005). To save space, we did not tabulate the results on the Arellano-Bond and Sargan specification tests but they are available upon request.

precautionary motive, assuming a composite representative insider as per Proposition I. In the case of the dynamic model, the reported estimates are consistent with the attitudinal precautionary motive as per Corollary III (CP.III) to Proposition I and, therefore, assuming that the representative insider is an equity holder. If we further assume that *sd*(*roa*) is a good proxy for the standard deviation of ROE, the estimates reported in the second column of the Table (specification [2]) are consistent with the attitudinal precautionary motive also as per Corollary II (CP.II) to Proposition I.

The estimated coefficients associated with our proxies for firm profitability and efficiency, namely roa and soa, are positive. They are, therefore, consistent with the attitudinal precautionary motive. With the exception of the coefficient of soa in the static models, they are also significant at all conventional levels.

In the static model, the coefficients of the two variables most directly related to the hedging motive, namely *cor*(*cfoa,coa*) and *cor*(*cfoa,coa*^{2}), are negative and significant, consistent with Acharya et al. (2007). In the dynamic model, however, they are statistically significant only in the specification that treats them and the earning variables as endogenous (specification [2]). Most importantly, and perhaps surprisingly, the coefficients of the ratios capital expenditures to total assets (*coa*) and intangibles assets to total assets (*ioa*) are negative. This is consistent with the view that cash acts indeed as a substitute for debt capacity and thus as 'negative debt', in contrast with the hedging motive put forth by Acharya et al. (2007). Intangibles are typically a large fraction of assets at firms with greater growth opportunities. For these firms, there is a greater chance of facing a costly funding shortfall in the future and, therefore, they should find the hedging motive more pressing, leading them to hold more cash. In addition, a large fraction of intangible over

total assets should negatively affect the firm ability to raise external capital, due to the limited extent to which intangible assets may be pledged as collateral, and therefore should render the firm more capital constrained. Under the hedging motive, this should lead the firm to a greater accumulation of cash. For related reasons, it is almost equally remarkable that the coefficients of short-term and long-term debt (*bol* and *ltdol* respectively) are negative. Unless we make the arguably unrealistic assumption that the typical private firm is financially unconstrained (in which case high debt would imply high debt capacity in the future and, hence, low hedging needs), this finding is inconsistent with the hedging motive.

[Insert Table 3]

Perhaps more importantly, when the earning risk variables (i.e., those more closely related to the attitudinal precautionary motive) are excluded from the regression equation, the significance and even the sign of a number of coefficients of the dynamic models are considerably affected, suggesting inconsistency of the estimates brought about by an omitted variable problem. This is shown in Table 4, where the first and third columns contain estimation results of a static and a dynamic model (specifications [4] and [6], respectively) that exclude the funding risk variables, whereas the second and fourth columns report estimation results of a static and a dynamic model (specifications [5] and [7], respectively) that exclude the earning risk variables. For the dynamic models, to save space, we only report results estimated using a set of instruments that does not include the earning risk variables and the funding risk variables and, therefore, as for specification [3] in Table 3.

Comparing the latter with model [7] in Table 4, we see that the omission of the earning risk variables affects the sign and significance of the coefficients of the funding risk variables. This means that the attitudinal precautionary motive should be taken into account not only because of the evidence that it plays a statistically significant role in the determination of cash holdings but, perhaps more importantly, because it contributes to the econometric identification of the role of other complementary effects. Possibly due to the unique characteristics of private businesses and, therefore, of our sample, omission of the attitudinal precautionary motives appears to have a confounding effect on the estimates of the implications of other effects, including the traditional hedging motive.

[Insert Table 4]

In both Table 3 and Table 4, the sign of the estimated coefficients of the other variables is largely consistent with previous studies. In particular, we find that the level of cash holdings is positively associated with GDP growth. We note, however, that the sign of the coefficient of the variable that proxies for the availability of a banking relationship is significant and negative and, therefore, consistent with the hedging motive, only when we use the restricted set of instruments.

Overall, our results offer evidence that the hedging motive, at least as traditionally conceived, is an incomplete explanation of cash holding choices of private firms and that, in our sample of such firms, the attitudinal precautionary motive, picked up by the estimates of the ROA standard deviation and, more importantly, skewness coefficients, complements it in an important way. This is so in spite of the relative small magnitude of the coefficients of the earning risk variables (those more closely related to the attitudinal

precautionary motive). In fact, such coefficients imply that a variation of one standard deviation of the coefficients of *sd*(*roa*) and *skew*(*roa*) explain only about 6.73% of the standard deviation of *choa*, based on the static model estimates (from Table 3). This is less than a third of the fraction explained by the funding risk variables. This limited yet highly statistically significant effect, together with the crucial role played by *sd*(*roa*) and *skew*(*roa*) in identifying the effect of the other variables, while initially surprising, can be explained on the basis of the likely endogeneity of cash flow risk (due to reverse causality), which is the key consideration that lead us to allow, in our reduced form cash holding determination equation, for a dynamic component given by lags of the dependent variable. That is, it is possible, and even likely, that the most important effect of the attitudinal precautionary motive is not the one for which we obtain a direct estimate but the indirect one, related to the endogeneity of cash flow risk, which is very difficult to directly observe. In fact, endogeneity of cash flow risk might be behind the systematic difference in cash holdings between public and private firms recently emphasized by Gao et al. (2013). In any case, the dynamic component of our estimated model of cash holding determination appears important, implying a half-life of cash flow shocks of approximatively $h = \frac{\ln(0.5)}{\ln(0.5513)} = 1.16$ years (from the estimate of the coefficient of the first lag of $choa$ in model [2] in Table 3).

Table 5 succinctly reports results concerning the other estimators for the model that includes all explanatory variables except the earning risk ones and for the model that includes all explanatory variables with no exception, in the column labelled with "(a)" and "(b)", respectively. We report estimates only for the coefficients that are more closely related to the hedging and attitudinal precautionary motives, namely the earning risk

variables and the funding risk variables. The estimators are, in Panel A, P-OLS and RE-GLS and, in Panel B and Panel C, SYS-GMM with one lag of the dependent variable included among the regressors and DIFF-GMM.[18] For the reader's convenience, so as to facilitate comparison, we also reproduce results already reported in Table 3 concerning FE-OLS and SYS-GMM with two lags of the dependent variable. The results reported in Panel B are based on a set of instruments that includes the earning risk variables and funding risk variables whereas Panel C refers to results obtained excluding these variables from among the instruments. The sign, magnitude and significance of the estimated coefficients in the static models (i.e., those considered in Panel A), are largely in line with the corresponding results reported in Table 3. In the case of the dynamic models (Panel B and Panel C), the sign and statistical significance of a number of coefficients changes depending on the estimator and on whether the earning risk variable are excluded. Nonetheless, in line with our earlier results, the funding risk variables are, in most cases, statistically insignificant and become significant only when the earning risk variables are included.

[Insert Table 5 here]

6. Interaction effects analysis

The analysis in Section 2 suggests that the strength of both motives varies with a number of variables. For the sake of parsimony, we did not explicitly allow for these effects in the

[18] On a cautionary note, however, it is worth recalling that, in DIFF-GMM, the two-step estimates of the standard errors tend to be severely downward biased (see, for example, the discussion in Arellano and Bond (1991) and Blundell and Bond (1998)). The SYS-GMM estimator uses the same two-step procedure but with a finite-sample correction to the two-step covariance matrix derived by Windmeijer (2000), which also makes it more efficient.

regressions considered so far but we explore them here. We examine heterogeneity across firms with respect to, on the one hand, the strength of the motives and, on the other hand, a number of firm characteristics. The latter include firm profitability, efficiency, concentration of ownership[19], growth, ratio of intangibles to total assets, bank debt, debt maturity, liquidity, whether the country of residence is banking oriented, size[20], taxation, and whether the industry in which the firm is active is cyclical or anti-cyclical[21].

To estimate the joint effect on cash holding of these characteristics and each one of the two cash holding motives, we classify firms into sub-samples according to each characteristic[22] and estimate, for each sub-sample, separate static panel regressions like the ones considered in Table 3. We then perform "poolability" tests across subsamples, by testing for the difference across subsamples of the coefficients associated to the two cash holding motives.

[19] For a majority shareholder, the stake in the private firm under consideration is likely to represent a large fraction of her overall wealth and sources of cash flows and that this might lead her to be more sensitive to perspective fluctuations of such cash flows and, therefore, to influence cash holding decisions in a manner consistent with the attitudinal precautionary motive. The ownership of the majority of the company shares would, moreover, put her in a better position to exert such influence.

[20] Consideration of size, following Acharya et al. (2007), is motivated by a belief that smaller firms are more financially constrained, due to greater information asymmetries and associated agency costs.

[21] Cyclicality is proxied by the correlation between final demand for the industry output and GDP of the country where the firm is based. Consideration of whether firms are active in anti-cyclical or pro-cyclical industries is motivated by the possibility that the firm might hold cash to ensure a smooth payout profile for key employees (and/or other key stakeholders in a similar position, e.g. suppliers) rather than the equity holder. In this respect, a crucial consideration is that retention of key employees (or key suppliers, etc.) is especially problematic at times when the firm is doing poorly but the rest of the economy is doing well, as disheartened employees might find employment elsewhere (whereas the risk is lower during bad general economic times, when unhappy employees might not leave simply due to the inability to find alternative employment) and, therefore, firms active in counter-cyclical industries might have a more pressing need to hold cash to ensure a smooth remuneration policy towards employees who risk attitudes exhibit prudence and temperance.

[22] For example, we classify firms as either small or large depending on the number of employees, as firms with concentrated or dispersed ownership depending on the presence of a majority shareholder, and firms active in anti-cyclical or pro-cyclical industries, etc.

The estimates of the coefficients and their differences is reported in Table 6a and Table 6b for the earning risk variables and for the funding risk variables, respectively. For each characteristic, the second and third column of each Table report the regression coefficients estimated within each subsample. The fourth column reports the difference between the values reported in the previous two columns, which represents an estimate of the effect of the sorting characteristic on the strength of the associated cash holding motive, akin to coefficients of the regression of *choa* on 'interaction' variables represented by the product of the sorting characteristic and either *sd*(*roa*) and *skew*(*roa*), for the attitudinal precautionary motive, or *cor*(*cfoa, coa*) and *cor*(*cfoa, coa*^{2}), for the hedging motive.

We find that the attitudinal motive is stronger in more profitable firms, consistent with the attitudinal precautionary motive, and in firms where ownership is concentrated, likely as a by-product of the larger insider-outsider agency problems that this entails. As such, it is also consistent with the view that cash is accumulated especially when, from the perspective of the representative insider, it is less likely that it will be used inefficiently. This is in line with the arguments emphasized by the empirical literature on corporate governance and cash holdings (e.g., Harford et al. (2008)). The attitudinal motive is also significantly stronger in low growth firms and firms with low rates of intangibles to total assets. Notably, this fact is consistent with a long run endogeneity of firm growth, in that stakeholders will choose low growth strategies if growth is associated with negative skewness of the earnings distribution (i.e., if it is risky) and they cannot accumulate the cash they wish to hold. As expected, it is only the hedging motive that is weaker in banking oriented countries, whereas this circumstance does not affect the strength of the attitudinal precautionary motive. Interestingly, the attitudinal motive is stronger in firms active in

cyclical industries, suggesting that bad times for the economy amount to bad times for the representative stakeholder.

[Insert Table 6a]

[Insert Table 6b]

Notably, there is a suggestive pattern in Table 6a and in Table 6b. In Table 6a, the most significant interaction effects are the ones pertaining to the third order variable, namely $skew(roa)$. To the contrary, in Table 6b, it is the interaction effects involving the second order variable, namely $corr(cfoa, coa)$, that matter the most. Overall, this suggests that the two motives that we estimate are indeed two distinct effects. While, in principle, it is possible that the variables that we deem to be associated to either motive proxy for the other, due to the partial observational equivalence of the motives themselves, the noted pattern offers some reassurance that this is not the case. Moreover, the limited variation of the average coefficients of variables associated to the hedging motive across subsamples, compared to the much more pronounced variation of the coefficients associated to the attitudinal precautionary motive, suggest that, if a problem of econometric identification is indeed present in our estimates, it is more likely that the hedging motive-related variables act as proxies for those related to the attitudinal precautionary motive than the other way round.

7. Conclusions and final remarks

In this paper, we explored the possible role of stakeholders' risk attitudes as determinants of cash holding decisions, alongside the more traditional hedging motive à la Acharya et al. (2007). In doing so, we extended the scope of the definition of risk typically adopted in the literature on cash holding determinants by considering the skewness of ROA, alongside measures of cash flow volatility and of correlation between cash flows and investment funding needs. In modelling cash balances determination in private firms, we focused on the saving and cash holding decisions of a representative insider, who may be the controlling shareholder or, more generally, a composite economic agent whose preferences are reflected in the expected utility function that is maximized by the firm financial policies.

In our model, in keeping with the seminal analysis of Opler et al. (1999), firms' optimal cash holdings are indeed determined by the tradeoff between the marginal costs and marginal benefits of holding liquid assets. Typically (e.g., Subramaniam et al. (2011)), it is thought that the costs of holding cash includes opportunity costs of idle capital and agency costs associated with managerial discretion whereas the benefits include avoiding unnecessary transactions to borrow money and alleviating information asymmetry and agency costs associated with external capital. To these, we add two other types of benefits, namely the ability of firm cash holdings to (a) transfer consumption possibilities over time and states of the world in a tax efficient manner and (b) demonstrate the representative insider's commitment to the firm. In the context of private firms, these considerations interact with the representative insider's preference for holding cash, leading to the joint determination of her cash holding decision and the fraction thereof stored within the firm.

Private firms are characterized by lower monitoring costs of managerial action and, from the point of view of the representative insider, better protection of her rights. Therefore, the disincentives to hold cash posed by poor governance and poor protection of investors' rights considered, among others, by Dittmar et al. (2003), Pinkowitz et al. (2006), Dittmar and Mahrt-Smith (2007), Kalcheva and Lins (2007) and Harford et al. (2008), either do not apply or do so only weakly in our context. To the contrary, leaving excess-cash in the firm may play an important function as a pledge of commitment by the representative insider since the latter is the owner/entrepreneur, whose rights are well protected, whereas the right of other stakeholders are poorly protected (yet they can impose agency and transaction costs upon the firm).

Compared to Acharya et al. (2007), who emphasize the role of cash as a hedging tool against the risk of being unable to finance future valuable investment opportunities, we suggest that large cash holdings may be optimal simply as a consequence of prudence and temperance on the part of key stakeholders, in the presence of volatile and left-skewed distributions of the return on their (broadly defined) investment in the firm and agency costs that prevent them from accumulating cash outside the perimeter of the firm. This leads to an attitudinal precautionary motive that, in principle, complements the traditional hedging motive for holding cash.

The evidence in favor of the attitudinal motive is more clear-cut relative to the evidence in favor of the hedging motive, especially as far as the sign of the investment and growth variables is concerned, which is compatible with the attitudinal precautionary motive but inconsistent with the hedging motive. This might depend on the fact that, unlike Acharya et al. (2007), we use a sample of private firms, pointing to a possible difference in cash

balances determination between private and publicly listed firms. Testing for whether there is such a difference would require a sample that comprised both types of firms. It is therefore an endeavor that we leave for future research. Our research also reveals that there are significant dynamic effects in the level of cash holdings, consistent with Gao et al. (2013).

From a policy point of view, our results suggest intriguing avenues for future research. The fact that firms seem to hold more cash in the presence of negative ROA skewness suggests that, in the event that cash holdings were limited by funding constraints, firms may respond by refraining from pursuing business strategies characterized by payoffs with negatively skewed distributions. Hence, if the latter were an unavoidable trait of strategies that more aggressively pursue innovation, the inability to build up cash holdings might have adverse implications for the propensity of firms to innovate. Recent research, such as the work of He and Wintoki (2015) suggests this might be the case. We leave the investigation of this important possibility to future research.

Appendix

We present here a simple model of consumption-savings and cash holding decisions under uncertainty. Building on the two-period model of Kimball (1990), a crucial feature is that we allow for the possibility that the firm's cash holdings represent a safe form of savings made on behalf of the representative insider (as defined in the main text). For simplicity, we assume that the preferences of the representative insider can be represented by a time and state-separable utility function, $U\left(c_1, c_2\right)$, defined over present, c_1, and future, $\tilde{c}_2$, consumption that takes the form

$$U\left(c_1, c_2\right) = u\left(c_1\right) + \beta u\left(\tilde{c}_2\right) \tag{A1}$$

Here, $\beta \in (0,1)$ is the subjective discount factor and, from the point of view of the representative insider who makes a choice in period 1, $\tilde{c}_2$ is a random variable. We assume that the representative insider's marginal utility is positive, $u'(.) > 0$, and decreases with consumption, $u''(.) < 0$, thereby assuming both non-satiety (NS) and risk aversion (RA). We also assume that marginal utility is convex, $u'''(.) > 0$, which implies decreasing absolute risk aversion (DARA), and that absolute risk aversion decreases at a decreasing rate, $u^{(4)}(.) < 0$. In the formalization put forth by Kimball (1990), NS, RA and DARA together define *prudence*, which is at the heart of the so-called precautionary savings motive in the household literature. For a utility function that exhibits this property, $u^{(4)}(.) < 0$ defines decreasing absolute prudence (DAP) or *temperance*.[23]

For simplicity, and at the cost of a only relatively minor loss of generality, we model the representative insider as an undiversified shareholder that is entirely invested in the firm. In the setup of our two-period model and assuming (for simplicity and with no loss of generality) no initial cash holdings outside of the firm and a zero interest rate, the life-time budget constraint is then

$$\tilde{c}_2 = k_1 + \pi_1 - c_1 + \tilde{\pi}_2 \tag{A2}$$

[23] Given the monotonicity and concavity of the utility function, the combination of DARA and DAP is necessary and sufficient for 'standard risk aversion' as defined by Kimball (1993).

where k_1 is the stakeholder's share of the capital, **including cash holdings**, accumulated by the firm until period 1 (by its start) and π_1 and $\tilde{\pi}_2$ are the firm's first and second period earnings respectively (received at their end). The second period earnings are stochastic and, for convenience, we can divide them into their expectation, $\bar{\pi}_2$, and a zero-mean stochastic term, $\tilde{\varepsilon}_2$, that is $\tilde{\pi}_2 = \bar{\pi}_2 + \tilde{\varepsilon}_2$. In (A2), the difference $s_1 = \pi_1 - c_1$ is the amount of savings in the first period that is either channeled towards risky (internal financing) or safe (cash holdings) assets, held either directly (in the bank account) or indirectly (within the firm) by the stakeholder. In other words, the life-time budget constraint simply says that all residual wealth in period 2 is consumed, i.e. distributed. The problem of the representative insider who wants to maximize her expected utility under the life-time budget constraint can then be written as

$$\max_{c_1} u(c_1) + \beta E_1\left[u\left(k_1 + \pi_1 - c_1 + \bar{\pi}_2 + \tilde{\varepsilon}_2\right)\right] \tag{A3}$$

where the expectation, $E_1[.]$, is taken conditional on the information set available in the first period. Also, for simplicity and relatively minor loss of generality, we assume that $\bar{\pi}_2$ increases in the fraction (not the amount) of cash balances held within the firm (due to lower taxes and agency costs, as argued in the main text) and that the sensitivity of $\bar{\pi}_2$ to such fraction is so high that the representative insider will always find it convenient to hold

all her cash in the firm, ultimately implying that all cash holdings, if any, are in the firm. The optimality condition of the problem in (A3) is given by the Euler equation[24]

$$u'(c_1) = \beta E_1\left[u'(\tilde{c}_2)\right] \tag{A4}$$

The Euler equation simply says that the representative insider must be indifferent between consuming one more unit in the first period and saving that unit and consuming it in the second period. For the Euler equation to hold and, thus, to preserve the optimality of the solution, if $E_1\left[u'(\tilde{c}_2)\right]$ rises, so does $u'(c_1)$. Thus, given that due to the RA assumption $u'(c_1)$ decreases with c_1, an increase in $E_1\left[u'(\tilde{c}_2)\right]$ implies a decrease in the first period consumption (c_1) and, consequently, an increase in savings (s_1). To understand how the cash holding decisions depend on the (conditional) distribution of future earnings, we need to consider the other two properties of the representative insider's utility function, namely $u'''(.) > 0$ and $u^{(4)}(.) < 0$ or prudence and temperance, respectively, and use them to link variation in $E_1\left[u'(\tilde{c}_2)\right]$ to variation in the conditional moments of the earnings distribution. To this end, we consider a third order Taylor expansion of $u'(\tilde{c}_2)$ about the expected value $\overline{c}_2$ of the second period consumption,

[24] The multi-period optimality condition of the consumption-savings problem is $u'(c_t) = \beta E_t\left[u'(\tilde{c}_{t+1})\right]$. One of the approaches to obtain this solution is writing the problem in Bellman equation form and using the envelope theorem to derive the Euler equation. The multi-period Euler equation is analogous to that in (A4). Thus, considering a simple two-period setup simplifies the analysis without substantially affecting the generality of the conclusions.

$$u'(\tilde{c}_2) \equiv u'(\bar{c}_2 + \tilde{\varepsilon}_2) \cong u'(\bar{c}_2) + u''(\bar{c}_2)\tilde{\varepsilon}_2 + \frac{1}{2}u'''(\bar{c}_2)\tilde{\varepsilon}_2^2 + \frac{1}{6}u^{(4)}(\bar{c}_2)\tilde{\varepsilon}_2^3 \quad \text{(A5)}$$

Taking expected values leads to

$$\begin{aligned} E_1\left[u'(\tilde{c}_2)\right] &\cong u'(\bar{c}_2) + u''(\bar{c}_2)E_1\left[\tilde{\varepsilon}_2\right] + \frac{1}{2}u'''(\bar{c}_2)E_1\left[\tilde{\varepsilon}_2^2\right] + \frac{1}{6}u^{(4)}(\bar{c}_2)E_1\left[\tilde{\varepsilon}_2^3\right] \\ &= u'(\bar{c}_2) + \frac{1}{2}u'''(\bar{c}_2)\,\mathrm{var}_1\left[\tilde{\varepsilon}_2\right] + \frac{1}{6}u^{(4)}(\bar{c}_2)\,\mathrm{skew}_1\left[\tilde{\varepsilon}_2\right] \end{aligned} \quad \text{(A6)}$$

where $\mathrm{var}_1[.]$ and $\mathrm{skew}_1[.]$ denote the variance and skewness operators respectively.[25] When prudence and temperance are present, if the variance of earnings increases or their skewness decreases, then $E_1\left[u'(\tilde{c}_2)\right]$ increases and, for the equality in (A4) to hold, current consumption c_1 must decrease (since marginal utility decreases in wealth, due to the risk aversion assumption). Hence, because of the budget constraint in (A2), the amount of savings (s_1) must increase. In other words, if the representative insider is prudent and temperant, then she saves more if earnings are characterized by high volatility and negative skewness. Moreover, as shown by Kimball (1993), temperance determines the fraction of savings allocated to safe investments. Hence, in our context, a representative insider who exhibits greater temperance will allocate a greater the fraction of savings to cash. Ultimately, this is because, as explained by Kimball (1993), temperance reflects the desire to moderate the exposure to total risk and thus, in the context of firm level consumption-

[25] While in the statistical literature skewness is typically defined as the third standardized moment, in the finance literature it is often defined, as in (A5), as the third central (but not scaled) moment. The two definitions are related by a proportionality relation.

savings decisions, the fraction of savings that is conveyed to cash holdings and away from risky reinvestment. In our context, in which the representative insider consumes all she has at the end of the second period, the variance and skewness of the return on her wealth are proportional to the variance and skewness of the earnings distribution and, therefore, we will henceforth refer to the moments of the return distribution instead of the corresponding moments of the earnings distribution.

It is worth emphasizing that prudence and temperance, and therefore DARA and DAP, are necessary for an increase in risk (wealth volatility) and downside risk (negative skewness of the distribution of the return on wealth) to lead to a greater allocation to savings and to the safe asset. Risk aversion, per se, would not warrant this. In particular, in the presence of constant absolute risk aversion (exponential utility), the allocation to the safe asset is independent of the moments of the return distribution, as it depends entirely on the risk aversion coefficient.

Table 1. Sample breakdown by year, country, and industry

Year	**N. of observations**	**%**
2004	28,471	11.60
2005	29,400	11.98
2006	30,082	12.26
2007	31,532	12.85
2008	32,185	13.11
2009	32,783	13.36
2010	32,413	13.20
2011	28,601	11.65
Total	245,467	100.00
Country	**N. of firms**	**%**
Austria	217	0.63
Belgium	4,982	14.38
Denmark	1,515	4.37
Finland	1	0.00
France	3,809	10.99
Germany	841	2.43
Greece	1,351	3.90
Ireland	52	0.15
Italy	10,032	28.96
Luxembourg	592	1.71
Netherlands	86	0.25
Portugal	22,16	6.40
Spain	7,548	21.79
Sweden	28	0.08
United Kingdom	1,376	3.97
Total	34,646	100.00
Industry	**N. of firms**	**%**
Agriculture, Forestry and Fishing	313	0.90
Mining and Quarrying	176	0.51
Manufacturing	10,820	31.23
Construction	2,889	8.34
Wholesale and Retail Trade	9,576	27.64
Transportation and Storage	1,798	5.19
Accommodation and Food Service Activities	612	1.77
Information and Communication	1,200	3.46
Real Estate Activities	1,733	5.00
Professional, Scientific and Technical Activities	2,390	6.90
Administrative and Support Service Activities	1,422	4.10
Public Administration and Defense	34	0.10
Education	465	1.34
Human Health and Social Work Activities	641	1.85
Arts, Entertainment and Recreation	320	0.92
Other Service Activities	248	0.72
Activities of Households as Employers	1	0.00
Activities of Extraterritorial Organizations and Bodies	8	0.02
Total	34,646	100.00

Table 2a. Descriptive statistics

Variables	*Short description*	*Mean*	*Median*	*Std. dev.*
Dependent variable				
choa	Ratio of cash and cash equivalents to total assets	0.09	0.03	0.14
Determinants under attitudinal precautionary motive				
Earning risk				
sd(*roa*)	Standard deviation of *roa* by industry, country, and year.	0.07	0.07	0.04
skew(*roa*)	Skewness of *roa* by industry, country, and year.	0.21	0.40	1.98
Profitability/efficiency				
roa	Return on assets, defined as the ratio of EBIT minus tax to total assets.	0.04	0.03	0.07
soa	Ratio of sales to total assets.	1.72	1.31	1.72
Ownership concentration				
comm	Dummy variable equal to 1 if a shareholder has a total ownership over 50%, 0 otherwise.	0.25		
Determinants under hedging motive				
Funding risk				
cor(*cfoa,coa*)	Correlation between the ratio of cash flow to total assets and the ratio of capital expenditures to total assets (*coa*).	-0.03	-0.33	2.68
cor($cfoa,coa^2$)	Correlation between the ratio of cash flow to total assets and the squared ratio of *coa*	-0.10	-0.02	2.95
Investment and growth				
coa	Ratio of capital expenditures to total assets.	-0.06	0.00	24.21
ioa	Ratio of intangible assets to total assets.	0.03	0.00	0.08
Leverage				
bol	Ratio of short term bank debts to total assets.	0.11	0.05	0.15
ltdol	Ratio of long-term financial debt to total assets.	0.10	0.03	0.16
Banking relationship				
bank	A dummy variable, denoted by bank, that takes the value of one in the event that the country where the firm is based has a banking orientation and zero otherwise.	0.68		
Determinants under both motives				
Liquidity/trade credit				
doa	Ratio of trade receivables from clients and customers (trade debtors) to total assets.	0.31	0.29	0.23
col	Ratio of debts to suppliers and contractors (trade creditors) to total assets.	0.21	0.17	0.18
Size				
ln(*e*)	Natural logarithm of the number of employees.	4.18	4.19	1.36
Control variables				
Taxation				
ctax and *ptax*	Average corporate (*ctax*) and personal (*ptax*) rate for each country as reported by the KPMG's Corporate and Indirect Tax Survey 2010 (KPMG 2010).			
Economic cycle				
rm	Rate of return on country-specific market portfolios. The data are from Datastream.	0.04	0.15	0.29
inf	Annual inflation rate for each country. The data are from Eurostat.	0.02	0.02	0.01
ggdp	Annual growth rate of GDP at current market prices for each country. Data from Eurostat.	0.03	0.04	0.04
Opportunity cost of capital				
ciara	Industry-country average opportunity cost of capital.	0.05	0.04	0.02

Table 2b. Synopsis of key relations (Between cash holdings and determinants under either the hedging or the attitudinal precautionary motive, or both)

Variables	(a) *Sign of the relation with choa under hedging motive*	(b) *Sign of the relation with choa under attitudinal precautionary motive*	(c) *Sign of the relation with the strength of the hedging motive*	(d) *Sign of the relation with the strength of the attitudinal precautionary motive*
Determinants under attitudinal precautionary motive				
Earning risk				
sd(*roa*)		+/		
skew(*roa*)		-		
Profitability/efficiency				
roa		+		+
soa		+		+
Ownership concentration				
comm		+		+
Determinants under hedging motive				
Funding risk				
cor(*cfoa,coa*)	-			
cor(*cfoa,coa*^{2})	-			
Investment and growth				
coa	+		+	
ioa	+		+	
Leverage				
bol	+		+	
ltdol	+		+	
Banking relationship				
bank	-		-	
Determinants under both motives				
Liquidity/trade credit				
doa	-	-	-	-
col	+	+	+	+
Size				
ln(*e*)			-	-

The second and third columns of this table report the sign of the relation between the variables listed in the first columns and $choa$, under the hedging motive and attitudinal precautionary motive (in columns (a) and (b), respectively). The fourth and fifth columns report the sign of the relation between the same variables and the strength of the hedging and attitudinal precautionary motive (in columns (c) and (d), respectively). A positive relation is denoted by "+" whereas a negative one is denoted by "-". In the case of the relation with *sd*(*roa*) under the attitudinal precautionary motive, it is either positive (as per Proposition I and assuming that *sd*(*roa*) proxies for the standard deviation of ROE) or undefined (as per Corollary III to Proposition I); to denote this, we use the symbol "+/". When a cells is left blank, it means that the motive to which its column pertains does not carry any implication for the sign of the relation to which the cell refers.

Table 3. Linear static and dynamic panel-data models

	[1] - FE-OLS			[2] - SYS-GMM			[3] - SYS-GMM		
Variables	Coef	SE	Sign	Coef	SE	Sign	Coef	SE	Sign
constant	11.13	0.74	***	-4.35	2.21	**	-26.54	12.19	**
choa lag 1				55.13	1.48	***	50.49	1.65	***
choa lag 2				6.71	1.02	***	6.03	0.97	***
Earning risk									
sd(roa)	14.14	6.06	**	-5.99	4.61		-24.06	5.95	***
skew(roa)	-0.19	0.02	***	-0.17	0.02	***	-0.22	0.02	***
Profitability/efficiency									
roa	10.65	1.01	***	6.81	1.21	***	6.11	1.22	***
soa	0.26	0.16		0.40	0.10	***	0.35	0.09	***
Ownership concentration									
comm				0.77	1.18		-0.92	2.16	
Funding risk									
cor(cfoa,coa)	-1.55	0.31	***	-0.48	0.35		-0.73	0.36	**
cor(cfoa,coa^2)	-1.02	0.27	***	-0.39	0.32		-0.67	0.34	**
Investment and growth									
coa	-3.92	0.86	***	-5.16	1.09	***	-5.95	1.20	***
ioa	-10.01	1.00	***	-2.99	0.93	***	-4.63	0.98	***
Leverage									
bol	-6.38	0.42	***	-3.31	0.49	***	-3.42	0.51	***
ltdol	-6.59	0.48	***	-2.84	0.51	***	-2.73	0.55	***
Bank relationship									
bank				-0.95	0.28	***	5.19	1.12	***
Liquidity/trade credit									
col	1.57	0.49	***	1.15	0.61	*	1.23	0.62	**
doa	-21.57	0.62	***	-11.56	0.74	***	-15.17	0.91	***
Size									
ln(e)	0.06	0.13		0.59	0.11	***	0.10	0.15	
Taxation									
ptax				11.24	5.24	**	115.85	24.30	***
ctax				10.10	4.45	**	-111.01	27.66	***
Economic cycle									
rm	-3.48	0.31	***	-0.69	0.38	*	-0.49	0.38	
inf	58.73	5.79	***	-4.20	6.02		-6.61	6.24	
ggdp	45.88	2.59	***	12.05	2.85	***	21.93	3.48	***
Opportunity cost of capital									
ciara				-5.53	10.72		308.47	57.03	***
Year dummies χ^2	11316		***	24326		***	23182		***
R^2-overall	7.70			NA			NA		

***, ** and * denote significance at the 1, 5 and 10 per cent levels. Inference is based on robust standard errors. All figures are in percentage. The estimates in columns [2] and [3] differ by the set of instruments. The estimates in [2] are obtained including as instruments all variables that are not time invariant, with the exclusion of the economic cycle variables. The estimates in [3] are obtained including as instruments all variables that are not time invariant, with the exclusion of economic cycle variables and of our proxy variables for funding risk and earning risk.

Table 4. Robustness checks

	[4] - FE-OLS			[5] - FE-OLS			[6] - SYS-GMM			[7] - SYS-GMM		
Variables	Coef	SE	Sign	Coef	SE	Sign	Coef	SE	Sign	Coef	SE	Sign
constant	11.37	0.74	***	11.93	0.66	***	-25.77	12.15	**	-19.97	12.12	*
choa lag 1							50.56	1.65	***	50.24	1.65	***
choa lag 2							6.04	0.97	***	5.64	0.98	***
Earning risk												
sd(roa)	13.78	5.94	**				-24.07	5.89	***			
skew(roa)	-0.18	0.02	***				-0.20	0.02	***			
Profitability/efficiency												
roa	10.67	1.01	***	10.54	1.01	***	6.16	1.22	***	5.59	1.24	***
soa	0.26	0.16		0.26	0.16		0.35	0.09	***	0.35	0.10	***
Ownership concentration												
comm							-0.82	2.15		-1.45	2.14	
Funding risk												
cor(cfoa,coa)				-1.29	0.30	***				0.11	0.35	
cor(cfoa,coa^2)				-0.90	0.26	***				0.42	0.32	
Investment and growth												
coa	-3.88	0.85	***	-3.94	0.87	***	-5.94	1.18	***	-5.89	1.24	***
ioa	-9.95	1.00	***	-10.01	1.00	***	-4.56	0.98	***	-5.08	1.00	***
Leverage												
bol	-6.39	0.42	***	-6.33	0.42	***	-3.38	0.51	***	-3.26	0.50	***
ltdol	-6.61	0.48	***	-6.51	0.49	***	-2.75	0.55	***	-2.66	0.54	***
Bank relationship												
bank							5.16	1.11	***	5.41	1.12	***
Liquidity/trade credit												
col	1.58	0.49	***	1.51	0.49	***	1.28	0.62	**	1.26	0.62	**
doa	-21.55	0.62	***	-21.57	0.62	***	-15.16	0.90	***	-15.06	0.91	***
Size												
ln(e)	0.05	0.13		0.03	0.13		0.09	0.15		0.08	0.15	
Taxation												
ptax							115.20	24.25	***	102.47	24.17	***
ctax							-112.11	27.57	***	-114.71	27.58	***
Economic cycle												
rm	-3.49	0.31	***	-3.71	0.31	***	-0.52	0.38		-0.92	0.38	**
inf	51.63	5.63	***	68.70	5.86	***	-10.68	6.19	*	1.19	6.24	
ggdp	46.32	2.60	***	44.99	2.55	***	21.66	3.45	***	20.56	3.38	***
Opportunity cost of capital												
ciara							306.67	56.86	***	290.54	56.65	***
Year dummies χ^2	11146		***	11239		***	22878		***	22401		***
R^2-overall	7.69			7.58			NA			NA		

***, ** and * denote significance at the 1, 5 and 10 per cent levels. Inference is based on robust standard errors. All figures are in percentage. The estimates in [6] and [7] are obtained including as instruments all variables that are not time invariant, with the exclusion of economic cycle variables and of our proxy variables for funding risk and earning risk.

Table 5. Linear static and dynamic panel-data models (other estimators)

Panel A
Static models

	FE-OLS		P-OLS		RE-GLS	
	(a)	**(b)**	**(a)**	**(b)**	**(a)**	**(b)**
Earning risk						
sd(*roa*)		14.14 **		58.92 ***		38.61 ***
skew(*roa*)		-0.19 ***		-0.07 **		-0.14 ***
Funding risk						
cor(*cfoa,coa*)	-1.29 ***	-1.55 ***	-1.68 ***	-1.44 ***	-1.31 ***	-1.63 ***
cor(*cfoa,coa*^{2})	-0.90 ***	-1.02 ***	-1.83 ***	-0.97 **	-1.00 ***	-0.88 ***

Panel B
Dynamic models
(Instruments include earning risk variables and funding risk variables)

	SYS-GMM (two lags)		SYS-GMM (one lag)		DIFF-GMM (one lag)	
	(a)	**(b)**	**(a)**	**(b)**	**(a)**	**(b)**
Earning risk						
sd(*roa*)		-5.99		-4.57		-7.97 ***
skew(*roa*)		-0.17 ***		-0.16 ***		-0.12 ***
Funding risk						
cor(*cfoa,coa*)	-0.04	-0.48	-0.10	-0.47	0.15	-0.43 **
cor(*cfoa,coa*^{2})	0.39	-0.39	0.30	-0.29	-0.01	-0.30 *

Panel C
Dynamic models
(Instruments exclude earning risk variables and funding risk variables)

	SYS-GMM (two lags)		SYS-GMM (one lag)		DIFF-GMM (one lag)	
	(a)	**(b)**	**(a)**	**(b)**	**(a)**	**(b)**
Earning risk						
sd(*roa*)		-24.06 ***		-20.11 ***		-7.87 ***
skew(*roa*)		-0.22 ***		-0.19 ***		-0.12 ***
Funding risk						
cor(*cfoa,coa*)	0.11	-0.73 **	0.05	-0.52	0.29	-0.20
cor(*cfoa,coa*^{2})	0.42	-0.67 **	0.34	-0.46	-0.03	-0.31 *

***, ** and * denote significance at the 1, 5 and 10 per cent levels. Inference is based on robust standard errors. Colums (a) report results for models that do not include the earning risk variables whereas columns (b) report results for models that include them. Regressors include an intercept and all the control variables. All figures are in percentage. Panel A and Panel B differ in the set of instruments used in estimating the dynamic models.

Table 6a. Cross-sectional variation in cash-holding attitudinal precautionary motives

Panel A -High vs. low profitability						
	High *roa* (a)		Low *roa* (b)		Δ (a – b)	
sd(roa)	22.37	**	6.51		15.85	
skew(roa)	-0.2108	***	-0.1424	***	-0.0684	*
Panel B -High vs. low efficiency						
	High s*oa* (a)		Low s*oa* (b)		Δ (a – b)	
sd(roa)	4.28		22.87	***	-18.59	
skew(roa)	-0.2477	***	-0.1370	***	-0.1107	***
Panel C – Concentrated vs. dispersed ownership						
	Concentrated (a)		Dispersed (b)		Δ (a – b)	
sd(roa)	13.31	*	14.90		-1.60	
skew(roa)	-0.22	***	-0.12	***	-0.10	**
Panel D – High vs. low growth						
	High *coa* (a)		Low *coa* (b)		Δ (a – b)	
sd(roa)	26.09	***	7.97		18.13	
skew(roa)	-0.13	***	-0.24	***	0.12	***
Panel E – High vs.low intangibles						
	High *ioa* (a)		Low *ioa* (b)		Δ (a – b)	
sd(roa)	21.77	***	4.76		17.02	
skew(roa)	-0.15	***	-0.24	***	0.09	**
Panel F – High vs. low bank debt						
	High *bol* (a)		Low *bol* (b)		Δ (a – b)	
sd(roa)	7.27	*	16.30		-9.03	
skew(roa)	-0.1211	***	-0.2487	***	0.1277	***
Panel G – High vs. low long term debt						
	High *ltdol* (a)		Low ltdol (b)		Δ (a – b)	
sd(roa)	18.77	**	9.87		8.90	
skew(roa)	-0.1252	***	-0.2369	***	0.1117	***
Panel H – High vs. low liquidity						
	High *doa* (a)		Low *doa* (b)		Δ (a – b)	
sd(roa)	24.05		6.47		17.58	
skew(roa)	-0.15		-0.23		0.08	**
Panel I – Bank-oriented vs. market-oriented						
	Bank-oriented (a)		Mkt-oriented (b)		Δ (a – b)	
sd(roa)	2.31		39.92	**	-37.62	**
skew(roa)	-0.06	**	0.03		-0.09	
Panel L – Small vs. big firms						
	Small (a)		Big (b)		Δ (a – b)	
sd(roa)	16.50		12.75	*	3.75	
skew(roa)	-0.19	***	-0.19	***	-0.01	
Panel M – High vs. low corporate taxation						

	High c*tax* (a)		Low c*tax* (b)		Δ (a – b)	
sd(roa)	22.10	***	30.34	***	-8.24	
skew(roa)	0.02		-0.23	***	0.24	***
Panel N – High vs. low personal taxation						
	High *ptax* (a)		Low *ptax* (b)		Δ (a – b)	
sd(roa)	15.78	**	29.90	*	-14.12	
skew(roa)	-0.19	***	-0.01		-0.18	
Panel O – Anticyclical vs. procyclical						
	Anti (a)		Pro (b)		Δ (a – b)	
sd(roa)	39.61	***	0.31		39.30	**
skew(roa)	0.00		-0.18	***	0.18	***

***, ** and * denote significance at the 1, 5 and 10 per cent levels. Inference is based on robust standard errors. This table reports the fixed effect model coefficients of the earning risk variables computed over subsamples. Regressors include an intercept and all the control variables. All figures are in percentage.

Table 6b. Cross-sectional variation in cash-holding hedging motives

Panel A -High vs. low profitability						
	High *roa* (a)		Low *roa* (b)		Δ (a – b)	
cor(cfoa,coa)	-2.14	***	-0.85	*	-1.29	**
cor(cfoa,coa²)	-1.44	***	-0.67	*	-0.77	
Panel B -High vs. low efficiency						
	High s*oa* (a)		Low s*oa* (b)		Δ (a – b)	
cor(cfoa,coa)	-2.23	***	-0.68		-1.55	**
cor(cfoa,coa²)	-1.63	***	-0.83	**	-0.80	
Panel C – Concentrated vs. dispersed ownership						
	Concentrated (a)		Dispersed (b)		Δ (a – b)	
cor(cfoa,coa)	-1.74	***	-0.96		-0.78	
cor(cfoa,coa²)	-1.23	***	-0.30		-0.93	
Panel D – High vs. low growth						
	High coa (a)		Low coa (b)		Δ (a – b)	
cor(cfoa,coa)	-1.10	***	-2.32	***	1.23	**
cor(cfoa,coa²)	-0.81	**	-1.66	***	0.86	*
Panel E – High vs.low intangibles						
	High *ioa* (a)		Low *ioa* (b)		Δ (a – b)	
cor(cfoa,coa)	-1.42	***	-1.62	***	0.20	
cor(cfoa,coa²)	-1.10	***	-0.93	**	-0.17	
Panel F – High vs. low bank debt						
	High *bol* (a)		Low *bol* (b)		Δ (a – b)	
cor(cfoa,coa)	-0.72	**	-1.99	***	1.27	**
cor(cfoa,coa²)	-0.64	**	-1.44	***	0.80	
Panel G – High vs. low long term debt						
	High *ltdol* (a)		Low ltdol (b)		Δ (a – b)	
cor(cfoa,coa)	-0.90	**	-1.99	***	1.09	*
cor(cfoa,coa²)	-0.94	***	-1.19	***	0.25	
Panel H – High vs. low liquidity						
	High *doa* (a)		Low *doa* (b)		Δ (a – b)	
cor(cfoa,coa)	-2.29		-1.10		-1.19	**
cor(cfoa,coa²)	-1.04		-1.42		0.38	
Panel I – Bank-oriented vs. market-oriented						
	Bank-oriented (a)		Mkt-oriented (b)		Δ (a – b)	
cor(cfoa,coa)	-0.63	**	-3.65	***	3.02	***
cor(cfoa,coa²)	-0.38		-0.61		0.23	
Panel L – Small vs. big firms						
	Small (a)		Big (b)		Δ (a – b)	
cor(cfoa,coa)	-1.28	***	-1.80	***	0.52	
cor(cfoa,coa²)	-0.98	**	-1.10	***	0.12	
Panel M – High vs. low corporate taxation						

	High c*tax* (a)		Low c*tax* (b)		Δ (a – b)	
cor(cfoa,coa)	-0.26		-2.02	***	1.76	**
cor(cfoa,coa²)	-0.13		-0.09		-0.04	
Panel N – High vs. low personal taxation						
	High *ptax* (a)		Low *ptax* (b)		Δ (a – b)	
cor(cfoa,coa)	-1.82	***	-0.63		-1.19	
cor(cfoa,coa²)	-1.24	***	0.28		-1.52	*
Panel O – Anticyclical vs. procyclical						
	Anti (a)		Pro (b)		Δ (a – b)	
cor(cfoa,coa)	-1.86	***	-1.45	***	-0.41	
cor(cfoa,coa²)	-0.66		-0.96	***	0.30	

***, ** and * denote significance at the 1, 5 and 10 per cent levels. Inference is based on robust standard errors. This table reports the fixed effect model coefficients of the funding risk variables computed over subsamples. Regressors include an intercept and all the control variables All figures are in percentage.

Figure 1. Time series of cash holdings

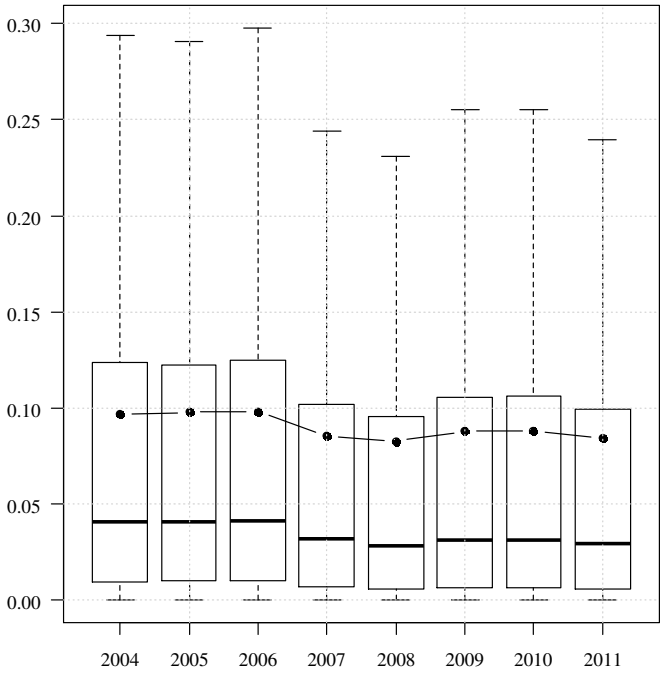
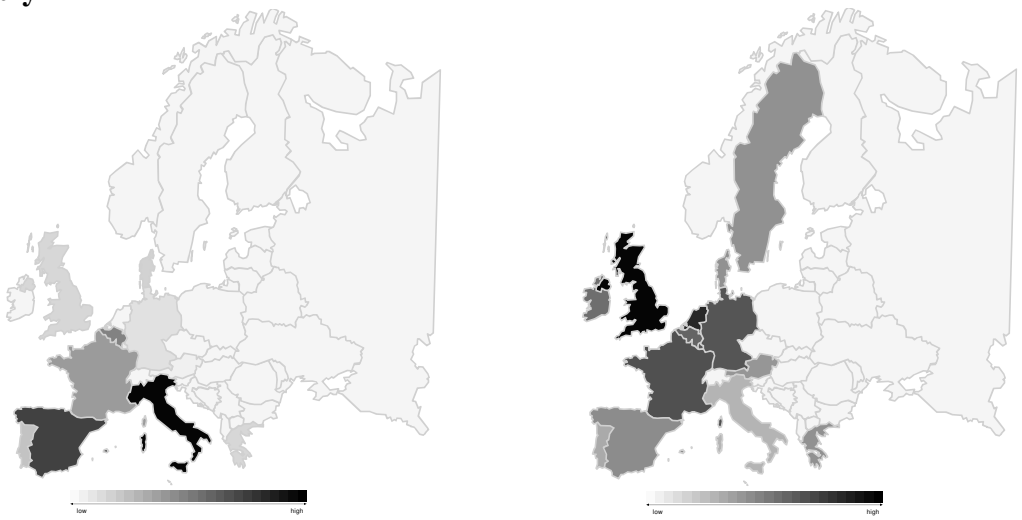


Figure 2. Spatial distribution of number of firms (left) and cash holdings (right) by country



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