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Organization capital and corporate cash holdings☆

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ABSTRACT

This paper investigates the relationship between organization capital and corporate cash holdings. We develop two competing hypotheses in relating organization capital with cash holding. Our analysis reveals that organization capital is related to high levels of cash holdings. Moreover, we find that the effect of organization capital on corporate cash holdings is stronger for firms experiencing high levels of financing constraint and cash flow risk. Our results remain robust to alternative measures of organization capital and corporate cash holdings, and are not driven by omitted variable bias or endogeneity issues. We also find that the positive relation between organization capital and cash holdings is not confounded by sample period or industry group. Overall, we provide robust evidence that supports the precautionary motive for corporate cash holding.

1. Introduction

Organization capital: an agglomeration of business practices, processes, designs, and culture that enables firms to combine both human skills and physical capital consistently and efficiently into systems for efficient production; has received considerable attention in contemporary finance literature. Examples of organization capital include Apple's corporate culture and product development systems, Walmart's supply chain management systems and Toyota's people-oriented corporate culture and knowledge-sharing systems. Recent studies show that organization capital captures the largest portion of intangible assets in the U.S., and provides firms with a sustainable competitive advantage, which, in turn, leads to superior performance (Corrado, Hulten, & Sichel, 2009; Eisfeldt & Papanikolaou, 2013; Hasan & Cheung, 2018; Li, Qiu, & Shen, 2018). For example, Lev et al. (2009, p. 277) note that, "organization capital enables superior operating, investment and innovation performance". Despite this insightful evidence, the extent to which organization capital influences the liquid asset allocation (i.e., cash holdings) of firms remains unexplored. In this paper we fill this gap in the literature.

Our study is motivated by recent evidence that cash holdings of U.S. firms have increased remarkably in recent years. Sánchez and Yurdagul (2013) find that U.S. firms during 2011 were holding 11 times as much cash as they were holding in 1979, and cash and liquid investments of U.S. non-financial companies' reached $1.9 trillion at the end of 2017.[1] Given these record-high cash holdings by U.S. firms, previous research investigates determinants of cash holdings based largely on the agency and the precautionary theories (e.g. Dittmar, Mahrt-Smith, & Servaes, 2003; Opler, Pinkowitz, Stulz, & Williamson, 1999). We relate cash holdings to organization capital, an increasingly important factor of production and an important part of global capital stocks (Eisfeldt & Papanikolaou, 2014; Peters & Taylor, 2017). Corrado et al. (2009) find that organization capital is the largest portion of business intangible capital, corresponding to about 30% of all intangible assets. Despite the rising importance of organization capital in improving firm performance, the role of organization capital in liquid asset holdings remains largely unexplored. Therefore, in this study, we ask the following research questions: Do firms with more organization capital hold more or less cash, and what are the mechanisms through which organization capital affects the cash holdings of the firm?

We develop two competing hypotheses in relation to organization capital and cash holdings. Based on the precautionary motives of cash holdings, we predict a positive relation between organization capital and corporate cash holdings. The precautionary motive for corporate cash holdings indicates that firms with more organization capital tend to accumulate more cash to avoid costly external financing, either to cope with potential underinvestment or to maintain sufficient liquidity. Eisfeldt and Papanikolaou (2013) show that shareholders of firms with

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[1] https://www.moodys.com/researchdocumentcontentpage.aspx?docid=PBC_1100976.

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high organization capital are exposed to both idiosyncratic and aggregate shocks, leading to an increase in the cost of equity financing. Moreover, organization capital cannot be verified or liquidated easily, and it is potentially movable across firms along with key talent. These characteristics make organization capital difficult to pledge as collateral in order to raise debt financing. Furthermore, the more firms invest in organization capital, the less capital is available for investing in physical assets. Studies also indicate that firms with high organization capital are subject to loss of key talent and key business secrets, implying an increase in adverse cash flow shocks stemming from such losses (He, 2018). This would imply that organization capital increases the volatility of firms' future cash flows, which would require these firms to hold more cash, to maintain future financial stability and a competitive position in the labour market. Finally, high-level of growth opportunities for firms investing in organization capital may prompt them to hold more cash to avoid foregoing profitable investment opportunities. Thus, the aforementioned arguments all indicate that firms with more organization capital will hold more cash.

We also have reasons to argue that firms with more organization capital hold less cash. Our argument is premised on the previous literature that shows that organization capital enables firms to achieve efficient production, stable business operations and transactions, and better firm performance (Lev et al., 2009; Lev & Radhakrishnan, 2005). This stable and better performance reduces the uncertainty of future cash flows and mitigates incentives for hoarding high levels of cash in firms with high levels of organization capital. Furthermore, this increased organizational performance and future profitability may also mitigate the high costs of borrowing and alleviate capital market imperfections (Attig & Cleary, 2014). The reduction in financial friction that results from increased organizational performance and profitability reduces the sensitivity of investment to internal cash flows. This allows firms to access bank loans easily, implying that firms would require to hold less cash.

Following prior literature (e.g., Eisfeldt & Papanikolaou, 2013, 2014; Peters & Taylor, 2017), we measure organization capital as the accumulation of a fraction of past selling, general and administrative (SG&A) expenditure, using the perpetual inventory method. Using a large sample of U.S. listed firms from 1981 to 2017, we find that firms with high levels of organization capital hold significantly more cash compared to firms with less organization capital. In terms of economic significance, we find that a one standard deviation increase in organization capital increases firms' cash holdings by 2.58%–21.13% relative to the mean, which may be interpreted as an increase in cash holdings by $5.49 million–$44.93 million, depending on the measure of organization capital. We also shed light on the potential explanations for such high cash holdings. Our analyses reveal that the positive relation between organization capital and cash holdings is more pronounced for firms with more financing constraints. We also find robust (weak) evidence that firms with more organization capital hoard high levels cash reserves when they have risker cash flow (more growth opportunities). Overall, we find evidence to support the precautionary motive for cash holdings in firms with higher organization capital.

The results from our analyses remain robust when alternative measures of cash holdings and organization capital are used. We also provide evidence that the relation between organization capital and cash holdings is not confined to any particular time period or to high-tech firms. Finally, we provide evidence that our results are not affected by model misspecification, omitted variables, and potential endogeneity concerns.

We contribute to the literature in two ways. First, we add to the emerging literature on the impact of organization capital on firms' financial policies. Building on the notion that organization capital is embodied in key talent, and shareholders have residual claim to the cash flow generated from organization capital only, Eisfeldt and Papanikolaou (2013) reveal that shareholders require a premium for assuming this additional risk and firms with more organizational capital have higher average return than firms with less organizational capital. Using international data, Leung, Mazouz, Chen, and Wood (2018) also find similar evidence. In addition, previous literature also reveals that organization capital helps firms to reach and maintain the prime life cycle stages (Hasan & Cheung, 2018), to improve firm performance and stock return (Lev et al., 2009), and to enjoy superior deal performance (Li et al., 2018). However, the extent to which organization capital affects the liquidity policy of the firms remains unexplored. Our empirical results suggest that precautionary motive prompts high organization capital firms to hold more cash.

Second, we contribute to the cash holdings literature. Most existing studies on corporate cash holdings focus on either the precautionary motive (Bates, Kahle, & Stulz, 2009) or the agency motive (Harford, Mansi, & Maxwell, 2008) for holding cash. Consistent with those motives, recent studies show that corporate governance (proxied by board independence and separation of chief executive officer and chair positions), strength of labour union and stock liquidity reduce corporate cash holding (Boubaker, Derouiche, & Lasfer, 2015; Hu, Li, & Zeng, 2019; Tong & Huang, 2018), whereas geographical remoteness increases it (Boubaker, Derouiche, & Nguyen, 2015). Studies also show that the market reacts negatively to the cash held by politically connected firms in emerging markets, in countries with high levels of corruption (Kusnadi, 2019) and when the control–ownership wedge is high (Belkhir, Boubaker, & Derouiche, 2014). Our study deepens the understanding of cash holding decisions. We find robust and consistent evidence that firms with high levels of organization capital hold relatively more cash: a finding that is new to the cash holdings literature. We identify that financing constraints and cash flow volatility motivate managers to accumulate cash in firms with organization capital. Our study complements that of He (2018), who shows that competition for talent increases the cash holdings of the firm. He (2018) focuses on precautionary motives, and suggests that firms hold additional liquidity to protect their labour force from moving to competitors. Complementing that paper, we identify both financing constraints and cash flow volatility play important roles in affecting the cash holdings of firms with relatively more organization capital.

The remainder of the paper proceeds as follows. Section 2 discusses the relevant literature and develops hypotheses. Section 3 provides sample selection, variable construction and methodology. Section 4 presents empirical findings and robustness of the results, and Section 5 provides concluding remarks.

2. Literature review

2.1. Organization capital

Evenson and Westphal (1995, p. 2237) define organization capital as "…the knowledge used to combine human skills and physical capital into systems for producing and delivering want-satisfying products." Furthermore, Lev and Radhakrishnan (2005, p. 75) relates organization capital to firms' operating, investment and innovation capabilities, and define this as "an agglomeration of technologies, business practices, processes and designs, and incentive and compensation systems that, together, enable some firms to consistently and efficiently extract from a given level of physical and human resources, a high value of product." In a recent study Eisfeldt and Papanikolaou (2013) contend that efficiency stemming from organization capital is firm-specific, is embodied within the firms' key talent and, therefore, both shareholders and key talent have a claim on its cash flows.

The impact of organization capital on firm value, performance and corporate policies has recently received attention in the finance literature. Studies document that organization capital enhances productivity (Atkenson & Kehoe, 2005; Lev et al., 2009), leads to better firm performance and deal performance in mergers and acquisitions (Lev et al., 2009; Li et al., 2018), progressively moves firm across the life cycle stages (Hasan & Cheung, 2018), increases the cross-section of

expected returns (Eisfeldt & Papanikolaou, 2013; Leung et al., 2018), and reduces investment-cash flow sensitivity (Attig & Cleary, 2014).

Though the literature provides common findings that organization capital improves firm performance and outcomes, a recent study also suggests that organization capital increases shareholder risk (Eisfeldt & Papanikolaou, 2013). This is because the efficiency gained from organization capital is embodied within the key talent of the firm. Therefore, key talent claims the cash flows accruing from organization capital and the value of these cash flows depends on their outside option. Developing this notion, Eisfeldt and Papanikolaou (2013) find that shareholders require additional return for such cash flow risk. Furthermore, Leung et al. (2018) find that the influence of organization capital on the cost of equity is more prominent when labour market flexibility allows key talent to relocate between firms, taking their knowledge with them. Moreover, like other intangible assets, organization capital has low re-deployability, high information asymmetry, and greater uncertainty of liquidation value (Holthausen & Watts, 2001; Myers, 1977). Therefore, organization capital weakens firm's ability of raising debt financing as well. In this paper, we examine whether organization capital affects the liquid asset holdings of the firm.

2.2. Corporate cash holdings

Cash holdings of U.S. firms have increased remarkably in recent years (Amess, Banerji, & Lampousis, 2015; Duchin, 2010). Bates et al. (2009) find that during the period of 1980 to 2006, the average cash ratio increased by 0.46% per year, reaching a point where the cash ratio in 2006 was more than double the cash ratio in 1980. Gao, Harford, and Li (2013) find that from 2011 pubic firms held on average 20.45% of their assets in cash. Moody's Investor Service documents that U.S. non-financial companies' cash and liquid investments rose to $1.9 trillion by the end of 2017.

Extant literature advanced several theories to explain the determinants of cash holdings. For example, the agency motive of cash holdings postulates that managers have incentives to hold excess cash to pursue their own interests (e.g., empire building, consumption of perks) at the expense of shareholders (Hope & Thomas, 2008; Jensen, 1986; Richardson, 2006). Harford (1999) shows that firms with larger cash holdings engage in more acquisitions, and that these acquisitions are value decreasing. Dittmar et al. (2003) show that firms with low shareholder rights have high levels of cash holdings due to the inability of their shareholders to force management to disgorge excessive cash. Nonetheless, firms with more agency problems may also find it difficult to raise external funds and this may prompt them to hold more cash.

The precautionary motive of cash holdings proposes that firms hold more cash to avoid forgoing profitable investment opportunities when they are subject to a shortfall of internal cash flow or when access to external financing is difficult and costly (Bates et al., 2009; Opler et al., 1999). This motive indicates that financial constraints and cash flow volatility of the firm affect corporate cash holdings. Han and Qiu (2007) find support for this argument, showing that constrained firms exhibit precautionary cash savings from a response to increases in cash flow volatility.[2] Duchin (2010) finds that multidivisional firms hold significantly less cash, as their investment opportunities and cash flows are more diverse. Cheung (2016) finds that corporate social responsibility has a positive influence on a firms' cash holdings, as these firms have a shorter debt maturity structure and a higher refinancing risk.

In a recent study, Phan, Simpson, and Nguyen (2017) find that tournament-based incentives increase corporate cash holdings, owing to the pursuit of riskier corporate policies by managers: practices that increase cash flow risk. Other determinants of cash holdings include ownership (Chen, Ghoul, Guedhami, & Nash, 2018), corporate diversification (Subramaniam, Tang, Yue, & Zhou, 2011), CEO risk-taking incentives (Liu & Mauer, 2011), refinancing risk (Harford, Klasa, & Maxwell, 2014) and R&D investment (He & Wintoki, 2016).

2.3. Hypothesis development

Building on the precautionary motive of cash holdings, we offer three arguments to establish a positive relation between organization capital and cash holdings.

First, the precautionary motive of cash holdings suggests that firms tend to hold more cash when access to external financing is difficult and costly (Almeida, Campello, & Weisbach, 2004; Chen, Chen, Schipper, Xu, & Xue, 2012; Denis & Sibilkov, 2010; Han & Qiu, 2007). This is because cash holdings give financially constrained firms the ability to invest in future projects, which might otherwise be inaccessible. Since organization capital increases the riskiness of the firm from the shareholders' perspective, shareholders warrant a higher discount rate for bearing this additional risk (Eisfeldt & Papanikolaou, 2013; Leung et al., 2018). Furthermore, given that intangible assets are rarely accepted as collateral, investment in organization capital shrinks firms' debt capacity, and increases the costs of debt financing. Thus, the higher discount rate that shareholders and debt holders require may reach a point where the firm finds it unfavourable to raise funds externally, and more beneficial to hold additional cash.

Second, the precautionary motive for cash holdings also suggests that firms hold cash to cope with adverse shocks to their cash flows (Bates et al., 2009). Opler et al. (1999) also find support for the contention that firms with riskier cash flows hold more cash to take advantage of profitable investment opportunities. Extant studies suggest that organization capital is embodied in the firm's key talent, who may have better outside options (Eisfeldt & Papanikolaou, 2013). Therefore, firms with high levels of organization capital are exposed not only to the loss of key personnel but also to the threat of losing invaluable information to rival firms. Given that organization capital is an important resource-base, and a valuable factor of production, loss of key talents and business secrecy may expose the firms to adverse financial shocks, which further increase cash flow risk. Holding sufficient cash helps firms to take prompt initiative in making better counter-offers and increasing human capital investment (He, 2018). Furthermore, large cash reserves help firms to utilize cash as a liquidity buffer against the adverse shocks to their cash flows. Thus, we predict that firms will hold more cash to combat cash flow shocks from potential key talent departure.

Finally, as noted by Opler et al. (1999), firms with profitable investment opportunities bear a larger marginal cost for being short of liquid assets, which prompts them to hold more cash. Lev and Radhakrishnan (2005) portray organization capital as a source of persistent value creation and growth. Investment in organization capital improves post-merger operating and stock return performance (Li et al., 2017), enhances growth and productivity (Eisfeldt & Papanikolaou, 2013) and promotes future operating and stock return performance (Lev et al., 2009), implying that the cost of being short of liquid assets is higher for firms with high levels of organization capital. Therefore, we predict firms with more organization capital will hold more cash.

Based on the above arguments, we develop the following hypothesis:

H1a. : Firms with high levels of organization capital hold more cash.

In contrast to the above arguments, we have reasons to argue that firms with high levels of organization capital hold less cash. Our argument is based on the precautionary motive for cash holdings that suggests that firms are likely to hold more cash when other avenues of financing are not easily accessible and cash flows are more volatile (Opler et al., 1999). Literature suggests that organization capital

[2] Some other arguments for cash holdings include: information asymmetries (Myers & Majluf, 1984), financing hierarchy (Myers & Majluf, 1984), tax motive (Foley, Hartzell, Titman, & Twite, 2007) and transaction costs (Keynes, 1936; Opler et al., 1999).

alleviates financial constraints, in that it decreases a firms' sensitivity to internal cash flows (Attig & Cleary, 2014). Furthermore, Lev et al. (2009) document that investment into organization capital increases firm productivity and profitability. This would imply that organization capital would help firms smooth their future cash flows and reduce cash flow uncertainty. Thus, reduced financing constraints would result in lower cash holdings for firms with high levels of organization capital. Therefore, we develop the following alternative hypothesis:

H1b. : Firms with high levels of organization capital hold less cash.

3. Research method

3.1. Sample selection and industry distribution

We collect data for this study from the Compustat annual files for the period 1981–2017. This gives an initial sample of 433,093 firm-year observations. We exclude 37,507 firm-year observations in the process of dropping duplicates. We also exclude financial (Standard Industrial Classification (SIC) codes 6000-6999) and utilities firms (SIC codes 4900-4999), reducing our sample size by 117,372 firm-year observations. Following Peters and Taylor (2017), we exclude firms with less than $5 million in physical capital (70,976 firm-year observations) to reduce the bias resulting from smaller firms.[3] Finally, we exclude observations with missing variables for the baseline regression model, giving a final sample of 143,052 firm-year observations pertaining to 15,795 unique firms. Note that the number of observations in the regression models varies depending on the model-specific data requirements. The sample selection procedure is presented in Panel A, Table 1.

Panel B, Table 1 reports the distribution of sample across the Fama-French twelve industry groups. We find that computers, software, and electronic equipment represent the largest share of our sample (19.22%), whereas chemicals, and allied products represent the smallest percentage (2.89%).

Table 1
Sample selection and industry distribution.
Panel A reports the sample selection procedure and Panel B reports the distribution of the sample by the Fama-French 12 industry groups.

Panel A. Sample selection procedure

Explanation	Observations
Initial sample from 1981 to 2017	433,093
Less: duplicates of GVKEY and FYEAR	(37,507)
Less: utility Industries [SIC 4900-4999]	(15,540)
Less: financial institutions [SIC 6000-6999]	(101,832)
Less: firms with property, plant & equipment < $5 m	(70,976)
Less: missing variables for the baseline regression model	(64,186)
Final sample	143,052

Panel B. Industry distribution

Industry	Observations	% distribution
Consumer non-durables	10,555	7.38%
Consumer durables	4326	3.02%
Manufacturing	21,412	14.97%
Oil, gas, and coal extraction and products	11,887	8.31%
Chemicals and allied products	4128	2.89%
Computers, software, and electronic equipment	27,488	19.22%
Telephone and television transmission	5592	3.91%
Wholesale, retail, and some services	17,822	12.46%
Healthcare, medical equipment, and drugs	13,551	9.47%
Other	26,291	18.38%
Total	143,052	100%

3.2. Variable measurement

3.2.1. Dependent variable: cash holdings

Following prior literature (Almeida et al., 2004; Bates et al., 2009; Cheung, 2016; Han & Qiu, 2007; Subramaniam et al., 2011), we use the ratio of cash and marketable securities to total assets (CASH/TA) as our primary measure of cash holdings. We also use two alternative measures of cash holdings in the robustness section of the paper. In particular, following prior studies (Dittmar et al., 2003; He, 2018; Opler et al., 1999), we use the ratio of cash and marketable securities to net assets (CASH/NA) and the natural log of one plus the ratio of cash and marketable securities to net assets (LN (CASH/NA)), as it is argued that a firm's ability to generate future profits is a function of its assets in place.

3.2.2. Independent variable: organization capital

Following Peters and Taylor (2017), we measure organization capital as the accumulation of a fraction of past SG&A expenditure using the perpetual inventory method as follows:

$$OC_{i,t} = (1 - \delta_0)OC_{i,t-1} + (SG\&A_{i,t} \times \theta_0) \quad (1)$$

where $OC_{i,\ t}$ denotes firm-specific organization capital at time t, δ_0 denotes the depreciation rate of organization capital, SG & $A_{i,\ t}$ represents the firms' SG&A expenses at time t, and θ_0 represents the percentage of SG&A expenditure which is invested into organization capital. The theory behind this is that a portion of SG&A expenditure is invested into organization capital through employee training, advertising or payments to strategy consultants. Eisfeldt and Papanikolaou (2013) put forth the notion that a large portion of SG&A expenditure is invested into labour and IT, implying that any value gained from these expenses is firm-specific and must be shared with key talent. Peters and Taylor (2017) also argue that employee training to strengthen human capital, and advertising to build brand capital, is a general or administrative expense contained within SG&A.

We calculate our initial stock of organization capital as follows:

$$OC_{i,t_0} = \frac{(SG\&A_{i,t_0} \times \theta_0)}{g + \delta_0} \quad (2)$$

where g represents the growth in the flow of organization capital, estimated as the average growth of firm-level SG&A expenditure. Following prior literature (Eisfeldt & Papanikolaou, 2013; Hulten & Hao, 2008; Peters & Taylor, 2017), we include only 30% of SG&A as investment into organization capital. We also follow Peters and Taylor (2017) in including a depreciation rate for SG&A of 20%.[4] We then scale organization capital by the lagged real value (in 2016 dollars) of total assets. We also use alternative scaling of organization capital to test the robustness of our results. Specifically, we use the ratio of organization capital to the lagged real value of total capital (measured as total intangible and physical capital) and the ratio of organization capital to the lagged real value of physical capital (PPEGT).

In the sensitivity analysis, we also use the organization capital measure of Eisfeldt and Papanikolaou (2013). This measure has been used in prior studies (Hasan & Cheung, 2018; Li et al., 2018). Eisfeldt and Papanikolaou's (2013) construction of organization capital is similar to Peters and Taylor's (2017) method, in regard to the incorporation of the perpetual inventory method, though their specification involves cumulating the deflated value of SG&A expenses, rather than a fraction of past SG&A expenses. Their method is as follows:

$$OC_{i,t} = (1 - \delta_{OC})OC_{i,t-1} + \frac{SG\&A_{i,t}}{cpi_t} \quad (3)$$

[3] Our results remain qualitatively similar if we include firms with less than $5 million in physical capital.

[4] Peters and Taylor (2017) also show that varying percentages of SG&A expenditure and depreciation rates still provide consistent results.

where cpi_t represents the consumer price index, and other variables are explained earlier. Organization capital is then separately scaled by total assets and physical capital.

3.2.3. Control variables

We use a standard set of control variables that literature suggests to affect corporate cash holdings (e.g., Bates et al., 2009; Harford et al., 2014; Opler et al., 1999). These variables include firm size, market-to-book, leverage, research and development expenditure, capital expenditure, net working capital, dividends, cash flows and cash flow volatility. We also include dummies to control for year effects. Our firm fixed effect regression model also controls for unobserved firm-level time invariant heterogeneity. Since firm size affects information asymmetry and firms' access to the external capital market in the regression, we control for firm size (SIZE). We expect market-to-book (LN(MB)) and research and development (R&D) to be related with cash positively, as it is costlier for high growth firms to be financially constrained (Opler et al., 1999). We expect leverage (LEVERAGE) and net working capital (NWC) to be related with cash negatively, since firms can use them as a substitute for holding cash (Ozkan & Ozkan, 2004). Capital expenditure (CAPEX) is expected to be related with cash negatively, as capital expenditure results in fewer current resources (Opler et al., 1999). Dividends are expected to be related with cash negatively, as dividend paying firms can raise funds at a low cost by cutting dividends (Opler et al., 1999). Cash flow (CFO) is expected be related with cash negatively, as firms with positive cash flows would be able to accumulate more cash easily, while cash flow volatility (CFO_VOL) increases the precautionary motive for holding cash (Almeida et al., 2004; Minton & Schrand, 1999). All continuous variables, except LN(MB), are winsorized at the 1st and 99th percentile.[5] Definitions of variables are presented in the Appendix.

3.3. Research model

We use a firm fixed effect (FFE) regression model to investigate the relationship between organization capital and corporate cash holdings. A firm fixed effect regression approach allows one to control for unobserved time invariant firm characteristics. Our firm fixed effect regression model is as follows:

$$\begin{aligned} CASH_{i,t} = {} & \alpha_0 + \beta_1 OC_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 LN(MB)_{i,t} + \beta_4 LEVERAGE_{i,t} \\ & + \beta_5 R\&D_{i,t} + \beta_6 CAPEX_{i,t} + \beta_7 NWC_{i,t} + \beta_8 DIVIDEND_{i,t} \\ & + \beta_9 CFO_{i,t} + \beta_{10} CFO\_VOL_{i,t} + \alpha_1 FYEAR + \alpha_2 + \epsilon_{i,t} \end{aligned} \quad (4)$$

where the dependent variable is the cash holding (see Section 3.2.1), and the main independent variable is organization capital (see Section 3.2.2). The regression model includes several controls that prior studies suggest to affect cash holdings (see Bates et al., 2009; Dittmar et al., 2003; Opler et al., 1999). The subscripts i and t indicate firm and year. We also control for year fixed effect ($\alpha_1 FYEAR$) and time-invariant unobserved firm characteristics (α_2).

4. Empirical results

4.1. Summary statistics

The descriptive statistics of the variables used in the study are presented in Panel A, Table 2. On average, our sample firm holds 16% of total assets in cash, which is consistent with the prior literature (Cheung, 2016; He, 2018). The mean (median) cash scaled by net assets for the sample firms is 0.22 (0.09). Moreover, the mean (median) value of organization capital scaled by the lagged real value of total assets is 0.20 (0.14) with a standard deviation of 0.21. We also find that mean (median) organization capital estimated using Eisfeldt and Papanikolaou (2013) is 1.67 (1.22), which is consistent with prior studies (Hasan & Cheung, 2018; Li et al., 2018). The average firm in our sample is a moderately large (SIZE = 5.34) growth firm (LN (MB) = 1.09), has a moderate level of leverage (LEVERAGE = 0.23), invests a small portion of its total assets in capital expenditure (CAPEX = 0.07) and research and development (R&D = 0.04), holds a small portion of its total assets in working capital (NWC = 0.07) and has a moderate level of cash flow volatility (CFO_VOL = 0.10).

4.2. Univariate test

The univariate test of difference in means of the variables between high and low organization capital firms is presented in Panel B, Table 2. We find that firms with high levels of organization capital hold significantly more cash. This result is consistent for all three variants of cash (CASH/AT, CASH/NA and LN (CASH/NA)) and supports our hypothesis H1a that organization capital is associated positively with corporate cash holdings. Consistent with Eisfeldt and Papanikolaou (2013), we find that high organization capital firms are smaller in size, have higher growth opportunities, and spend more on R&D. In addition, we find that firms with relatively high levels of organization capital maintain more net working capital, and are subject to more cash flow volatility.

4.3. Correlation matrix

Correlations between the variables used in the main regression are presented in Table 3. We find that CASH/TA is correlated positively and significantly with OC/TA ($\rho = 0.07$, $p < 0.01$), OC/TC ($\rho = 0.13$, $p < 0.01$) and OC/PPE ($\rho = 0.21$, $p < 0.01$). We also find that the correlations between CASH/NA and organization capital measures are positive and significant ($p < 0.01$). With respect to the control variables, we find that cash is correlated negatively with leverage ($\rho = -0.40$, $p < 0.01$), capital expenditure ($\rho = -0.14$, $p < 0.01$), net working capital ($\rho = -0.20$, $p < 0.01$) and dividends ($\rho = -0.21$, $p < 0.01$). On the other hand, cash is correlated positively with SIZE ($\rho = 0.05$, $p < 0.01$), market-to-book ($\rho = 0.23$, $p < 0.01$), R&D ($\rho = 0.52$, $p < 0.01$) and volatility of cash flows ($\rho = 0.27$, $p < 0.01$). These correlations are in line with expectation, and consistent with the literature (Bates et al., 2009; Opler et al., 1999).

4.4. Baseline regression result

Table 4 reports the firm fixed effect regression results that examine the relationship between organization capital and cash holding. In columns (1) to (3), our main independent variable is organization capital and our main dependent variable is cash holdings. The regression model includes control variables that prior studies have shown to affect cash holdings.

In Column (1), we use organization capital scaled by the lagged real value (in 2016 dollars) of total assets (OC/TA) as our main independent variable. The coefficient on OC/TA is positive (coefficient = 0.019) and statistically significant ($p < 0.01$). In terms of economic significance, this coefficient indicates that a one standard deviation increase in OC/TA leads to a 2.58% ((0.212 × 0.019)/0.156) increase in a firms' cash holdings relative to the mean. In dollar terms, this is interpreted as an increase in cash holdings by $5.49 m.[6] This finding supports our hypothesis H1a and suggests that organization capital increases cash holdings.[7]

In Columns (2) and (3), we scale organization capital by the lagged

[5] Because of many extreme observations despite the use of natural log of market-to-book ratio (LN(MB)), we winsorize LN(MB) at 2% level. Findings from our analysis remain qualitatively similar if we winsorize LN(MB) at 1% level or if all continuous variables are winsorized at 2% level (untabulated).

[6] Mean cash holdings of our sample is $212.64 million.

[7] Inference from our analysis remains qualitatively similar after including Text-based Network Industry Classification (TNIC) developed by Hoberg and Phillips (2016) in the regressions.

Table 2
Summary statistics.

Panel A presents the descriptive statistics of the variables used in the regression models. Panel B presents the univariate test of difference of variables used in main regression analysis. ***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively. Variable definitions are provided in the Appendix.

Panel A. Descriptive statistics

Variables	Mean	p1	p25	Med	p75	p99	Std. dev
Dependent variable							
CASH/TA	0.156	0.000	0.023	0.081	0.219	0.827	0.187
CASH/NA	0.221	0.000	0.024	0.089	0.280	1.000	0.295
LN(CASH/NA)	0.176	0.000	0.023	0.085	0.247	0.693	0.209
Main independent variables							
OC/TA	0.200	0.000	0.056	0.139	0.268	1.151	0.212
OC/TC	0.183	0.000	0.060	0.151	0.266	0.685	0.154
OC/PPE	0.641	0.000	0.080	0.307	0.802	5.191	0.913
OC/TA_EP	1.669	0.048	0.574	1.217	2.146	10.098	1.679
OC/PPE_EP	5.168	0.046	0.939	2.907	6.572	39.231	6.679
Control variables							
SIZE	5.337	0.272	3.714	5.246	6.865	10.963	2.268
LN(MB)	1.093	−0.028	0.707	1.012	1.400	2.214	0.571
LEVERAGE	0.231	0.000	0.046	0.202	0.354	0.944	0.205
R&D	0.036	0.000	0.000	0.000	0.036	0.444	0.076
CAPEX	0.072	0.001	0.024	0.047	0.09	0.417	0.076
NWC	0.073	−0.612	−0.035	0.059	0.195	0.532	0.193
DIVIDEND	0.373	0.000	0.000	0.000	1.000	1.000	0.484
CFO	−0.031	−1.105	−0.040	0.022	0.058	0.221	0.194
CFO_VOL	0.098	0.003	0.019	0.041	0.098	1.159	0.168
Variables used in cross-sectional analysis and sensitivity tests							
DELAYCON	−0.013	−0.190	−0.078	−0.020	0.045	0.230	0.091
EQUITY_DELAYCON	−0.018	−0.181	−0.079	−0.027	0.033	0.227	0.087
SA	−3.362	−4.637	−3.836	−3.323	−2.875	−1.741	0.694
KZ	−4.191	−91.959	−3.762	−0.434	1.029	7.389	13.168
WW	−0.183	−0.545	−0.334	−0.241	−0.144	1.972	0.334
HOSTILE	0.143	0.028	0.069	0.118	0.194	0.416	0.099
DELTA	0.096	0.000	0.007	0.021	0.062	1.826	0.253
VEGA	0.005	0.000	0.000	0.000	0.000	0.065	0.012
MGR_ABILITY	0.008	−0.221	−0.077	−0.023	0.057	0.476	0.136
SG&A	0.268	0.012	0.115	0.217	0.366	1.006	0.209
CCC_YR	0.198	−0.620	0.086	0.184	0.307	0.907	0.631
RE/TA	0.116	−3.782	0.046	0.242	0.432	0.852	0.827
#SEGMENTS	5.830	1.000	2.000	3.000	9.000	20.000	4.953
ACQUISITIONS	0.030	−0.002	0.000	0.000	0.026	0.346	0.065
INTANGIBLES	1.975	0.000	0.064	0.509	2.014	21.108	3.734

Panel B. Univariate test

Variables	OC/TA ≥ median	OC/TA < median	*t*-Value
CASH/TA	0.16	0.15	−15.92***
CASH/NA	0.24	0.21	−18.68***
LN(CASH/NA)	0.19	0.16	−21.84***
SIZE	5.09	5.58	40.87***
LN(MB)	1.15	1.04	−32.76***
LEVERAGE	0.20	0.26	50.61***
R&D	0.04	0.03	−29.07***
CAPEX	0.06	0.09	87.06***
NWC	0.11	0.03	−78.42***
DIVIDEND	0.35	0.39	14.51***
CFO	−0.03	−0.03	−6.80***
CFO_VOL	0.11	0.09	−22.54***

real value of total capital (OC/TC) and by the lagged real value of property, plant and equipment (OC/PPE), respectively. We continue to find the coefficient on organization capital to be positive and significant (coefficient on OC/TC = 0.214 and on OC/PPE = 0.013; both significant at $p < 0.01$). With respect to economic significance, coefficients in Columns (2) and (3) suggest that a one standard deviation increase in respective measures of organization capital leads to a 21.13% ($44.93 m) and 7.61% ($16.18 m) increase, respectively, in corporate cash holdings relative to the mean.

We note that the results for the control variables are generally consistent with the prior literature. For example, levels of cash holdings are relatively high for large (SIZE), growth (LN(MB)) and volatile firms (CFO_VOL), but lower for levered (LEVERAGE), capital intensive (CAPEX), dividend-paying firms (DIVIDEND) with high levels of net working capital (NWC) (Bates et al., 2009; Harford et al., 2014; Opler et al., 1999). We also note that, in contrast to expectation, the coefficient on research and development (R&D) is negative and significant. This may be because firms that invest heavily in research and development have fewer resources and are less able to accumulate cash (Opler et al., 1999).

Table 3
Correlation matrix.

This table presents the correlation matrix between the variables used in the main regression. Variables with superscript [a] and [b] indicate significance at the 1% and 5% level respectively. Variable definitions are provided in the Appendix.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
CASH/TA (1)	1													
CASH/NA (2)	0.98 [a]	1												
OC/TA (3)	0.07 [a]	0.07 [a]	1											
OC/TC (4)	0.13 [a]	0.14 [a]	0.76 [a]	1										
OC/PPE (5)	0.21 [a]	0.22 [a]	0.59 [a]	0.75 [a]	1									
SIZE (6)	0.05 [a]	0.05 [a]	−0.15 [a]	−0.08 [a]	−0.01 [a]	1								
LN(MB) (7)	0.23 [a]	0.23 [a]	0.07 [a]	0.10 [a]	0.12 [a]	0.41 [a]	1							
LEVERAGE (8)	−0.40 [a]	−0.40 [a]	−0.12 [a]	−0.18 [a]	−0.17 [a]	−0.11 [a]	−0.11 [a]	1						
R&D (9)	0.52 [a]	0.50 [a]	0.06 [a]	−0.04 [a]	0.12 [a]	−0.03 [a]	0.22 [a]	−0.22 [a]	1					
CAPEX (10)	−0.14 [a]	−0.14 [a]	−0.17 [a]	−0.24 [a]	−0.26 [a]	−0.02 [a]	0.04 [a]	0.05 [a]	−0.14 [a]	1				
NWC (11)	−0.20 [a]	−0.20 [a]	0.08 [a]	0.23 [a]	0.07 [a]	−0.04 [a]	−0.09 [a]	−0.21 [a]	−0.10 [a]	−0.17 [a]	1			
DIVIDEND (12)	−0.21 [a]	−0.21 [a]	−0.08 [a]	−0.11 [a]	−0.15 [a]	0.39 [a]	0.03 [a]	−0.01 [a]	−0.21 [a]	−0.03 [a]	0.14 [a]	1		
CFO (13)	−0.02 [a]	−0.02 [a]	−0.06 [a]	0.03 [a]	−0.05 [a]	0.29 [a]	0.06 [a]	−0.11 [a]	−0.39 [a]	0.01 [b]	0.34 [a]	0.22 [a]	1	
CFO_VOL (14)	0.27 [a]	0.26 [a]	0.17 [a]	0.09 [a]	0.16 [a]	−0.19 [a]	0.08 [a]	−0.05 [a]	0.27 [a]	0.01 [b]	−0.24 [a]	−0.28 [a]	−0.37 [a]	1

Table 4
Organization capital and cash holdings.

This table reports the firm-fixed effects regression estimates of the relationship between organization capital and cash holdings. The dependent variable CASH/TA is calculated as cash and marketable securities scaled by total assets. Standard errors are in parentheses and are clustered by firm. ***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively. Detailed definitions of the variables are provided in the Appendix.

Dep. Var. =	(1)	(2)	(3)
	CASH/TA	CASH/TA	CASH/TA
OC/TA	**0.019*** [0.01]**		
OC/TC		**0.214*** [0.01]**	
OC/PPE			**0.013*** [0.00]**
SIZE	0.009*** [0.00]	0.011*** [0.00]	0.008*** [0.00]
LN(MB)	0.011*** [0.00]	0.007*** [0.00]	0.011*** [0.00]
LEVERAGE	−0.212*** [0.01]	−0.200*** [0.00]	−0.210*** [0.01]
R&D	−0.098*** [0.02]	−0.062*** [0.02]	−0.080*** [0.02]
CAPEX	−0.190*** [0.01]	−0.204*** [0.01]	−0.190*** [0.01]
NWC	−0.197*** [0.01]	−0.204*** [0.01]	−0.197*** [0.01]
DIVIDEND	−0.002 [0.00]	−0.002 [0.00]	−0.002 [0.00]
CFO	0.016*** [0.00]	0.016*** [0.00]	0.018*** [0.00]
CFO_VOL	0.067*** [0.01]	0.055*** [0.01]	0.063*** [0.01]
Constant	0.204*** [0.00]	0.176*** [0.00]	0.201*** [0.00]
Observations	143,052	141,790	141,649
Number of unique firms	15,795	15,654	15,613
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Adj. R-squared	0.75	0.76	0.76

In summary, the regression results in Table 4 document that organization capital is related positively to cash holdings and this strongly supports our hypothesis H1a. This result, thus, supports our argument that precautionary motive may drive firms with high levels of organization capital to hold more cash.[8] In the following section, we examine the potential explanation for this documented relationship.

4.5. Potential explanations

In this sub-section, we use three proxies to examine whether precautionary motive explains higher cash holdings by firms with high-level of organization capital.

4.5.1. Financing constraints-based explanation

While developing our hypotheses, we argue that firms with organization capital will be subject to severe financial constraints and, as a consequence, these firms will hold more cash to avoid costly external financing. If this is the case, the positive relationship between organization capital and corporate cash holdings would be expected to be stronger for firms that are exposed to more severe financing constraints. To test the above argument empirically, we employ two text-based measures of financing constraints: 'delaycon' and 'equity_delaycon' (Hoberg & Maksimovic, 2015). Firms with higher values of 'delaycon' ('equitydelaycon') are more similar to firms known to be at risk of delaying their investments owing to issues with liquidity (and indicate plans to issue equity to address their liquidity challenges) (Hoberg & Maksimovic, 2015). We also use three traditional measures of financing constraints: the SA index (Hadlock & Pierce, 2010), the KZ index (Kaplan & Zingales, 1997) and the WW index (Whited & Wu, 2006). We split the sample based on the median value of financing constraints measures, and re-estimate Eq. (4). Panel A of Table 5 reports the results from this analysis.

In Columns (1) to (10), we classify firms into a high (low) financial constraints subsample if the respective financing constraints measure is above (below) the sample median. We find that the coefficient for OC/TA is positive and significant ($p < 0.01$) only for the sub-sample of firms that is subject to high levels of financing constraint.[9] However, coefficients for OC/TA are insignificant for the low financing constraints subsample. An *F*-test suggests that the difference in coefficients for OC/TA between the high and low financing constraints sub-samples is significant at the conventional level. Overall, results from this analysis indicate that financing constraints explain the positive relation between organization capital and cash holdings.

[8] Inferences from our analysis remain qualitatively similar with alternative regression models (e.g., weighted least squares, fixed effect tobit and random effect regressions).

[9] Our results are qualitatively similar when using OC/TA and OC/PPE to measure organizational capital.

Table 5
Potential explanations.

This table reports firm fixed effect regression results that explore potential explanations for the relation between organization capital and cash holding. Panel A explores whether financing constraints explain the relation between organization capital and cash holding. Panel B explores cash flow risk-based explanation of corporate cash holdings and Panel C examines whether firm growth explains the relation between organization capital and cash holding. Robust standard errors are in parentheses and are clustered by firm. ***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively. Detailed definitions of the variables are provided in the Appendix.

Panel A. Financing constraints-based explanation

Dep. Var. =	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	High FC	Low FC	High FC	Low FC	High FC	Low FC	High FC	Low FC	High FC	Low FC
	Delaycon > Median	Delaycon < Median	Equity_delaycon > Median	Equity_delaycon < Median	SA > Median	SA < Median	KZ > Median	KZ < Median	WW > Median	WW < Median
	CASH/TA	CASH/TA	CASH/TA	CASH/TA	CASH/TA	CASH/TA	CASH/TA	CASH/TA	CASH/TA	CASH/TA
OC/TA	**0.050*** **	**0.010**	**0.057*** **	**0.011**	**0.055*** **	**0.002**	**0.020*** **	**−0.014**	**0.028*** **	**0.014**
	[0.01]	**[0.01]**	**[0.01]**	**[0.01]**	**[0.01]**	**[0.01]**	**[0.01]**	**[0.01]**	**[0.01]**	**[0.01]**
SIZE	0.015***	0.005**	0.015***	0.005***	0.022***	0.003**	0.007***	−0.000	0.015***	0.000
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
LN(MB)	0.008***	0.009***	0.008***	0.008***	−0.002	0.012***	0.007***	0.030***	0.001	0.017***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
LEVERAGE	−0.165***	−0.224***	−0.168***	−0.222***	−0.224***	−0.164***	−0.067***	−0.264***	−0.233***	−0.173***
	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.00]	[0.01]	[0.01]	[0.01]
R&D	−0.117***	−0.100**	−0.101***	−0.134**	−0.151***	−0.141***	0.166***	−0.122***	−0.071***	−0.389***
	[0.04]	[0.05]	[0.04]	[0.06]	[0.03]	[0.05]	[0.03]	[0.03]	[0.03]	[0.06]
CAPEX	−0.249***	−0.283***	−0.260***	−0.300***	−0.195***	−0.239***	−0.067***	−0.421***	−0.206***	−0.229***
	[0.02]	[0.02]	[0.02]	[0.02]	[0.01]	[0.01]	[0.01]	[0.02]	[0.01]	[0.01]
NWC	−0.189***	−0.221***	−0.185***	−0.220***	−0.184***	−0.224***	−0.051***	−0.354***	−0.193***	−0.242***
	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.00]	[0.01]	[0.01]	[0.01]
DIVIDEND	−0.003	0.005	−0.001	0.004	−0.001	0.000	−0.014***	−0.027***	0.002	−0.002
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
CFO	−0.002	0.040***	0.003	0.036***	−0.001	0.041***	−0.050***	−0.010	0.014***	0.068***
	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.00]	[0.01]	[0.01]	[0.01]
CFO_VOL	0.086***	0.045***	0.077***	0.040***	0.063***	0.055***	0.035***	0.069***	0.058***	0.064***
	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]
Constant	0.191***	0.212***	0.201***	0.194***	0.227***	0.186***	0.077***	0.357***	0.244***	0.200***
	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.00]	[0.01]	[0.01]	[0.01]
Observations	26,052	26,025	26,703	25,374	71,310	71,742	68,672	68,858	68,817	69,552
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R-squared	0.82	0.78	0.81	0.78	0.78	0.73	0.67	0.80	0.76	0.73
Difference in coefficients on OC/TA between low vs high financing constraints sub-sample:										
χ^2 (*p*-value)	11.58*** (0.00)		15.57*** (0.00)		56.39*** (0.00)		24.58*** (0.00)		3.81** (0.05)	

Panel B: Cash flow volatility-based explanation

Dep. Var. =	(1)	(2)	(3)	(4)	(5)	(6)
	CF_VOL > Median	CF_VOL < Median	CF_VOL > Median	CF_VOL < Median	CF_VOL > Median	CF_VOL < Median
	CASH/TA	**CASH/TA**	**CASH/TA**	**CASH/TA**	**CASH/TA**	**CASH/TA**
OC/TA	**0.044*** **	**−0.001**				
	[0.01]	**[0.01]**				
OC/TC			**0.227*** **	**0.175*** **		
			[0.01]	**[0.02]**		

(*continued on next page*)

Table 5 (*continued*)

Panel B: Cash flow volatility-based explanation

Dep. Var. =	(1)	(2)	(3)	(4)	(5)	(6)
	CF_VOL > Median	CF_VOL < Median	CF_VOL > Median	CF_VOL < Median	CF_VOL > Median	CF_VOL < Median
	CASH/TA	**CASH/TA**	**CASH/TA**	**CASH/TA**	**CASH/TA**	**CASH/TA**
OC/PPE					**0.015*****	**0.009*****
					[0.00]	**[0.00]**
SIZE	0.014***	0.001	0.014***	0.004***	0.013***	0.001
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
LN(MB)	0.006***	0.019***	0.004***	0.013***	0.007***	0.018***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
LEVERAGE	−0.219***	−0.190***	−0.210***	−0.177***	−0.218***	−0.188***
	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]
R&D	−0.065**	−0.340***	−0.025	−0.327***	−0.041	−0.332***
	[0.03]	[0.06]	[0.03]	[0.06]	[0.03]	[0.06]
CAPEX	−0.201***	−0.198***	−0.218***	−0.204***	−0.202***	−0.197***
	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]
NWC	−0.191***	−0.227***	−0.198***	−0.234***	−0.193***	−0.227***
	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]
DIVIDEND	0.001	−0.001	0.001	−0.002	0.001	−0.001
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
CFO	0.010**	0.045***	0.013***	0.039***	0.014***	0.044***
	[0.00]	[0.01]	[0.00]	[0.01]	[0.00]	[0.01]
Constant	0.229***	0.198***	0.204***	0.169***	0.227***	0.194***
	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]
Observations	71,815	71,237	70,924	70,866	70,806	70,843
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R-squared	0.75	0.74	0.76	0.75	0.75	0.74
Difference in coefficients on OC/TA between high vs low cashflow volatility sub-sample:						
χ^2 (*p*-value)	27.50*** (0.00)		22.88*** (0.00)		8.51*** (0.00)	

Panel C. Growth-based explanation

Dep. Var. =	(1)	(2)	(3)	(4)	(5)	(6)
	LN(MB) > Median	LN(MB) < Median	LN(MB) > Median	LN(MB) < Median	LN(MB) > Median	LN(MB) < Median
	CASH/TA	**CASH/TA**	**CASH/TA**	**CASH/TA**	**CASH/TA**	**CASH/TA**
OC/TA	**0.023*****	**0.015****				
	[0.01]	**[0.01]**				
OC/TC			**0.239*****	**0.175*****		
			[0.01]	**[0.01]**		
OC/PPE					**0.013*****	**0.013*****
					[0.00]	**[0.00]**
SIZE	0.012***	0.009***	0.013***	0.010***	0.011***	0.009***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
LEVERAGE	−0.215***	−0.199***	−0.200***	−0.192***	−0.213***	−0.197***
	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]
R&D	−0.100***	−0.006	−0.064**	0.022	−0.084***	0.011
	[0.03]	[0.04]	[0.03]	[0.05]	[0.03]	[0.05]
CAPEX	−0.277***	−0.135***	−0.292***	−0.145***	−0.277***	−0.134***

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Table 5 (*continued*)

Panel C. Growth-based explanation

Dep. Var. =	(1)	(2)	(3)	(4)	(5)	(6)
	LN(MB) > Median	LN(MB) < Median	LN(MB) > Median	LN(MB) < Median	LN(MB) > Median	LN(MB) < Median
	CASH/TA	CASH/TA	CASH/TA	CASH/TA	CASH/TA	CASH/TA
	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]
NWC	−0.236***	−0.172***	−0.247***	−0.177***	−0.239***	−0.173***
	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]
DIVIDEND	−0.003	−0.001	−0.003	−0.001	−0.002	−0.001
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
CFO	0.041***	0.001	0.041***	−0.000	0.043***	0.002
	[0.01]	[0.01]	[0.01]	[0.00]	[0.01]	[0.00]
CFO_VOL	0.070***	0.052***	0.060***	0.040***	0.068***	0.049***
	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]
Constant	0.252***	0.170***	0.214***	0.147***	0.249***	0.166***
	[0.01]	[0.00]	[0.01]	[0.00]	[0.01]	[0.00]
Observations	71,524	71,528	70,964	70,826	70,892	70,757
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R-squared	0.78	0.74	0.78	0.74	0.77	0.74
Difference in coefficients on OC/TA between high vs low cashflow volatility sub-sample:						
χ^2 (*p*-value)	1.14 (0.29)		18.02*** (0.00)		0.22 (0.64)	

4.5.2. Cash flow volatility-based explanation

Based on the precautionary motive of cash holdings, we argue that firms with more organization capital are exposed to more cash flow risk, which may prompt them to hold more cash to avoid adverse financial shocks. This would imply that the positive relationship between organization capital and corporate cash holdings would be more pronounced for firms with severe cash flow volatility.

To test the above conjecture, we divide the sample based on the median value of cash flow volatility and re-estimate Eq. (4) with our three alternative specifications of organization capital. We report the results from this analysis in Panel B of Table 5. In Columns (1) to (6), we find that the relation between organization capital and cash holdings is positive and significantly stronger for the high cash flow volatility subsample (Columns 1, 3 and 5) than for the low cash flow volatility subsample (Columns 2, 4 and 6). Thus, results from this analysis provide support to our cash flow volatility-based explanation, that the cash flow volatility of firms with high levels of organization capital prompts them to hold more cash.

4.5.3. Growth-based explanation

Finally, we argue that firms with more organization capital have profitable investment opportunities, which require firms to hold additional cash to supplement their growth opportunities. We therefore expect the positive relationship between organization capital and cash holdings to be more pronounced in the presence of higher growth opportunities. To test this conjecture, we split the sample based on the median value of growth (LN(MB)).

In Panel C of Table 5, we find that relation between organization capital and cash holdings is positive and relatively stronger for the high growth sub-sample. However, an *F*-test suggests that the difference in coefficients on organization capital between the high and low growth sub-samples is significant only when organization capital is proxied by OC/TC. Thus, results reported in Panel C provide weak support to the growth-based explanation that future growth opportunities prompt firms with higher organization capital to hold more cash in order to avoid foregoing profitable investment opportunities.

4.6. Robustness tests

4.6.1. Alternative measures of cash holdings

Recall that, in our baseline regression model, we scale cash holdings by total assets. In the sensitivity analysis, we use two alternative measures of cash holdings. Following Opler et al. (1999), we use the ratio of cash and marketable securities to net assets (i.e., total assets minus cash and marketable securities - CASH/NA) and the log of the ratio of cash and marketable securities to net assets (LN (CASH/NA)). These measures of cash holdings have been widely used in the literature (see Bates et al., 2009; Dittmar et al., 2003; Foley et al., 2007). We report the results from this analysis in Panel A, Table 6.

Columns (1) to (3) and Columns (4) to (6) of Panel A use CASH/NA and LN (CASH/NA) as a measure of cash holdings, respectively. Consistent with our previous results, we find that the coefficients for organization capital are positive and statistically significant (mostly at $p < 0.01$), and the results remain robust with all variants of organization capital measures. Thus, we provide evidence that positive relationship between organization capital and cash holdings is not driven by specific measure of cash holdings.

4.6.2. Alternative measures of organization capital

To address the concern that our results may be biased due to measurement error associated with organization capital, we use two alternative specifications of organization capital adopted by Eisfeldt and Papanikolaou (2013) and report the results in Panel B, Table 6.

In Column (1) we scale the organization capital measure of Eisfeldt and Papanikolaou (2013) by total assets (OC/TA_EP). We find that the coefficient for OC/TA_EP is positive (coefficient = 0.005), statistically

significant ($p < 0.01$) and economically meaningful (one standard deviation increase in OC/TA_EP increases cash holdings by 5.38% relative to the mean). In Column (2), we scale organization capital by physical capital (OC/PPE_EP) and find qualitatively similar results (coefficient = 0.003; $p < 0.01$). Further, in Columns (3) to (6), we find that the inference from our analysis remains robust when the organization capital measure of Eisfeldt and Papanikolaou (2013) is used with respect to other measures of cash holdings (i.e., CASH/NA and LN (CASH/NA)). Overall, results in Panel B of Table 6 corroborate findings from our main analysis (Table 4).

4.6.3. Sub-sample test

Since our study spans a period from 1981 to 2017, there may be concern that a specific period within our sample may drive the documented positive relation between organization capital and cash holdings. To address this concern, we control for year effects in the regression model. Nonetheless, to further mitigate the above concern, we re-run the regression for 10-year sub-sample periods (1981–1990, 1991–2000, 2001–2010 and 2011–2017) and report the results in Panel A, Table 7. We find that the positive relation between organization capital and cash holdings remains robust for each of the sub-sample periods (coefficients vary from 0.029 to 0.093; $p < 0.01$). Notably, the relation between organization capital and cash holdings is more pronounced during the 2011–2017 period (coefficient on OC/TA = 0.093), compared to other periods, and this difference is statistically significant ($p < 0.01$). This may be because of an increasing trend for U.S. firms to hold more cash (Bates et al., 2009; Faulkender, Hankins, & Peterson, 2019).

We further examine how the 2007–2008 global financial crisis (GFC) period within our sample affects the relation between organization capital and cash holdings. This analysis is important, given the fact that both organization capital and cash holdings would have been affected significantly by this crisis. We re-run Eq. (4) for three sub-sample periods (Pre GFC, GFC and Post GFC) and report the results in Panel B, Table 7. We find that the coefficient for organization capital remains positive and statistically significant ($p < 0.01$) for all three sub-samples. Importantly, we find that the relation between organization capital and cash is more pronounced during the GFC (coefficient for OC/TA = 0.155), and this difference is statistically significant ($p < 0.01$). This may imply that the severity of financial constraints for firms with organizational capital increased during the GFC period. Furthermore, we find that the relationship between organization capital and cash holdings is more pronounced during the post-GFC period (OC/TA = 0.085) than during the pre-GFC period (OC/TA = 0.019) and this difference is statistically significant ($p < 0.01$). This result further corroborates the recently increasing trend in corporate cash holding by US firms. Overall, results from Table 7 indicate that, in our sample, the positive relation between organization capital and cash holdings is not driven by specific time-periods. Though not tabulated, we find consistent results when we control for the GFC period in regressions and when we use alternative measures of cash in our analysis.[10]

4.6.4. Is the positive relation between organization capital and cash holdings driven by technology firms?

In Panel B of Table 1, the computers, software, and electronic equipment industry firms exhibit the largest representation in our sample (19.22%). Studies show that technology firms have few physical assets but high levels of intangible assets (Carpenter & Petersen, 2002). Therefore, one may argue that our documented positive relation between organization capital and cash holdings is driven by the computers, software, and electronic equipment firms in our sample. To address this concern, we conduct two additional tests.

First, we re-estimate the regressions after excluding the computers, software and electronic equipment industry from our sample and report the results in Panel A, Table 8. We find that the coefficient for organization capital remains qualitatively similar in terms of sign, significance and magnitude, corroborating the evidence from our main analysis. Second, we partition our sample between non-high tech and high-tech firms using the industry classifications of Barton and Waymire (2004).[11] We then re-run the regression for both sub-samples and present the results in Panel B, Table 8. We find that the coefficient for organization capital remains positive and statistically significant ($p < 0.01$) for the non-high-tech (=0.023) sub-sample. We also find that coefficients for non-high-tech and high-tech sub-samples are not statistically different ($p > 0.10$). This result is robust to alternative measures of cash (results not tabulated). Thus, we provide evidence that our results are not driven by the high-tech firms pertaining to our sample.

4.6.5. Accounting for omitted variables

We use firm fixed effect regression estimates that control for time-invariant unobserved firm-specific characteristics. However, our estimates may be susceptible to misspecification owing to omitted time-variant variables. To address this concern, we include additional controls that may affect cash holdings. Liu and Mauer (2011) show that CEO risk-taking is related to corporate cash holdings positively. There is also evidence that managerial ability is linked to greater operating performance and policy action (Bertrand & Schoar, 2003; Chemmanur & Paeglis, 2005). Dittmar et al. (2003) show that poor corporate governance results in high levels of cash holdings. Therefore, we include CEO DELTA and VEGA, managerial ability score (MGR_ ABILITY) of Demerjian, Lev, and McVay (2012) and the anti-takeover index (HOSTILE) of Cain, McKeon, and Solomon (2017). Given that our organization capital measure is developed based on the fraction of SG&A expenditure, one may argue that it is imperative to control for SG&A in the regression model. In addition, there may be a concern that our estimation is biased as it omits intangible assets reported in the balance sheet. Therefore, we control for SG&A scaled by total assets (SG&A) and intangibles scaled by total assets (INTANGIBLES). We include the cash conversion cycle (CCC) to incorporate the liquidity and time the inventory takes to be converted to cash (Opler et al., 1999). Faff, Kwok, Podolski, and Wong (2016) show that firm life cycle affects cash holdings. Therefore, we include retained earnings scaled by total assets (RE/TA). Duchin (2010) shows that diversified companies hold significantly less cash because of their diversified investment opportunities and cash flows. For this reason, we include the natural log of the number of business segments. Harford (1999) show that firms with acquisition incentives hold more cash and, therefore, we control for acquisition expenses scaled by total assets (ACQUISITIONS). We define all these variables in the Appendix.

In Columns (1) to (9) of Table 9, we find that the coefficients for organization capital remain positive and significant (mostly at $p < 0.01$), even after we incorporate the additional controls. We also note that the inclusion of all additional controls reduces our sample size to 21,133 firm-year observations, but this does not alter the inference from our analysis. Thus, we provide evidence that our documented result is not driven by omitted variable bias.

4.6.6. Addressing endogeneity problem

Our firm fixed effect regression estimates provide robust evidence

[10] We would like to thank an anonymous reviewer for suggesting these additional views to us.

[11] Following Barton and Waymire (2004), we define high technology firms as those in the following industries using 3-digit SIC codes: aircraft (372), automotive (371), communications (481, 482, 489), electronics (363, 366, 369), film and entertainment (781, 783, 791), industrial machinery (351–356), office equipment (357), photography (381, 383, 384, 387) and electrical utilities (491, 493).

Table 6
Robustness tests.

This table shows the sensitivity of the results using alternative measure of cash holdings (Panel A) and organization capital (Panel B). Robust standard errors are in parentheses and are clustered by firm. ***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively. Detailed definitions of the variables are provided in the Appendix.

Panel A. Alternative measures of cash holdings

Dep. Var. =	(1)	(2)	(3)	(4)	(5)	(6)
	CASH/NA	CASH/NA	CASH/NA	LN(CASH/NA)	LN(CASH/NA)	LN(CASH/NA)
OC/TA	**0.019****			**0.037*****		
	[0.01]			**[0.01]**		
OC/TC		**0.343*****			**0.329*****	
		[0.02]			**[0.02]**	
OC/PPE			**0.020*****			**0.020*****
			[0.00]			**[0.00]**
Constant	0.291***	0.244***	0.285***	0.284***	0.240***	0.278***
	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]
Observations	143,052	141,790	141,649	143,052	141,790	141,649
Other controls	Yes	Yes	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm effects	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R-squared	0.73	0.73	0.73	0.75	0.75	0.75

Panel B. Alternative measures of organization capital

Dep. Var. =	(1)	(2)	(3)	(4)	(5)	(6)
	CASH/TA	CASH/TA	CASH/NA	CASH/NA	LN(CASH/NA)	LN(CASH/NA)
OC/TA_EP	**0.005*****		**0.006*****		**0.011*****	
	[0.00]		**[0.00]**		**[0.00]**	
OC/PPE_EP		**0.003*****		**0.005*****		**0.006*****
		[0.00]		**[0.00]**		**[0.00]**
Constant	0.187***	0.182***	0.274***	0.262***	0.241***	0.232***
	[0.00]	[0.00]	[0.01]	[0.01]	[0.01]	[0.01]
Observations	121,302	120,406	121,302	120,406	121,302	120,406
Other controls	Yes	Yes	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm effects	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R-squared	0.73	0.74	0.71	0.72	0.72	0.73

that organization capital is related to high levels of cash holdings. However, there may be a concern that this relationship is biased, because of an endogeneity problem. For example, it is possible that firms with high levels of cash holdings may have high levels of organization capital purely because these firms have more available resource to invest in organization capital.

To address this endogeneity concern we utilize a two-stage least squares (2SLS) regression model. The instrumental variable extracts the exogenous component of organization capital and relates it to cash holdings. Following prior studies (Hasan & Cheung, 2018) we employ the industry (3-digit SIC codes) median organization capital in each year as our instrumental variable. Carlin, Chowdhry, and Garmaise (2012) note that firms in rapidly changing industries invest less in organization capital, because of their high technology obsolescence risk. Hasan and Cheung (2018) also suggest that firms belonging to the same industries tend to have similar organization capital and, therefore, firm-level organization capital is likely to be highly correlated with industry-level organization capital. As it is highly unlikely that the industry-level organization capital affects firm-level cash holdings, our chosen instrument satisfies the standard requirements of an instrumental variable.[12]

Columns (1) and (3) of Table 10 report the first stage regression results for the OC/TA and OC/TC measures of organization capital, respectively. In Column (1), we find that our selected instrument (i.e., OC/TA_Industry) has a significantly positive association (coefficient = 0.563; $p < 0.01$) with our first measure of organization capital (OC/TA). Similarly, in Column (3), we find that the industry-year level organization capital (i.e., OC/TC_Industry) has a significantly positive association (coefficient = 0.430; $p < 0.01$) with our second measure of organization capital (OC/TC). Thus, first-stage regression results in Columns (1) and (3) indicate the validity of our chosen instrumental variable. The under-identification test results show that our excluded instruments are relevant, as the Kleibergen-Paap rk LM statistic is significant at $p < 0.01$. Furthermore, our weak identification test shows that our excluded instruments are correlated with our endogenous regressors, as the Cragg-Donald Wald F-statistic for each respective industry median organization capital (3625.27 and 6113.06 respectively) is greater than the Stock and Yogo (2005) critical value (16.38).[13] These statistics further provide validity for our instrument.

Columns (2) and (4) of Table 10 report the second-stage regression results for our predicted measure of OC/TA and OC/TC respectively. Consistent with our previous results, we find that the relation between our predicted measure of organization capital and cash holdings remains positive and statistically significant ($p < 0.05$). Thus, this finding from the second-stage regression results confirms that the positive relation between organization capital and cash holdings remains

[12] Though not reported, use of a combination of industry-year median organization capital and industry-level labour mobility provides consistent results.

[13] Though not reported, we find similar results with alternative measures of cash.

Table 7
Sub-sample test.

This table reports the firm fixed effect regression results for sub-sample periods. In Panel A, each column indicates a different decade starting from 1981 and ending with 2017. In Panel B, we estimate the results for three sub-sample period: pre-GFC, GFC and post-GFC period. Standard errors are in parentheses and are clustered by firm. ***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively. Detailed definitions of the variables are provided in the Appendix.

Panel A. Sub-sample periods (ten years interval)

Dep. Var. =	(1)	(2)	(3)	(4)
	1981–1990	1991–2000	2001–2010	2011–2017
	CASH/TA	**CASH/TA**	**CASH/TA**	**CASH/TA**
OC/TA	**0.043*** **	**0.029*** **	**0.052*** **	**0.093*** **
	[0.02]	**[0.01]**	**[0.01]**	**[0.01]**
Constant	0.150***	0.182***	0.152***	0.106***
	[0.01]	[0.01]	[0.01]	[0.01]
Difference in coefficients for OC/TA				
Col. (1) vs (2): χ^2 (*p*-value)	1.13 (0.29)			
Col. (1) vs (3): χ^2 (*p*-value)	0.47 (0.49)			
Col. (1) vs (4): χ^2 (*p*-value)	9.71*** (0.00)			
Col. (2) vs (3): χ^2 (*p*-value)	5.17** (0.02)			
Col. (2) vs (4): χ^2 (*p*-value)	21.97*** (0.00)			
Col. (3) vs (4): χ^2 (*p*-value)	9.04*** (0.00)			
Observations	30,490	43,376	44,548	24,638
Other controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Adj. R-squared	0.72	0.81	0.81	0.86

Panel B. Sub-sample analysis based on the GFC

Dep. Var. =	(1)	(2)	(3)
	Pre-GFC	GFC (2007–2008)	Post-GFC
	CASH/TA	**CASH/TA**	**CASH/TA**
OC/TA	**0.019*** **	**0.155*** **	**0.085*** **
	[0.01]	**[0.02]**	**[0.01]**
Constant	0.201***	0.132***	0.116***
	[0.00]	[0.02]	[0.01]
Difference in coefficients for OC/TA			
Col. (1) vs (2): χ^2 (*p*-value)	63.58*** (0.00)		
Col. (1) vs (3): χ^2 (*p*-value)	39.21*** (0.00)		
Col. (2) vs (3): χ^2 (*p*-value)	13.42*** (0.00)		
Observations	101,318	8763	32,971
Controls	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Adj. R-squared	0.77	0.90	0.84

robust, even after addressing endogeneity concerns.[14]

5. Conclusion

In this study, we examine the relation between organization capital and corporate cash holdings. We develop two competing hypotheses to establish the relation between them. On the one hand, based on precautionary motives for cash holdings, we hypothesize that firms with more organization capital hold more cash. On the other hand, since organization capital is associated with stable business operation and performance, we also argue that firms with more organization capital hold less cash. Using a large sample of U.S. firms spanning from 1981 to 2017, we find robust evidence that firms with more organization capital hold significantly more cash. This result is both statistically significant and economically meaningful. In addition, we explore the potential explanations for the positive relationship between organization capital and corporate cash holdings. We find that the positive relation between organization capital and cash holdings is more pronounced for firms with more financing constraints and cash flow risk, lending support to the precautionary-based explanations of cash holdings. We find that our results are robust to a battery of robustness checks including alternative measures of cash holdings and organization capital, sub-sample tests, omitted variable concerns and the endogeneity problem.

Our study contributes to the literature on both cash holdings and organization capital. Prior studies have advanced a fundamental relationship between organization capital and firm value and performance (Eisfeldt & Papanikolaou, 2013; Hasan & Cheung, 2018; Lev et al., 2009; Lev & Radhakrishnan, 2005; Li et al., 2018). We show

[14] Though we address the endogeneity concern by using 2SLS and adding more control variables, we are unable to completely rule out all sources of endogeneity and, therefore, we ask readers to interpret the results with care and caution.

Table 8
Sensitivity tests: technology firms.

Panel A of this table reports firm fixed effect regression results after excluding computers, software and electronic equipment companies. Panel B reports the results for high-tech and non-high-tech firms. Standard errors are in parentheses and are clustered by firm. ***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively. Detailed definitions of the variables are provided in the Appendix.

Panel A: Exclusion of computers, software and electronic equipment companies

Dep. Var. =	(1)	(2)	(3)
	CASH/TA	**CASH/TA**	**CASH/TA**
OC/TA	**0.021*** [0.01]**		
OC/TCAP		**0.198*** [0.01]**	
OC/PPE			**0.014*** [0.00]**
Constant	0.176*** [0.00]	0.152*** [0.00]	0.173*** [0.00]
Observations	115,564	114,388	114,261
Controls	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Adj. R-squared	0.74	0.75	0.74

Panel B. Partition by non-high-tech and high-tech firms

Dep. Var. =	(1)	(2)
	Non-high tech	High-tech
	CASH/TA	**CASH/TA**
OC/TA	**0.023*** [0.01]**	**0.010 [0.01]**
Constant	0.180*** [0.00]	0.300*** [0.01]
Difference in coefficients for OC/TA		
Col. (1) vs (2): χ^2 (*p*-value)	2.50 (0.11)	
Observations	107,641	35,411
Controls	Yes	Yes
Year FE	Yes	Yes
Firm FE	Yes	Yes
Adj. R-squared	0.75	0.74

that organization capital has important implications affecting the liquidity policy of the firm. Furthermore, our study provides valuable implications for regulators, policy makers, practitioners and academics. By providing robust empirical evidence on the relation between organization capital and corporate cash holdings, we contribute to the debate on the recognition of intangible assets in financial statements. In particular, given the recent surge of corporate intangible assets and their critical impact on corporate financial outcomes, our study demonstrates that regulators and standard setting bodies should amend corporate reporting frameworks and guidelines to incorporate the disclosure of intangible assets in financial statements. In addition, although organization capital improves firm performance and productivity, managers should be aware of the pitfalls of investing in organization capital.

For academics, our study suggests several directions by which future research can extend from our analysis. First, it is well documented within the literature that organization capital relates to value enhancement (Eisfeldt & Papanikolaou, 2013; Hasan & Cheung, 2018; Lev et al., 2009; Lev & Radhakrishnan, 2005; Li et al., 2018). We encourage future research to examine how investors value the cash holdings of firms with high levels of organization capital. Findings from such future research would indicate whether cash holding is a channel through which organization capital creates value. Second, we encourage future research to further assess the liquidity implications of other intangibles (e.g., brand capital, customer loyalty and reputational capital) that are not routinely reported in balance sheets.

Table 9
Omitted variables bias.

This table reports the firm fixed effect regression results after including additional control variables that may affect cash holdings. Standard errors are in parentheses and are clustered by firm. ***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively. Variables are defined in the Appendix.

Dep. Var. =	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	CASH/TA	CASH/TA	CASH/TA	CASH/NA	CASH/NA	CASH/NA	LN(CASH/NA)	LN(CASH/NA)	LN(CASH/NA)
OC/TA	**0.071*** **			**0.110*** **			**0.331** **		
	[0.02]			**[0.03]**			**[0.16]**		
OC/TCAP		**0.387*** **			**0.624*** **			**3.285*** **	
		[0.03]			**[0.04]**			**[0.25]**	
OC/PPE			**0.040*** **			**0.063*** **			**0.254*** **
			[0.00]			**[0.01]**			**[0.04]**
DELTA	0.015**	0.014**	0.014**	0.021**	0.019**	0.019**	0.092	0.083	0.086
	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.06]	[0.06]	[0.06]
VEGA	−0.209**	−0.192**	−0.232**	−0.293*	−0.265	−0.330*	−2.038*	−1.812*	−2.153**
	[0.10]	[0.10]	[0.10]	[0.17]	[0.17]	[0.17]	[1.09]	[1.07]	[1.08]
MGR_ABILITY	0.041***	0.022**	0.029***	0.066***	0.036**	0.048***	0.374***	0.210*	0.298***
	[0.01]	[0.01]	[0.01]	[0.02]	[0.02]	[0.02]	[0.11]	[0.11]	[0.11]
HOSTILE	−0.135**	−0.092	−0.116**	−0.179*	−0.110	−0.149	−1.873***	−1.578***	−1.784***
	[0.06]	[0.06]	[0.06]	[0.10]	[0.10]	[0.10]	[0.62]	[0.60]	[0.61]
SG&A	−0.253***	−0.286***	−0.238***	−0.407***	−0.462***	−0.384***	−1.422***	−1.840***	−1.387***
	[0.02]	[0.02]	[0.02]	[0.04]	[0.04]	[0.04]	[0.21]	[0.21]	[0.21]
INTANGIBLES	−0.015***	−0.014***	−0.017***	−0.026***	−0.023***	−0.029***	−0.090***	−0.074***	−0.102***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.01]	[0.01]	[0.01]
CCC_YR	−0.028**	−0.033***	−0.028**	−0.033*	−0.040**	−0.032*	−0.183	−0.223*	−0.182
	[0.01]	[0.01]	[0.01]	[0.02]	[0.02]	[0.02]	[0.12]	[0.12]	[0.12]
RE/TA	−0.006	−0.010**	−0.007*	−0.008	−0.015**	−0.010	0.026	−0.004	0.021
	[0.00]	[0.00]	[0.00]	[0.01]	[0.01]	[0.01]	[0.03]	[0.03]	[0.03]
# OF BUS. SEG.	−0.000	−0.000	−0.000	−0.001	−0.000	−0.001	0.000	0.001	0.000
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
ACQUISITIONS	−0.222***	−0.281***	−0.215***	−0.368***	−0.463***	−0.356***	−1.818***	−2.369***	−1.796***
	[0.01]	[0.01]	[0.01]	[0.02]	[0.02]	[0.02]	[0.13]	[0.14]	[0.13]
Constant	0.297***	0.229***	0.279***	0.440***	0.331***	0.412***	−1.176***	−1.804***	−1.316***
	[0.02]	[0.02]	[0.02]	[0.03]	[0.03]	[0.03]	[0.21]	[0.22]	[0.21]
Observations	21,143	21,133	21,133	21,143	21,133	21,133	21,143	21,133	21,133
Other controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year/Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R-squared	0.82	0.82	0.82	0.80	0.81	0.80	0.73	0.74	0.73

Table 10
2SLS test.

This Table presents firm fixed effects estimates of the 2SLS regression results. The first stage regression results are reported in Columns (1) and (3). We use industry (3-digit SIC codes) –year median organization capital as instrument. Columns (2) and (4) report the 2SLS regression results. Robust standard errors are in parentheses and are clustered by firm. ***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively. Detailed definitions of the variables are provided in the Appendix.

Dep. Var. =	(1)	(2)	(3)	(4)
	1st stage	2nd stage	1st stage	2nd stage
	OC/TA	CASH/TA	OC/TC	CASH/TA
OC/TA		**0.069** **		
		[0.03]		
OC/TC				**0.091** **
				[0.04]
SIZE	−0.045***	0.011***	−0.012***	0.009***
	[0.00]	[0.00]	[0.00]	[0.00]
LN(MB)	0.043***	0.008***	0.021***	0.010***
	[0.00]	[0.00]	[0.00]	[0.00]
LEVERAGE	−0.076***	−0.207***	−0.056***	−0.207***
	[0.01]	[0.01]	[0.00]	[0.01]
R&D	0.145***	−0.105***	−0.131***	−0.079***
	[0.03]	[0.02]	[0.01]	[0.02]
CAPEX	0.043***	−0.193***	0.062***	−0.196***
	[0.01]	[0.01]	[0.01]	[0.01]
NWC	−0.058***	−0.192***	0.269***	−0.199***
	[0.00]	[0.01]	[0.00]	[0.01]
DIVIDEND	0.005***	−0.003	0.001	−0.002
	[0.00]	[0.00]	[0.00]	[0.00]
CFO	0.076***	0.013***	0.010***	0.017***
	[0.01]	[0.00]	[0.00]	[0.00]

(*continued on next page*)

Table 10 (*continued*)

Dep. Var. =	(1)	(2)	(3)	(4)
	1st stage	2nd stage	1st stage	2nd stage
	OC/TA	CASH/TA	OC/TC	CASH/TA
CFO_VOL	0.140***	0.059***	0.058***	0.062***
	[0.01]	[0.01]	[0.00]	[0.01]
OC/TA_Industry	**0.563*** **			
	[0.03]			
OC/TC_Industry			**0.430*** **	
			[0.02]	
Observations	141,169	141,169	139,880	139,880
Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Underidentification test				
Kleibergen-Paap rk LM statistic	347.96		473.81	
p-Value	0.00		0.00	
Weak identification test				
Corrected Cragg-Donald Wald F Statistic	3625.27		6113.06	
Stock and Yogo (2005) 10% maximal IV size (critical value)	16.38		16.38	

Appendix

Variable	Definition	Source
Dependent variables		
CASH/TA	Cash and marketable securities (CHE) scaled by total assets (AT).	COMPUSTAT
CASH/NA	Cash and marketable securities (CHE) scaled by total assets (AT) minus cash and marketable securities (CHE).	COMPUSTAT
Ln(CASH/NA)	The natural log of one plus cash and marketable securities (CHE) scaled by total assets (AT) minus cash and marketable securities (CHE).	COMPUSTAT
Main independent variables		
OC/TA	The ratio of the stock of organization capital (OC) to the lagged real value of total assets (AT), where the stock of organization capital is estimated as the accumulation of a fraction of past SG&A expenditure using the perpetual inventory method.	WRDS (Peters and Taylor Total Q)
OC/TC	The ratio of the stock of organization capital (OC) to the lagged real value of total capital, measured as the sum of physical capital (PPEGT) and intangible capital.	WRDS (Peters and Taylor Total Q)
OC/PPE	The ratio of the stock of organization capital (OC) to the lagged real value of physical capital (PPEGT).	WRDS (Peters and Taylor Total Q)
OC/TA_EP	The ratio of the stock of organization capital (OC) to total assets (AT), where OC is measured following Eisfeldt and Papanikolaou (2013).	COMPUSTAT
OC/PPE_EP	The ratio of the stock of organization capital (OC) to physical capital (PPEGT), where OC is measured following Eisfeldt and Papanikolaou (2013).	COMPUSTAT
Control variables		
SIZE	The natural log of the market value of firms (PRCC_F*CSHO).	COMPUSTAT
LN(MB)	The natural log of market to book value, measured as total assets (AT) minus cash and marketable securities (CHE) scaled by total common/ordinary equity (CEQ).	COMPUSTAT
LEVERAGE	Leverage, measured as the ratio of the sum of short-term (DLC) and long-term (DLTT) debts to total assets (AT).	COMPUSTAT
R&D	Research and Development, measured as the ratio of research and development expenses (XRD) to total assets (AT). We replace missing research and development variables with zero.	COMPUSTAT
CAPEX	Capital expenditure, measured as the ratio of capital expenditure (CAPX) to total assets (AT).	COMPUSTAT
NWC	Net working capital, measured as the ratio of current assets (ACT) minus current liabilities (LCT) minus cash and marketable securities (CHE) to total assets (AT).	COMPUSTAT
DIVIDEND	A dummy variable given a value of 1 if the firm paid dividends in the current year, 0 otherwise.	COMPUSTAT
CFO	Cash flow, measured as the ratio of income before extraordinary items (IB) minus common dividends (DVC) to total assets (AT).	COMPUSTAT
CFO_VOL	Cash flow volatility, measured as the five-year rolling standard deviation of cash flows (CFO).	COMPUSTAT
Variables used in cross-sectional analysis and sensitivity analysis		
Delaycon	A text-based measure of financing constraints. Firms with higher values of 'delaycon' are more similar to a set of firms known to be at risk of delaying their investments due to issues with liquidity.	Hoberg and Maksimovic (2015)
Equitydelaycon	A text-based measure of financing constraints. Firms with higher values of 'equitydelaycon' are more similar to a set of firms known to be at risk of delaying their investments due to issues with liquidity and that indicate plans to issue equity (presumably to address their liquidity challenges).	Hoberg and Maksimovic (2015)
WW INDEX	Financing constraints index of Whited and Wu (2006).	COMPUSTAT
SA INDEX	Financing constraints measure of Hadlock and Pierce (2010).	COMPUSTAT
KZ INDEX	Financing constraints measure of Kaplan and Zingales (1997).	COMPUSTAT
DELTA	The ratio of a change in CEO wealth given a 1% change in stock price to the mean total compensation for a given firm in a given year.	Cain and McKeon (2016)
VEGA	The ratio of a CEO stock options' sensitivity with respect to a 0.01 change in stock return volatility to the mean total compensation for a given firm in a given year.	Cain and McKeon (2016)
MGR_ABILITY	Managerial ability score.	Demerjian et al. (2012)
HOSTILE	An index that measures the hostile takeover defences for individual firms.	Cain et al. (2017)
SG&A	The ratio of selling, general and administration expenses (XSGA) scaled by total assets (AT).	COMPUSTAT
CCC_YR	Cash conversion cycle (in year), measured as receivable collection period ((RECT/SALE)*365) plus inventory conversion period ((INVT/COGS)*365) minus payable deferral period ((AP/COGS)*365).	COMPUSTAT

RE/TA	Retained earnings (RE) scaled by total assets (AT).	COMPUSTAT
# OF BUS. SEG.	Natural log of the number of business segments.	COMPUSTAT
ACQUISITIONS	Acquisitions, measured as acquisition expenses (AQC) scaled by total assets (AT).	COMPUSTAT
INTANGIBLES	Intangibles, measured as total intangibles (INTAN) scaled by total assets (AT).	COMPUSTAT

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