The Sensitivity of Corporate Cash Holdings to Corporate Governance

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The average cash holdings of Chinese-listed firms decreased significantly after the split share structure reform in China, which specified a process that allowed previously nontradable shares held by controlling shareholders to be freely tradable on the exchanges. The reduction in cash holdings is greater for firms with weaker governance and firms facing more financial constraints prior to the reform. The reform also significantly reduced the average corporate savings rate, as measured by cash-to-cash-flow sensitivity. These findings are consistent with the premise that the reform removed a significant market friction, which led to better incentive alignment between controlling shareholders and minority shareholders and relaxed financial constraints. Additional analyses show that the reform affects firms' cash management policies, investment decisions, dividend payout policies, and financing choices differently in private firms than in state-owned enterprises. (*JEL* G32, G34, G35)

This paper examines the effect of corporate governance on corporate cash holdings in the context of the split share structure reform commenced in 2005 in China (hereafter, the share reform or the reform). The 2005 share reform specified a time period during which large (and, typically, controlling)

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shareholders of Chinese-listed firms were required to convert their previously nontradable shares into shares that are freely exchangeable (tradable on stock exchanges), subject to shareholder approvals and appropriate compensation to holders of tradable shares. By removing a significant market friction, the reform represented an exogenous shock to firms' governance systems that increased incentives for large shareholders to be concerned about share prices, because after the reform they can realize gains and obtain cash by selling shares; prior to the reform, they could realize gains and obtain cash only from cash distributions, including, possibly, cash obtained from related-party transactions and tunneling.

We examine the implications of the share-reform-induced increase in incentive alignment for corporate cash holding policies. We consider two channels through which the reform affects cash holdings: a direct, free cash flow channel and an indirect financial constraint channel. With regard to the former, the free cash flow hypothesis presented by Jensen (1986) suggests that corporate insiders have incentives to hold excessive amounts of cash for their private benefit. In China specifically, a common perception is that parent companies (i.e., controlling shareholders) view the cash holdings of listed companies as a source of financing for their own use, as opposed to existing for the benefit of all shareholders. This effect is acute in the pre-reform period when controlling shareholders cannot freely sell their shares and thereby obtain cash. With regard to the latter channel, we note that agency costs can also affect cash holdings indirectly, because outside investors (banks, other creditors, and future equity investors) are less likely to provide capital to firms with significant agency problems. Bad corporate governance can therefore exacerbate existing financial constraints, which in turn increases the need/incentive to hold cash.

Using a panel of 1,293 Chinese-listed nonfinancial firms, and a sample period covering 2000–2008, we find that the average corporate cash holding decreased from 23.5% of noncash assets to 20.8% of noncash assets after the reform, a statistically reliable, economically significant decrease of 11%. We also find a significant reduction in the average corporate savings rate, as measured by the sensitivity of cash holdings to cash flow. These results are robust to controls for the operational, investment, and financing determinants of cash holdings and controls for unobserved firm- and year-fixed effects. To explore the roles of the free cash flow and financing channels in these changes in cash policies, we provide cross-sectional evidence of differing effects for firms characterized by weaker pre-reform governance arrangements and by tighter financial constraints. We find greater reductions in cash holdings in firms in which governance is weaker before the reform; our governance measures are monitoring from other large (noncontrolling) shareholders and the extent of related-party transactions between controlling shareholders and the listed company; more related-party transactions indicate weaker governance. This effect is consistent with an agency-induced free cash flow channel from governance to cash holdings. We also find greater reductions in cash holdings

in firms that would otherwise face tighter financial constraints (e.g., younger and smaller firms); this effect is consistent with an indirect financing channel from governance to cash holdings.

We also examine whether the effects of the reform differ between state-owned enterprises (SOEs) and privately owned firms. Differences in cash management policy responses between private firms and SOEs are not unexpected given the special characteristics of controlling shareholders of SOEs, who are themselves government agencies, as opposed to the persons or families who are controlling shareholders of private firms. The nature of both corporate governance and agency conflicts in SOEs is shaped by the existence of the controlling shareholder's government-agency objective function, including substantial nonprice considerations, for example, a wish to meet certain political and social welfare objectives (e.g., Shleifer 1998); in addition, the incentive and opportunity for a government agency to regard an SOE's cash as a fund for its own needs is diminished by the fact that the agency is not a person or a family but rather an organization with its own system of internal controls (e.g., Lin, Cai, and Li 1998). Controlling shareholders of private firms, in contrast, would in general not be expected to have political and social welfare objectives but would instead be expected to focus on maximizing returns, including the private returns associated with viewing corporate cash as a means to meet their own needs. Consistent with this difference in perspectives between controlling shareholders of SOEs and private firms, we find that the reduction in cash holdings is larger in privately owned firms than in state-owned firms. However, both groups experience similar degrees of reduction in cash savings rates.

To shed light on the relative importance of the free cash flow channel and the financial constraints channel for private firms and SOEs, we analyze post-share-reform dividend payout, and borrowing and investing behaviors, as well as investor valuation of corporate cash holdings. We predict that firms more affected by the free cash flow channel would be expected to increase cash payouts relatively more and firms more affected by the financial constraints channel would be expected to increase borrowing and capital investment more. We find that private firms increase dividend payouts but not capital investment, whereas SOEs increase dividends, but not as much as private firms, and SOEs also increase capital investment and short-term borrowings. We also find evidence that the market valuation of cash holdings increased after the share reform, more so for SOEs than for private firms. Taken together, these findings indicate that although both private firms and SOEs reduced cash holdings after the share reform, the reductions of cash holdings in private firms are more affected by the free cash flow channel and the reductions of cash holdings in SOEs are more affected by the financial constraint channel. These findings are consistent with the perspective that corporate insiders' ability to make personal use of corporate assets, including cash, was relatively more constrained in SOEs because their controlling owners are organizations with their own systems of internal controls.

Our research design assumes that the reform represents an exogenous shock to firms' governance systems, and that it affected only the exchangeability of previously nontradable shares, with no effects on (exogenously given) operating, financing, and investment opportunities that are unrelated to governance. Although we regard these assumptions as plausible, we also take steps to validate them and address alternative explanations. We find that our results are robust after controlling for the possibility that firms may have (limited) discretion in their choice of the reform timing. We also eliminate sample firms that undertook major restructurings or operational reorganizations during the reform period to ensure that the operations/business models of the sample firms are not changed concomitant with the reform. Finally, we find that the reduction in cash holdings is strongest in firms whose controlling shareholders' holdings are low, and that the sensitivity of cash holdings to cash flow is significantly reduced only in firms whose governance arrangements were weakest before the reform. These results are inconsistent with the alternative explanation that reduced cash holdings following the reform are due to exogenous, non-governance-related factors that affect financial constraints. Our findings of an average increase in capital expenditures and in the stock market valuation of cash after the reform are also inconsistent with the explanation that the reduced level of cash holdings is due to exogenous, negative shocks to investment opportunities.

Our paper belongs to the broad literature on the effects of corporate governance and contributes specifically to the literature on the determinants of cash holdings. Because cash can account for over one-fifth of corporate assets[1] and cash management in general has substantial consequences (see, e.g., Fresard 2010), understanding how corporate governance affects cash holdings can shed light on one of the channels through which governance arrangements affect firm value (Shleifer and Vishny 1997; Gompers, Ishii, and Metrick 2003). From a methodological perspective, our paper contributes by identifying a setting in which firms experience an exogenous shock to their governance systems, enabling us to identify the causal effect of governance on cash holdings. Our setting avoids the inference problems arising from the concern that both cash holdings and corporate governance arrangements can be endogenous responses to forces in firms' operating environments that are unobservable to researchers. Prior literature has relied on cross-country settings to minimize the impact of endogeneity at the firm level by studying the effect of country-level investor protection on firms' cash policies (e.g., Durnev and Kim 2005; Doidge, Karolyi, and Stulz 2007); however, these studies are subject to the concern that the level of investor protection is often correlated with other country characteristics that are difficult to control for. Our setting avoids the problem of correlated omitted variables by using a one-country design.

[1] Bates, Kahle, and Stulz (2009) report that the average ratio of cash to noncash assets in U.S. public companies is 23.2% in 2006, similar to the average ratio (23.4% over 2000–2008) for our sample firms.

In addition to these identification advantages, we also believe that our research setting should increase the power of our tests for three reasons. First, the ownership structures of Chinese-listed firms in the pre-reform period were arguably exogenously specified as part of the IPO arrangements, and the trading restrictions imposed on controlling shareholders before the reform would effectively preclude more than a very modest partial adjustment to changes in the economic environment. Second, China is characterized by weak shareholder protection, so the effects of governance changes that benefit minority shareholders should be relatively more pronounced and therefore easier to detect. Third, cash holdings are very important to Chinese-listed companies because Chinese financial markets are relatively underdeveloped.[2] The overall weak protection afforded Chinese minority investors makes it possible for controlling shareholders to control the listed company's cash and, if needed, to divert the cash to their own uses by related-party transactions and similar arrangements (see, e.g., Jian and Wong 2010; Jiang, Lee, and Yue 2010). This effect is exacerbated by the nontradability of controlling shareholders' shares; they cannot exchange their shares for cash, so they have an even stronger incentive to require the entities they control to hold cash, for their own cash needs. We believe that the importance of cash in the Chinese corporate setting implies that the effects of governance changes on cash holdings should be substantial and readily detectable.

Our paper also contributes by highlighting the interaction between the operational and agency motivations for holding cash, in that governance arrangements affect cash holdings directly (the free cash flow channel) and indirectly through the financial constraints channel. In contrast, previous research on corporate cash holdings focuses on either operational or agency considerations. The operational considerations literature emphasizes the effects of investment opportunities and financial constraints (e.g., Opler et al. 1999; Faulkender and Wang 2006; Bates, Kahle, and Stulz 2009; Denis and Sibilkov 2010; Duchin 2010), and suggests that cash holdings prevent underinvestment in desirable projects by managers who wish to increase share values. The agency considerations literature (e.g., Dittmar, Mahrt-Smith, and Servaes 2003; Pinkowitz, Stulz, and Williamson 2006; Kalcheva and Lins 2007; Dittmar and Mahrt-Smith 2007; Harford, Mansi, and Maxwell 2008) suggests that ample cash holdings facilitate overinvestment in undesirable projects or outright misappropriation.

Finally, our study extends research on the split share structure reform itself. For example, Lin (2009) finds that related-party transactions decline in both frequency and amount after the reform, and interprets this reduction as

[2] The China Capital Markets Development Report (2008), issued by the China Securities Regulatory Commission (CSRC), shows that investments in debt and equity securities were 22% of China's total financial assets in 2006, compared to 82%, 71%, 62%, and 75% in the United States, United Kingdom, Japan, and South Korea, respectively. From 2001 to 2008, total funds raised from the equity markets and corporate bond markets were 4,097 and 3,329 billion RMB, about 6.3% and 4.0% of funds raised from total bank loans, respectively.

consistent with the view that the reform reduced agency conflicts, specifically conflicts that induced tunneling in the form of related-party transactions. In the context of our study, her results support our use of related-party transactions as an indicator of corporate governance, and suggest that when the reform reduced market frictions, governance improved. Like Lin (2009), we examine a real effect of the reform, and find that reform is associated with improved outcomes, in the form of lower cash holdings and higher market valuations of cash holdings. Two recent studies also examine the reform process itself. Li et al. (2011) hypothesize and find that the compensation paid by controlling shareholders to minority shareholders as part of the reform process is partly determined by the gains from improved risk sharing made possible by the reform, which removed the market friction that precluded certain shareholders from freely exchanging their shares. Relatedly, Firth, Lin, and Zou (2010) find that state ownership increases compensation, whereas mutual fund ownership decreases compensation, particularly in SOEs. That is, state shareholders both offer more compensation, to facilitate a rapid and smooth reform process, and pressure mutual funds to accept the offered compensation. Relative to our study, both Li et al. (2011) and Firth, Lin, and Zou (2010) examine aspects of the reform process; we examine its outcomes.

The rest of this paper is organized as follows. Section 1 describes the institutional environment that provides the setting for our analysis and the development of our hypotheses. Section 2 describes the data and our main empirical results; Section 3 summarizes additional analyses; and Section 4 concludes.

1. Institutional Background and Hypothesis Development

1.1 Institutional background

In 2005, a government-mandated reform eliminated the two-tier share structure in Chinese-listed companies that distinguished between tradable and nontradable common shares; this reform is described in detail in, for example, Li et al. (2011). In the two-tier share structure, tradable shares were issued to investors, typically small shareholders, through the IPO subscription process at government-approved IPO prices, typically 12–15 times earnings, whereas nontradable shares were issued to the government (for former state-owned enterprises) or the founders (for private companies) and their affiliates, often for a nominal price of 1 RMB per share. Nontradable shares account for the majority of shares issued at the IPO; before the reform, almost all controlling shareholders in our sample firms held nontradable shares (the sample average ownership is 47%). Before the reform, nontradable shares could not be freely traded; they could be exchanged but only at a negotiated price under special circumstances, often requiring government approval. Although tradable and nontradable shares have the same cash flow rights and voting rights, the inability

of holders of nontradable shares to dispose of those shares in open market transactions constituted a significant market friction.

The reform required the nontradable shares to be converted into tradable shares, subject to agreement by supermajorities of both tradable and nontradable shareholders and subject to compensation from the holders of nontradable shares to the holders of tradable shares. The reform was implemented under the supervision of the China Securities Regulatory Commission (CSRC). Two pilot programs involving four and forty-two listed companies in May and June 2005 were conducted before the CSRC formalized the procedure and applied the reform to all listed firms in August 2005. All reforms were supposed to be completed by the end of 2006.

In a typical reform, holders of nontradable shares propose the conversion of nontradable shares to tradable shares, along with compensation to be paid by the nontradable shareholders (not the firm itself) to the tradable shareholders. Compensation can be a one-time cash payment, warrants, and most frequently, shares transferred from the nontradable shareholders to the tradable shareholders. The proposal may also include plans for organizational changes and asset restructurings, either of which may involve capital infusions or asset infusions from the controlling shareholders, or business combinations with other affiliates controlled by the controlling shareholders.[3] Trading of the listed company's stock is suspended and negotiations between the tradable and nontradable shareholders commence; the board facilitates these negotiations. A final proposal is put to a shareholder vote at a specially called shareholder meeting. Trading is resumed temporarily at this point but is suspended again between the date shareholders start to register to receive the compensation and to vote, and the date when the vote outcome is known. Lin (2009) reports that the average (median) numbers of calendar days for the first and second suspension periods are 17.3 (14) days and 35.2 (28) days, respectively. The reform is completed when the proposal is approved by at least two-thirds of the tradable shareholders and two-thirds of all shareholders.[4]

1.2 Hypothesis development

Research proposes that corporate cash holdings are mainly determined by business environments (operational determinants) and by governance arrangements and agency conflicts. In the absence of agency conflicts, firms (in the neoclassical sense, where each firm operates as a single economic agent) will choose their cash holdings to maximize firm values given their underlying business environments. With regard to operational determinants, research indicates that firms that use more cash for payments and incur higher transaction

[3] Our analysis excludes these firms to ensure that our sample firms experience no significant changes in their underlying business models.

[4] The first-round passing rate for the proposal is 97.5% (see Lin 2009); if the first proposal does not pass, the proposal is revised, and shareholders vote again until the reform is completed.

costs from converting noncash financial assets to cash will hold more cash, to facilitate transacting (Baumol 1952; Miller and Orr 1966). Similarly, firms with relatively greater investment opportunities or those who face more costly or more constrained access to capital markets will also hold more cash, again, for operational reasons.[5] These factors have been examined by, for example, Opler et al. (1999), Bates, Kahle, and Stulz (2009), and Duchin (2010).

With regard to governance-related determinants, misaligned incentives of corporate insiders and outsiders can cause corporate cash holdings to deviate from the levels that would be observed if only operational determinants were at work. We consider two related channels through which governance-related considerations affect cash holdings. First, the free cash flow channel links insiders' incentives directly to cash holdings. Specifically, if corporate cash holdings are chosen to meet the needs and wishes of insiders and not to maximize shareholder value, we expect, as discussed by Jensen (1986), that firms will hold excess cash, relative to amounts needed for operational and investment purposes. Second, the financing channel links insiders' incentives to cash holdings through financing constraints. Whereas the operational determinants literature predicts that firms facing financial constraints would hold more cash than the amounts needed if the financial constraints were relaxed, the presence of misaligned incentives will exacerbate these effects, because external suppliers of capital will be reluctant to provide capital to firms with agency problems. Although financial constraints, alone, would be expected to increase cash holdings, agency conflicts within financially constrained firms will, we predict, increase cash holdings even further, by adding to the financing difficulties already present. Put another way, incentive misalignment can intensify the effects of existing financial constraints to the extent that outside investors are disinclined to invest in firms beset by agency conflicts (i.e., badly governed firms). Therefore, governance arrangements that increase incentive alignment and reduce agency conflicts can lead to lower cash holdings through a direct cash flow channel, by mitigating the Jensen free cash flow problem, and through an indirect financial constraints channel, by reducing the agency-cost-induced intensification of financial constraints.

The split share reform in China reduced a substantial market friction and thereby facilitated a better alignment of the interests of the controlling shareholders (holders of previously nontradable shares) with those of the outside minority investors (holders of tradable shares). The ability to sell their shares on exchanges and thereby realize the benefits of stock price appreciation gives the controlling shareholders incentives to care about share values, which in turn increases their incentives to take value-maximizing actions for the firm as a whole, including reducing or eliminating their expropriating behaviors.

[5] Foley et al. (2007) propose that U.S. multinational corporations have high cash holdings outside the United States because repatriating cash has negative tax consequences. This tax motive is not applicable to Chinese public companies.

Following this reasoning, we predict that cash holdings of Chinese-listed companies will decline after the 2005 reform. We state this prediction in alternative form as follows:

H1: The average postreform cash holding is lower than the average pre-reform cash holding.

We also investigate how the effect of reform on cash holdings varies cross-sectionally with firm-specific characteristics that capture agency conflicts and financial constraints. Firms with more severe agency conflicts will experience the effects of the share reform through the free cash flow channel; we predict larger decreases in cash holdings in firms with more severe agency conflicts before the reform, because they are more likely to benefit directly from the reform. Firms with more severe financial constraints will experience the effects of the share reform through the (indirect) financial constraints channel; we predict larger decreases in cash holdings for firms facing more severe financial constraints, because they are more likely to benefit from better access to outside capital. We summarize this second prediction below.

H2: The reduction in cash holdings in the postreform period is greater for firms with more governance problems and for firms with more financial constraints before the reform.

We provide additional analyses of the channels through which the share reform affects corporate cash holdings and of two outcome indicators of the cash-policy-related effects of the reform: the propensity of firms to save cash, and investors' valuations of cash holdings. With regard to the former, our hypotheses are based on the premise that the effects of the share reform on cash holdings operate through either or both the free cash flow channel and the financial constraints channel, and that one or the other channel would be relatively more important for firms with more governance problems and more financial constraints. We also expect that most or all of our sample firms would be affected through both channels, because they would experience at least some agency conflicts that would be (at least) partially reduced by the reform. However, the reform-induced governance improvement would be expected to lead to different outcomes, depending on firm-specific circumstances. As explained in more detail in Section 3, firms whose pre-reform excess cash holdings were held mostly to benefit controlling shareholders, not for operational or investing purposes, are predicted to reduce cash holdings and pay out more cash to investors, with little or no impact on financing or investing decisions. In contrast, firms that held excess cash as a response to financial constraints that were exacerbated by agency problems are predicted to reduce cash holdings, increase borrowing, and increase investment. With regard to outcome indicators of the cash flow effects of the reform, we expect that firms will save less of the cash they generate from operations, and that investors' valuation of cash holdings will increase. We analyze these predictions empirically in Sections 2 and 3.

2. Empirical Analysis

2.1 Sample and data description

Our sample consists of all nonfinancial firms listed on the Shanghai and Shenzhen stock exchanges from 2000 to 2008. We start with 2000, the first year Chinese-listed firms applied a consistent and unified set of accounting standards, because many of the measures used in our analysis rely on accounting data, and we wish to ensure comparability among these variables. To hold the operational and investment environment for our sample firms constant over the share reform period, we exclude 126 firms with significant asset infusions or restructurings during the reform. Our final sample consists of 8,933 firm-year observations and 1,293 unique firms. Of these, 1,016 firms completed the conversion of nontradable shares to tradable shares: 213 firms completed the conversion in 2005, 721 in 2006, 64 in 2007, and 18 in 2008. The 277 firms that did not complete the conversion either had no nontradable shares before the reform or were first listed after the reform (and therefore did not issue nontradable shares). Including these firms helps increase the precision of our estimates of the normal level of cash holdings.

We retrieve all variables from the WIND, CSMAR, and CCER databases. We winsorize all continuous variables at 1% and 99%. Table 1, Panel A, provides variable definitions, and Panel B tabulates summary statistics for all variables used in the analysis. The measure of total $Cash_{i,t}$, is calculated as firm i's balance sheet amount of cash and cash equivalents as a percentage of the firm's noncash assets in year t.[6] Table 1, Panel B, shows that the mean (median) pooled sample ratio of cash to all noncash assets is 23.4% (15.7%). Panel B also provides summary statistics for cash holdings by year. Despite differences in the institutional environments of China and the United States, the average cash ratios for our sample are by and large comparable in magnitude to those documented for U.S. firms by Bates, Kahle, and Stulz (2009). The data suggest different calendar time trends in cash holdings between U.S. firms and Chinese firms. For example, the mean (median) cash to noncash asset ratio for our sample firms was 26.9% (19.1%) in 2001, and decreased to 21.1% (15%) in 2006; the mean (median) cash ratio for U.S. firms was 21.4% (10.7%) in 2001 and increased to 23.2% (13.3%) by 2006 (see Table 1 in Bates, Kahle, and Stulz 2009). Bates, Kahle, and Stulz (2009) argue that increasing corporate cash holdings in the United States are largely attributable to increasing operational uncertainty. The decrease in total cash holdings for Chinese firms was concentrated in 2005 and 2006, when most firms finished their share reforms.[7]

[6] In untabulated results, we obtain qualitatively similar results when we include short-term investments in $Cash$.

[7] The calendar time summary data on total corporate cash holdings do not provide evidence on our hypotheses, for two reasons. First, our hypotheses and tests focus on excess cash, that is, cash holdings conditional on controls for operational and investing needs. Second, the calendar-year timing of the share reform differs across firms, so its effects cannot be assessed by analyzing calendar time changes in cash holdings.

Table 1
Variable definitions and summary statistics

Panel A: Variable definitions

Variable	Definition
Cash	Cash and cash equivalents scaled by noncash assets.
Reform	An indicator variable that equals one if firm i has completed the share reform by the end of year t.
Monitor	Herfindahl index of shareholdings by the second to the fifth largest shareholders, multiplied by their total percentage holdings.
RPT	Ratio of the amount of related-party transactions between the listed company and the parent company (or its affiliates) to total sales.
LogTA	Logarithm of total assets.
LogSales	Logarithm of total revenues.
Leverage	Ratio of total liabilities to total noncash assets.
OPCF	Cash from operations scaled by noncash assets.
NETWC	Difference between current noncash assets and current liabilities, scaled by noncash assets.
CashVol	Standard deviation of cash from operations across firms in the same industry.
CAPEX	Capital expenditures, scaled by noncash assets.
Age	The number of years since the firm was listed on the exchange.
M2B	Ratio of market value to book value of equity.
IPO	Indicator variable for the year of and the year after the IPO.
Dividend	Indicator variable that equals one if firm i paid cash dividends in year t.
SEO	Indicator variable that equals one if firm i issued seasoned equity in the preceding four years.
Dum_ST	Indicator variable that equals one if firm i has losses in the preceding two years.
SOE	Indicator variable that equals one if the controlling shareholder is a government agency.
TobinQ	Ratio of market value to book value of assets; market value of assets is proxied by market value of equity plus book value of total liabilities.
ExRet	Annual stock return of firm i in excess of the average industry return in year t.
ROA	Ratio of after-tax operating income to noncash assets.
Div/Earnings	Dividend payments scaled by earnings.
TotalDebt	Total interest bearing debt scaled by noncash assets.
STDebt	Short-term interest bearing debt scaled by noncash assets.
LTDebt	Long-term interest bearing debt scaled by noncash assets.

Panel B: Summary statistics

Variable	N	Mean	SD	5%	25%	50%	75%	95%
Cash	8,933	0.234	0.239	0.027	0.088	0.157	0.287	0.735
Reform	8,933	0.405	0.491	0	0	0	1	1
Monitor	8,913	0.243	0.124	0.090	0.150	0.217	0.308	0.502
RPT	8,931	0.142	0.312	0.000	0.000	0.001	0.141	0.734
LogTA	8,933	21.202	0.916	19.833	20.569	21.106	21.758	22.864
LogSales	8,931	20.536	1.235	18.596	19.700	20.502	21.316	22.693
Leverage	8,933	0.558	0.203	0.216	0.418	0.564	0.699	0.888
OPCF	8,933	0.065	0.101	−0.095	0.012	0.060	0.115	0.239
NETWC	8,933	−0.040	0.224	−0.424	−0.184	−0.038	0.107	0.337
CashVol	8,933	0.098	0.017	0.077	0.086	0.093	0.100	0.135
CAPEX	8,913	0.082	0.079	0.002	0.022	0.058	0.116	0.248
Age	8,933	6.898	3.782	1	4	7	10	13
M2B	8,933	2.905	2.066	1.082	1.522	2.240	3.542	7.038
IPO	8,933	0.147	0.354	0	0	0	0	1
Dividend	8,933	0.552	0.497	0	0	1	1	1
SEO	8,933	0.063	0.243	0	0	0	0	1
Dum_ST	8,933	0.025	0.155	0	0	0	0	0
SOE	8,920	0.707	0.455	0	0	1	1	1
TobinQ	8,932	1.527	0.602	1.001	1.131	1.323	1.693	2.792
ExRet	8,278	−0.010	0.490	−0.761	−0.188	−0.049	0.114	0.798
ROA	8,889	0.045	0.067	−0.068	0.023	0.049	0.077	0.140
Div/Earnings	8,889	0.317	0.458	0.000	0.000	0.145	0.505	1.052
TotalDebt	8,933	0.255	0.162	0.000	0.130	0.252	0.371	0.531

(*Continued*)

Table 1
Continued

Variable	N	Mean	SD	5%	25%	50%	75%	95%
STDebt	8,933	0.190	0.139	0.000	0.076	0.177	0.281	0.445
LTDebt	8,933	0.064	0.093	0.000	0.000	0.022	0.095	0.272
Cash by Year								
2000	754	0.241	0.261	0.018	0.085	0.152	0.288	0.808
2001	818	0.269	0.257	0.036	0.101	0.191	0.339	0.782
2002	884	0.245	0.245	0.029	0.090	0.168	0.300	0.758
2003	938	0.234	0.233	0.032	0.093	0.160	0.290	0.709
2004	1,037	0.233	0.235	0.029	0.088	0.154	0.286	0.745
2005	1,032	0.201	0.208	0.023	0.075	0.139	0.245	0.600
2006	1,067	0.211	0.214	0.026	0.081	0.150	0.256	0.607
2007	1,162	0.242	0.251	0.027	0.089	0.161	0.294	0.787
2008	1,241	0.237	0.247	0.026	0.090	0.158	0.289	0.766

The sample consists of 8,933 firm-year observations from 1,293 nonfinancial firms listed on Chinese domestic exchanges from 2000 to 2008. All variables are calculated for each firm-year.

2.2 Main results

2.2.1 The average effect of share reform on cash holdings. Because our sample firms completed the conversion of nontradable shares to tradable shares at different calendar times, we are able to apply a difference-in-differences method to identify the effect of the reform separately from time-specific changes. In a given year, some sample firms have completed the conversion (the treatment group) and other sample firms have not (the control group). Both groups experience the same time-specific changes so the differences in their cash holdings provide an estimate of the effect of the share reform on cash holdings. We estimate the following equation to test $H1$:

$$Cash_{i,t} = \alpha_t + \alpha_i + \gamma Reform_{i,t} + \beta X_{i,t} + \varepsilon_{i,t}, \quad (1)$$

where α_t and α_i are dummies for year and firm, respectively. $Reform_{i,t}$ is an indicator variable equal to one if firm i has finished the reform by year t. The year dummies control for calendar-year-specific effects. The firm fixed effects dummies control for time-invariant unobservable firm-specific characteristics; in untabulated analysis, we obtain qualitatively similar results when we use industry fixed effects instead of firm fixed effects. $X_{i,t}$ is the set of control variables that determine the normal level of cash holdings. We cluster all standard errors at the firm level to control for an arbitrary firm-level correlation structure; therefore, the effective number of observations is the number of unique firms.

Based on prior research (e.g., Opler et al. 1999), $X_{i,t}$ includes the following control variables: $LogSales_{i,t}$ (size, the logarithm of total sales revenues), $OPCF_{i,t}$ (operating cash flow scaled by total noncash assets), $NETWC_{i,t}$ (net working capital, the difference between current noncash assets and current liabilities, scaled by total noncash assets), $CAPEX_{i,t}$ (capital expenditures scaled by total noncash assets), $Age_{i,t}$ (number of years since the firm's IPO), $M2B_{i,t}$ (the ratio of market value to book value of equity), and $CashVol_{i,t}$

(the standard deviation of cash from operations across all firms in the same industry each year).[8] These variables control for normal cash holdings to meet operational and investment needs. We include an indicator variable equal to one for firms experiencing two consecutive years of losses ($Dum\_ST_{i,t}$). Chinese stock exchanges designate as ST (for special treatment) firms with two consecutive years of losses; a firm with three years of losses is subject to potential delisting. We also include financing-related variables: $Leverage_{i,t}$ (total liabilities to noncash assets ratio), $Dividend_{i,t}$ (an indicator variable equal to one if a cash dividend is paid in year t), $SEO_{i,t}$ (an indicator variable equal to one if the firm completed a seasoned equity issuance including a rights offering in the preceding four years), and $IPO_{i,t}$ (an indicator variable equal to 1 in the IPO year and the year after). Finally, we include an indicator variable ($SOE_{i,t}$) equal to one if the controlling shareholder is a state-owned enterprise or government agency, in which case we refer to the firm as an SOE; otherwise, we refer to it as a private (non-SOE) firm. Unless otherwise noted, all variables are measured on a firm-year basis; we omit the subscripts i and t for notational ease.

Table 2 tabulates results from estimating (1). Column 1 shows the main result. The coefficient for the reform indicator variable is −0.0274 (t-statistic = 2.75, significant at better than the 1% level, two-tailed). This result is consistent with the prediction that the share reform results in smaller cash holdings, after controlling for cash holdings to meet operational/investing needs ("normal" cash holdings); that is, the reform results in reduced levels of excess corporate cash. The magnitude of this effect is economically significant: −0.0274 represents an 11.7% (= 2.74/23.5) reduction from the sample average pre-reform cash level of 23.5%, suggesting that prior to the reform, close to 12% of cash holdings by Chinese-listed companies were due to problems that were partially or wholly resolved by the share reform.

In Column 2, we add a variable capturing the interaction between *Reform* and *SOE*; the estimated coefficient on this interaction term captures the differential cash holding response of a state-owned firm (*SOE*) to the reform. The coefficients for *Reform* and *Reform*∗*SOE* are −0.0483 and 0.0317, respectively; both are significant at better than the 1% level. In terms of economic magnitude, the sample average pre-reform cash holdings for private firms and SOEs are 25.9% and 22.8%, respectively, indicating that the share reform reduces cash holdings by 18.6% (= 4.83/25.9) for private firms and by 7.3% (= (4.83-3.17)/22.8) for SOEs. These results indicate that private firms reduced their cash holdings more than SOEs did after the share reform. This difference in how the reform affected cash holdings is not unexpected given that the controlling shareholders of SOEs are government agencies whose primary objective may be something other than maximizing returns, including private

[8] Our sample firms lack sufficient observations to calculate firm-specific overtime cash flow volatility, so we use $CashVol_{i,t}$ as a cross-sectional measure of volatility. In unreported results, we find qualitatively similar results if we use firm-specific stock return volatility.

Table 2
Average effect of the reform on cash holdings

	(1)	(2)	(3)	(4)	(5)	(6)
Reform	−0.0274***	−0.0483***		−0.0286**	−0.0554***	
	[2.75]	[3.82]		[2.30]	[3.45]	
*Reform*SOE*		0.0317***	0.0340***		0.0405***	0.0412***
		[2.92]	[3.21]		[2.95]	[3.06]
LogSales	−0.0246***	−0.0249***	−0.0261***	−0.0232***	−0.0234***	−0.0245***
	[3.15]	[3.18]	[3.32]	[3.16]	[3.19]	[3.32]
Leverage	0.338***	0.336***	0.336***	0.334***	0.332***	0.333***
	[10.84]	[10.77]	[10.77]	[10.69]	[10.63]	[10.65]
OPCF	0.492***	0.493***	0.495***	0.483***	0.484***	0.484***
	[16.01]	[15.99]	[16.08]	[15.35]	[15.35]	[15.41]
NETWC	−0.0103	−0.00857	−0.00834	−0.0167	−0.0160	−0.0157
	[0.41]	[0.34]	[0.33]	[0.67]	[0.64]	[0.63]
CashVol	0.574***	0.606***	0.616***	0.542***	0.559***	0.565***
	[2.94]	[3.10]	[3.14]	[2.73]	[2.81]	[2.83]
CAPEX	−0.0609*	−0.0670*	−0.0677*	−0.0806**	−0.0845**	−0.0852**
	[1.66]	[1.84]	[1.86]	[2.14]	[2.25]	[2.26]
Age	0.00250	0.00219	−0.00236	0.00298	0.00258	−0.00262
	[1.20]	[1.06]	[1.16]	[1.42]	[1.25]	[1.23]
M2B	0.00154	0.00142	0.00167	0.00654***	0.00649***	0.00650***
	[0.73]	[0.67]	[0.79]	[2.93]	[2.91]	[2.91]
IPO	0.213***	0.212***	0.211***	0.221***	0.220***	0.221***
	[21.25]	[21.25]	[21.15]	[20.01]	[20.00]	[20.02]
Dividend	0.0340***	0.0345***	0.0345***	0.0332***	0.0335***	0.0334***
	[7.83]	[7.95]	[7.96]	[7.60]	[7.68]	[7.64]
SEO	0.0940***	0.0942***	0.0938***	0.0911***	0.0912***	0.0911***
	[11.26]	[11.27]	[11.24]	[10.82]	[10.83]	[10.83]
Dum_ST	−0.0218	−0.0223	−0.0206	−0.0150	−0.0146	−0.0135
	[1.48]	[1.51]	[1.39]	[0.95]	[0.93]	[0.85]
SOE	−0.00276	−0.0165	−0.0183*	−0.000853	−0.0166	−0.0175
	[0.26]	[1.49]	[1.65]	[0.08]	[1.48]	[1.56]
$Before^2$			0.0106			0.0143
			[1.11]			[1.46]
$Before^1$			0.0122			0.0164
			[1.01]			[1.28]
$After^0$			−0.0366***			−0.0334**
			[2.68]			[2.23]
$After^1$			−0.0320**			−0.0265*
			[2.51]			[1.91]
$After^2$			−0.0108			−0.0132
			[1.16]			[1.42]
$Reform*TimingFactors_{04}$						
included	No	No	No	Yes	Yes	Yes
N	8,898	8,898	8,898	8,292	8,292	8,292
Adjusted R^2	0.653	0.654	0.654	0.617	0.618	0.618

The dependent variable is $Cash_{it}$, defined as the ratio of cash to noncash assets for firm i in year t. $Reform_{it}$ is a dummy variable that equals one if firm i has completed the share reform by the end of year t. $Before^j$ ($After^j$) is a dummy variable for the *jth* year prior to (after) the year firm i finished the reform. See Table 1 for definitions of all other variables. In all regressions, year- and firm-fixed effects are included, and standard errors are adjusted for heteroscedasticity and within-cluster correlation among all observations belonging to the same firm. Columns 4–6 include regressors of $Reform*TimingFactors_{04}$, where $TimingFactors_{04}$ include *Dummy_2/3* (an indicator variable equal to one if the controlling shareholder owns more than two-thirds of all nontradable shares), *%State* (percent of shares owned by government agencies), *%Inst* (percent of shares owned by mutual funds), *Dum_ST* (an indicator variable for whether the firm is listed as ST by the exchanges), *%NonTradable* (total percent of nontradable shares), and *RetVol* (the standard deviation of the residuals from a market model estimation using the firm's daily returns over 2004). All *TimingFactors* variables are measured at their 2004 values. Absolute values of t-statistics are shown in brackets. ***, **, and * indicate significance at equal to or less than the 1%, 5%, and 10% levels, respectively.

returns. In Section 3, we report the results of additional analyses of the reasons for reductions in cash holdings at private firms and SOEs.

Because all regressions in Table 2 include calendar-year indicator variables (these estimated coefficients are not tabulated), the coefficient on *Reform* can be interpreted as the average effect of the share reform on cash holdings. To investigate the dynamics of cash holdings and the effect of the reform over time, we introduce five event-year indicator variables: $Before^2$, $Before^1$, $After^0$, $After^1$, and $After^2$, where $Before^j$ ($After^j$) equals one for the firm-observation j years prior to (after) the reform is completed.[9] If the reform induces lower excess cash holdings, we should observe negative coefficients for the *After* indicator variables but not for the *Before* indicator variables. The $Before^j$ variables allow us to assess whether the sample firms reduced their cash holdings prior to the reform, and the $After^j$ variables assess the average time for firms to adjust cash holdings in light of the reform.

Column 3 shows the estimation results from this specification. The coefficients for $Before^2$ and $Before^1$ are small (approximately 0.01) and statistically indistinguishable from zero (neither t-statistic exceeds 1.15). The coefficients for $After^0$ and $After^1$ are reliably negative at the 1.2% level or better; the coefficient on $After^0$ is –0.0366 (t-statistic = 2.68) and the coefficient on $After^1$ is -0.0320 (t-statistic = 2.51). The coefficient for $After^2$ is negative (-0.0108) but not significant at conventional levels. These results support the interpretation that the reform results in meaningful reductions in the cash holdings of affected firms, after controlling for cash needed to meet operational/investing needs, and the effect persists for at least one year after the reform.

Although it is not the main focus of our paper, Table 2 also provides information about the operating and investing determinants of cash holdings in Chinese-listed companies. These determinants are largely consistent with those identified using U.S. data (e.g., Opler et al. 1999). For example, *LogSales* has a negative coefficient of -0.0246 (t-statistic = 3.15), consistent with the transactions motive for holding cash: Large companies hold relatively less cash because of economies of scale. The coefficient estimate for *CashVol* is 0.574 (t-statistic = 2.94), consistent with the view that firms with more volatile cash flows hold more cash. Inferences from results in other columns are similar.

2.2.2 Cross-sectional variation in the effects of share reform on cash holdings. As discussed earlier, governance arrangements can affect cash holdings through a direct cash flow channel, by reducing the cash accumulated to meet the needs and demands of self-interested insiders, and through an indirect financial constraints channel, in which the reduction of agency conflicts

[9] Bertrand and Mullaianathan (2003) use a similar specification to assess the direction of causality between the passage of state-level business combination laws in the United States and changes in wages, employment, and investment.

makes outside creditors and investors more willing to provide capital. To further explore these two effects and to test our second hypothesis, we modify Equation (1) to include variables that capture agency problems and financial constraints:

$$Cash_{i,t} = \alpha_t + \alpha_i + \gamma Reform_{i,t} + \lambda \left(Reform_{i,t} * Z_i \right) + \beta X_{i,t} + \varepsilon_{i,t}, \qquad (2)$$

where Z_i refers to variables that capture agency problems and financial constraints for firm i *before* the reform. Because Z_i is measured as a firm-specific average over pre-reform years for each sample firm i, we do not include Z_i on its own in the presence of the firm fixed effects. In untabulated results, we obtain qualitatively similar results when we use $Z_{i,t}$ instead of Z_i (there we include $Z_{i,t}$ on its own). Hypothesis 2 predicts that $\widehat{\lambda} > 0$ when higher values of Z measure less severe pre-reform agency problems and financial constraints.

We use two firm-specific measures of the severity of agency conflicts prior to the reform, $Monitor_i$ and RPT_i. $Monitor_i$ captures monitoring intensity by large shareholders other than controlling shareholders. Large shareholders have both the incentive to monitor insiders' behavior (because they have more at stake) and the ability to do so (because of their voting power/resources). On the other hand, large shareholders' monitoring effectiveness will be attenuated if they face a free rider problem (Shleifer and Vishny 1986). We measure $Monitor_i$ as the product of total shares (as a percentage of total shares outstanding) held by the second to the fifth largest shareholders of firm i and a Herfindahl index for the concentration of shares among these shareholders, averaged over the pre-reform years. We expect stronger pre-reform monitoring in firms whose largest shareholders (other than the controlling shareholder) collectively hold more shares, and these shares are held in a more concentrated way. To the extent that large shareholders' postreform monitoring incentives are not affected by the ability to trade their shares, we expect a positive coefficient estimate for $Reform * Monitor_i$. However, because the reform allows all nontradable shares to be traded and most large shareholders held nontradable shares, it is possible that large shareholders' postreform monitoring incentives could be strengthened because they can benefit from stock price appreciation. This would imply that the effect of the reform is stronger for firms with higher concentration. If this effect dominates, we could observe a negative coefficient estimate for $Reform * Monitor_i$.[10] It is an empirical question which effect dominates.

RPT_i, measures the extent of related-party transactions (RPT) between the controlling shareholder (the parent company and its affiliates) and the listed company; previous research shows that controlling shareholders use RPT to extract resources (e.g., Johnson et al. 2000; Jian and Wong 2010; Jiang, Lee, and Yue 2010). As previously mentioned, Lin (2009) finds a significant reduction in the frequency and magnitude of related-party transactions after the reform.

[10] We thank the referee for bringing up this point.

Based on prior research, we use RPT as a proxy for the extent of agency conflicts in the pre-reform period. We calculate RPT_i as the average value of related-party transactions, scaled by total sales of the listed company, over the pre-reform years.[11] We hypothesize that firms with larger values of RPT_i have more severe pre-reform agency conflicts and would see larger reductions in their cash holdings after the reform (i.e., we predict a negative coefficient estimate for $Reform*RPT_i$).

To the extent that the reform reduces agency conflicts that intensify financial constraints, we also expect that the reform reduces cash holdings more for firms with more severe pre-reform financial constraints. We measure these constraints using two proxy variables developed by previous research (e.g., Almeida, Campello, and Weisbach 2004): firm size, measured as total assets (in logarithm, $LogTA_i$), and number of years since the *IPO* (Age_i), both calculated as the average over the pre-reform years. The idea is that larger and older firms are less likely to face financial constraints because they have more assets suitable for use as collateral and less information uncertainty about their operations and long-term viability. Studies using U.S. data (e.g., Almeida, Campello, and Weisbach 2004; Faulkender and Wang 2006) often measure financial constraints inversely using credit ratings and dividend policies (rated firms and dividend-paying firms are less financially constrained). However, because few domestically listed Chinese firms had credit ratings before the share reform and because the CSRC *requires* listed firms to pay dividends as a condition for issuing additional equity, neither measure has the same ability to capture financial constraints in our setting as it would in a U.S. setting.

Table 3, Panel A, reports the results from estimating (2), including our measures of pre-reform agency conflicts (Columns 1–2) and pre-reform financial constraints (Columns 3–4); Column 5 includes all four measures. To facilitate interpretations, all continuous interactive variables are demeaned. To preserve space, the coefficient estimates for control variables are not tabulated. In Column 1, the coefficient estimate for $Reform*Monitor_i$ is 0.0673 (t-statistic = 1.59, significant at the 11% level, two-tailed). The coefficient magnitude implies that a one-standard-deviation increase in $Monitor_i$ from its mean value (an increase of 0.124) would reduce the impact of the reform on cash holdings by 3.6% (= 0.124*6.73/23.5, recall that 23.5% is the average cash holding prior to the reform). In other words, Table 2 shows that the reform reduces the average firm's cash holding by 11.7%, as discussed earlier; a one-standard-deviation decrease in the value of $Monitor_i$ would be associated with

[11] Chinese accounting standards require that each listed company disclose the amount and nature of all transactions between the company and its parent (the controlling shareholders) or affiliates controlled by the parent. To the extent that related-party transactions occur for reasons other than tunneling, RPT_i measures agency conflicts with error that should bias against finding results. We obtain results similar to those reported in the tables from scaling average related-party transactions by total assets, or from using a dummy variable for the existence of RPT (results not tabulated).

Table 3
Cross-sectional variation in the effect of the reform on cash holdings

Panel A: Cross-sectional variation in the effect of the reform on cash holdings

	(1)	(2)	(3)	(4)	(5)
Reform	−0.0682***	−0.0460***	−0.478***	−0.109***	−0.594***
	[3.94]	[3.61]	[3.84]	[6.99]	[4.72]
*Reform*Monitor*$_i$	0.0673				0.0448
	[1.59]				[1.00]
*Reform*RPT*$_i$		−0.0494**			−0.0519**
		[2.22]			[2.34]
*Reform*LogTA*$_i$			0.0206***		0.0231***
			[3.45]		[3.89]
*Reform*Age*$_i$				0.0113***	0.0110***
				[6.62]	[6.26]
*Reform*SOE*	0.0333***	0.0324***	0.0206*	0.0297***	0.0245**
	[3.03]	[2.97]	[1.88]	[2.82]	[2.22]
Control variables	Yes	Yes	Yes	Yes	Yes
N	8,385	8,394	8,394	8,394	8,385
Adjusted R^2	0.616	0.616	0.617	0.619	0.621

Panel B: Alternative specification for the effect of the reform on cash holdings

	(1)	(2)	(3)	(4)	(5)
Intercept	−0.0655***	−0.0385***	−0.645***	−0.0879***	−0.732***
	[4.10]	[3.56]	[4.84]	[6.61]	[5.43]
Monitor	0.0845*				0.0639
	[1.85]				[1.39]
RPT		−0.0476**			−0.0534**
		[2.15]			[2.43]
LogTA			0.0291***		0.0308***
			[4.53]		[4.78]
Age				0.00941***	0.00859***
				[5.51]	[5.03]
SOE	0.0485***	0.0473***	0.0304**	0.0373***	0.0291**
	[3.80]	[3.73]	[2.36]	[2.97]	[2.26]
N	1,015	1,016	1,016	1,016	1,015
Adjusted R^2	0.014	0.015	0.030	0.039	0.062

In Panel A, the dependent variable is $Cash_{it}$, defined as the ratio of cash to noncash assets for firm i in year t. $Reform_{it}$ is a dummy variable that equals one if firm i has completed the share reform by year t. See Table 2 for definitions of all other variables. All variables are measured by firm-year except those with the subscript i, which are calculated as the firm-specific average over the pre-reform years. In all regressions, year- and firm-fixed effects are included, and standard errors are adjusted for heteroscedasticity and within-cluster correlation among all observations belonging to the same firm. The coefficient estimates for the control variables are not tabulated and are available from the authors upon request. In Panel B, the dependent variable is the change in the average excess cash for each firm from pre-reform periods to postreform periods. Average excess cash for each period is the average of the residuals from estimating Equation (1) using the entire sample (excluding the dummy variable *Reform*) for each firm over each period. The independent variables are calculated as the firm-specific average over the pre-reform years. Absolute values of t-statistics are shown in brackets. ***, **, and * indicate significance at equal to or less than the 1%, 5%, and 10% levels, respectively.

a postreform decrease in cash holding of 15.3% (= 11.7% + 3.6%). This result is consistent with the idea that firms with less severe agency issues (as proxied by high values of $Monitor_i$) reduce their cash holdings relatively less after the reform. Similarly, in Column 2, the coefficient estimate for RPT_i is −0.0494 (t-statistic = 2.22), suggesting that a one-standard-deviation increase in RPT_i of 0.312 (from Table 1) would increase the effect of the reform from 11.7% to

18.3% (the incremental 6.6% is calculated as 0.312*4.94/23.5). To the extent that firms with low values of $Monitor_i$ and high values of RPT_i before the reform have higher levels of pre-reform agency conflicts and would therefore benefit more from governance improvements induced by the reform, these coefficient estimates support our second prediction.

Hypothesis 2 also predicts that the reform is associated with greater reductions in cash holdings in firms with more severe pre-reform financial constraints. To the extent that larger and older firms face fewer financial constraints, we predict positive coefficient estimates for both $Reform*LogTA_i$ and $Reform*Age_i$. Results in Columns 3 and 4 of Panel A of Table 3 confirm these predictions, in that the coefficient estimate for $Reform*LogTA_i$ is 0.0206 (t-statistic = 3.45) and the estimate for $Reform*Age_i$ is 0.0113 (t-statistic = 6.62). The economic magnitudes are also meaningful. Specifically, a one-standard-deviation decrease in $LogTA_i$ of 0.916 (see Table 1) is associated with a total postreform reduction of cash holdings of 19.7%, calculated as the sum of 11.7% (the average effect, discussed earlier) and the incremental effect of $LogTA_i$ of 8% (= 0.916*2.06/23.5). Similarly, a one-standard-deviation decrease in Age_i (3.782 from Table 1) would result in a total reduction of 29.9%, calculated as the sum of the average 11.7% and the incremental effect of 18.2% (= 3.782*1.13/23.5). When we include all four measures, results (in Column 5) are similar to those in Columns 1–4 except that the coefficient on $Reform*Monitor_i$ is not significant at conventional levels (t-statistic = 1.00).

Bertrand, Duflo, and Mullaianathan (2004) caution that standard errors may be underestimated in difference-in-differences panel regressions. In the context of our research design, they suggest collapsing all observations for a given firm into one observation from the pre-reform period and one observation from the postreform period; the difference provides an estimate of the average treatment effect. To implement this suggestion, we first estimate the benchmark model of cash holdings (Equation (1)), excluding *Reform*, to obtain the expected (normal) cash holdings. We then average the residuals (excess cash holdings that are not attributable to operational needs) for each firm separately over the pre-reform and postreform periods, and regress the difference between the two averages ($\Delta ExCash_i$) on the four proxy measures of governance arrangements and financial constraints.

As reported in Panel B of Table 3, results from this alternative specification are largely consistent with those reported in Panel A. The estimated intercepts are negative and significant at better than the 1% level in all columns, consistent with the result in Table 2 that the reform is associated with reductions in corporate cash holdings. Cross-sectionally, the coefficient for $Monitor_i$ is 0.0845 (t-statistic = 1.85, significant at the 6.5% level, two-tailed), larger than the estimate from Table 3 (0.067). The coefficient for RPT_i is −0.0476 (t-statistic = 2.15, significant at the 3.2% level, two-tailed), similar in magnitude to the coefficient (−0.0494) reported in Panel A of Table 3. The coefficient estimates are 0.0291 (t-statistic = 4.53) and 0.009 (t-statistic = 5.51), on the

size ($LogTA_i$) and age (Age_i:) variables, respectively, compared with 0.0206 and 0.0113 in Panel A of Table 3.

Taken together, we interpret the results presented in Table 3 as supporting our predictions. First, the 2005 split share structure reform resulted in a significant decline in corporate cash holdings of affected firms. Second, consistent with the view that the effects of the share reform will be most pronounced for firms with greater pre-reform agency conflicts, we find larger declines in cash holdings for firms with less pre-reform shareholder monitoring and more pre-reform related-party transactions. Third, consistent with the view that the effects of the reform will be most pronounced for firms with greater pre-reform financial constraints, we find larger declines for smaller and younger firms. Finally, including variables that capture operational and investing determinants of cash holdings yields results that are consistent with previous research. We also find larger reductions in cash holdings for private firms than for SOEs, suggesting that the free cash flow channel and the financial constraints channel may operate in different ways for these two types of firms.

2.3 The effects of the share reform on cash-to-cash-flow sensitivity

We now consider the impact of the reform on another aspect of cash management policies, specifically, the propensity to accumulate cash generated by operations. We predict that the effects of the share reform through both the free cash flow channel and the financial constraints channel will reduce the propensity to accumulate cash, as captured by the cash-to-cash-flow sensitivity measure developed in Almeida, Campello, and Weisbach (2004).[12] We estimate the following equation:

$$\Delta Cash_{i,t} = \alpha_t + \alpha_i + \beta_0 OPCF_{i,t} + \beta_1 \left(Reform_{i,t} * OPCF_{i,t}\right) + Reform_{i,t} + TobinQ_{it-1} + LogTA_{i,t} + \varepsilon_{i,t}, \quad (3)$$

where $\Delta Cash_{i,t}$ is the change in cash holdings from year $t-1$ to t for firm i, scaled by noncash assets, $OPCF_{i,t}$ is operating cash flow for firm i in year t scaled by total noncash assets, $TobinQ_{it-1}$ is a measure of Tobin's Q, calculated as the ratio of market value of assets (sum of market value of equity and book value of liabilities) to book value of assets, and $LogTA_{i,t}$ is the logarithm of the firm's total assets in year t. α_t and α_i are year-and firm-fixed effects dummies. Standard errors are clustered at the firm level. β_0 estimates the cash-to-cash-flow sensitivity (CFS) in the pre-reform period, and $\beta_0 + \beta_1$ estimates the average CFS in the postreform period. $\beta_1 < 0$ would indicate that the share reform reduces the propensity to save/accumulate cash out of operating cash

[12] Almeida, Campello, and Weisbach (2004) show that it is optimal for firms with financial constraints to accumulate cash from operating cash flows and not so for firms without these constraints. Using U.S. data, they find that cash-to-cash-flow sensitivity is significantly positive for firms classified as financially constrained (small firms, nondividend paying firms, and firms with no credit ratings).

Table 4
Effect of the reform on cash-to-cash-flow sensitivity

	(1) Whole Sample	(2) Whole Sample	(3) SOE	(4) SOE	(5) Non-SOE	(6) Non-SOE
OPCF	0.516***	0.465***	0.522***	0.454***	0.471***	0.471***
	[18.77]	[21.28]	[16.86]	[19.35]	[8.03]	[8.91]
*Reform*OPCF*	−0.112***	−0.114***	−0.101**	−0.0932**	−0.0938	−0.143**
	[2.87]	[3.46]	[2.15]	[2.31]	[1.17]	[2.02]
Reform	−0.00727	−0.00892	−0.00367	0.00663	0.0202	0.000450
	[0.58]	[0.81]	[0.27]	[0.63]	[1.01]	[0.02]
TobinQ	0.0242***	0.0233***	0.0242***	0.0236***	0.0258**	0.0224**
	[4.88]	[5.55]	[4.36]	[4.65]	[2.31]	[2.53]
LogTA	0.0636***	0.0480***	0.0550***	0.0388***	0.0875***	0.0763***
	[12.40]	[9.85]	[9.61]	[6.62]	[7.86]	[7.23]
CAPEX		−0.283***		−0.310***		−0.244***
		[11.68]		[11.08]		[4.74]
Δ*NETWC*		−0.0268		−0.0417**		0.00561
		[1.57]		[2.01]		[0.19]
Δ*Leverage*		0.419***		0.400***		0.452***
		[23.44]		[19.98]		[12.96]
N	6,584	6,573	4,698	4,695	1,876	1,868
Adjusted R^2	0.179	0.417	0.178	0.431	0.179	0.391

The dependent variable is the change in $Cash_{it}$, defined as the ratio of change in cash holdings for firm i in year t scaled by noncash assets. $Reform_{it}$ is a dummy variable that equals one if firm i has completed the share reform by year t. See Table 1 for definitions of all other variables. Observations from the year firms completed their reforms are excluded. Columns 1–2 report results for the whole sample, Columns 3–4 for the subsample of SOE firms, and Columns 5–6 for the subsample of private (non-SOE) firms. In all regressions, year- and firm-fixed effects are included and standard errors are adjusted for heteroscedasticity and within-cluster correlation among all observations belonging to the same firm. Absolute values of t-statistics are shown in brackets. ***, **, and * indicate significance at equal to or less than the 1%, 5%, and 10% levels, respectively.

flows. In estimating (3), we exclude the year the reform is completed because we are interested in comparing CFS in the pre-reform period with CFS in the postreform period, and the reform year itself straddles two different regimes.

Results of this analysis are shown in Table 4. In Column 1, the coefficient estimate for β_0 is 0.516 (t-statistic = 18.77), indicating that the average Chinese-listed company saves more than half its operating cash flow prior to the reform. For comparison, the cash-to-cash-flow sensitivity for U.S. firms as documented in Almeida, Campello, and Weisbach (2004) is around 0.06 for financially constrained firms and statistically indistinguishable from zero for nonconstrained firms. The high corporate savings rate in Chinese-listed companies has been noted in the financial press[13] and suggests that many Chinese firms face financial constraints. Consistent with the view that the reform loosens financial constraints, the coefficient estimate for β_1 is −0.112 (t-statistic = 2.87), suggesting an average cash flow savings rate of 40.4% (=0.516−0.112) in the postreform period. Column 2 adds three additional control variables: *CAPEX*, Δ*NETWC*, and Δ*Leverage*. This specification models cash changes as a function of the sources and uses of cash, so the resulting equations are close to an accounting identity. Not surprisingly,

[13] See, for example, "China's State Firms Cling to Their Cash," *Wall Street Journal*, Nov. 30, 2009, A2, http://online.wsj.com/article/NA_WSJ_PUB:SB125953211574968639.html.

the adjusted R^2 more than doubles in Column 2 as compared to Column 1. However, the coefficient estimate for β_1 does not change substantially. For example, $\widehat{\beta_1}$ is -0.114 in Column 2, compared to -0.112 in Column 1. The standard error estimate for $\widehat{\beta_1}$ is smaller, and the resulting t-statistic is larger when we add more regressors, as they help explain more of the variation in the dependent variable.[14]

Columns 3–6 report the results of estimating (3) separately for SOEs and private firms. Column 3 shows that the cash savings rate for SOEs decreased from 0.522 before the reform to $0.421 (= 0.522 - 0.101)$ after the reform, a 19% drop (0.101/0.522); the t-statistic for $\widehat{\beta_1}$ is 2.15, significant at the 3% level, two-tailed. Results are similar when we add additional control variables (Column 4). For the private firms, Columns 5–6 show a pre-reform savings rate of around 47.1%. The reform reduces the savings rate in both columns; the reduction is not significant at conventional levels in Column 5, which does not include control variables, and the reduction is significant at the 4.3% level (t-statistic = 2.02) when we include control variables (Column 6). The coefficient estimates unconditional on control variables in Column 5 suggest that the savings rate dropped by 19.9% (= 0.0938/0.471), and those in Column 6 suggest a drop of more than 30% (= 0.143/0.471). We interpret the results in Table 4 as providing evidence that the share reform provided economic benefits by inducing firms to accumulate less excess cash provided by operations.

2.4 Robustness analysis

2.4.1 Sensitivity to endogenous timing choice. A key assumption of the difference-in-differences identification strategy is that the timing of the reform is exogenous to firms' cash policies. We believe this is a reasonable assumption for two reasons. First, the nature of the reform and the way the reform was implemented did not allow much discretion as to timing. The reform was mandatory; the CSRC set August 2005 as the start date and the end of 2006 as the deadline for all firms (privately owned or state-owned) to finish the reform (Firth, Lin, and Zou 2010). The CSRC and stock exchanges also restricted the number of firms starting the reform at any given time.[15] The mandatory nature of the reform also implies that the actual timing of the reform depends largely on the time required to implement its procedures (e.g., the time it took to communicate with shareholders and obtain the necessary votes would affect the reform timing). We believe these factors both affect the reform timing and are exogenous to firms' cash policies.

Governmental restrictions notwithstanding, firms in principle had some limited discretion about when to start the share reform process. If early

[14] To ensure that $\widehat{\beta_1}$ is not capturing changes in cash-to-cash-flow sensitivity in response to investment opportunities or size, we interact the control variables with the dummy variable *Reform* in Columns 1 and 2 and find qualitatively similar results (not tabulated).

[15] This was done in order to reduce excess price pressure and market volatility as firms' stock trading was suspended during the reform period.

adoptions are driven by considerations related to cash policy, the coefficient estimate on *Reform* in the main specification (Equation (1), Table 2) can still be interpreted as the average effect of the reform on cash. The coefficient on *Reform* would overestimate the average effect of the reform on cash by the extent early adopters adopt for reasons unrelated to the reform's effect on cash and early adopters experience cash reduction shocks (that we cannot observe) after the reform. To correct this potential bias, we follow the approach in Duflo (2001) by including additional control variables for non-cash-related determinants of the reform timing. Specifically, we estimate a modified version of the baseline model:

$$Cash_{i,t} = \alpha_t + \alpha_i + \gamma Reform_{i,t} + \beta X_{i,t} + \lambda \mathrm{Re}\, form_{i,t} * TimingFactor_{i,2004} + \varepsilon_{i,t}, \tag{4}$$

where $TimingFactors_{i,2004}$ are variables capturing determinants of the timing of firm i's start of the share reform process that are unrelated to changes in cash policies, measured at their 2004 values. Including $Reform_{i,t} * TimingFactors_{i,2004}$ enables the interpretation of $\widehat{\gamma}$ as the effect of the reform on cash.

We consider timing determinants that are related to the procedural aspects of the reform, or that capture the reform's benefit unrelated to cash policies. To capture procedural aspects, we include an indicator variable for whether the controlling shareholder holds more than two-thirds of all nontradable shares (*Dummy_2/3*) to control for the fact that the reform would not start until at least two-thirds of the nontradable shareholders agree on a compensation plan for the tradable shareholders; the percentage of shares owned by government agencies (*%State*) to control for the complex and lengthy procedures for government owners to approve the reform proposal; an indicator variable to identify special treatment (ST) firms (*Dum_ST*) because ST firms are subject to additional oversight by the stock exchanges; and the percentage of shares held by mutual funds (*%Inst*) as Firth, Lin, and Zou (2010) argue that institutional investors (who hold tradable shares) are more likely to be persuaded or coerced into accepting the nontradable shareholders' proposals.

On the benefits side, we include the percentage of shares that are nontradable (*%NonTradable*), based on the idea that when many shares are nontradable, lifting the trading constraint benefits more shareholders. We also include a measure of idiosyncratic risk (*RetVol*, calculated as the standard deviation of the residuals from a market model estimation using the firm's daily returns over 2004) to capture the risk sharing benefits of the reform discussed in Li et al. (2011). Except for *Dum_ST*, which captures both (poor) firm performance and the procedural complications, the timing determinants are not (directly) related to operations. Including too many operations-related variables, which may also capture the governance-related benefits of the reform, would underestimate the effect of the reform on cash. That said, in a sensitivity test, we include size ($LogSales_{2004}$) as a catch-all variable for benefits in Equation (4) as a timing

determinant and obtain results similar to those reported in tables (results not tabulated).

We verify the validity of the timing factors by estimating a duration model, where the dependent variable is the hazard rate and the duration is measured as the number of months or years between August 2005 (when the reform was officially formalized and mandated) and when a firm entered the reform process. Results (not tabulated) are that the coefficient estimates for *Dummy_2/3*, *%State*, *%NonTradable*, and *RetVol* are all reliably different from zero at the 10% level or better in most specifications. These results confirm our assumption that procedural aspects of the reform affect the timing of reform.

The results from estimating (4) are presented in Columns 4–6 of Table 2; to save space, the coefficient estimates for the timing factor variables are not tabulated. All timing variables are demeaned; the coefficient estimates in Columns 4–6 represent the average effect of the reform, similar to those in Columns 1–3. Overall, these results indicate that including the timing factors does not alter our main result and inference. For example, the coefficient estimate for *Reform* in Column 4 is −0.0286 (*t*-statistic = 2.30), compared to −0.0274 (*t*-statistic = 2.75) in Column 1. The coefficient estimates for *Reform* and *Reform∗SOE* in Column 5 are −0.0554 (*t*-statistic = 3.45) and 0.0405 (*t*-statistic = 2.95), respectively. Both are larger in magnitude than those shown in Column 2. Columns 3 and 6 also show qualitatively similar results, especially with regard to $Before^2$, $Before^1$, $After^0$, $After^1$, and $After^2$. We interpret these results as supporting our assumption that the share reform provided an exogenous governance shock, and we conclude that our main finding—that the share reform led to an economically meaningful reduction in excess cash holdings—is not sensitive to endogenous choices by firms as to when to undertake the reform.

2.4.2 Sensitivity to alternative specification. Table 2 adopts the linear regression approach used by, for example, Opler et al. (1999), Dittmar, Mahrt-Smith, and Servaes (2003), Kalcheva and Lins (2007), and Harford, Mansi, and Maxwell (2008). This approach uses observable, contemporaneous changes in variables to estimate the "normal" level of cash holdings, that is, the level necessary for operational needs, and uses the residuals as proxies for "excess" cash holdings; firm- and year-fixed effects are included to control for unobservable firm- or time-specific factors. When the reform timing differs across firms, the estimated coefficient for *Reform* is interpretable as the causal effect of the reform on corporate cash holdings. In this approach, including *Reform∗TimingFactors* can correct the potential bias introduced by endogenous timing choices as discussed earlier.

To gauge the sensitivity of our results to the linear estimation approach, we estimate the effect of the reform using a matching estimator.[16] The idea is to

[16] We thank the referee for suggesting this approach.

compare the cash holdings of a treatment firm (that has finished the reform as of year t) with the average cash holdings of comparable firms with similar characteristics (that have not finished the reform as of year t), measuring the characteristics as of 2004, before the reform began. This approach controls for unobservable time-fixed effects. Unlike the linear regression approach, the matching estimator does not restrict the relation between control variables and cash to be linear. Matching firms based on pre-reform characteristics also reduces complications associated with the possibility that some control variables might be affected by the share reform. The potential bias from endogenous timing choices can be addressed by including the timing factors (from Equation (4)) in the matching criteria. To control for unobservable firm-fixed effects, we use the annual change in cash as the dependent variable. The effect of the reform on cash is calculated as the difference between the treatment firms' changes in cash and the weighted average of control firms' changes in cash, weighted by control firms' propensity scores based on the control variables included in the main regression (i.e., Equation (1)).

The average effects of the reform on cash holdings, using the matching estimation, are presented in Panel A of Table 5. Column 1 shows that the average postreform cash level declines by 3.12% (t-statistic = 6.97), or about 13.3% (= 3.12/23.5) of the average cash holding, a magnitude similar to the 11.7% reduction implied by the linear regression estimates from Table 2. The reduction in SOEs' cash holdings, shown in Column 2, is 2.86% (t-statistic = 6.14), a relative reduction of 12.5% (= 2.86/22.8, where 22.8% is the sample average pre-reform SOE cash holding). The effect of the reform on private firms' cash holdings, shown in Column 3, is 3.68% (t-statistic = 3.72), a 14.4% reduction in the average private firm's cash holdings (= 3.68/25.9, where 25.9% is the average cash holding of private firms).

Panel B of Table 5 presents evidence on cross-sectional variation in the effects of the share reform based on the matching estimator. We regress the change in cash due to the reform on *Monitor*, *RPT*, *LogTA*, and *Age*; the coefficient estimates for *Monitor* and *Age* are 0.0963 (t-statistic = 2.64) and 0.0075 (t-statistic = 5.60), respectively. The magnitudes of these estimates are comparable to those estimated by the linear approach and reported in Panels A and B of Table 3. However, unlike the linear regression results, the coefficient estimates for *RPT* and *LogTA* are statistically indistinguishable from zero.[17]

To summarize, our main findings are that Chinese-listed firms reduced their cash holdings in conjunction with the split share structure reform, and these reductions are more pronounced in firms with more severe agency conflicts

[17] We repeat this analysis with two alternative sets of matching variables. First, firms are matched only on *LogSales*, *CashVol*, *M2B*, *IPO*, and *SOE*, all measured at their 2004 values. Second, we add to the match variables the timing factors discussed earlier. In both cases, we obtain quantitatively and qualitatively similar results (not tabulated).

Table 5
Matching estimator for the effect of the reform on cash holdings

Panel A: Average effect of the reform on cash holdings

	(1) Whole Sample	(2) *SOE*	(3) Non-*SOE*
Average effect	−0.0312***	−0.0286***	−0.0368***
	[6.97]	[6.14]	[3.72]
N	918	624	294

Panel B: Cross-sectional variation in the effect of the reform

	(1)	(2)	(3)	(4)	(5)
Intercept	−0.0268*	−0.00294	−0.126	−0.0444***	−0.129
	[1.90]	[0.26]	[1.13]	[3.38]	[1.13]
$Monitor_{04}$	0.0963***				0.0805**
	[2.64]				[2.17]
RPT_{04}		−0.00650			−0.000994
		[0.49]			[0.08]
$LogTA_{04}$			0.00581		0.00322
			[1.10]		[0.60]
Age_{04}				0.00753***	0.00711***
				[5.60]	[5.15]
SOE_{04}	0.0217**	0.0167*	0.0138	0.0170*	0.0197*
	[2.15]	[1.68]	[1.35]	[1.74]	[1.93]
N	915	918	918	918	915
Adjusted R^2	0.038	0.031	0.032	0.063	0.065

Panel A presents the average effect of the reform on cash holding estimated using the matching estimator. For each firm-year observation that has finished the reform (the treatment firm), a matched sample of firms that have not finished the reform in that year (the control firms) was chosen by the propensity score based on the 2004 values of the control variables, including *SOE, LogSales, Leverage, OPCF, NETWC, CashVol, CAPEX, Age, M2B, IPO, Dividend, SEO,* and *Dum_ST* (see Table 1 for variable definitions). We calculate the difference between the change in cash in the treatment firm and the change in the control firms. Panel A shows the sample averages of these differences in the whole sample and in the subsamples of SOEs and private firms (non-SOE). Panel B shows results regressing the difference in cash change between the control firms and the treatment firms on firm-specific variables calculated based on their 2004 values. Year dummies are included in the regression, and the coefficient estimates are not tabulated. Absolute values of t-statistics are shown in brackets. ***, **, and * indicate significance at equal to or less than the 1%, 5%, and 10% levels, respectively.

and more stringent financial constraints prior to the reform. These results are robust to the endogenous timing choice and the matching estimator.

2.4.3 Sensitivity to alternative explanations. We consider two alternative explanations for our main findings that attribute the effect of the reform to changes in business environments or changes in investment opportunities. The business environment explanation posits that the reform merely provides the affected firms with access to cash, by allowing controlling shareholders to sell their shares and use the cash proceeds to finance the listed firms. This explanation suggests a larger postreform reduction in cash holdings in firms with more severe financial constraints, as in Hypothesis 2. However, this explanation also presumes complete incentive alignment between the controlling shareholders and the listed firm, effectively equating additional postreform financing to controlling shareholders with additional financing to the listed firm. Under this explanation, the reform reduces cash holdings more

Table 6
Effect of the reform on cash holdings and cash-to-cash-flow sensitivity on subsamples

Panel A: Effect of the reform on cash holdings on subsamples partitioned by controlling shareholders holdings

	(1) Controlling Shareholder Holding>50%	(2) Controlling Shareholder Holding<50%	(3) Top 3 Deciles Ranked by Controlling Shareholder Holding	(4) Bottom 3 Deciles Ranked by Controlling Shareholder Holding
Reform	−0.0319	−0.0701***	−0.0278	−0.0737**
	[1.21]	[3.93]	[0.91]	[2.54]
*Reform*SOE*	0.0435	0.0303**	0.0390	0.0479**
	[1.55]	[2.29]	[1.22]	[2.44]
Control variables	Yes	Yes	Yes	Yes
N	3,835	5,063	3,092	2,435
Adjusted R^2	0.686	0.625	0.717	0.622

Panel B: Effect of the reform on cash-to-cash flow sensitivity by subsamples partitioned by governance and size

	(1)	(2)	(3)	(4)
	MONITOR		*LOGTA*	
	High	Low	High	Low
OPCF	0.514***	0.516***	0.451***	0.568***
	[12.80]	[13.95]	[11.15]	[15.14]
*Reform*OPCF*	−0.0538	−0.164***	−0.106**	−0.109**
	[1.09]	[2.73]	[1.97]	[1.97]
Control variables	Yes	Yes	Yes	Yes
N	3,395	3,182	3,583	3,001
Adjusted R^2	0.229	0.122	0.173	0.200

The dependent variable in Panel A is *Cash*, defined as the ratio of cash holdings scaled by noncash assets for firm i in year t. $Reform_{it}$ is a dummy variable that equals one if firm i has completed the share reform by year t. See Table 1 for definitions of all other variables. Panel A estimates Equation (1) in the main text on subsamples of firms partitioned by controlling shareholders' holdings. Column 1 (2) is estimated for the subsample of firms where the controlling shareholders hold more (less) than 50% of the shares prior to the reform. Column 3 (4) is estimated for the subsample of firms where the controlling shareholders' holdings are in the top (bottom) three deciles of all firms prior to the reform. Column 1 (2) of Panel B estimates Equation (3) in the main text on subsamples of firms with above (below) sample median values of *Monitor*. Column 3 (4) of Panel B estimates Equation (3) for the subsample of firms with above (below) sample median values of *LogTA*. For Panel B, observations from the year firms completed their reform are excluded. In all regressions in both panels, year- and firm-fixed effects are included and standard errors are adjusted for heteroscedasticity and within-cluster correlation among all observations belonging to the same firm. Absolute values of t-statistics are shown in brackets. ***, **, and * indicate significance at equal to or less than the 1%, 5%, and 10% levels, respectively.

in firms whose controlling shareholders have a larger percentage ownership, because incentive alignment issues are less of a concern for these shareholders and because they have more shares to sell.

We test this explanation by re-estimating Equation (1) after partitioning the sample based on the controlling shareholders' percentage ownership. Results are shown in Table 6, Panel A (coefficient estimates for the control variables are not tabulated). In Columns 1 and 2, we partition firms by whether the controlling shareholders hold more than 50% of the shares prior to the reform. Column 1 shows that when the controlling shareholders hold the majority of shares, the reduction in cash holdings associated with the share reform is modest and not significant at conventional levels: The coefficient for *Reform* is -0.0319

(t-statistic = 1.21). In contrast, the coefficient estimate for *Reform* is -0.0701 (t-statistic = 3.93) for firms in which the controlling shareholders own less than 50% of the total shares. Similar results are obtained in Columns 3 and 4; in these analyses, we rank firms into deciles based on the controlling shareholders' average pre-reform holdings and estimate Equation (1) for firms in the top and bottom three deciles. The mean percentage held by the controlling shareholders in the top (bottom) three deciles is 65% (25%). The coefficient estimate for *Reform* is -0.0278 (t-statistic = 0.91) for firms in the top three deciles sorted on controlling shareholder ownership (Column 3) and -0.0737 (t-statistic = 2.54) for firms in the bottom three deciles (Column 4). These results are inconsistent with the alternative explanation. In fact, to the extent that lower holdings by controlling shareholders indicate agency conflicts, so that the reform improves incentive alignment more in these firms, these results are consistent with our primary hypothesis.

If the reform affects financial constraints for reasons unrelated to governance improvements, there should be no differences in the reduction in the cash-to-cash-flow sensitivity across subsamples of firms partitioned by pre-reform measures of agency conflicts. Instead, reductions in cash-to-cash-flow sensitivity (CFS) should be larger in firms with more financial constraints. To test this explanation, we re-estimate Equation (3) for samples partitioned on $Monitor_i$, an indicator of the strength of external monitoring by large noncontrolling shareholders and samples partitioned on $LogTA_i$, an indicator of financial constraint. Results are tabulated in Table 6, Panel B. Columns 1 and 2 report results for firms with high versus low values of $Monitor_i$, and Columns 3 and 4 report results for firms with high versus low values of $LogTA_i$. The coefficient estimate for $Reform*OPCF$ is -0.0538 (t-statistic = 1.09) for firms with above-median values of $Monitor_i$ and -0.164 (t-statistic = 2.73) for firms with below-median values. This result suggests that the reduction in CFS is greater in firms with greater agency conflicts, as evidenced by weaker shareholder monitoring, before the reform. In untabulated results, we also find that the reduction in CFS is mostly driven by firms with below-median holdings by controlling shareholders, that is, firms with more agency conflicts. Results (not tabulated) are qualitatively similar when we partition firms by RPT_i. When we partition firms by their average pre-reform $LogTA_i$ values (Columns 3 and 4), we find no reliable evidence of differences in the reduction in CFS across subsamples: The coefficient estimate for $Reform*OPCF$ is -0.106 (t-statistic = 1.97) for large firms and -0.109 (t-statistic = 1.97) for small firms. We obtain qualitatively similar results (untabulated) when we partition by $Monitor_i$ and $LogTA_i$ on the subsamples of SOEs and private firms. Together, these results are not consistent with the hypothesis that the reform relaxes financial constraints for reasons unrelated to governance.

The second alternative explanation is that negative shocks to investment opportunities around the time of the reform induce financially constrained firms to reduce both their cash holdings and their tendency to accumulate

cash generated from operations (measured as the cash-to-cash-flow sensitivity) in response to those shrinking investment opportunities. Given China's 8% to 11.4% GDP growth rate during our sample period, it seems unlikely that Chinese-listed firms faced limited investment opportunities in general. Further, this explanation predicts a postreform reduction in both investment and the market valuation of corporate cash holdings. However, we find that on average investment increased after the reform (tabulated in Column 1 of Table 7, Panel A, and discussed next), and the average market valuation of cash also increased after the reform (results are untabulated); both results are inconsistent with the shrinking-investment-opportunity explanation.

3. Effects of the Reform on Firm Decisions and Performance

Our results that both the level of cash holdings and the cash savings rate decline after the split share reform are consistent with the view that governance arrangements have a meaningful effect on corporate cash policies. As discussed earlier, these effects can operate via either the free cash flow channel or the financial constraint channel. These channels are not mutually exclusive, as most of our sample firms experience some degree of agency conflicts and some degree of financial constraint; they are related, in that agency conflicts exacerbate the effects of existing financial constraints; and they have different implications for post-share-reform investment and financing decisions. In this section, we explore these implications.

From the perspective of maximizing firm value, the free cash flow channel implies that the pre-reform cash holding was suboptimal because excess cash was held simply for the benefit of controlling shareholders. In the most extreme case, firms experience no frictions other than insiders' desire to hoard cash for their personal benefit, implying that the excess cash served no operational or investing purpose and could have been paid out to investors, but for insiders' cash hoarding incentives. Under this scenario, when the share reform reduces insiders' cash hoarding incentives, we expect lower cash holdings and increased cash payouts to investors, but little or no change in investments. In contrast, the financial constraint channel implies that pre-reform cash holdings were excessive because agency problems exacerbated the cash-holdings effects of any existing financial constraints. This channel implies that when the reform loosened financial constraints, we should observe lower cash holdings and increases in both capital expenditures and external financing. Both channels predict improved performance.

To analyze the effects of the reform on firms' cash payout, investment, and borrowing decisions, we estimate the following regression:

$$Y_{i,t} = \alpha_t + \alpha_i + \beta_1 Reform_{i,t} + \beta_2 Reform_{i,t} * SOE_{i,t} + \beta_3 SOE_{i,t} + Controls_{i,t} + \varepsilon_{i,t}, \quad (5)$$

where $Y_{i,t}$ is either performance as measured by return on assets (ROA), or one of three firm choices: the investment decision as measured by capital

Table 7
Effects of the reform on other firm decisions

Panel A: Effects of the reform on investment, performance, and payout policy

Dependent Variable	(1) CAPEX	(2) CAPEX	(3) ROA	(4) ROA	(5) Div/Earnings	(6) Div/Earnings
Reform	0.0089*	−0.0027	0.0169***	0.0148***	0.0382	0.0714**
	[1.78]	[0.46]	[5.25]	[3.60]	[1.50]	[2.52]
*Reform*SOE*		0.0170***		0.0034		−0.0468**
		[3.93]		[0.93]		[2.02]
SOE		−0.0143***		−0.0111**		−0.0019
		[2.82]		[2.17]		[0.07]
TobinQ	0.0131***	0.0127***	0.0208***	0.0206***	0.0134	0.0137
	[5.12]	[4.96]	[8.48]	[8.44]	[1.03]	[1.05]
OPCF	0.0454***	0.0460***	0.131***	0.131***	−0.0544	−0.0571
	[4.51]	[4.57]	[11.54]	[11.49]	[0.98]	[1.03]
LogTA	0.0179***	0.0179***	0.0298***	0.0301***	−0.0110	−0.00858
	[5.43]	[5.43]	[7.98]	[8.05]	[0.58]	[0.45]
N	7,545	7,535	7,521	7,511	7,521	7,511
Adjusted R^2	0.391	0.394	0.453	0.454	0.249	0.250

Panel B: Effects of the reform on debt-to-asset ratios

Dependent Variable	(1) Total Debt	(2) Total Debt	(3) Short-Term Debt	(4) Short-Term Debt	(5) Long-Term Debt	(6) Long-Term Debt
Reform	0.0008	−0.0206**	−0.00410	−0.0269***	0.0041	0.0052
	[0.13]	[2.36]	[0.72]	[3.27]	[1.08]	[0.98]
*Reform*SOE*		0.0312***		0.0330***		−0.00160
		[3.63]		[4.07]		[0.32]
SOE		−0.0179**		−0.0138*		−0.00371
		[2.19]		[1.74]		[0.72]
TobinQ	−0.0216***	−0.0215***	−0.0142***	−0.0140***	−0.0069***	−0.0069***
	[5.02]	[5.06]	[3.62]	[3.64]	[2.81]	[2.83]
OPCF	−0.166***	−0.165***	−0.128***	−0.127***	−0.0377***	−0.0379***
	[9.80]	[9.80]	[8.02]	[7.97]	[3.75]	[3.76]
LogTA	0.0868***	0.0861***	0.0279***	0.0270***	0.0574***	0.0576***
	[11.07]	[11.07]	[4.56]	[4.50]	[10.99]	[10.96]
N	7,557	7,547	7,557	7,547	7,557	7,547
Adjusted R^2	0.693	0.695	0.651	0.654	0.599	0.599

The dependent variables are *CAPEX* (the ratio of capital expenditure to noncash assets) in Columns 1–2 of Panel A; *ROA* (the ratio of after-tax operating income to noncash assets) in Columns 3–4 in Panel A; *Div/Earnings* (the ratio of dividends paid to earnings) in Columns 5–6 in Panel A; total, short-term, and long-term debt (calculated as the ratios of total, short-term, and long-debt to noncash assets) in Columns 1–2, 3–4, and 5–6, respectively, in Panel B. $Reform_{it}$ is a dummy variable that equals one if firm i has completed the share reform by year t. See Table 1 for definitions of all other variables. In all regressions, year- and firm-fixed effects are included, and standard errors are adjusted for heteroscedasticity and within-cluster correlation among all observations belonging to the same firm. Absolute values of t-statistics are shown in brackets. ***, **, and * indicate significance at equal to or less than the 1%, 5%, and 10% levels, respectively.

expenditure (*CAPEX*); payout policy as measured by dividend payout ratio (*Div/Earnings*); and financing policy as measured by total debt ($TotalDebt$); short-term debt ($STDebt$), and long-term debt ($LTDebt$). Other than the dividend payout ratio, variables are scaled by noncash assets. $Controls_{i,t}$ is the vector of control variables including a proxy for Tobin's Q (*TobinQ*), operating cash flows (*OPCF*), and logarithm of total assets (*LogTA*), and α_t and α_i capture time- and firm-fixed effects. As before, standard errors are clustered at the firm level and are adjusted for heteroscedasticity.

Table 7 presents the results from estimating (5). In Panel A, with *CAPEX* as the dependent variable, the coefficient estimate for *Reform* in Column 1 is 0.0089 (t-statistic = 1.78, significant at the 7.5% level, two-tailed), suggesting that on average firms increased their *CAPEX* by about 10.8% (= 0.0089/0.0825, where 0.0825 is the sample average for pre-reform *CAPEX*). In Column 2, when we include *Reform*∗*SOE*, the coefficient estimate for *Reform* is no longer significant at conventional levels, whereas the coefficient estimate for *Reform*∗*SOE* is 0.017 (t-statistic = 3.93). These results suggest that the average investment increase is driven by the SOEs. Given the pre-reform sample average *CAPEX* for SOEs of 0.081, the estimates imply that, on average, SOEs increased capital expenditures by 17.8% (=(0.017 − 0.0027)/0.081).

Columns 3–4 use ROA as the dependent variable. In Column 3, the coefficient estimate for *Reform* is 0.0169 (t-statistic = 5.25). In Column 4, the coefficient estimates for *Reform* and *Reform*∗*SOE* are 0.0148 (t-statistic = 3.60) and 0.0034 (t-statistic = 0.93). These results suggest that both SOEs and private firms experienced significant performance improvement after the reform with no statistically reliable difference between the two subsamples. The performance increase is economically meaningful: With the sample average pre-reform ROA at 4.26%, the coefficient estimate for *Reform* in Column 3 implies a nearly 40% (= 1.69/4.26) postreform improvement.

Columns 5–6 of Panel A present the results with the dividend payout ratio (*Div/Earnings*) as the dependent variable. Column 5 shows that the dividend payout for the sample as a whole weakly increased; the coefficient estimate for *Reform* is 0.0382, t-statistic = 1.50, significant at the 13% level, two-tailed. Column 6 reveals differences in postreform dividend payouts between private firms and SOEs. Specifically, the coefficient estimate for *Reform* in Column 6 is 0.0714 (t-statistic = 2.52), suggesting that private firms increased their dividend payout ratio by 25.8% (= 0.0714/0.277, where 0.277 is private firms' pre-reform average dividend payout ratio). The coefficient estimate for *Reform*∗*SOE* is -0.0468 (t-statistic = 2.02), suggesting that SOEs' average dividend payout ratio increased by 0.0246 (=0.0714 − 0.0468), a 6.5% increase relative to the pre-reform average payout ratio of 0.38.

Panel B shows the effects of the reform on corporate debt, as measured by the total debt to asset ratio ($TotalDebt$) and its two components, short-term debt ($STDebt$) and long-term debt ($LTDebt$). Columns 1, 3, and 5 estimate the effect on the sample as a whole. The coefficient estimates on *Reform* in all three columns are statistically indistinguishable from zero (all t-statistics are 1.08 or less), suggesting no change, on average, in postreform borrowing. However, Columns 2, 4, and 6 reveal significant differences between private firms and SOEs. In Column 2, the coefficient estimate for *Reform* is -0.0206 (t-statistic = 2.36), suggesting that private firms reduced their total debt after the reform. In contrast, the coefficient estimate for *Reform*∗*SOE* is 0.0312 (t-statistic = 3.63), suggesting that SOEs increased their debt by 1.06% (=3.12 − 2.06). Columns 4 and 6 show that the changes in total debt are driven by changes

in short-term debt. Column 4 shows that the coefficient estimates for *Reform* and *Reform*∗*SOE* are -0.0269 (t-statistic = 3.27) and 0.0330 (t-statistic = 4.07), respectively. These estimates imply that the average short-term debt to net asset ratio in private firms declined by 2.69% in absolute magnitude and by 11.6% in relative terms (= 2.69/23.1, where 23.1% is the pre-reform sample average short-term debt ratio for private firms). In contrast, the sample SOEs increased their short-term debt by 0.61% (=0.0330−0.0269) in absolute terms and by 3.3% relatively (=0.61/18.4, where 18.4% is the sample average short-term debt ratio for SOEs). Columns 5–6 show no evidence of changes in long-term debt in either private firms or SOEs. In interpreting these results, it is important to keep in mind that short-term debt is the predominant form of debt financing for Chinese firms (the sample average long-term debt is 6.4% of total assets, about one-third of the short-term debt).

In untabulated results, we find that investors increase their valuations of cash holdings after the reform, for both SOEs and private firms. Prior to the reform, investors value SOEs' cash holding positively but do not assign significant value to cash held in private firms, consistent with the idea that private firms are more likely to hold cash for controlling shareholders' use than for operational and investment purposes.

Together, these results suggest that the reasons for excess cash holdings differ between private firms and SOEs. Our interpretation is that before the share reform, private firms are more likely to hold cash to meet the needs and wishes of controlling shareholders, and the reform induces reductions in cash holdings directly, by better aligning controlling shareholders' incentives with those of the minority shareholders. In contrast, corporate insiders/controlling owners in SOEs face relatively more constraints in their incentives and abilities to direct corporate resources for personal use because they themselves are organizations with their own sets of internal controls.[18] Consistent with this perspective, our findings suggest that pre-reform cash holdings at SOEs are more likely a response to financial constraints that are exacerbated by pre-reform agency problems, and the reform induces reductions in cash holdings indirectly, by reducing the agency-cost-related intensification of financial constraints.[19]

4. Conclusion

We analyze the change in cash holdings of a large sample of Chinese-listed firms associated with the split share structure reform that required nontradable shares held by controlling shareholders to be converted to tradable shares, subject to

[18] As described in Lin, Cai, and Li (1998), a lack of managerial autonomy in SOEs points to shirking as an agency problem, but not consumption of corporate resources.

[19] These results suggest that *overtime* changes in cash holdings from before to after the reform mostly operate via the financial constraints channel for the SOEs and via the free cash flow channel for the private firms. They do not imply that at a given point in time SOEs face more financial constraints than do private firms.

shareholder approval and adequate compensation to tradable shareholders. The reform removed a substantial market friction and gave controlling shareholders a clear incentive to care about share prices, because they could benefit from share value increases by selling some of their shares for cash. We predict and find that this governance improvement led to reduced cash holdings of affected firms, and that the effect is more pronounced for private firms than for state-owned enterprises (SOEs), for firms with more agency conflicts, and for firms for which financial constraints are most binding. We interpret these results as consistent with both a direct free cash flow channel and an indirect financial constraint channel. These results are robust to several alternative specifications that address concerns about endogeneity and concomitant effects. They provide strong evidence that governance arrangements affect firms' cash holdings and cash management behaviors. To the extent that cash management is a key operational decision that affects firm value, our findings suggest an important mechanism for corporate governance to affect firm value.

Our analyses of postreform firm behaviors find that private firms increased cash payouts but not external debt financing or capital expenditures; we interpret this finding as consistent with a relatively more pronounced free cash flow channel effect that reduced the incentives of private firm controlling shareholders to hoard the listed firm's cash as a reservoir for their personal cash needs and a relatively less pronounced financial constraints channel. In contrast, the SOEs increased both external debt financing and capital expenditures, consistent with the operation of the financial constraints channel; SOEs also increased dividend payouts but not by as much as did private firms.

We draw two important implications from our results. The first is that the liquidity of large shareholders matters, in that our results are based on a natural experiment that improves corporate governance arrangements by relaxing trading constraints imposed on large shareholders. The second implication from our analyses of the relative effects on private firms and SOEs is that ownership matters, in that the free cash flow channel appears more descriptive of the governance path taken by the share reform in private firms and the financial constraint channel appears more descriptive for the SOEs. We attribute this difference in effects to important differences in the two types of owners. Specifically, controlling shareholders of private firms—persons and families—have both the ability and the incentive to use corporate cash for personal needs while controlling shareholders of SOEs—government agencies—are themselves organizations whose employees are subject to organizational controls. The nature of the agency conflict, and therefore its partial resolution by the share reform, differs for the two types of firms because their owners differ.

References

Almeida, H., M. Campello, and M. Weisbach. 2004. The cash flow sensitivity of cash. *Journal of Finance* 59:1777–804.

Bates, T. W., K. M. Kahle, and R. M. Stulz. 2009. Why do U.S. firms hold so much more cash than they used to? *Journal of Finance* 64:1985–2022.

Baumol, W. J. 1952. The transactions demand for cash: An inventory theoretic approach. *Quarterly Journal of Economics* 66:545–56.

Bertrand, M., and S. Mullaianathan. 2003. Enjoy the quiet life? *Journal of Political Economy* 111:1043–75.

Bertrand, M., E. Duflo, and S. Mullaianathan. 2004. How much should we trust differences-in-differences estimates? *Quarterly Journal of Economics* 119:249–75.

Denis, D. J., and V. Sibilkov. 2010. Financial constraints, investment, and the value of cash holdings. *Review of Financial Studies* 23:247–69.

Dittmar, A., and J. Mahrt-Smith. 2007. Corporate governance and the value of cash holdings. *Journal of Financial Economics* 83:599–634.

Dittmar, A., J. Mahrt-Smith, and H. Servaes. 2003. International corporate governance and corporate cash holdings. *Journal of Financial and Quantitative Analysis* 38:111–33.

Doidge, C. G., A. Karolyi, and R. M. Stulz. 2007. Why do countries matter so much for corporate governance? *Journal of Financial Economics* 86:1–39.

Duchin, R. 2010. Cash holdings and corporate diversification. *Journal of Finance* 65:955–92.

Duflo, E. 2001. Schooling and labor market consequences of school construction in Indonesia: Evidence from an unusual policy experiment. *American Economic Review* 91:795–813.

Durnev, A., and E. H. Kim. 2005. To steal or not steal: Firm attributes, legal environment, and valuation. *Journal of Finance* 60:1461–93.

Faulkender, M., and R. Wang. 2006. Corporate financial policy and the value of cash. *Journal of Finance* 61:1957–90.

Firth, M., C. Lin, and H. Zou. 2010. Friend or foe? The role of state and mutual fund ownership in the split share structure reform in China. *Journal of Financial and Quantitative Analysis* 45:685–706.

Foley, C. F., J. Hartzell, S. Titman, and G. J. Twite. 2007. Why do firms hold so much cash? A tax-based explanation. *Journal of Financial Economics* 86:579–607.

Fresard, L. 2010. Financial strength and product market behavior: The real effects of corporate cash holdings. *Journal of Finance* 64:1097–122.

Gompers, P. A., J. Ishii, and A. Metrick. 2003. Corporate governance and equity prices. *Quarterly Journal of Economics* 118:107–55.

Harford, J., S. A. Mansi, and W. F. Maxwell. 2008. Corporate governance and firm cash holdings in the United States *Journal of Financial Economics* 87:535–55.

Jensen, M. 1986. Agency costs of free cash flow, corporate finance, and takeovers. *American Economic Review* 76:323–29.

Jian, M., and T. J. Wong. 2010. Propping and tunneling through related party transactions. *Review of Accounting Studies* 15:70–105.

Jiang, G., C. Lee, and H. Yue. 2010. Tunneling through inter-corporate loans: The China evidence. *Journal of Financial Economics* 98:1–20.

Johnson, S., R. La Porta, F. Lopez de Silanes, and A. Shleifer. 2000. Tunneling. *AEA Papers and Proceedings* 90:22–27.

Kalcheva, I., and K. V. Lins. 2007. International evidence on cash holdings and expected managerial agency problems. *Review of Financial Studies* 20:1087–112.

Li, K., T. Wang, Y. L. Cheung, and P. Jiang. 2011. Privatization and risk sharing: Evidence from the split share structure reform in China. *Review of Financial Studies* 24:2499–525.

Lin, H. 2009. Essays on empirical corporate finance and corporate governance. Working Paper, Columbia University.

Lin, J. Y., F. Cai, and Z. Li. 1998. Competition, policy burdens, and state-owned enterprise reform. *AEA Papers and Proceedings* 88:422–27.

Miller, M. H., and D. Orr. 1966. A model of the demand for money by firms. *Quarterly Journal of Economics* 80:413–35.

Opler, T., L. Pinkowitz, R. M. Stulz, and R. Williamson. 1999. The determinants and implications of corporate cash holdings. *Journal of Financial Economics* 52:3–46.

Pinkowitz, L., R. M. Stulz, and R. Williamson. 2006. Does the contribution of corporate cash holdings and dividends to firm value depend on governance? A cross-country analysis. *Journal of Finance* 61:2725–51.

Shleifer, A. 1998. State versus private ownership. *Journal of Economic Perspective* 12:133–50.

Shleifer, A., and R. W. Vishny. 1986. Large shareholders and corporate control. *Journal of Political Economy* 94:461–88.

———. 1997. A survey of corporate governance. *Journal of Finance* 52:737–83.