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Determinants of corporate cash policy: Insights from private firms ☆

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ABSTRACT

We provide one of the first large sample comparisons of cash policies in public and private U.S. firms. We first show that despite higher financing frictions, private firms hold, on average, about half as much cash as public firms do. By examining the drivers of cash policies for each group, we are able to attribute the difference to the much higher agency costs in public firms. By combining evidence from across public and private firms as well as within public firms across different qualities of governance, we are able to reconcile existing mixed evidence on the effects of agency problems on cash policies. Specifically, agency problems affect not only the target level of cash, but also how managers react to cash in excess of the target.

1. Introduction

Corporate holdings of cash reserves have received increasing academic interest.[3] As of 2011, public firms in the U.S. held, on average, 20.45% of their assets in cash or near-cash instruments.[4] Work explaining cash holdings has focused primarily on financing frictions and agency conflicts. Financing frictions lead firms to have a precautionary demand for cash holdings, which has been studied as early as Keynes (1936). A specific form of financing

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[3] Starting from the seminal work by Baumol (1952), Miller and Orr (1966), and Jensen (1986), there has been a recent surge of papers including Opler, Pinkowitz, Stulz, and Williamson (1999), Dittmar and Mahrt-Smith (2007), Foley, Hartzell, Titman, and Twite (2007), Harford, Mansi, and Maxwell (2008), Bates, Kahle, and Stulz (2009), Nikolov and Whited (2011), and Dittmar and Duchin (2012) examining determinants of corporate cash policies.

[4] This number is based on all public U.S. firms listed on the NYSE, Amex, and Nasdaq in 2011. The corresponding numbers for 2008, 2009, and 2010 are 18.25%, 19.81%, and 19.79%, respectively.

frictions, the wedge between internal and external costs of capital created by information asymmetry, can lead firms with greater information asymmetry about their investment opportunities to hold more cash. Evidence in favor of this explanation has been found by Harford (1999) and Opler, Pinkowitz, Stulz, and Williamson (1999).

Agency conflicts should also affect cash policies. Dittmar, Mahrt-Smith, and Servaes (2003) study cash holdings across countries and conclude that in countries where investor protection is lower, firms hold more cash, while in countries where investors have more power, they use that power to force managers to disgorge the cash. More broadly, Nikolov and Whited (2011) estimate that typical agency problems increase cash holdings by 22%, resulting in a 6% drop in shareholder value. Alternatively, Harford, Mansi, and Maxwell (2008) show that firms with more entrenched managers actually hold less cash than otherwise similar firms and conclude that managers would prefer to overinvest rather than maintain observably high cash levels.

In this study we exploit a database of private firms to help understand public firms' cash policies. It is worth noting that the cash policy of private firms in itself is of great interest to financial economists due to a lack of data prior to our study. Further, the contrast between public and private firm behavior in cash management serves as cross-validation of prior research on cash policies using only public firms. We expect that the variation in agency conflicts across these two groups of firms is likely to be at least as substantial as the variation within public firms. Further, differences across these two groups of firms in financing frictions allow us to explore the relative importance of these two effects on cash levels, the speed of adjustment to target cash, and the dissipation of excess cash.

Using a sample of public and private U.S. firms over the period 1995–2011, we first show that, on average, private firms hold about half as much cash as public firms do. This is despite the fact that they arguably have less access to external financing and would be expected to have a stronger precautionary motive due to financing frictions. Even controlling for standard factors affecting cash reserves, we find that the effect of agency costs from being public, net of the reduced effect of financing frictions, still leads public firms to hold cash reserves that are approximately 4% of assets higher than are those of similar private firms.

Next, we examine how excess cash influences firm investment and performance across these two groups of firms. As compared to private firms, public firms tend to spend excess cash via investment in a myopic way and in ways that reduce firm operating performance. These results suggest that more severe agency problems make public firm managers spend excess cash in a less efficient way. We find consistent evidence for well- versus poorly governed public firms. By increasing investment, poorly governed public firms have a higher speed of adjustment away from excess cash than do well-governed public firms.

Taken together, our evidence allows us to reconcile mixed conclusions in the extant literature by viewing them in the context of a classic Miller and Orr (1966) inventory model allowing for agency conflicts. Agency problems affect both the target level of cash and the actions taken when a firm has excess cash (i.e., hits the upper bound of the inventory model). Between private and public firms there is a large increase in agency problems. The result is that managers, who prefer more freedom from external monitoring, hold more internal slack. The target cash level (from the manager's perspective) increases. Thus, the average public firm holds more cash than the average private firm. However, governance quality still varies in public firms, and it affects what a firm does when it hits the upper boundary. Even well-governed firms will find themselves with excess cash. This is a natural consequence of being profitable, not overinvesting, and adjusting payout policy with a lag. Well-governed public firms will react to excess cash by paying out or reducing leverage. Poorly governed public firms will simply convert the cash into different assets (thus, not shrinking the firm), by investing and acquiring. The difference is that poorly governed firms tend to make large investments with excess cash, while well-governed firms reduce leverage, but not in huge amounts. The net result is that poorly governed firms bounce down from the boundary much further than well-governed firms (resulting in the observation that within public firms, they have less cash on average), and also appear to adjust toward their cash target faster from excess cash. This is simply because they spend excess cash at a greater rate than well-governed firms distribute it. All of the extant results as well as our new results fit consistently within this framework.

Our inferences are vulnerable to selection concerns, so we take a multi-pronged approach to addressing them. First, we apply a treatment regression approach to addressing the selection issues that companies may choose to stay public or private. We find that the differences in the level of cash holdings are even greater between public and private firms after controlling for selection. Second, we implement propensity score-matching based on several sets of observable firm characteristics, and show that the level of private firms' cash holdings is significantly lower than that of their propensity score-matched public peer firms, as observed in the full cross section. Finally, we employ a transitioning sample involving secondary initial public offerings (IPOs) where firms change their private status but do not receive proceeds from the offering. We find that the level of cash holdings increases significantly post-IPO for the transitioning firms relative to their matched public and private firm control samples.

Our study contributes to the literature by being one of the first to examine the cash policies of private U.S. firms and by using that sample to establish a conservative estimate of the effect of agency costs on cash holdings. Our ability to speak to big-picture questions of financing frictions and agency costs (with the somewhat surprising finding that private firms hold less cash) and to reconcile conflicting extant evidence is the real distinction of our paper from others. Previous investigations of the issue have been limited to using data on public firms only. For example, Dittmar, Mahrt-Smith, and Servaes (2003) show that one would expect U.S. firms to hold less cash than firms in countries with weaker investor protection, and we extend that by showing that even given better

investor protection, U.S. firms still hold more cash than they would if their agency costs were mitigated by being private. We also show that despite the evidence that financing frictions such as the cost of external financing are greater for private firms, the effect of agency conflicts is strong enough to lead to much higher cash holdings in public firms. Finally, we provide an interpretation of the evidence that reconciles these and extant findings that *within* public firms, better-governed firms hold more cash on average.

In using private firms, we join a recent surge of papers using data on private companies to draw new insights into public company behavior. Bargeron, Schlingemann, Stulz, and Zutter (2008) show that private acquirers pay significantly less for targets than public acquirers which they attribute to lower agency costs stemming from more concentrated ownership structures. Brav (2009) examines the financial policies of private and public firms in the U.K. and shows that private firms tend to borrow more, resulting in higher leverage ratios. Maksimovic, Phillips, and Yang (in press) show that public firms participate more in mergers and acquisitions than do private firms, are more cyclical in their acquisitions, and are impacted more by macro factors, consistent with public firms having better access to capital. Asker, Farre-Mensa, and Ljungqvist (2012) contrast investment behavior of private firms with that of public firms and find that public firms invest less and are less responsive to changes in investment opportunities compared to observably similar private firms. They conclude that agency problems resulting from the separation of ownership and control in publicly listed firms distort investment incentives. Michaely and Roberts (2012) show that private firms smooth dividends significantly less than their public counterparts. They conclude that the scrutiny of public capital markets plays a central role in the propensity of firms to smooth dividends over time.

The plan of the paper is as follows. We review the literature and develop our hypotheses in the next section. We describe our sample and present summary statistics in Section 3. We examine the difference in cash policies between public and private U.S. firms in Section 4. Sample selection issues are addressed in Section 5. We conclude in Section 6.

2. Literature review and hypothesis development

There is a substantial literature examining firms' motives for holding cash see Bates, Kahle, and Stulz (2009) for an excellent summary of the state of the literature. For our purpose, we only review papers directly related to our empirical investigation, namely, the role of financing frictions and agency conflicts, then proceed to develop our hypotheses.

2.1. Related research

Firms hold cash to protect themselves against adverse cash flow shocks that might force them to forgo valuable investment opportunities due to costly external financing. Empirical research on cash holdings has generally found support for the precautionary motive—especially among firms with greater information asymmetry with external capital providers (for example, Opler, Pinkowitz, Stulz, and Williamson, 1999). Work by Bates, Kahle, and Stulz (2009) has provided partial explanations for the rising trend in cash holdings by public U.S. firms, finding support for precautionary motives, but not for agency-based explanations. Further support for the precautionary demand explanation is provided by Duchin (2010) showing that increasing cash flow uncertainty can help explain the build-up in cash holdings by public firms, and by McLean (2011) showing that share issuance has become an increasingly important source of cash for firms with high precautionary motives as captured by large research and development (R&D) expenditures and high cash flow volatility. From a more direct angle, several papers provide evidence of greater financing frictions for private firms. Brav (2009) shows that cash holdings of private U.K. firms are more sensitive to operating cash flows than those of public firms, and that the former do not increase their investments concurrent with an increase in performance. Bharath and Dittmar (2010) find that public firms with high cash holdings and few investment opportunities are more likely to go private. Saunders and Steffen (2011) compare borrowing costs for private and public U.K. firms, and show that private firms must pay higher borrowing costs, ceteris paribus. Using international surveys of public and private firms, Campello, Giambona, Graham, and Harvey (2011) show that lines of credit are more expensive for private firms, and Lins, Servaes, and Tufano (2010) show that private firms rely more on non-operational (excess) cash instead of lines of credit for their corporate liquidity.

In addition to the precautionary motive of holding cash, Jensen (1986) argues that entrenched managers would rather retain cash than increase payouts to shareholders when their firms have poor investment opportunities. Stulz (1990) characterizes the shareholders' problem as providing sufficient internal slack to avoid underinvestment while not providing too much so as to fund overinvestment. These discretionary cash holdings are typically estimated as the excess cash holdings derived from models controlling for the transaction and precautionary motives for holding cash. A number of recent papers by Dittmar, Mahrt-Smith, and Servaes (2003), Pinkowitz, Stulz, and Williamson (2006), Dittmar and Mahrt-Smith (2007), and Harford, Mansi, and Maxwell (2008) have provided support for the agency perspective of corporate cash policies: Excess cash reserves aggravate agency problems by providing a pool of accumulated free cash flow. Harford, Mansi, and Maxwell (2008) find that firms with poor governance spend more cash than those with better governance, often to the effect that their accumulated cash reserves are actually lower. In contrast, studies such as Bertrand and Mullainathan (2003) suggest a slightly more benign form of agency problems—the chief executive officer's (CEO's) desire for a quiet life, would lead to a higher-than-optimal buffer stock of cash holdings.

2.2. Hypothesis development

Cash reserve policy should balance the precautionary demand identified in Keynes (1936), Baumol (1952), and

Miller and Orr (1966) against agency problems highlighted in Jensen (1986) and Stulz (1990).

One of the primary reasons given for being public is to have lower-cost access to capital. Being listed provides liquidity and a market price for a firm's equity that substantially lowers its cost of equity capital (Bharath and Dittmar, 2010; Maksimovic, Phillips, and Yang, in press). The transparency provided by listing may also reduce its cost of debt (Campello, Giambona, Graham, and Harvey, 2011; Saunders and Steffen, 2011) and may increase access to public debt and other sources of liquidity (Faulkender and Petersen, 2006; Lins, Servaes, and Tufano, 2010). Given higher costs of accessing external capital, the precautionary motive should be stronger for private firms, leading to our first hypothesis:

Hypothesis 1. Private firms hold higher cash reserves than otherwise similar public firms.

The alternative, that public firms hold cash reserves that are equal to or greater than those of private firms, is motivated by the countervailing effect of agency problems. Private firms have much fewer agency problems than public firms. Private firms often have owner-managers and at a minimum have concentrated illiquid ownership and large private lenders providing greater monitoring incentives. The greater separation of ownership and control, along with the free-rider problem from dispersed highly liquid ownership, significantly increases agency problems in public firms (Bhide, 1993; Asker, Farre-Mensa, and Ljungqvist, 2012; Gao, Lemmon, and Li, 2012). With reduced ability to overinvest or to enjoy the quiet life, private firm managers will have lower incentives to maintain a large supply of accessible funds.

Hypothesis 1a. Private firms hold lower/higher cash reserves than otherwise similar public firms.

However, prior work, such as Harford, Mansi, and Maxwell (2008), finds in a sample of public U.S. firms that worse-governed firms actually hold less cash because they spend, rather than hold, cash balances. Thus, if we find that public firms hold lower cash reserves than private firms, it could be because of financing frictions or agency problems. Only the finding that public firms hold higher cash reserves provides definitive support for the agency explanation of cash because agency predicts either outcome while financing frictions predict lower public firm cash holdings.

In our empirical analysis, we test these hypotheses and also attempt to distinguish between some of the alternative explanations for the differences. In the next section we describe our data and present summary statistics.

3. Our sample

3.1. Sample formation

Our primary data source is the Capital IQ database. Capital IQ is an affiliate of Standard & Poor's which produces the Compustat database.[5] We start with public U.S. firms traded on the NYSE, Amex, or Nasdaq, and all private U.S. firms filing Form 10-K (annual reports), Form 10-Q (quarterly reports), or Form S-1 (securities registration) with the Securities and Exchange Commission (SEC) for the period 1995–2011. Following prior work such as Opler, Pinkowitz, Stulz, and Williamson (1999), we remove financial and utilities firms. We further require that all sample firms have financial information for at least two consecutive years to estimate the annual changes in cash holdings; and our sample firms' operating cash flow over total assets is no less than −50%. Finally, we remove all firm-year observations associated with 1,872 IPOs and 176 going private transactions.

Prior work including Miller and Orr (1966), Harford (1999), Opler, Pinkowitz, Stulz, and Williamson (1999), and Dittmar, Mahrt-Smith, and Servaes (2003) has shown that cash holdings tend to vary systematically by industry and larger firms tend to have lower cash holdings due to economies of scale in the transaction motive for cash. These findings motivate us to industry- and size-match our sample of private firms, resulting in the matched public firm sample. Specifically, we match each private firm in our sample with a public firm in the same industry (as defined by Fama and French, 1997) and closest in size (total assets) from the very beginning of our sample period, and only change the matched public firm when the initial match drops out of the Capital IQ database. The matching (with replacement) procedure helps mitigate the large difference in the size distribution between the two samples and the smaller, but potentially important difference in sample firm distribution across industries.[6] For some of our analysis, we compare results employing both the full sample and the matched sample of public firms.

In our final sample, we have 54,404 public firm-year observations representing 7,879 unique public firms, 10,595 matched public firm-year observations representing 2,624 unique public firms, and 10,595 private firm-year observations representing 3,604 unique private firms for the period 1995–2011. Data for a vast majority (92%) of the private firm-year observations in our sample come from Form 10-K (annual reports), and the remainder (8%) comes from Form S-1 (and its supplemental Form 424B). The SEC requires firms with $10 million or more in total assets and 500 or more shareholders to file annual (10-K) and quarterly (10-Q) reports.[7] The SEC also requires firms to file Form S-1 (sometimes Form DEF 14A as well) associated with public debt issues. It is worth noting that the private

[5] Starting from the mid-1990s, Capital IQ provides data on some private U.S. firms. When available, Capital IQ provides data on firm accounting information with a similar level of detail as provided by Compustat for public U.S. firms.

[6] The top five public firm industries are: Business Services (15.3%), Electronic Equipment (7.4%), Pharmaceutical Products (6.4%), Retail (6.3%), and Petroleum and Natural Gas (5.1%). The top five private firm industries are: Business Services (11.8%), Communication (10%), Petroleum and Natural Gas (8.5%), Wholesale (7.5%), and Restaurants, Hotels, Motels (6.2%).

[7] According to the SEC's Web site at http://www.sec.gov/investor/pubs/companies.htm, it states as follows: "Generally, smaller companies only have to file reports with the SEC if they have $10 million or more in assets ***and*** 500 or more shareholders, or list their securities on an exchange or Nasdaq."

firms in our sample are large firms with some access and/or intend to gain access to the public debt market, and are more comparable to public firms than are the private firms as examined by Brav (2009), Asker, Farre-Mensa, and Ljungqvist (2012), and Farre-Mensa (2012),[8] in terms of disclosure and information asymmetry. Nonetheless, while our firms are among the larger private firms with some access to bond markets, they are still more constrained than are public firms (they cannot easily raise new equity, for example) and have fewer agency conflicts.

3.2. Summary statistics

Table 1 provides summary statistics for our sample. We have two samples of public firms. The first is public firms for which we have data. The second is a sample of public firms matched to our private firms by industry and size. All dollar values are in 2011 dollars. All continuous variables are winsorized at the 2.5% and 97.5% levels.

Cash is the ratio of cash and marketable securities to total assets. The first row shows that public firms hold substantially more cash. The mean (median) cash holdings is 17.17% (8.68%) for the public firm sample, the mean (median) cash holdings is 14.21% (6.65%) for the matched public firm sample, while the mean (median) cash holdings is 9.39% (3.79%) for the private firm sample. The two-sample *t*-test and Wilcoxon-test both reject the null that cash holdings in public firms (using either public firm sample) is the same as that in private firms at the 1% level. On average, cash holdings in public firms are approximately twice that in private firms.

One might argue that the difference in cash holdings between public and private firms is driven by the different industry representation across public and private firms. To mitigate that concern, we compute industry-adjusted cash holdings as the difference between firm-specific cash holdings and its industry median based on Fama and French's (1997) 48-industry classification and using the full sample. By using a uniform benchmark level of cash holdings across public and private firms for a particular industry, we emphasize the importance of common industry-specific investment opportunities to both public and private firms alike.

We show that the contrast between public and private firms in terms of cash holdings is even more striking. The mean (median) industry-adjusted cash holdings is 5.23% (0.11%) for the public firm sample, the mean (median) industry-adjusted cash holdings is 6.03% (0.43%) for the matched public firm sample, while the mean (median) industry-adjusted cash holdings is 1.34% (−1.35%) for the private firm sample. The two-sample *t*-test and Wilcoxon-test both reject the null that industry-adjusted cash holdings in public firms (using either public firm sample) are the same as those in private firms at the 1% level.

Change in cash is simply the difference between this year's and last year's cash. We show that public firms' change in cash is positive and at least three times as large as private firms', indicating that, on average, public firms add to their cash reserves each year and do so by significantly more than do private firms. The univariate statistics thus far are consistent with the agency conflicts hypothesis of cash policies whereby there are more serious agency problems in public firms compared to private firms.

The mean (median) value of total assets is $1,686 million ($209 million) for the public firm sample, the mean (median) value of total assets is $1,495 million ($280 million) for the matched public firm sample, and the mean (median) value of total assets is $1,493 million ($279 million) for the private firm sample.[9] While the two-sample Wilcoxon-test rejects the null that firms in the public firm sample are the same size as those in the private firm sample at the 5% level, the two-sample *t*-test indicates no significant difference in size between these two samples. Firms in the matched public firm sample are the same size as those in the private firm sample by construction. The fact that our private firm sample tends to consist of larger private firms actually makes our sample more comparable to public firms. The reader should bear in mind the sample selection criteria imposed on us by the data when deciding how our results might generalize.

In terms of profitability, the two-sample *t*-test indicates that the average operating cash flow of public firms is significantly lower than that of private firms, while the Wilcoxon-test indicates that the median operating cash flow of public firms is significantly higher than that of private firms. The greater standard deviation of operating cash flow for private firms suggests greater positive skewness in that sample, explaining the differing mean and median results.

We calculate cash flow volatility using the standard deviation of industry-median-adjusted quarterly operating cash flow over the previous two years. Using industry-adjusted cash flow controls for the differences across industries in the quarterly seasonality of cash flows and in the nature of firms' operations. The two-sample *t*-test shows that private firms have significantly higher cash flow volatility than public firms in either sample, while the Wilcoxon-test shows that the median cash flow volatility in private firms is similar to that in the matched public firm sample. A standard precautionary demand model for cash holdings would predict a higher average level of cash holdings in the presence of greater cash flow volatility, but the univariate results from row 1 do not support that.

[8] In contemporaneous work, Farre-Mensa (2012) explores why the majority of firms are privately held. He also notes that public firms hold more cash than private firms and argues that this is consistent with public firms mitigating disclosure costs from raising capital. It is worth noting that Farre-Mensa uses a sample of private firms provided by mid-market accounting firms (Sageworks collects the data). His sample of private firms does not necessarily have public debt and hence are not subject to Regulation Fair Disclosure (FD) resulting in selective disclosure. In contrast, our sample of private firms must file with the SEC due to meeting the size criterion for disclosure and/or being formally defined as issuers (of public debt). Farre-Mensa (2012) and our paper offer complementary explanations for the robust phenomenon that public firms hold more cash than private firms.

[9] Using the Sageworks database, Asker, Farre-Mensa, and Ljungqvist (2012) show that the sample average total assets is $157.3 million and $142.1 million for their matched public sample and the private sample, respectively. The difference in firm size between the two samples is not statistically significant at the 10% level.

Table 1
Summary statistics.

The sample consists of 54,404 public firm-year observations and 10,595 private firm-year observations from 1995 to 2011, obtained from Capital IQ. For each private firm, we match it to a public firm in the same Fama and French 48 industry and closest in total assets, resulting in the matched public firm sample. Cash is the cash and marketable securities scaled by total assets. Industry-adjusted cash is the industry-median-adjusted cash ratio. ΔCash is the change in the cash ratio. Total assets is the book value of total assets. CF is the operating cash flow scaled by total assets, where the operating cash flow is computed as earnings after interest, dividends, and taxes but before depreciation. We calculate cash flow (CF) volatility using the standard deviation of industry-median-adjusted quarterly operating cash flows over the previous two years. Sales growth is the change in sales. Leverage is the long-term debt scaled by total assets. Public debt is an indicator variable that takes the value of one if a firm has public debt outstanding, and zero otherwise. Net working capital is defined as (current assets—current liabilities—cash) scaled by total assets. #Of segments is the number of segments a firm has. Capex is the capital expenditures scaled by total assets. Acquisition is the acquisition expenditures scaled by total assets. R&D is the R&D expenditures scaled by total assets. Dividend is an indicator variable that takes the value of one if a firm pays dividends, and zero otherwise. Firm age is the number of years since a firm's incorporation. MNC is an indicator variable taking the value of one if the fraction of foreign sales to total sales exceeds 20%, and zero otherwise. All dollar values are in 2011 dollars. All continuous variables are winsorized at the 2.5% and 97.5% levels. Test statistics of the *t*-test and the Wilcoxon-test of the differences in cash holdings and firm characteristics between public (matched public) firms and private firms are given in superscript ***, **, and * denoting statistical significance at the 1%, 5%, and 10% levels, respectively.

	Public firms			Matched public firms			Private firms		
	Mean	Median	StdDev	Mean	Median	StdDev	Mean	Median	StdDev
1 Cash	17.17%***	8.68%***	19.97%	14.21%***	6.65%***	17.72%	9.39%	3.79%	13.69%
2 Industry-adjusted cash	5.23%***	0.11%***	16.96%	6.03%***	0.43%***	15.43%	1.34%	−1.35%	12.72%
3 ΔCash	1.18%***	0.34%***	9.32%	0.61%***	0.15%**	7.98%	0.28%	0.11%	7.14%
4 Total assets	1686	209**	4134	1495	280	3451	1493	279	3437
5 CF	5.20%***	7.26%***	13.30%	5.89%***	7.49%	12.93%	7.37%	6.55%	14.29%
6 CF volatility	4.29%***	2.55%***	4.95%	4.23%**	2.34%	5.26%	4.44%	2.31%	5.69%
7 Sales growth	19.39%***	8.72%***	44.66%	17.25%	7.77%***	43.19%	19.23%	3.95%	51.63%
8 Leverage	16.13%***	10.24%***	18.24%	20.73%***	14.33%***	22.77%	37.97%	33.07%	35.42%
9 Public debt	0.19	0	0.39	0.21***	0***	0.41	0.19	0	0.39
10 Net working capital	13.83%***	11.65%***	18.84%	9.61%***	6.56%***	19.21%	7.11%	4.42%	17.89%
11 #Of segments	1.67***	1***	1.13	1.68***	1***	1.10	1.33	1	0.77
12 Capex	5.96%***	3.85%***	6.28%	6.90%***	4.29%***	7.44%	6.41%	3.62%	8.09%
13 Acquisition	2.40%***	0.00%***	5.63%	2.28%***	0.00%****	5.43%	3.41%	0.00%	10.05%
14 R&D	3.62%***	0.00%***	6.73%	2.04%***	0.00%***	5.25%	1.51%	0.00%	5.06%
15 Dividend	0.33**	0***	0.47	0.35***	0***	0.48	0.32	0	0.47
16 Firm age	36.43***	24****	34.09	37.92***	25***	34.26	23.62	10	31.02
17 MNC	0.19***	0***	0.39	0.15***	0***	0.35	0.08	0	0.27

Public firms' sales growth is somewhat higher, while leverage is drastically higher in private firms, consistent with the fact that private firms must rely on debt and internally generated or privately placed equity, while public firms are able to tap the public equity market (as shown by Brav, 2009; Asker, Farre-Mensa, and Ljungqvist, 2012). Our sample public and private firms have similar access to the public debt market: 19% (21%) of public firms (matched public firms) and 19% of private firms have public debt outstanding. As with the greater cash flow volatility, greater leverage would increase demand for cash holdings both to reduce net debt and to provide a buffer to meet interest obligations. Our evidence thus far does not support either argument as private firms in our sample hold less cash than their public counterparts.

Net working capital is defined as the difference between current assets and current liabilities excluding cash. Net working capital can be a substitute for cash (Opler, Pinkowitz, Stulz, and Williamson, 1999). Row 10 of the table shows that net working capital for public firms is significantly higher than private firms on average. Row 11 shows that public firms have a slightly higher tendency to have multiple segments. This result does not support the notion that selling non-core assets is another viable substitute to holding cash (Lang, Poulsen, and Stulz, 1995).

We find that, on average, public firms spend 5.96% of total assets on capital expenditures, and 2.40% of total assets on acquisitions, while private firms spend 6.41% of total assets on capital expenditures, and 3.41% of total assets on acquisitions.[10] These differences in capital expenditures and acquisitions are statistically significant at the 1% level.

Private firms spend less on R&D, are less likely to pay dividends, and are younger. The former set of results supports information asymmetries/transaction costs models of cash holdings. Non-R&D investments are easier to finance externally due to their lower information asymmetry. Opler, Pinkowitz, Stulz, and Williamson, (1999) argue and show that firms with low dividend payouts will hold less cash due to lower transaction demand.

Foley, Hartzell, Titman, and Twite (2007) find that U.S. companies that would incur tax consequences associated with repatriating foreign earnings hold higher levels of cash. We define MNC, an indicator variable to take a value of one if the fraction of foreign sales to total sales of a firm exceeds 20%, and zero otherwise. We find that the fraction of multinational companies is highest among the public

[10] Using the Sageworks database, Asker, Farre-Mensa, and Ljungqvist (2012) show that private firms invest significantly more, as captured by the annual change in either gross or net fixed assets, than do public firms. Using the plant-level data, Maksimovic, Phillips, Yang (in press) show that public firms are more acquisitive and more likely to sell assets than are private firms; and Bharath, Dittmar, and Sivadasan (2010) find that after going private transactions, firms reduce investment and scope of operation, relative to peer groups.

Table 2
Cash ratios over time.

The sample consists of 54,404 public firm-year observations and 10,595 private firm-year observations from 1995–2011, obtained from Capital IQ. For each private firm, we match it to a public firm in the same Fama and French 48 industry and closest in total assets, resulting in the matched public firm sample. Cash is the cash and marketable securities scaled by total assets. All dollar values are in 2011 dollars. All continuous variables are winsorized at the 2.5% and 97.5% levels.

	Public firms				Matched public firms				Private firms			
Year	#Of firms	Median total assets	Mean cash	Median cash	#Of firms	Median total assets	Mean cash	Median cash	#Of firms	Median total assets	Mean cash	Median cash
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1995	2654	232	13.53%	5.72%	309	474	9.58%	3.71%	309	458	7.18%	3.92%
1996	3783	146	16.81%	7.11%	553	302	10.82%	4.77%	553	334	7.81%	3.57%
1997	3945	136	17.09%	7.86%	658	308	11.85%	5.06%	658	327	9.42%	3.72%
1998	3724	155	15.83%	6.70%	769	345	11.26%	3.96%	769	323	9.69%	3.64%
1999	3441	165	15.32%	6.07%	875	306	12.68%	4.12%	875	315	9.69%	3.34%
2000	4454	184	18.39%	7.70%	785	230	11.99%	4.25%	785	228	8.69%	2.68%
2001	3983	190	19.71%	8.99%	686	258	12.35%	5.35%	686	259	8.62%	3.30%
2002	3619	216	19.54%	9.90%	625	271	12.94%	5.55%	625	280	8.00%	3.06%
2003	3372	248	20.77%	12.14%	685	320	15.93%	8.94%	685	263	9.52%	3.87%
2004	3243	276	21.35%	12.82%	635	357	15.83%	7.53%	635	343	8.54%	3.79%
2005	3072	302	21.19%	13.28%	644	348	16.42%	8.66%	644	346	9.58%	3.77%
2006	2906	356	20.63%	12.20%	665	300	16.75%	8.46%	665	326	10.01%	3.56%
2007	2673	384	20.31%	11.59%	579	293	15.58%	8.21%	579	319	8.82%	3.69%
2008	2500	417	18.25%	10.30%	492	367	14.05%	6.63%	492	382	8.69%	3.95%
2009	2324	456	19.81%	12.96%	529	264	17.79%	11.81%	529	305	10.42%	5.32%
2010	2201	515	19.79%	14.05%	622	240	17.84%	11.03%	622	256	12.42%	6.11%
2011	2510	548	20.45%	12.73%	484	484	18.51%	10.83%	484	433	11.85%	5.13%

firm sample (at 19%), the second highest among the matched public firm sample (at 15%), and the lowest among the private firm sample (8%).

Bates, Kahle, and Stulz (2009) note that the average cash ratio (relative to assets) for U.S. firms more than doubles from 1980–2006. In Table 2, we present cash ratios over time for the public firm sample, the matched public firm sample, and the private firm sample. For public firms, the average (median) cash ratio increases from 13.53% (5.72%) in 1995 to 20.45% (12.73%) in 2011. For the matched public firms, the average (median) cash ratio increases from 9.58% (3.71%) in 1995 to 18.51% (10.83%) in 2011. The average (median) cash ratio for private firms increases as well, moving from 7.18% (3.92%) in 1995 to 11.85% (5.13%) in 2011. The fact that public firms hold more cash than private firms is prevalent in every year of our sample period.

Table 3 presents the correlation matrix for the explanatory variables used in this study. None of the correlations are high enough to present collinearity problems for our multivariate analyses. In the next section, we will run multiple regressions to test our hypotheses.

4. Main results

4.1. Excess cash holdings

Table 4 Panel A presents the regression results of a model for normal levels of cash holdings based on the extant literature (see, for example, Kim, Mauer, and Sherman, 1998; Opler, Pinkowitz, Stulz, and Williamson, 1999; Dittmar and Mahrt-Smith, 2007; Foley, Hartzell, Titman, and Twite, 2007; Harford, Mansi,and Maxwell, 2008):

$$\begin{aligned} Ln(Cash) = {} & \alpha + \beta_1 Public + \beta_2 Ln(Total\ assets) \\ & + \beta_3 CF + \beta_4 CF\ volatility + \beta_5 Sales\ growth \\ & + \beta_6 Leverage + \beta_7 Public\ debt \\ & + \beta_8 Net\ working\ captial + \beta_9 Ln(of\ segments) \\ & + \beta_{10} Capex + \beta_{11} Acquisition + \beta_{12} R\&D \\ & + \beta_{13} Dividend + \beta_{14} Ln(Firm\ age) + \beta_{15} MNC \\ & + Industry \times Year\ FEs + \varepsilon. \end{aligned} \quad (1)$$

The dependent variable is the natural logarithm of the cash ratio. In addition to firm-level determinants of cash, we also include the industry-year fixed effects (FEs) to control for the effect of time-varying industry factors on cash policies in the regression.

The results confirm the univariate findings from Table 1. Specifically, public firm cash holdings are still abnormally high, controlling for a host of factors from the cash literature. We present results using the full sample (columns 1–2) as well as the combination of the matched public firms and private firms (columns 3–4). The inferences are the same for the two samples: The coefficient on the public firm indicator variable is 0.393 for the full sample (column 2); and the coefficient on the public firm indicator variable is 0.439 when the sample includes only private firms and their matching public firms (column 4). This result indicates that public firms hold 48% ($e^{0.393}-1$) to 55% ($e^{0.439}-1$) more cash than private firms. In percentage points, public firms in the full sample (matched sample) hold 3.86 (2.84) percentage points higher cash than private firms based on calculations following Wooldridge (2005). In brief, public firms hold cash

Table 3
Correlation matrix.

The sample consists of 54,404 public firm-year observations and 10,595 private firm-year observations from 1995 to 2011, obtained from Capital IQ. All dollar values are in 2011 dollars. Variable definitions are provided in Table 1. All continuous variables are winsorized at the 2.5% and 97.5% levels. *p*-values are reported in brackets.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 Public	1														
2 Ln(total assets)	0.02	1													
	[0.00]														
3 CF	−0.02	0.14	1												
	[0.00]	[0.00]													
4 CF volatility	−0.02	−0.42	−0.16	1											
	[0.02]	[0.00]	[0.00]												
5 Sales growth	0.00	−0.05	−0.10	0.05	1										
	[0.91]	[0.00]	[0.00]	[0.00]											
6 Leverage	−0.26	0.33	−0.03	−0.21	−0.02	1									
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]										
7 Public debt	0.03	0.44	0.06	−0.18	−0.05	0.32	1								
	[0.00]	[0.01]	[0.00]	[0.00]	[0.00]	[0.00]									
8 Net working capital	0.06	0.02	0.01	−0.04	−0.08	−0.06	−0.03	1							
	[0.00]	[0.00]	[0.03]	[0.00]	[0.00]	[0.00]	[0.00]								
9 Ln(# of segments)	0.17	0.30	0.04	−0.15	−0.06	0.07	0.17	0.05	1						
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]							
10 Capex	0.04	−0.01	0.12	−0.01	0.15	0.00	0.00	−0.19	−0.11	1					
	[0.00]	[0.11]	[0.00]	[0.29]	[0.00]	[0.54]	[0.94]	[0.00]	[0.00]						
11 Acquisition	−0.03	0.14	−0.02	−0.10	0.17	0.16	0.05	0.01	0.08	−0.09	1				
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.35]	[0.00]	[0.00]					
12 R&D	0.05	−0.21	−0.23	0.22	0.07	−0.19	−0.13	−0.09	−0.08	−0.07	−0.06	1			
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]				
13 Dividend	0.02	0.23	0.27	−0.13	−0.09	−0.07	0.11	0.09	0.08	−0.01	−0.021	−0.16	1		
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.13]	[0.00]	[0.00]			
14 Ln(firm age)	0.29	0.28	0.12	−0.18	−0.15	−0.01	0.18	0.15	0.24	−0.08	−0.03	−0.07	0.19	1	
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.03]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]		
15 MNC	0.10	0.17	−0.01	−0.07	−0.04	0.01	0.08	0.06	0.28	−0.10	0.02	0.13	0.01	0.13	1
	[0.99]	[0.00]	[0.05]	[0.00]	[0.00]	[0.13]	[0.00]	[0.01]	[0.00]	[0.00]	[0.01]	[0.00]	[0.25]	[0.00]	

reserves that are approximately 50% (3–4 percentage points) higher than are those of similar private firms.

The coefficients on the control variables are consistent with prior findings: Large firms hold lower cash reserves, while firms with greater cash flow, cash flow volatility, and sales growth hold more. Leverage, the public debt indicator variable, capital expenditures (capex), acquisitions, and the dividend indicator variable have negative effects on cash reserves, while the need to make R&D expenditures has a positive effect on cash reserves. There is a substitution effect between non-cash working capital which can easily be converted into cash, in contrast to the finding from the univariate statistics. Due to tax considerations, multinational firms hold more cash.

It is informative to compare the primary drivers of cash within public firms to the primary drivers within private firms. In columns 5–6, we estimate the cash model separately using the matched public firm sample and the private firm sample, respectively, and in column 7, we report the *F*-statistics associated with the Chow-test for different coefficients on the same firm characteristics across samples. Excepting MNC, which is influenced by the 0/1 nature of the variable and has a tax interpretation, looking across specifications at the coefficients, we see that the coefficients that are larger for private firms are the ones that are associated with precautionary demand models (size, cash flow volatility, and R&D), while the ones that are larger for public firms are the ones associate with monitoring (leverage, public debt, and dividends), spending (capex and acquisitions), or simply saving out of cash flow (CF). So, the results in Table 4 Panel A foreshadow the general conclusion, discussed in the introduction, that private firms manage their cash as a buffer against a shortfall, while public firms generally accumulate cash (CF) and are only held back by control of agency (leverage, public debt, and dividends), or their desire to spend it (capex and acquisitions) when control of agency fails.

The excess cash of public firms estimated in Panel A may be biased because in pooled regressions, we force the coefficients on firm characteristics to be the same across public and private firms. To allow these coefficients to vary across samples, we apply each individual public firm characteristic to the regression model estimated using only the private firm sample (column 6 of Panel A) and obtain the predicted cash ratio for each public firm.[11] Excess cash is the difference between a firm's actual cash ratio and predicted cash ratio. By doing so, we can estimate how public firms should behave were they a private firm. In particular, this measure of excess cash not only removes the agency problems but also predicts the

[11] Maksimovic, Phillips, and Yang (in press) apply a similar method to estimate the difference in participation in merger waves between public and private firms.

Table 4
The cash model.

The sample consists of 54,404 public firm-year observations and 10,595 private firm-year observations from 1995 to 2011, obtained from Capital IQ. For each private firm, we match it to a public firm in the same Fama and French 48 industry and closest in total assets, resulting in the matched public firm sample. Panel A presents the baseline cash model where the dependent variable is the natural logarithm of cash ratio. Panel B presents the excess cash for two public firm samples. Specifically, we apply each individual public firm's characteristics to the regression model estimated using only the private firm sample (reported in column 6 of Panel A) and obtain the predicted cash ratio for each public firm. Excess cash is the difference between a firm's actual cash ratio and predicted cash ratio. Panel C presents the excess cash across public firms with different qualities of governance. Insider ownership is the percentage equity ownership held by all executive officers and directors. The E-index is the Bebchuk, Cohen, and Ferrell (2009) entrenchment index. All dollar values are in 2011 dollars. All continuous variables are winsorized at the 2.5% and 97.5% levels. Industry times year fixed effects are included in the regressions and the heteroskedasticity-consistent standard errors account for possible correlation within a firm cluster. Standard errors are reported in brackets. Superscripts ***, **, * correspond to statistical significance at the 1%, 5%, and 10% levels, respectively.

	Full sample		Matched public firms and private firms		Matched public firms	Private firms	*F*-statistic of Chow test (5)–(6)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: *The baseline model of cash*							
Public	0.550***	0.393***	0.545***	0.439***			
	[0.025]	[0.021]	[0.033]	[0.029]			
Ln(total assets)	−0.109***	−0.072***	−0.142***	−0.116***	−0.092***	−0.134***	69.68***
	[0.006]	[0.006]	[0.007]	[0.008]	[0.015]	[0.011]	
CF		0.590***		0.810***	1.286***	0.365**	19.15***
		[0.077]		[0.146]	[0.175]	[0.182]	
CF volatility		2.088***		2.339***	1.613***	3.243***	8.33***
		[0.146]		[0.279]	[0.388]	[0.316]	
Sales growth		0.172***		0.136***	0.116**	0.132***	0.08
		[0.017]		[0.030]	[0.048]	[0.037]	
Leverage		−0.744***		−0.185***	−0.378***	−0.121***	6.48**
		[0.035]		[0.027]	[0.102]	[0.025]	
Public debt		−0.132***		−0.114***	−0.139**	−0.076*	7.84***
		[0.018]		[0.032]	[0.056]	[0.043]	
Net working capital		−2.280***		−1.488***	−1.635***	−1.385***	1.40
		[0.054]		[0.103]	[0.163]	[0.112]	
Ln(# of segments)		0.009		0.130***	0.065	0.189***	2.14
		[0.015]		[0.028]	[0.040]	[0.036]	
Capex		−2.094***		−0.737***	−1.974***	−0.171	12.97***
		[0.134]		[0.238]	[0.315]	[0.265]	
Acquisition		−2.678***		−1.440***	−2.104***	−1.024***	10.84***
		[0.108]		[0.183]	[0.315]	[0.196]	
R&D		4.298***		5.338***	4.516***	5.827***	6.29**
		[0.153]		[0.248]	[0.378]	[0.337]	
Dividend		−0.136***		−0.136***	−0.201***	−0.035	7.54***
		[0.016]		[0.033]	[0.040]	[0.037]	
Ln(firm age)		0.014*		0.034**	−0.009	0.043***	10.09***
		[0.008]		[0.014]	[0.022]	[0.015]	
MNC		0.406***		0.504***	0.493***	0.519***	1.15
		[0.016]		[0.033]	[0.042]	[0.052]	
Industry × year FEs	Yes	Yes	Yes	Yes	Yes	Yes	
Constant	−1.073***	−1.138***	−0.705***	−1.212***	−0.793***	−1.044***	16.61***
	[0.113]	[0.104]	[0.143]	[0.157]	[0.296]	[0.221]	
Observations	64,999	64,999	21,190	21,190	10,595	10,595	
Adj *R*2	7%	32%	8%	21%	22%	18%	

Panel B: *Excess cash for two public firm samples*

	Public firms	Matched public firms
Mean	12.46%***	8.78%***
Median	4.79%***	2.36%***

Panel C: *Excess cash across public firms with different qualities of governance: Insider ownership and the E-index*

	Subsample A (1)	Subsample B (2)	Test of difference (1)–(2)
Insider ownership bottom quartile (Subsample A) versus top quartile (Subsample B)			
Mean	13.67%	12.79%	0.88%***
Median	7.66%	6.23%	1.43%***
E-index top quartile (Subsample A) versus bottom quartile (Subsample B)			
Mean	8.93%	12.85%	−3.92%***
Median	3.89%	6.09%	−2.20%***

cash ratio of public firms as if these firms needed the same level of precautionary savings as private firms. As reported in Panel B, the average (median) excess cash of public firms in the full sample is 12.46% (4.79%); the average (median) excess cash of public firms in the matched sample is 8.78% (2.36%). All these numbers are significantly different from zero at the 1% level. These results suggest that public firms would hold much less cash if they were the same firm but private.[12]

Having established how public and private firm cash policies differ and the resulting higher average holdings of public firms, in Panel C, we further examine how, within public firms, different qualities of governance affect firms' cash holdings. Based on the sample of public firms with available information on insider ownership and anti-takeover provisions, we first find that public firms with insider ownership in the bottom quartile have significantly higher excess cash than the public firms with insider ownership in the top quartile. This indicates that good governance reduces excess cash holdings. On the contrary, when using the Bebchuk, Cohen, and Ferrell (2009) entrenchment index (E-index) to measure governance, we find that poorly governed public firms (firms in the top quartile of the E-index) hold less excess cash than well-governed public firms (firms in the bottom quartile of the E-index). These results are consistent with existing literature, which finds mixed evidence on the relation between the severity of agency conflicts and the level of cash holdings when studying only public firms. It is also worth pointing out that the difference in excess cash within public firms of different governance qualities is smaller than the difference in excess cash between public and private firms. The difference in excess cash between firms with low insider ownership and firms with high insider ownership is, on average, 0.88%, while average excess cash of public firms relative to private firms is 8.78–12.46% (see Panel B). These results support our conjecture made earlier that the variation in agency problems is greater between public and private firms than within public firms.

In summary, our results reject Hypothesis 1 that financing frictions would lead private firms to hold more cash and support the alternative that reduced agency problems would lead private firms to hold less cash. In fact, given the results that variables associated with financing frictions and precautionary demand are clearly important for private firm cash policies, the results can be viewed as the net effect of the reduction in agency problems and the increase in financing frictions. Thus, the conclusion that agency problems associated with the public status increases cash reserves relative to total assets by, on average, about 4 percentage points is conservative.

[12] As a robustness check, we also apply each individual private firm's characteristics to the regression model estimated using only the matched public sample (column 5 of Panel A) and obtain excess cash for each private firm as the difference between a firm's actual cash ratio and predicted cash ratio. The average and median excess cash of private firms are −4.64% and −4.88%, respectively; both are significantly different from zero at the 1% level. While we view our measure based on the private firm estimation as the relevant benchmark, we have repeated all the analysis in the paper using the public firm estimation to produce the benchmark for expected cash and our inferences are unchanged.

4.2. Excess cash, investment, and performance

While the previous section provides several insights into cash policies of both public and private firms, we are still left with the difficulty of reconciling the clear effect of agency costs on cash levels between private and public firms with the mixed evidence on the agency effect within public firms. In this section, we explore an avenue for reconciliation by examining firms' speed of adjustment to cash targets as well as how firms react to excess cash. Our motivation in doing so is that by combining a comparison of public with private firms with a within-public comparison, we have insight into a consistent explanation for how agency conflicts affect cash policies.

We begin with the speed of adjustment (SOA). Market imperfections such as transaction costs may prevent firms from rapidly adjusting their cash holdings to their target levels. In Table 5 Panel A, we use the following partial adjustment model to estimate the SOA of cash holdings across public and private firms:

$$\Delta Cash = \alpha + \beta_1 Public \times (Cash^* - Lagged\ cash) + \beta_2 (Cash^* - Lagged\ cash) + \beta_3 Public + \varepsilon. \quad (2)$$

The dependent variable is the change in the cash ratio, $Cash^*$ is the predicted cash ratio based on column 6 of Table 4 Panel A, and thus ($Cash^* - Lagged\ cash$)measures the deviation of a firm's cash holdings from its target level of cash holdings. The coefficient β_2 captures the SOA, and the coefficient β_1 captures the difference in SOA across public and private firms.

We use the full sample in column 1 and find that the coefficient on ($Cash^* - Lagged\ cash$) is positive and significant at the 1% level, while the coefficient on $Public \times (Cash^* - Lagged\ cash)$ is negative, and significant at the 1% level. These results indicate that both public and private firms are actively adjusting their cash holdings towards target levels and that the SOA for public firms is slower than that for private firms. However, the above analysis might hide heterogeneity between public and private firms when their actual levels of cash holdings fall above or below their target cash levels. Public and private firms can face asymmetric adjustment costs between building and depleting cash reserves. The cost of external financing may be particularly important for firms with a cash deficit to build their reserves. Therefore, when the firms' actual levels of cash holdings are below their target cash levels, public firms should adjust their cash holdings to their target levels more rapidly than private firms.

In columns 2 and 3, we separately estimate Eq. (2) using a subsample of public and private firms with actual levels of cash falling above and below target levels, respectively. To mitigate the concern that we do not know the true model of target cash, we define the “excess cash” subsample and the “cash shortfall” subsample using the bottom quartile (P25) and top quartile (P75) of the population by the measure of ($Cash^* - Lagged\ cash$). In this way, our separation is less sensitive to errors in $Cash^*$,

Table 5
Speed of adjustment to target cash.

The sample consists of 54,404 public firm-year observations and 10,595 private firm-year observations from 1995 to 2011, obtained from Capital IQ. Panel A presents the speed of adjustment to target cash where the dependent variable is the change in cash ratio, ΔCash. Cash* is the predicted cash ratio from column 6 of Table 4 Panel A. In columns 2 and 3, the samples consist of the bottom quartile (P25) and top quartile (P75) of the sample firms by the measure of (Cash* − Lagged cash), respectively. In Panel B, we use the subsample of public firms with (Cash*−Lagged cash)≤P25 and estimate the regression $\Delta Cash = \alpha + \beta(Cash^{*}–Lagged\ cash) + \varepsilon$. Panel B reports the coefficient estimates across public firms with different qualities of governance. The heteroskedasticity-consistent standard errors account for possible correlation within a firm cluster. Standard errors are reported in brackets. Superscripts ***, **, * correspond to statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Estimating the speed of adjustment to target cash

	Full sample (1)	Subsample of firms with excess cash: (Cash*−Lagged cash)≤P25 (2)	Subsample of firms with cash shortfall: (Cash*−Lagged cash)≥P75 (3)
Public × (Cash*−Lagged cash)	−0.041***	−0.060***	0.059***
	[0.009]	[0.023]	[0.022]
Cash*−Lagged cash	0.125***	0.117***	0.702***
	[0.009]	[0.023]	[0.050]
Public	0.013***	0.022**	0.006***
	[0.001]	[0.009]	[0.001]
Constant	0.009***	−0.009	−0.003**
	[0.001]	[0.009]	[0.002]
Observations	64,999	16,250	16,250
Adj *R2*	4%	2%	6%

Panel B: Estimating the speed of adjustment to target cash within public firms with excess cash

	Subsample A (1)	Subsample B (2)	*F*-statistic of Chow test (1) – (2) (3)
Insider ownership bottom quartile (Subsample A) versus top quartile (Subsample B)	0.074	0.046	0.26
E-index top quartile (Subsample A) versus bottom quartile (Subsample B)	0.076	0.007	6.60***

since we are only selecting firms in the extremes of the distribution.

Using the subsample of firms with a cash surplus (*Cash**–Lagged cash*≤*P25*) in column 2, we find that the coefficient on *Public* × (*Cash**–*Lagged cash*) is negative and significant at the 1% level. This result indicates that public firms are slower in adjusting towards their target levels than are private firms when more cash is held than the target level. In contrast, examining the subsample of firms with a cash deficit (*Cash**–*Lagged cash* ≥*P75*) in column 3, we find a positive and significant coefficient on the interaction term *Public* × (*Cash**–*Lagged cash*), suggesting that public firms adjust their cash holdings much faster toward their target levels than do private firms when holding less cash than the target levels.

In Panel B, we further sort the subsample of public firms with cash surplus by insider ownership and the E-index and examine how governance, within public firms, influences a firm's speed of adjusting down to target cash levels. Consistent with Dittmar and Mahrt-Smith (2007), we find that well-governed public firms are slower in adjusting down to their target levels of cash than poorly governed public firms. While the SOA from excess cash is slower for public firms than for private firms, it is faster for poorly governed public firms than for well-governed private firms. One reason the SOA may appear to be slower for public firms is that we may underestimate the upper bound at which they adjust cash downward. If we take the Miller and Orr (1966) model literally, then the upper bound is proportional to the target level of cash. Since public firms have a higher target level, they will have a larger distance between the target and the upper bound. This is especially the case if the target level is proportional to cash flow variation. Further, since we measure excess cash relative to the private firm benchmark, managers of public companies could view the target as being higher than what we predict based on the private firm cash model. The end result is that the upper quartile of excess cash based on our model will contain some public firms that do not see themselves in an extreme excess cash position, and so have not started to adjust downward. In the next section, we directly examine how firms in this group spend their cash to better understand the drivers of these findings.

4.2.1. Dissipation of excess cash

The evidence in Table 5 suggests that agency conflicts affect how firms spend excess cash. The differences in SOA are suggestive, but far from conclusive. Next, we investigate how firms disgorge their excess cash by comparing their financing and investment policies using the subsample of firms with excess cash. Specifically, we estimate a multinomial logit regression to examine whether firms with excess cash increase payouts (the sum of dividends and stock repurchases), increase investment (the sum of capex, acquisitions, and R&D), or increase debt repayment, with doing nothing as the baseline.[13] We also control for

[13] Some firms take more than one of these actions. We have tried all possible hierarchies (e.g. coding a firm that invests and pays out as paying out or vice versa) as well as excluding firms that take more than action. In all cases, our inferences are unchanged.

Table 6
Disgorging excess cash via payout, investment, and debt repayment.

The sample consists of the bottom quartile of the sample firms by the measure of (Cash*−Lagged cash), where Cash* is the predicted cash ratio from column 6 of Table 4 Panel A. In Panel A, we estimate a multinomial logit regression to examine how firms disgorge excess cash. Increase payout is an indicator variable taking the value of one if a firm increases the sum of dividend payment and stock repurchases in the next year, and zero otherwise. Increase investment is an indicator variable taking the value of one if a firm increases the sum of capex, acquisitions, and R&D in the next year, and zero otherwise. Increase debt repayment is an indicator taking the value of one if a firm increases debt repayment in the next year, and zero otherwise. The baseline case is doing nothing. In Panel B, we use the subsample of public firms with (Cash*−Lagged cash)≤P25 and employ the same multinomial logit regression as in Panel A, except that we replace the public firm indicator variable with the indicator variables for the insider ownership top/bottom quartiles (columns 1–3) and the indicator variables for the E-index top/bottom quartiles (columns 4–6), respectively. Panel B reports the coefficient estimates on the insider ownership top/bottom quartile indicator variables and the E-index top/bottom quartile indicator variables. The heteroskedasticity-consistent standard errors account for possible correlation within a firm cluster. Standard errors are reported in brackets. Superscripts ***, **, * correspond to statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: *Public firms* versus *private firms*

	Increase payout (1)	Increase investment (2)	Increase debt repayment (3)
Public	−0.044	0.443***	−0.178**
	[0.115]	[0.095]	[0.082]
Ln(total assets)	0.136***	0.123***	0.234***
	[0.019]	[0.015]	[0.015]
CF	2.595***	1.507***	0.039
	[0.206]	[0.145]	[0.139]
CF volatility	−0.044	−1.871***	−0.258
	[0.578]	[0.427]	[0.402]
Sales growth	0.001	0.104***	0.163***
	[0.057]	[0.039]	[0.036]
Leverage	−0.740***	−1.090***	−0.003
	[0.189]	[0.132]	[0.006]
Dividend	1.003***	0.377***	0.321***
	[0.081]	[0.071]	[0.070]
Industry × year FEs	Yes	Yes	Yes
Constant	−3.764***	−5.422***	−5.289***
	[0.423]	[0.353]	[0.322]
Observations	16,250	16,250	16,250
Pseudo *R*2	6.5%	6.5%	6.5%

Panel B: *Examining how public firms with different qualities of governance disgorge excess cash*

	Increase payout (1)	Increase investment (2)	Increase debt repayment (3)	Increase payout (4)	Increase investment (5)	Increase debt repayment (6)
Insider ownership bottom quartile indicator	−0.093 [0.135]	0.220** [0.090]	−0.221** [0.098]			
Insider ownership top quartile indicator	−0.098 [0.137]	−0.250*** [0.095]	0.191* [0.099]			
E-index top quartile indicator				−0.357 [0.220]	0.327** [0.164]	−0.295* [0.169]
E-index bottom quartile indicator				0.126 [0.178]	−0.367*** [0.141]	0.162 [0.140]

firm size, operating cash flow, cash flow volatility, and other drivers of firms' financing and investment policies. The variable of interest is the public firm indicator variable.

We identify the subsample with excess cash by computing the excess cash held by public firms and private firms, respectively, using the private firm cash model in column 6 of Table 4 Panel A. The private firm cash model tells us how firms should behave absent agency problems and access to the external stock market, and so we use it as a baseline estimate of cash holdings based on the private firm level of precautionary demand with only minimal effect of agency problems. By doing so, we are imposing the precautionary demand of private firms on public firms.

Table 6 Panel A shows that conditional on having excess cash, public firms are more likely to increase investment, and less likely to increase debt repayment, than are private firms, while the payout policies are similar across these two groups of firms. Our investment results showing an increase in investment spending is consistent with the more severe agency problems in public firms. More generally, private and public firms react to excess cash very differently.

In Panel B, we repeat the analysis in Panel A by focusing on public firms only, and we find that, conditional on having excess cash, well-governed public firms are less likely to increase investment and more likely to repay debt, as compared to poorly governed public firms. The fact that we find a similar dichotomy across governance strength in public firms as that between public and private firms is notable because the response of private firms can

be viewed as a benchmark of how firms with little agency conflict would respond to excess cash.

4.2.2. Investment quality

The increase in investment by poorly governed firms with excess cash is suggestive of overinvestment. To confirm that interpretation, we examine the type of investment and subsequent performance. Stein (1989) and others argue that the stock market tends to pressure public firms to behave myopically by underinvesting in long-term, intangible projects such as R&D, as shown in Bushee (1998) and Bhojraj, Hribar, Picconi, and McInnis (2009). Private firms typically face little pressure from the stock market and thus should behave less myopically. Similar to Bushee (1998) and Bhojraj, Hribar, Picconi, and McInnis (2009), we examine managerial myopia with respect to R&D spending. In particular, we measure lack of managerial myopia using R&D/Investment, which captures the expenditure on R&D as a proportion of total investment.

In column 1 of Table 7 Panel A, we compare investment in R&D between public and private firms. The coefficient on the public firm indicator variable is –0.185 and is significant at the 1% level. As the public firms increase their investment in response to excess cash, they are less likely to spend that excess cash on long-term projects as compared to private firms, which is consistent with the view that public firms are more myopic than private firms.

In column 2, we examine how operating performance changes after accumulating excess cash. The dependent variable *ROA* is return on assets, computed by Capital IQ as earnings before interest and taxes (EBIT) × 0.625/total assets by assuming that the average corporate tax rate is 37.5% (1–0.625). The coefficient on the public firm indicator variable is –0.028 and is significant at the 1% level. These results indicate that public firms dissipate excess cash in ways that significantly reduce operating performance relative to the way private firms use the cash.

Comparing public and private firms provides a baseline for how agency problems affect excess cash investment and subsequent performance. To close the loop on our understanding of public firms, we now repeat the analysis within public firms, varying their governance quality. In Panel B, we compare public firms divided along insider

Table 7
Excess cash and investment quality.

The sample consists of the bottom quartile of the sample firms by the measure of (Cash*–Lagged cash), where Cash* is the predicted cash ratio from column 6 of Table 4 Panel A. In column 1 of Panel A, the dependent variable is R&D/Investment, computed as R&D/ (Capex+Acquisition+R&D). In column 2 of Panel A, the dependent variable is return on assets (ROA), computed by Capital IQ as EBIT × 0.625/ total assets by assuming that the average corporate tax rate is 37.5%. In Panel B, we use the subsample of public firms with (Cash*–Lagged cash)≤P25 and employ the same regression as in Panel A, except that we replace the public firm indicator variable with the indicator variables for the insider ownership top/bottom quartiles (columns 1–2) and the indicator variables for the E-index top/bottom quartiles (columns 3–4), respectively. Panel B reports the coefficient estimates on the insider ownership top/bottom quartile indicator variables and the E-index top/bottom quartile indicator variables. The heteroskedasticity-consistent standard errors account for possible correlation within a firm cluster. Standard errors are reported in brackets. Superscripts ***, **, * correspond to statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: *Public firms* versus *private firms*

	R&D/Investment (1)	ROA (2)
Public	–0.185***	–0.028***
	[0.013]	[0.003]
Ln(total assets)	0.009***	0.007***
	[0.001]	[0.001]
Sales growth	0.009**	–0.008***
	[0.004]	[0.001]
Lagged R&D/Investment	0.707***	
	[0.018]	
Lagged ROA		0.762***
		[0.011]
Industry × year FEs	Yes	Yes
Constant	0.080***	–0.109***
	[0.025]	[0.010]
Observations	16,250	16,250
Adj *R2*	56%	67%

Panel B: *Examining how public firms with different qualities of governance and excess cash invest and perform*

	R&D/Investment (1)	ROA (2)	R&D/Investment (3)	ROA (4)
Insider ownership bottom quartile indicator	0.001 [0.008]	–0.007*** [0.002]		
Insider ownership top quartile indicator	0.023*** [0.007]	0.005* [0.002]		
E-index top quartile indicator			–0.003 [0.011]	–0.008*** [0.003]
E-index bottom quartile indicator			0.001 [0.007]	0.009*** [0.002]

ownership and the E-index. We find some evidence that better-governed public firms are more likely to spend excess cash on R&D. There is consistent evidence that better-governed public firms spend excess cash in a way that improves operating performance relative to poorly governed firms. This is one of the reasons they tend to only slowly revert down from the excess cash position—they continue to produce excess cash flows whereas the poorly governed firms dissipate excess cash and reduce their performance. Thus, the public versus private differential response to excess cash is replicated in the badly versus well-governed public subsamples and is being driven by the badly governed public firms.

4.3. Toward a better understanding of the effects of agency problems on cash policy

The evidence in Table 5 suggests that between public and private firms, the former have fewer frictions in accumulating cash than the latter when it is low and are not as quick to reduce it when it is high, likely due to more severe agency problems in public firms. The relatively slow adjustment for public firms is consistent with extant results. Opler, Pinkowitz, Stulz, and Williamson (1999) show that cash-rich firms transition out very slowly. Harford, Mansi, and Maxwell (2008) show that the worst-governed public firms spend the most cash on capital expenditures and acquisitions. Because these are large, lumpy investments, the average adjustment for public firms can appear slow, similar to the findings in the capital structure literature [see Strebulaev (2007), for example, who notes that infrequent large adjustments towards a target level of leverage can generate a slow adjustment result in panel data analyses].

The results in Table 6 and 7 bring into focus an explanation of many seemingly conflicting results on the relation between agency conflicts and cash holdings. Our earlier results clearly demonstrate that the greater agency conflicts in public firms lead managers to set a higher target level of cash holdings. However, agency conflicts also affect how managers respond to being significantly above that target—having an excess cash position. Well-governed firms that generate excess cash make smaller adjustments such as reducing leverage, that lead them to transition down toward the target more slowly. Poorly governed firms make large increases in investment, which, while making them transition back to the target quickly, has the effect of preserving the size of the assets under their control by converting excess cash to real assets. Further, their investments tend to lead to poor performance, keeping them from returning quickly to an excess cash position. Thus, one can reconcile the higher cash holdings of public firms relative to private firms in a setting consistent with the lower holdings by worse-governed firms within the public firm sample.

5. Dealing with sample selection

Being public, of course, is not an exogenous event: Most firms stay public (or private) for reasons that correlate with their financing or investment decisions (see, for example, Brav, 2009; Asker, Farre-Mensa, and Ljungqvist, 2012; Bharath and Dittmar, 2010; Maksimovic, Phillips, and Yang, in press). To account for the possible selection effect, we have taken a multi-pronged approach: (1) employing an instrumental variable (IV) to estimate a selection equation; (2) implementing propensity score-matching based on observable firm characteristics; and (3) using a transitioning sample involving secondary IPOs.

Table 8
The instrumental variable approach.
The sample consists of 54,404 public firm-year observations and 10,595 private firm-year observations from 1995 to 2011, obtained from Capital IQ. Column 1 reports the first-stage probit regression with the public firm indicator variable as the dependent variable and underwriter concentration as the instrumental variable. Underwriter concentration is the ratio of the number of IPOs underwritten by the top five investment banks in an industry to the total number of IPOs in the same industry from 1995–2011. Column 2 reports the second-stage treatment regression of the cash model. The dependent variable is the natural logarithm of cash ratio. All dollar values are in 2011 dollars. All continuous variables are winsorized at the 2.5% and 97.5% levels. The heteroskedasticity-consistent standard errors account for possible correlation within a firm cluster. Standard errors are reported in brackets. Superscripts ***, **, * correspond to statistical significance at the 1%, 5%, and 10% levels, respectively.

	Public (1)	Ln(cash) (2)
Public		0.550***
		[0.051]
Ln(total assets)	−0.019***	−0.072***
	[0.004]	[0.003]
CF	−0.685***	0.602***
	[0.050]	[0.043]
CF volatility	0.043	2.152***
	[0.132]	[0.112]
Sales growth	0.157***	0.171***
	[0.013]	[0.011]
Leverage	−1.962***	−0.748***
	[0.028]	[0.013]
Public debt	−0.131***	−0.125***
	[0.018]	[0.016]
Net working capital	0.864***	−2.310***
	[0.035]	[0.035]
Ln(# of segments)	0.287***	0.007
	[0.015]	[0.012]
Capex	1.060***	−2.128***
	[0.097]	[0.091]
Acquisition	−0.137	−2.705***
	[0.101]	[0.087]
R&D	1.845***	4.243***
	[0.081]	[0.096]
Dividend	−0.099***	−0.134***
	[0.015]	[0.013]
Ln(firm age)	0.260***	0.005
	[0.006]	[0.006]
MNC	0.373***	0.392***
	[0.020]	[0.016]
Underwriter concentration	−0.229***	
	[0.066]	
Industry × year FEs		Yes
Constant	0.403***	−1.333***
	[0.073]	[0.086]
Observations	64,999	64,999
Endogeneity test		
Rho		−0.064***

5.1. The IV approach

Under the IV approach, the processes of cash holdings and the public status of a firm can be modeled as follows:[14]

$$Ln(Cash) = X\beta + \beta_1 Public + \varepsilon,$$
$$Public^* = Z\gamma_2 + \omega,$$
$$Public = 1,\ if\ Public^* > 0;\ = 0,\ if\ otherwise. \quad (3)$$

The dependent variable is the natural logarithm of the cash ratio. X is a list of firm-level control variables. The coefficient of key interest is β_1, on the public firm indicator variable, *Public*. The variable *Public*∗ indicates the latent propensity of a firm staying public. For the purpose of identification, we need instrumental variables that affect a firm's propensity of staying public, but do not affect its cash holdings directly other than through the effect of being public. That is, the vector of Z in Eq. (3) must contain variables in addition to a full overlap with the vector of X. The public firm indicator variable is allowed to be endogenous in the sense that $corr(\varepsilon, \omega) \neq 0$. A positive (negative) association indicates that cash holdings of public firms are larger (smaller) based on unobservable heterogeneity. Thus, an estimate for β_1 is upward (downward) biased if the endogeneity is not properly accounted for.

To allow for time-varying unobserved heterogeneity across firms, we resort to the treatment regression using the maximum likelihood estimator given in Maddala (1983, Chapter 5), where the public firm indicator variable is treated as endogenous.

Our choice of the instrumental variable is theoretically as well as econometrically driven. Liu and Ritter (2011) show that industry-level underwriter concentration increases the cost of going public—IPO underpricing. This variable passes the exclusion restriction because it is hard to expect this measure to be related to corporate cash policies. Using a sample of 5,942 IPOs over the period 1995–2011 from Securities Data Corporation (SDC), for each of the 48 Fama and French industries, we compute industry-level underwriter concentration as (# of IPOs by the top five lead underwriters in a given industry)/Total # of IPOs in that industry. We compute the underwriter concentration measure using the entire time period so that our instrument is only related to the cross-sectional decision to be public but is exogenous to a firm's cash policy, mitigating the "IPO timing" concern.

The results from estimating the treatment regression in Eq. (3) using the full sample are reported in Table 8. The identification relies on both the instrumental variable and the non-linearity of the propensity of going public. As shown in column 1, the industry-level underwriter concentration has a negative and significant coefficient in the first-stage probit regression. The instrument is significant at the 1% level (the Chi-square statistic is 89).

In column 2 the dependent variable is the natural logarithm of the cash ratio. The coefficient on the public firm indicator variable captures the effect of being a public firm, taking into account the possible selection of staying public decisions. The effect is, again, positive, and the coefficient is now 0.55 (significant at the 1% level), which is much larger than that of the coefficients in column 2 of Table 4 Panel A without controlling for the selection effect. The exogeneity test rejects the null hypothesis that $\rho = 0$ at the 1% level.

Results in column 2 indicate that there is a selection effect associated with being a public firm. In our sample, firms that choose to stay public tend to have lower cash holdings conditional on observable firm characteristics. That is, these firms would otherwise be associated with *lower* cash holdings (after controlling for observable characteristics) had they not been public. In contrast, Bharath and Dittmar (2010) show that firms that go private tend to have higher cash holdings. It is worth noting that our comparison is between firms that are public versus those that are private. This is a different comparison than examining firms at the time they make the decision to go public (or private) and these differences likely explain the differences in our findings from Bharath and Dittmar (2010). To the extent that the treatment regression framework is valid, such a selection effect makes the interpretation of a causal effect stronger as it renders the effect of being public underestimated using an ordinary least squares (OLS) regression (as in Table 4 Panel A). It provides further support for the stronger effect of agency conflicts instead of financing frictions on cash policies.

In summary, controlling for selection, our main findings on the level of cash holdings remain qualitatively unchanged.

Table 9
Propensity score-matching.

The sample consists of 54,404 public firm-year observations and 10,595 private firm-year observations from 1995–2011, obtained from Capital IQ. This table presents differences in the level of cash holdings between private firms and their propensity score-matched public firms. We match each private firm to a public firm using the nearest neighbor. In Model 1, the variables we use to match are Ln(total assets), and industry times year fixed effects. In Model 2, the variables we use to match are Ln(total assets), operating cash flow, cash flow volatility, sales growth, leverage, and industry times year fixed effects. In Model 3, the variables we use to match are Ln(total assets), operating cash flow, cash flow volatility, sales growth, leverage, the public debt indicator variable, net working capital, number of segments, capex, acquisitions, R&D, the dividend indicator variable, Ln(firm age), the MNC indicator variable, and industry times year fixed effects. To test pairwise differences in means between the two samples (i.e., matched public firms – private firms), we use bootstrapped standard errors based on 50 replications with replacement which are reported in brackets. Superscripts ***, **, * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	Model 1	Model 2	Model 3
Cash	7.64%*** [0.27%]	7.01%*** [0.26%]	4.77%*** [0.39%]

5.2. The propensity score-matched sample

We also employ a matching technique to examine differences in the level of cash holdings between public and private firms. The matching procedure controls for selection based on the observable firm characteristics. Our

[14] See Li and Prabhala (2007) for an overview of dealing with selection effects versus treatment effects in corporate finance.

data are well suited to the matching approach given that we have a much larger pool of potential matches in the public firm sample compared to the private firm sample treatment group, which increases the likelihood of finding close matches for the private firms among the public firms.

The matching procedure that we employ is a one-to-one nearest-neighbor matching with replacement (Heckman, Ichimura, and Todd, 1997). The matching starts with a probit regression, using three different specifications to better capture the choice between being a private or public firm (Bharath and Dittmar, 2010): (1) Ln(total assets), and industry times year fixed effects; (2) Ln(total assets), operating cash flow, cash flow volatility, sales growth, leverage, and industry times year fixed effects; and (3) the same set of explanatory variables as in Eq. (1), and the public firm indicator variable as the dependent variable. Then using the predicted probabilities—propensity scores—from the estimated probit regressions, we match to each private firm-year observation a public firm-year observation that minimizes the absolute value of the difference between propensity scores.

Table 9 presents differences in the level of cash holdings between private firms and their propensity score-matched public firms using three different matching criteria. We find that there are statistically significant differences between private and public firms in their level of cash holdings.

5.3. The transitioning sample

Finally, we examine the level of cash holdings for a set of firms during our sample period that undergo a transition in ownership status from private to public. Using the transition sample directly addresses the sample selection concern because we compare the same firm as both a private and public firm, and we control for selection on the time-invariant unobservable firm characteristics. Importantly, we focus on secondary IPOs (Asker, Farre-Mensa, and Ljungqvist, 2012) where the issuer does not receive any cash proceeds to eliminate the mechanical increase in cash holdings from any other forms of IPOs.

We identify 62 secondary IPOs during our sample period 1995–2011 that transition from private to public status and track their level of cash holdings for a period of three-years prior and three-years following the transition year. We also match each IPO firm to a control firm which is a public (private) firm from the same Fama-French 48 industry as the IPO firm and has the closest total assets in the year prior to the IPO. Fig. 1 plots the level of cash holdings around the IPO year for both the IPO firms and their matched public and private control firms. We show that both the mean and median levels of cash holdings for the IPO firms go up much more significantly than their matched public and private control firms. Put differently, we show that these secondary IPO firms switch from tracking the private firm cash levels to very quickly tracking the public firm cash levels. On average (at median), cash holdings of IPO firms increases from 8.43% (3%) from the year prior to the IPO to 10.28% (5.67%) in the year after. By contrast, during the same period, the average (median) cash holdings in the public control sample only

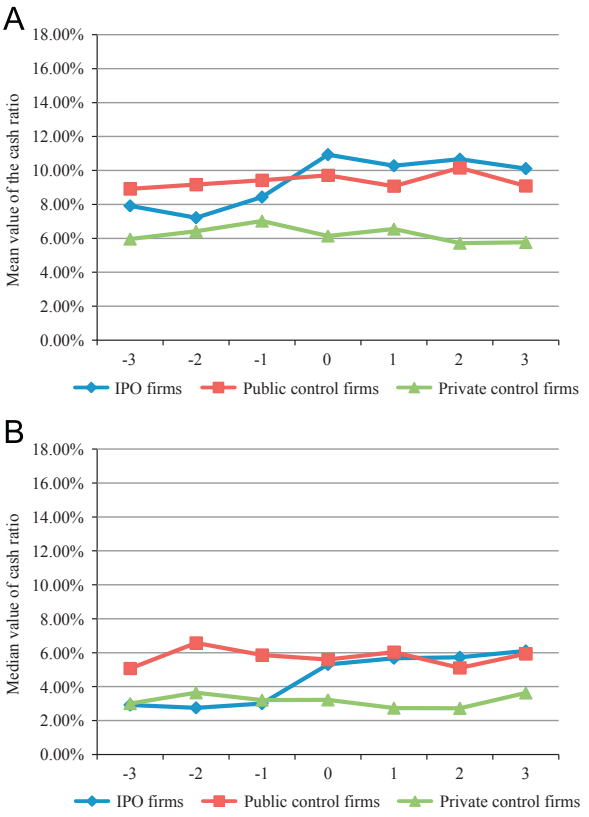

Fig. 1. Cash holdings around secondary IPOs. This figure is based on 62 secondary IPOs from 1995m to 2011 where the issuer receives no proceeds, obtained from SDC. All 62 IPOs are listed on the NYSE, Amex, or Nasdaq. All 62 IPO firms are neither financial nor utility firms. Each IPO firm is matched to a public (private) control firm that is in the same Fama-French 48 industry and has the closest total assets in the year prior to the IPO. We plot the time series of the level of cash holdings centered around the year of IPO, which is year 0 in the plot, for the IPO sample and its public/private control samples. Panel A presents the mean value of the cash ratio, and Panel B presents the median value. Panel A: mean cash and Panel B: median cash.

experiences a change in cash holdings from 9.41% (5.86%) to 9.07% (6.03%) and the average (median) cash holdings in the private control sample changes from 7.02% (3.21%) to 6.55% (2.74%).

Overall, the results indicate a significant permanent shift in the level of cash holdings as firms transition from private to public.

6. Conclusions

Almost all studies of cash policies to date have been based on variation across public firms. In this paper, we provide one of the first large sample comparisons of cash policies in public and private U.S. firms. The comparison allows us to exploit much greater variation in agency conflicts and financing frictions than is possible within the public firm universe alone. Further, we gain insights into theories of public firm cash holdings by comparing public with private firms. Finally, the cash policies of private firms are interesting in their own right given a lack of data before our study.

We can identify a conservative estimate, net of financing frictions, of the effect of agency costs on cash holdings. Further, the results presented here provide us with a way to reconcile existing conflicting inferences regarding the relation between agency costs and cash policies. Overall, our study finds that agency costs add substantially to a firm's cash holdings.

Adding our evidence to the findings in the extant literature clarifies the drivers of observed cash levels in public U.S. firms. We show that agency conflicts affect both managers' target level of cash and how they react to excess cash. Generally, greater agency conflicts in public firms lead managers to choose to hold more cash on average than they otherwise would. However, there is still cross-sectional variation in the control of those conflicts and it affects how managers react to levels of cash far in excess of that target level. Well-governed firms make conservative adjustments to reduce leverage, while worse-governed firms tend to invest, leading to lower performance. Thus, well-governed firms distribute some of the cash to investors (creditors), while poorly governed firms simply trade the cash for other assets through investment, retaining the scale of the firm.

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