Financial Flexibility and Corporate Cash Policy

Tao Chen, Jarrad Harford and Chen Lin*

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Abstract:

Using variations in local real estate prices as exogenous shocks to corporate financing capacity, we investigate the causal effects of financial flexibility on cash policies of US firms. Building on this natural experiment, we find strong evidence that increases in real estate values lead to smaller corporate cash reserves, declines in the marginal value of cash holdings, and lower cash flow sensitivities of cash. The representative US firm holds $0.037 less of cash for each $1 of collateral, quantifying the sensitivity of cash holdings to collateral value. We further find that the decrease in cash holdings is more pronounced in firms with greater investment opportunities, financial constraints, better corporate governance, and lower local real estate price volatility.

JEL classification: G32; G31; G34; R30

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1. Introduction

Financial flexibility refers to a firm's ability to access financing at a low cost and respond to unexpected changes in the firm's cash flows or investment opportunities in a timely manner (Denis, 2011). A survey of CFOs in Graham and Harvey (2001) suggests that financial flexibility is the most important determining factor of corporate capital structure decisions, but flexibility has not been studied as a first-order determinant of corporate financial policies until very recently.[1] Consequently, as pointed out in Denis (2011), an interesting and unresolved research question remains: "To what extent are flexibility considerations first-order determinants of financial policies?" In this paper, we directly test the effects of financial flexibility on corporate cash holdings by exploiting exogenous shocks to firms' financing capacity.

As the amount of cash U.S. firms hold on their balance sheets has grown, so has interest in how they manage liquidity and access to capital. While the literature documents substantial support for the precautionary savings hypothesis put forth by Keynes (1936), we still know relatively little about how firms tradeoff debt capacity and cash reserves, and specifically the degree to which increases in the supply of credit substitute for internal slack. Answers to such questions are important not only for a better understanding of cash and liquidity policy in general, but also for assessing the impact of the credit channel on real activity.

Reflected in cash holding theory, the concept of financial flexibility matters in the presence of financing frictions, under which firms have precautionary incentives to stockpile cash. Specifically, the precautionary savings hypothesis posits that firms hold cash as a buffer to shield from adverse cash flow shocks due to costly external financing. Opler, et al. (1999), Harford (1999), Bates, Kahle and Stulz (2009), and Duchin (2010), among others provide

[1] DeAngelo and DeAngelo (2007) discuss preservation of financial flexibility as an explanation for observed capital structure choices. Gamba and Triantis (2008) provide a theoretical analysis of the effect of financial flexibility on firm value. Denis and McKeon (2011) lend further support that in the form of unused debt capacity, financial flexibility plays an important role in capital structure.

evidence of precautionary savings' role in cash policy. Cash studies typically control for leverage and sometimes cash substitutes such as net working capital. Almeida, et al. (2004) and Faulkender and Wang (2006) have shown that cash policy is more important when firms are financially constrained. Nevertheless, to our knowledge, none of the extant studies have directly tested the role of external financing capacity in shaping corporate cash policies.[2] In this paper, we attempt to fill this void by providing a comprehensive understanding of the causal effects of financial flexibility on cash policies.

The striking paucity of the research into the effect of debt capacity on cash policy is likely to be partially driven by a lack of readily available measures of financing capacity. Moreover, the fact that financing capacity is endogenous has also hindered such attempts. For instance, firms' cash balance and liquidity policy might exert feedback effects on firms' financing capacity. Unobservable firm heterogeneity correlated with both debt capacity and corporate liquidity policies could also bias the estimation results.

In this paper, we make use of a novel experiment developed by Chaney, Sraer and Thesmar (2012). Specifically, we use changes in the value of a firm's collateral value caused by variations in local real estate prices (at state level or Metropolitan Statistical Areas (MSA) level) as an exogenous change to the financing capacity of a firm, increasing its financial flexibility. Existing literature points out that pledging collateral such as real estate assets can alleviate agency costs caused by moral hazard and adverse selection, enhance firms' financing capacity, and allow firms to borrow more in the presence of incomplete contracting (Barro, 1976; Stiglitz and Weiss, 1981; Hart and Moore, 1994; Jimenez et al., 2006). Firms with more tangible assets have higher recovery rate in financial distress, and banks are ex ante more likely to provide looser contract

[2] Most of the existent research in this area provides at most indirect evidences, by primarily focusing on the relationship between cash flow risk and cash holdings, and papers use industry cash flow volatility to proxy for cash flow risk (e.g., Opler et al., 1999; Bates et al., 2009), and find this measure is positively associated with cash holdings. Han and Qiu (2007) use firm-level measure of cash low volatility and find consistent results. More recently, Duchin (2010) finds that investment opportunity risk increases cash holdings.

terms to firms with more pledgeable assets. Tangible assets thus can alleviate banks' concern of asset substitution and debt recovery risk, which increases firms' financial flexibility. As a consequence, it reduces firms' incentive to save cash. Consistent with theory, recent empirical studies show that firms with greater collateral value are able to raise external funding at lower costs (e.g. Berger et al., 2011; Lin et al., 2011) and to invest more (Chaney et al., 2012).[3] If financial flexibility exerts first-order effects on a firm's financial policy, we would expect that an exogenous shock increasing real estate values translates into a lower precautionary motive to stockpile cash. Likewise, following a large deterioration in collateral value, firms would confront more stringent external financing, and consequently hold more cash. A key advantage of our identifying strategy is that it not only provides variation in exogenous shocks to debt capacity, but also solves the omitted variables concerns by allowing multiple shocks to different firms at different times at different locations (states or MSAs).

Primarily, we find that the representative US public firm holds $0.037 less of cash for each additional $1 of collateral over the 1993-2007 period. As Chaney et al. (2012) document that an average firm raises its investment by $0.06 and issues new debt of $0.03 for a $1 increase in collateral value, our results fit perfectly with their findings on the gap between the investment and new debt in the perspective that firms finance approximately half of their new investment using internal accumulated cash. In terms of economic magnitude, a one standard deviation increase in collateral value results in a decrease of about 8.1% of the mean value of cash ratio.

To further refine our understanding of the effects of debt capacity on cash holding decisions, we look at heterogeneous firm characteristics that might shape the relationship between debt capacity and cash reserves. Precautionary motives predict that the effects would be more pronounced in firms with more investment opportunities and generally greater financial

[3] Berger et al. (2011) use a rough measure indicating whether collateral was pledged at loan origination, and Lin et al. (2011) use tangibility to proxy for collateral value. One pertinent concern is that tangibility itself is a noisy measure of collateral value, while another concern is that collateral requirement and loan spread might be jointly determined by unobservable factors, which results in endogeneity problem.

constraint. Moreover, as agency theory argues that cash is the most vulnerable asset to agency conflicts (Berle and Means, 1933; Jensen and Meckling, 1976; Myers and Rajan, 1998) and Jensen (1986) argues that debt constrains managers, managers of poorly governed firms are unlikely to view debt capacity and cash as substitutes. Additionally, firms located in the areas with high historical real estate fluctuations might be subjective to more uncertainties in the future value of the real estate asset they hold, and thus might not be willing to reduce cash holdings as firms with low historical real estate volatilities. In further subsample tests, we indeed find that the decrease in cash holdings following increased collateral value is more pronounced in firms with greater investment opportunities, more financial constraint, better corporate governance, and lower historical local real estate volatility.

Our findings of the strong impact of financing capacity on cash holdings largely rely on two underlying assumptions: 1) higher collateral value reduces the marginal benefit of holding cash, and 2) firms consequently save less cash out of cash flow and display lower cash flow sensitivity of cash. We can test these assumptions by directly test the prediction for the marginal value of cash holdings using the Faulkender and Wang (2006) approach, and the prediction for the cash flow sensitivity of cash using Almeida et al. (2004)'s specification. We find that following exogenous shocks to collateral value, the marginal value of cash decreases. Quantitatively, a shocked firm's value of a marginal dollar of cash is approximately 25% lower than that of an otherwise similar firm. In further exploration, we find that for firms with prior financial constraint, shareholders value cash less after a positive exogenous shock to the value of the firm's real estate. In such firms, increasing collateral value provides more benefits to the firms as managers can use collateral to easily access external financing.

We next analyze how debt capacity affects the cash flow sensitivity of cash. We find that firms show reduced cash flow sensitivity of cash following an exogenous shock to their debt capacity. Compared to an unaffected firm, the median shocked firm has a 5% lower of cash flow sensitivity of cash. We further find that the effect on cash flow sensitivity of cash is larger in firms with greater investment opportunities. In addition, all of our empirical results are robust to controlling for the potential sources of endogeneity, as in Chaney et al. (2012) as well.

Our paper contributes to and is related to several strands of literature. Foremost, our paper contributes to the cash holding literature by showing how financing capacity causally affects cash holdings, the value of cash, and the cash flow sensitivity of cash. The evidence is consistent with the precautionary motive of cash holdings. In this regard, our paper also contributes to the broader literature of liquidity management (Campello et al., 2010, 2011) by documenting how firms manage liquid resources in response to financing capacity.

Moreover, our results also highlight the importance of corporate governance in cash policies. We find that there is a non-trivial gap between the degrees of the decline in the marginal value of cash holdings, and that of the drop in the actual cash balance, following increased collateral value. Through our subsample analysis, we find that the decrease in cash holdings is more pronounced in firms with greater investment opportunities, prior financial constraint, and better corporate governance. This reveals that firms with entrenched managers are reluctant to substitute cash and debt capacity. Further, exogenous changes in credit provision have an immediate impact on firms with strong investment opportunities and firms with some financial constraint.

The remainder of the paper proceeds as follows. Section 2 presents our construction of the sample and data. Sections 3 to 5 investigate the effects of collateral shocks on cash holdings, the marginal value of cash holdings, and the cash flow sensitivity of cash, respectively. In each section, we firstly introduce the estimation models and descriptive statistics, and then report our empirical findings. Section 6 concludes.

2. Sample and Data

The sample construction and the empirical approach in the first part of the paper closely follow Chaney et al. (2012), who identify local variation in real estate prices as an exogenous and meaningful shock to firms' debt capacity. Their study focuses exclusively on the credit channel's effect on real investment. We start from the universal sample of Compustat firms that were active in 1993 with non-missing information of total assets. We require that the firm was active in 1993 as this was the last year when data on accumulated depreciation on buildings is still available in Compustat. We retain firms whose headquarters are in the US, and keep only firms that exist for at least three consecutive years in the sample. We further exclude firms operating in the industry of finance, insurance, real estate, construction, and mining businesses. We also restrict the sample to firms not involved in major acquisitions. We further require that the firms have information for us to calculate the market value of real estate assets and also non-missing information for the major variables in the cash equation. Eventually we obtain a final sample of 26,242 firm-year observations associated with 2,790 unique firms.

Our key variable of interest is the market value of real estate assets. First, we define real estate assets as the summation of three major categories of property, plant, and equipment (PPE): buildings, land and improvement, and construction in progress. These values are at historical cost, rather than marked-to-market, and we need to recover their market value. Next, we estimate the average age of those assets using the procedure from Chaney et al. (2012). Specifically, we calculate the ratio of the accumulated depreciation of buildings (*dpacb* in Compustat) to the historic cost of building (*fatb* in Compustat) and multiply by the assumed mean depreciable life of 40 years (Nelson et al., 2000), and get the average age of the real estate assets. Thus we obtain the year of purchase for the real estate assets. Finally, for each firm's real estate assets (*fatp+fatb+fatc* in Compustat), we use a real estate price index to estimate the market value of these real estate assets for 1993 and then calculate the market value for each year in the sample period (1993 to 2007). We use both state-level and MSA-level real estate price indices. The real estate price indices are obtained from the Office of Federal Housing Enterprise Oversight (OFHEO). We match the state-level real estate price index with our accounting data using the state identifier from Compustat. For the MSA-level real estate price index, we utilize a mapping table between zip code and MSA code maintained by the US Department of Labor's Office of Workers' Compensation Programs (OWCP), to match with our accounting data by zip code from Compustat.

To be more specific, we obtain the real estate value in 1993 as the book value (*fatp+fatb+fatc* in Compustat) multiplied by the cumulative price increase from the acquisition year to 1993. For purpose of illustration, consider Johnson & Johnson with an accumulated depreciation of buildings of 808 million USD in 1993, and a historic cost of building of 2,389 million USD in 1993. We get the proportion of buildings used of 0.3382 (*dpacb/fatb* in Compustat), and obtain the average age of the real estate assets of 13 years by multiplying 0.3382 with the assumed mean depreciable life of 40 years. Consequently, we get the year of purchase for the real estate assets to be 1980. Then we use the cumulative price increase in the state real estate price index and MSA real estate price index from 1980 to 1993, and multiply by the historical cost of real estate assets (*fatp+fatb+fatc* in Compustat) (3,329 million USD) to get the market value of real estate assets in 1993 for Johnson & Johnson. We further adjust for inflation, divide by total assets, and get our final measure, *RE Value*. Johnson & Johnson has a value of 63% for *RE Value* in 1993, using state-level real estate prices. For the subsequent years, we estimate the real estate value as the book value at 1993 multiplied by the cumulative price increase from 1993 to that year.

One notable issue is that we do not consider the value of any new real estate repurchases or sales subsequent to 1993. This practice has both advantages and drawbacks. The advantage is that it successfully avoids any endogeneity between real estate purchases and investment opportunities, while the disadvantage is that it introduces noise into our measure. As illustrated in Chaney et al. (2012), firms are not likely to sell real estate assets to realize the capital gains when confronted with an increase in their real estate value, thus alleviating some of our concerns stemming from measurement error. Finally, we standardize our measure of market value of real estate assets by firms' total assets. This standardization will help us make dollar-to-dollar economic interpretations of the effect of collateral value on cash policy. For a representative firm over 1993 to 2007, the market value of real estate represents 26% of the firm's total assets.[4] Real estate is therefore a sizable proportion of firm's assets on balance sheet. More summary statistics will be discussed in section 3.2.

3. Collateral Shocks and Cash Holdings

We begin our analysis by examining the effects of collateral shocks on cash holdings. In this section, we first describe our estimation strategy and summary statistics, and then report the empirical results. Further, we provide instrumental variable analysis to cope with any lingering endogeneity concerns and present additional robustness tests. This initial part of our analysis generally follows Chaney et al.'s (2012) analysis of investment following collateral shocks. Finally, we conduct subsample analysis to look at the effects of investment opportunities, financial constraint, and corporate governance in shaping the relationship between debt capacity and cash holdings.

3.1. Estimation Model and Variables

[4] Our measures differ in magnitude with Chaney et al. (2012) as we are scaling real estate value using total book assets to better interpret in the cash regressions, while Chaney et al. (2012) are using PPE to standardize their major variables of real estate value.

In order to compute the sensitivity of cash reserves to collateral value, we augment the standard cash equation as in the literature (e.g., Opler et al., 1999; Bates et al., 2009) by introducing a variable capturing the value of real estate owned by the firm (*RE value*). Specifically, for firm *i*, with headquarters in location *j* (sate or MSA), in fiscal year *t*, we construct the following model:

$$Cash_{i,j,t} = \alpha + \beta_1 \times RE\ value_{i,j,t} + \beta_2 \times RE\ price\ index_{j,t} + \delta' X + \varepsilon_{i,j,t}, \qquad (1)$$

where the dependent variable *Cash* refers to the ratio of cash and short-term investments to total assets, or to net assets, following Opler et al. (1999) and Bates et al (2009). We also test the robustness of the results using log value of cash to net assets as an alternative measure (Bates et al., 2009). *RE value* is the market value of real estate assets in the fiscal year *t* scaled by total assets. For regressions using cash ratios scaled by net assets, *RE value* is scaled by the value of net assets for ease of coefficient interpretation. *RE price index* controls for state- or MSA-level of real estate prices in location *j* in fiscal year *t*.

The vector *X* includes a set of firm-specific control variables following the cash literature. These parameters are: 1) log firm size, measured as the log of real inflation-adjusted book assets; 2) market to book ratio, as the market value of assets over book value of assets; 3) leverage, as all debt scaled by total assets; 4) Investment as capital expenditures divided by total assets; 5) dividends paying dummy, with one indicating firm pays dividends and zero otherwise; 6) cash flow to total assets; 7) NWC, calculated as non-cash net working capital to total assets; 8) acquisition intensity, as acquisitions divided by total assets; 9) R&D/sales; 10) industry cash flow risk, defined as the standard deviation of industry cash flow to firm's total assets for the previous ten years; 11) two-digit SIC industry and year fixed effects. The detailed definitions are provided in Appendix A.

We include NWC as an independent variable because net working capital can substitute for cash, and therefore we expect firms with a higher value for net working capital to hold less cash. Market to book ratio and R&D/sales proxy for growth opportunities. For firms with larger growth opportunities, underinvestment is more costly, and these firms are expected to accumulate more cash. Firms with more capital expenditures are predicted to hoard less cash, and thus Capx/assets are predicted to be negatively correlated with the level of cash holdings. Similarly, acquisition intensity also proxies for the investment level of a firm, and it is expected to exert negative effects on cash holdings (Bates et al., 2009). Additionally, acquisition intensity also helps to control for the agency costs that managers of firms with excess cash holdings could conduct acquisitions for their private benefit (Jensen, 1986; Harford, 1999). Leverage is predicted to be negatively associated with cash holdings as interest payments decrease the ability of firms to hoard cash. Also, including leverage in the model helps to control for the refinancing risk of the firm, as Harford et al. (2013) find that firms increase cash holdings to mitigate the refinancing risk. Firms paying dividends are expected to have better access to debt financing, and thus less cash holdings. Industry cash flow risk captures cash flow uncertainty, and one would predict firms with greater cash flow risk to hold more precautionary cash (Opler et al., 1999; Bates et al., 2009).

Our primary focus is the coefficient estimate of *RE value*, β_1. A negative and statistically significant β_1 in regression (1) would be evidence for the causal effect of financing capacity on cash holdings, as it suggests that firms reduce cash balance after the appreciation of real estate value due to exogenous shocks. Therefore, this would be consistent with the precautionary saving hypothesis, as an analogous impact is expected on the downside of the cycle when adverse shocks occurs to the firm's real estate assets. Since *RE value* is at firm level and both cash ratios and *RE value* are using the same divisor, a clear advantage of this model specification is that β_1 could capture how sensitive a firm's cash holding responds to a $1 increment in the value of real estate owned by the firm.

3.2. Baseline Regression Results

After restricting the availability of information in regard to cash holdings and major independent variables in equation (1), we obtain a final sample consisting of 26,242 firm-year observations associated with 2,790 unique firms from 1993 to 2007. Panel A of Table 1 reports the corresponding summary statistics.

[Table 1 about here]

From Panel A of Table 1, we find that the ratio of cash to total assets has a mean of 0.18 and a standard deviation of 0.22, comparable with the literature (Opler et al., 1999; Bates et al., 2009). The ratio of cash to net assets is higher since cash and marketable assets have been subtracted from the denominator. Our major independent variable of interest, *RE value*, has two versions: one using state-level real estate price index, while the other using MSA-level real estate price index to compute the market value of the firm's real estate assets. Both of the measures are scaled using total book assets. The two versions yield similar values: the former (using state real estate price index) has a mean value of 0.25 with a standard deviation of 0.40, while the latter has a mean of 0.24 and a standard deviation of 0.39.

Table 2 shows the regression results. The dependent variables are Cash/Assets in columns (1) to (3) and Cash/Net Assets in columns (4) to (6). For each dependent variable, we first report the regressions of cash ratios on a set of control variables and our major independent variable of interest *RE value* calculated using the state real estate price index, and then *RE value* using the MSA real estate price index. All regressions control for year and two-digit SIC industry fixed effects, whose coefficient estimates are suppressed. Heteroskedasticity-consistent standard errors clustered at the state-year or MSA-year level are reported.[5] Across the four models, we consistently find that *RE value* has a statistically significant and negative coefficient (β_1) at the 1% level, which is consistent with managers trading off debt capacity and cash reserves in managing their access to capital. More importantly, we can characterize the degree of substitution. Specifically, based on the estimates in column (1) when using state real estate price index to compute *RE value*, the representative firm reduces cash reserve by $0.037 for each additional $1 of real estate actually owned by the firm, holding other factors constant. The effect is not only statistically significant, but also economically large. A one standard deviation increase in collateral value results in a decrease of 0.015 (=0.037×0.396) in the ratio of cash to total assets, which is about 8.1% of the mean, and 6.8% of one standard deviation of the cash ratio.

[Table 2 about here]

In column (2), we replicate the estimation performed in column (1) using the MSA real estate price index instead of the state index. As argued in Chaney et al. (2012), using MSA-level real estate prices has both advantages and caveats. The advantage is that it makes our identifying assumption that cash holdings are uncorrelated with local real estate prices milder, and it also offers a more accurate source of variation in real estate value (Chaney et al., 2012). The downside is that as now we assume that all the real estate assets owned by a firm are located in the headquarters city, it might be potentially subject to more measurement error. As

[5] We follow Chaney et al. (2012), and this clustering structure is conservative given the major explanatory variable of interest *RE value* is measured at the firm level (See Bertrand et al., 2004). We check the sensitivity by clustering at the firm level, and all the regressions reported in the paper are robust to this alternative clustering strategy.

shown in column (2), the coefficient estimate β_1 remains stable, at 0.038, and statistically significant at the 1% level.

In columns (4) and (5), we change the dependent variable to the ratio of cash and short-term investments to net assets. The coefficient estimates for *RE value* are negative and statistically significant at the 1% level, and the economic magnitudes are qualitatively similar to columns (1) and (2).

The control variables also generate interesting findings, consistent with the prior results in the cash literature. Both the market to book ratio and R&D/sales have positive coefficients, significant at the 1% level across all the models, supporting the hypothesis that firms with larger growth opportunities are more inclined to accumulate a large cash balance to accommodate future investment. The coefficient estimates for Capx/assets and acquisition intensity are both negative and significant at the 1% level for all the model specifications, echoing the results in Bates et al. (2009) that firms with higher level of investment are predicted to hoard less cash. Leverage has a negative and significant coefficient, in support of Harford et al. (2013) that firms with higher level of refinancing risk are more likely to accumulate large cash balance. Firms paying dividends and with a larger size are expected to have easier access to external financing, and that's why we observe negative and significant coefficients on firm size and the dividend-paying dummy. We also find that NWC has a negative coefficient estimate, statistically significant at the 99% confidence level across all the models, consistent with the substituting role of net working capital to cash reserves. Finally, the high adjusted R-squared of 0.49 provides further support to the trustworthiness of our results, as half of the variation in cash ratio can be explained by our model.

3.3. Endogeneity and Instrumental Variable Estimation

We follow Chaney et al. (2012) in addressing two potential endogeneity concerns with this experiment: (1) real estate prices could be correlated with investment opportunities and thus cash holdings; (2) the decision to own or lease real estate might be correlated with firms' investment opportunities and thus cash holdings.

To deal with the first endogeneity concern, we instrument MSA-level real estate prices by interacting local housing elasticity with nationwide real interest rate at which banks refinance their home loans as in Himmelberg et al. (2005).[6] The intuition is that the interest rate would affect the real estate prices differently for locations with different land supply elasticities. The demand for real estate increases as the mortgage rate decreases. For a location with very high elasticity in land supply, the increase in demand will mostly translate into more quantity through new construction rather than higher real estate prices. For a location with inelastic land supply, however, the decrease in interest rate will mostly translate into higher housing prices. In sum, the change in interest rate should have larger impact on real estate prices for locations with lower level of land supply elasticity. Therefore, we construct and estimate the following first-stage regression to predict real estate price index in MSA *l* at fiscal year *t*:

$$RE\ price\ index_{j,t} = \alpha_j + \gamma_t + \beta_1 \times Housing\ supply\ elasticity_j \times Interest\ rate_t + \mu_{j,t}, \quad (2)$$

where housing supply elasticity measures constraints on land supply at the MSA level. α_j is an MSA fixed effect, and γ_t is the year fixed effects. We replicate columns (1) and (2) of Table 3 in Chaney et al. (2012) and report the first-stage results in Appendix B. Column (1) reports the results directly using the measure of local land supply elasticity as provided in Saiz (2010), and in column (2) groups of MSAs by quartile of supply elasticity are used. As expected, the interaction of housing supply elasticity and interest rate has a positive and statistically significant coefficient at 1% confidence level, indicating that the positive effect of decreasing

[6] Local housing elasticity is only available at MSA level, provided in Saiz (2010).

mortgage rate on real estate prices is stronger in MSAs with lower land supply elasticity. The F-test for the weak instruments is 39.99, well above 10, which puts us at ease that we do not need to be concerned about a weak IV problem (Staiger and Stock, 1997; Stock et al., 2002).

In the second-stage regression, we use predicted *RE price index* to calculate *RE value* and also use the index itself as an explanatory variable in equation (1). As we are using different samples in the first-stage and second-stage regressions, we adjust our standard errors by bootstrapping. The second-stage results are presented in columns (3) and (6) of Table 1 for the ratio of cash to total assets, and the ratio of cash to net assets, respectively.

In column (3), the coefficient estimated from the IV regression is negative, significant at the 1% level, and the absolute value of 0.046 is slightly larger than the one from the OLS regression. In terms to economic magnitude, a one standard deviation increase in collateral value results in 0.018 (=0.046×0.39), which is 10% of the cash ratio. In column (6), the coefficient estimate remains negative and significant at 1% level, and it increases slightly from the OLS estimate in magnitude.

3.4. Robustness Tests

We address the second source of endogeneity related to ownership decision that firms are more likely to own real estate are also more sensitive to local demand shocks, by controlling for the interactions between firms' initial characteristics and the real estate price index (*RE price index*). To be more specific, the initial characteristics include five quintiles of firm age, firm size, ROA, as well as two-digit SIC industry dummies and state dummies, which are shown to play an important role in the ownership decision by Chaney et al. (2012).[7]

[7] As shown in Table 4 of Chaney et al. (2012), older, larger and more profitable firms are more likely to own real estate assets.

The results are shown in Table 3. After adding those additional controls into the regression, the coefficient estimates of *RE value* remain negative and statistically significant at 1% level across almost all the model specifications. The magnitude is slightly reduced to 0.026 in the OLS regression, and 0.034 in the IV regression, when using cash to total assets as the dependent variable. We further check the robustness of our results using an additional measure of cash ratio: log value of cash scaled by net assets. Columns (5) and (6) present these results. The coefficients of RE value are still negative and significant. An estimated coefficient of -0.179 in column (6) means the representative firm reduces cash holdings by 7% (=0.179×0.39) in response to a one standard deviation increase in its real estate value.

[Table 3 about here]

3.5. Further Exploration of Cash Holdings

As previously described, we have found a significant effect of the exogenous shocks in collateral value on firms' cash holdings. In this section, we reestimate our results by portioning the whole sample into high or low growth opportunity subsamples, financially constrained or unconstrained firms, subsamples with good or bad corporate governance, and subsamples with high or low local real estate price volatility to refine our understanding of the effect and further corroborate our interpretation.

3.5.1. High vs. Low Growth Opportunity

In section 3.2, we find that market to book ratio has positive coefficients consistently across all the models, implying that firms with larger growth opportunities are more likely to accumulate a large cash balance to accommodate future investment. A natural prediction is that the effect of debt capacity on cash holdings would be more pronounced for firms with higher levels of investment opportunities. We check this conjecture by dividing the sample into high and low growth opportunity subsamples, and reestimate our results. We place a firm in the high investment opportunity subsample if its market to book ratio is in the top tercile of the sample, and in the low investment opportunity group if its market to book ratio is in the bottom tercile of the sample. The results are presented in Panel A of Table 4.

[Table 4 about here]

As expected, throughout all of our three measures of cash ratios, we consistently find that the estimated coefficients on *RE value*, β_1, are much larger in the high investment opportunity firms than in the low investment opportunity firms. To test the equality of the *RE value* coefficients between the two subsamples, we rely on a Wald test. As shown in the third line from the bottom of Panel A, all of the null hypotheses of equality between the two subgroups are rejected at the 99% confidence level. For instance, when using cash to total assets as the dependent variable, the coefficient estimate of RE value for firms with higher growth opportunities is -0.080 (column (1)), almost 3.5 times of the coefficient for firms with lower growth opportunities (-0.025 in column (2)). This implies that the negative effect of collateral shocks on cash holdings is mostly driven by the high investment opportunity subsample. The estimated coefficient of -0.080 indicates that a one standard deviation increase in collateral value brings about approximately a decrease of 0.031 (=0.080×0.39) in the ratio of cash to total assets, which is 17% of the sample mean, and 14% of one standard deviation of the cash ratio.

3.5.2. Financially Constrained vs. Unconstrained Firms

As found in section 3.2, firms paying dividends, with a larger size, and higher ROA are expected to have easier access to external financing, and hold less cash reserves. In this section we check whether the effect of collateral shocks is more substantial for financially constrained firms. We use three different measures of financial constraint, namely Hadlock and Pierce's (2010) financial constraint index (*HP index*), payout policy, and bond ratings. A firm is regarded as financially constrained if its HP index falls in the top tercile of the whole distribution, and unconstrained if in the bottom tercile of the distribution. Firms paying dividend are regarded as unconstrained firms, while firms not paying dividend are constrained firms. Firms without a bond rating (*splticrm* in Compustat) are categorized as financially constrained, and financially unconstrained firms are those whose bonds are rated.

HP index is measured as follows:

$$HP\ index_{i,t} = -0.737 \times Firm\ size_{i,t} - 0.043 \times Firm\ size_{i,t}^2 - 0.040 \times Firm\ age_{i,t}, \qquad (3)$$

where firm size equals the log of inflation-adjusted book assets, and firm age is the number of years the firm is listed with a non-missing stock price on Compustat. In calculating this index, firm size is winsorized (i.e., capped) at (the log of) $4.5 billion, and firm age is winsorized at thirty-seven years.

Panel B of Table 4 reports the results. Across all of our measures of financial constraint, we consistently find that the estimated coefficients of *RE value* are significantly larger in the constrained firms than unconstrained firms, as shown by the larger magnitudes in the constrained subsample and the Wald tests.

3.5.3. Good vs. Bad Corporate Governance

Under agency theory, debt constrains managers, and accessing the capital markets provides discipline as well (Easterbrook, 1984; Jensen 1986). As such, entrenched managers are unlikely to view debt capacity and cash as substitutes and poorly-governed firms would not reduce cash holdings immediately as quickly as would firms with better corporate governance. To test this hypothesis, we divide the sample into good governance and bad governance subsamples and reestimate our results. We use two measures of corporate governance: institutional holdings and G-Index. Institutional holdings are measured by the percentage of common shares owned by institutional investors. The G-Index is taken from Gompers et al. (2003), based on 24 antitakeover provisions. Higher index levels correspond to more managerial power and poorer corporate governance. We categorize a firm as well-governed if institutional holding (G-Index) is in the top (bottom) tercile of the sample, and as poorly-governed if institutional holding (G-Index) is in the bottom (top) tercile of the sample.

Panel C of Table 4 shows the findings. Consistent with the prediction by the agency motive of cash holdings, the effect of collateral shocks on cash holdings is more pronounced in the firms with higher institutional holding and low G-Index (better governance).

3.5.4. High vs. Low Local Real Estate Price Volatility

Finally, we look at local real estate price volatility. Intuitively, firms located in an MSA with a history of high real estate price fluctuations might view house appreciation as a temperate event, and attach greater uncertainties to the future value of the real estate assets that they hold. Therefore, such firms might be more reluctant to reduce cash holdings facing real estate appreciation, relative to firms located in an MSA with low historical real estate price volatility. We directly test this conjecture in this subsection.

We measure local real estate price volatility by the standard deviation of the MSA real estate price index in the previous five years for a given MSA. High local real estate price volatility is coded when the local real estate price volatility falls in the top tercile of the sample, and low local real estate price volatility when the local real estate volatility is at the bottom tercile of the sample. Panel D reports the results.

Consistent with our expectation, we find that the effect of collateral shocks is much stronger in the subset of firms located in MSAs with low real estate price volatility. For instance, in Columns (1) and (2), the reduction in cash holdings is $0.057 for each $1 of collateral for firms with low real estate price volatility, which almost doubles the reduction of cash holdings for firms with high real estate volatility ($0.032). The Wald test indicates that the difference between the two estimates is statistically significant. The alternative measures of cash holdings give similar results.

The results of our further analysis of investment opportunity, financial constraint, corporate governance, and local real estate price volatility both refine our inferences and provide further support for our causal interpretation of tradeoff between debt capacity and cash holdings due to precautionary demand. An alternative explanation for the decrease in cash following an exogenous increase in collateral value would have to explain these results as well.

4. Collateral Shocks and the Marginal Value of Cash Holdings

So far, we have found robust evidence that firms reduce cash holdings after a collateral shock increases their debt capacity. As the supply of credit increases, allowing firms to rely more on external financing, cash should be less valuable. We test this hypothesis in this section by looking at the effect of collateral shocks on the marginal value of cash holdings.

4.1. Model Specification and Variables

We augment the model first developed in Faulkender and Wang (2006) by introducing our major parameter *RE value*. We then test our hypothesis by including an interaction term between RE value and the change in cash. Specifically, we construct the following model:

$$r_{i,j,t} - R^B_{i,j,t} =$$

$$\alpha_0 + \beta_1 \times \frac{\Delta Cash_{i,j,t}}{Market\ cap_{i,j,t-1}} + \beta_2 \times RE\ value_{i,j,t} \times \frac{\Delta Cash_{i,j,t}}{Market\ cap_{i,j,t-1}}$$

$$+\beta_3 \times RE\ value_{i,j,t} + \beta_4 \times RE\ price\ index_{j,t} + \delta' X + \varepsilon_{i,j,t} \tag{4}$$

where the dependent variable is the excess stock return $r_{i,j,t} - R^B_{i,j,t}$ over the fiscal year t in location *j*. $r_{i,j,t}$ is the stock return for firm *i* during fiscal year *t* and $R^B_{i,j,t}$ is the benchmark return in year t. We adopt two methods in calculating the benchmark return: (1) value-weighted return based on market capitalization within each of the 25 Fama-French portfolios formed basing on size and book-to-market ratio; (2) value-weighted industry-adjusted returns.[8] $\Delta Cash_{i,j,t}$ captures firms' unexpected changes in cash reserves from year *t-1* to t. Following Faulkender and Wang (2006), we standardize $\Delta Cash_{i,j,t}$ by one-year lagged market value of equity ($Market\ cap_{i,j,t-1}$) in order to avoid the results being dominated by the largest firms. Also the standardization allows us to interpret β_1 as the dollar change in shareholder wealth for a one-dollar change in cash holdings, since stock return is the difference of market value of

[8] Masulis et al. (2009) argue that industry-adjusted return is used as an alternative to alleviate the concern that market-to-book ratio is likely to be endogenous when using size and market-to-book ratio adjusted return. As we find later on that the results are quite similar for both the industry-adjusted return and size and market-to-book ratio adjusted return in our regression, we will focus on industry-adjusted return in the subsample analysis for brevity.

equity between t and t-1 ($Market\ cap_{i,j,t} - Market\ cap_{i,j,t-1}$) divided by $Market\ cap_{i,j,t-1}$. More detailed definitions of the variables are available in Appendix A.

The vector X includes a set of firm-specific control variables. These indicators are: (1) changes in earnings before extraordinary items ($\Delta Earnings_{i,t}$); (2) changes in net assets ($\Delta NetAssets_{i,t}$); (3) changes in R&D ($\Delta R\&D_{i,t}$); (4) changes in interest expense ($\Delta Interest_{i,t}$); (5) changes in dividend payout ($\Delta Dividends_{i,t}$); and (6) net financing, defined as new equity issues plus net new debt issues ($NetFinancing_{i,t}$). All these variables are scaled by $Market\ cap_{i,t-1}$. We also include the interaction between $\Delta Cash_{i,t}$ and one-year lagged value of cash holdings ($Cash_{i,t-1}$), and the interaction between $\Delta Cash_{i,t}$ and leverage ($Leverage_{i,t}$). Following Dittmar and Mahrt-Smith (2007) and Masulis et al. (2009), we also include the interaction between $\Delta Cash_{i,t}$ and a measure of financial constraint, which is a dummy variable with one indicating the firm's Hadlock and Pierce (2010) financial constraint index (*HP index*) is in the top tercile of the sample, and zero otherwise.[9]

Our primary interest is the coefficient estimate of the interaction between $RE\ value_{i,j,t}$ and $\frac{\Delta Cash_{i,j,t}}{Market\ cap_{i,j,t-1}}$, β_2. A negative and statistically significant β_2 in regression (4) would support our hypothesis that investors place a lower value on internal cash when positive shocks occur to firms' debt capacity.

4.2. Regression Results

We match our sample of real estate value information with variables needed for the marginal value of cash regressions, and obtain a final sample of 17,015 firm-year observations. The change in cash standardized by lagged value of market capitalization has a mean (median)

[9] For the detailed information of the calculation, please see Section 4.4.

of 0.5% (0.1), with a standard deviation of 11.9%. Consistent with Faulkender and Wang (2006), the annual excess stock returns are right skewed.

Table 5 presents the baseline regressions in regard to value of cash. In columns (1) to (3), the dependent variable is the industry-adjusted excess returns during fiscal year *t*, and in columns (4) to (6), it is the size and market-to-book adjusted excess returns of the stock during fiscal year *t*. All regressions control for year and industry fixed effects, whose coefficient estimates are suppressed. Heteroskedasticity-consistent standard errors clustered at the state-level or MSA-level are reported in the brackets.[10] Across all the four OLS models, we consistently find that the interaction term between *RE value* and the change in cash has a negative coefficient, statistically significant at the 1% level, supporting our hypothesis that cash is less valuable following an increase in a firm's debt capacity.[11]

[Table 5 about here]

To quantify the economic effects, a median shocked firm has a \$0.494 (=4.665×0.106) lower marginal value of a dollar of cash compared to an unshocked firm, with $\frac{\Delta Cash_{i,j,t}}{Market\ cap_{i,j,t-1}}$ at the mean and other factors unchanged, which is approximately a 25% lower than the value prior to the exogenous shocks to collateral value .

To cope with the endogeneity concern that real estate prices could be correlated with investment opportunities and thus the value of cash, we implement an IV strategy similar to that in section 3.3 by instrumenting real estate prices by the interaction of interest rates and

[10] All of the results are robust to clustering the standard errors at the firm level.
[11] The results are robust to controlling for the interactions between firms' initial characteristics and real estate price index as in section 3.4.

local housing supply elasticity. Columns (3) and (6) report the IV regression results for industry-adjusted excess return and size and M/B adjusted excess return respectively.[12] The results suggest that our findings are robust to the IV estimation.

4.3. Further Exploration of the Marginal Value of Cash Holdings

Faulkender and Wang (2006) find that financially constrained firms have larger marginal values of cash. In this section, we further explore whether the effect of debt capacity on the value of cash is more pronounced in firms with higher levels of financial constraints.

Similarly as in section 3.5.2, we replicate our baseline regression in subsamples of constrained and unconstrained firms. Financial constraint assignments are based on HP index, firm dividend payout policy, and bond ratings as previously described in section 3.5.2. Table 6 shows the empirical results.

[Table 6 about here]

As predicted by our hypothesis, the negative impact of collateral value on the marginal value of cash holdings is only significant in the subset of firms with prior financial constraint. For instance, when using HP index and bond ratings as measures of financial constraint, the interaction between *RE value* and change of cash is negative and statistically significant in constrained firms at the 1% level, but insignificantly different from zero in unconstrained firms at conventional significance levels.

[12] Standard errors are adjusted by bootstrapping as in section 3.3.

5. Collateral Shocks and Cash Flow Sensitivity of Cash

The evidence so far strongly supports a causal effect of debt capacity on cash policy. Further, it is economically large, both in terms of the effect on cash holdings and in terms of the change in the value of a marginal dollar of internal cash. In this section, we further examine the cash flow sensitivity of cash associated with debt capacity. Almeida et al. (2004) model a firm's demand for liquidity and find that financially constrained firms have a positive cash flow sensitivity of cash. An intuitive prediction is that firms with increasing value of collateral have exogenously reduced constraint, and consequently lower propensity to save cash from their cash flows and decreasing cash flow sensitivity of cash.

5.1. Model Specification and Variables

Following Almeida et al. (2004), we construct the following model to estimate the cash flow sensitivity of cash as follows:

$$\Delta Cash_{i,j,t} = \alpha + \beta_1 \times Cash\ flow_{i,j,t} + \beta_2 \times Cash\ flow_{i,j,t} \times RE\ value_{i,j,t} + \beta_3 \times RE\ value_{i,j,t} + \beta_4 \times RE\ price\ index_{j,t} + \delta' X + \varepsilon_{i,j,t}, \qquad (5)$$

where the dependent variable is the change of cash to total assets ratio. The regression coefficient on the cash flow variable β_1 captures the extent to which a firm saves cash out of current cash flows, namely cash flow sensitivity to cash. We add an interaction term between *RE value* and cash flow into the model, and the corresponding estimated coefficient β_2 is our primary focus. A negative and significant β_1 would suggest that positive collateral shocks lead to lower cash flow sensitivity of cash.

The vector *X* includes the standard control variables as in Almeida et al. (2004): market to book ratio, log of real book assets, Capx/assets, acquisition intensity, the current year change in net working capital scaled by total assets, and the current year change in short-term debt standardized by total assets.

5.2. Regression Results

After matching our sample of real estate information with variables in equation (5), we have a final sample of 26,283 firm-year observations. Summary statistics are shown in Panel C of Table 1. The change of cash to total assets has a mean value of 0.004, with a standard deviation of 0.121. Table 7 presents the results.

[Table 7 about here]

Columns (1) and (2) use *RE value* based on state real estate price index, while columns (3) to (6) use *RE value* based on MSA real estate price index. Columns (1) to (4) are based on OLS regressions, with columns (2) and (4) further controlling for the interactions between firms' initial characteristics and the real estate price index as in section 3.4. Standard errors clustered at the state-level or MSA-level are reported in brackets.[13] Across all four models, we consistently find a negative estimated coefficient on the interaction between *RE value* and cash flow, all statistically significant at the 1% level. This is consistent with our expectation that firms show reduced cash flow sensitivity of cash following an increase collateral value.

[13] All of the results are robust to clustering the standard errors at the firm level.

The results are both statistically and economically significant. Taking column (1) for example, a median shocked firm has a 0.01 (=0.139×0.061) lower of cash flow sensitivity of cash compared to an unshocked firm, which is equivalent to about a 5% lower sensitivity than before the increase in collateral value, holding cash flow at its mean and other factors constant. Columns (5) and (6) report the instrumental variable regression results, and the estimated coefficients remain significant at the 5% level.[14] Also the economic magnitudes are very close to those in the OLS regressions.

5.3. Further Exploration of the Cash Flow Sensitivity of Cash

As shown in Table 7, market to book ratio has positive and significant coefficients throughout all of our model specifications. An intuitive prediction is that the effect of collateral shocks on cash flow sensitivity of cash should be more prominent in firms with greater investment opportunities, as such firms are more likely to accumulate cash out of current cash flows in response to adverse shocks to collateral value.

In order to test this hypothesis, we partition the sample into high and low growth opportunity subsamples and reestimate our baseline regressions. The results are presented in Table 8.

[Table 8 about here]

Columns (1) and (2) use *RE value* based on state real estate price information, while columns (3) and (4) reply on *RE value* using MSA real estate price index. For both of the model

[14] Standard errors are adjusted by bootstrapping as in section 3.3.

specifications, the reduction of cash flow sensitivity of cash is only statistically significant in firms with higher level of growth opportunities, consistent with our expectation. For instance, when using state real estate price index to calculate *RE value*, the difference in cash flow sensitivity of cash between a median real estate holder and a non-real estate holder is 10% (=0.236×0.061/0.148) in firms with high growth opportunities (column (1)), compared to a much lower and insignificant difference of 0.3% (=0.012×0.061/0.258) between a median real estate holder and a non-real estate holder in firms with low growth opportunities (column (2)), holding cash flow at mean and other factors constant. This indicates that the effect of real estate value on cash flow sensitivity of cash is mainly driven by the firms with high investment opportunities.

Overall, our results suggest that firms with higher pledgable collateral value accumulate less cash. This empirically supports our predicted tradeoff between debt capacity and cash policy driven by the precautionary savings motive. Consistent with this theory, we find that the marginal value of cash holdings is significantly reduced after the exogenous increase in real estate value. We further find that firms display a lower cash flow sensitivity of cash after the increase in collateral value.

6. Concluding Remarks

In this paper, we explicitly examine the causal impact of financing capacity on corporate cash policies. Using variations in local real estate prices as shocks to the collateral value owned by the firms, we find strong evidence that increases in real estate values lead to smaller corporate cash reserves. Quantitatively, we show that the representative US firm holds $0.037 less of cash for each $1 of collateral. We further find that the decrease in cash holdings is more pronounced in firms with greater investment opportunities, financial constraint, better corporate governance, and lower historical real estate price volatility.

Next, we find that following collateral appreciation, the marginal value of cash holdings declines, and the effect on value of cash is more prominent in firms with financial constraint. We also document that firms show lower cash flow sensitivity of cash after the collateral appreciation, and the effect is larger in firms with greater investment opportunities.

By instrumenting real estate prices using interactions of long-term interest rate and local housing supply elasticity and controlling for the interactions between firms' initial characteristics and real estate price index, we further address remaining endogeneity concerns. We find that our results are robust to these approaches.

Taken together, our findings lend support to and give economic meaning to a direct tradeoff between debt capacity and cash holdings. In addition, our subsample analysis remedies the understanding in the sizeable gap between the degrees of the decline in the marginal value of cash holdings and the related decline in cash, by showing that the decrease in cash holdings is more pronounced in firms with greater investment opportunities, financial constraint, and better corporate governance. This suggests that unconstrained firms with entrenched managers maintain their existing cash reserves even following a shock to collateral value.

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Table 1
Summary Statistics

This table reports the summary statistics for the major variables used in this paper. The primary sample is drawn from Compustat firms from 1993 to 2007 that existed in 1993. RE value is the market value of the firm's real estate assets as of year t scaled by the book value of assets, using state real estate price index or MSA real estate price index. State real estate price index measures the growth in real estate prices in that state from 1993 until that year. MSA real estate price index measures the growth in real estate prices in that MSA from 1993 until that year. All other variables are defined in Appendix A.

Panel A. Analysis of Cash Holdings						
	Mean	Std.	Q1	Median	Q3	Obs.
Cash holdings						
Cash/Assets	0.180	0.222	0.021	0.084	0.258	26,242
Cash/Net Assets	0.304	0.458	0.022	0.091	0.347	26,228
Log(Cash/Net Assets)	-2.474	1.895	-3.773	-2.366	-1.042	25,936
Real estate value						
RE value (using state real estate price index)	0.246	0.396	0	0.061	0.330	26,242
RE value (MSA real estate price index)	0.240	0.390	0	0.050	0.321	25,275
State real estate price index	0.602	0.204	0.432	0.572	0.735	26,242
MSA real estate price index	0.597	0.210	0.412	0.571	0.746	25,290
Firm characteristics						
Market/book	2.194	1.805	1.105	1.529	2.473	26,242
Log firm size	4.707	2.298	3.129	4.592	6.287	26,242
Leverage	0.251	0.312	0.025	0.184	0.354	26,242
Capx/assets	0.057	0.056	0.021	0.041	0.073	26,242
Cash flow	-0.005	0.209	-0.026	0.065	0.111	26,242
Dividends paying dummy	0.276	0.447	0	0	1	26,242
NWC	0.064	0.285	-0.035	0.090	0.223	26,242
Acq. intensity	0.004	0.007	0	0	0.004	26,242
R&D/sales	0.083	0.170	0	0.005	0.077	26,242
Ind. cash flow risk	0.081	0.032	0.052	0.086	0.104	26,242

Panel B. Analysis of the Marginal Value of Cash Holdings						
	Mean	Std.	Q1	Median	Q3	Obs.
Excess stock returns during the fiscal year						
Industry-adjusted annual excess stock returns	-0.018	0.604	-0.365	-0.095	0.194	17,015
Size and M/B adjusted annual excess stock returns	-0.022	0.608	-0.380	-0.113	0.180	17,015
Real estate value						
RE value (using state real estate price index)	0.275	0.410	0	0.106	0.373	21,920
RE value (MSA real estate price index)	0.268	0.403	0	0.097	0.362	21,095
State real estate price index	0.609	0.202	0.438	0.580	0.739	21,920
MSA real estate price index	0.604	0.208	0.420	0.581	0.751	21,107
Firm characteristics						
Leverage	0.179	0.182	0.023	0.128	0.278	21,920
Constrained (dummy)$_t$	0.333	0.471	0	0	1	19,288
(The variables below are scaled by the market value of equity of the firm of fiscal year t - 1.)						
ΔCash$_t$	0.005	0.119	-0.029	0.001	0.035	21,920
Cash$_{t-1}$	0.157	0.213	0.023	0.074	0.193	21,920
ΔEarnings$_t$	0.012	0.177	-0.038	0.007	0.051	21,920
ΔNetAssets$_t$	0.039	0.355	-0.051	0.033	0.149	21,920
ΔR&D$_t$	0.001	0.007	0	0	0.002	21,920
ΔInterest$_t$	0.001	0.015	-0.003	0	0.005	21,920
ΔDividends$_t$	0.001	0.095	0	0	0	21,920
NetFinancing$_t$	0.026	0.177	-0.034	0	0.066	21,920

Panel C. Analysis of the Cash Flow Sensitivity of Cash						
	Mean	Std.	Q1	Median	Q3	Obs.
Changes of cash						
Δ(Cash/Assets)	0.004	0.121	-0.030	0.001	0.041	26,283
Real estate value						
RE value (using state real estate price index)	0.246	0.396	0	0.061	0.330	26,283
RE value (MSA real estate price index)	0.240	0.390	0	0.049	0.321	25,316
State real estate price index	0.602	0.204	0.432	0.572	0.734	26,283
MSA real estate price index	0.597	0.210	0.412	0.571	0.746	25,331
Firm characteristics						
Cash flow	-0.005	0.209	-0.026	0.065	0.111	26,283
Market/book$_t$	2.195	1.806	1.105	1.530	2.475	26,283
Log firm size$_t$	4.707	2.296	3.130	4.592	6.286	26,283
Capx/assets$_t$	0.057	0.056	0.021	0.041	0.073	26,283
Acq. intensity$_t$	0.004	0.007	0	0	0.004	26,283
ΔNWC$_t$	-0.007	0.133	-0.049	-0.001	0.041	26,283
ΔShort debt$_t$	0.002	0.053	-0.007	0	0.012	26,283

Table 2
Financial Flexibility and Corporate Cash Holdings

This table reports the effect of financial flexibility on corporate cash holdings. The dependent variables are Cash/Assets in columns (1) to (3), and Cash/Net Assets in columns (4) to (6). RE value is the market value of the firm's real estate assets as of year t scaled by the book value of assets, using state real estate price index or MSA real estate price index. In columns (4) to (6), RE value is scaled by the value of net assets for interpretation purpose. State real estate price index measures the growth in real estate prices in that state from 1993 until that year. MSA real estate price index measures the growth in real estate prices in that MSA from 1993 until that year. In instrumental variable regressions, real estate prices are instrumented using the interaction of interest rates and local housing supply elasticity provided in Saiz (2010). All other variables are defined in Appendix A. Industry and year fixed effects are included and not tabulated in the table. All regressions control for year and industry fixed effects, whose coefficient estimates are suppressed. Heteroskedasticity-consistent standard errors clustered at the state-year or MSA-year level are reported in brackets. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

	Dependent Variable					
	Cash/Assets			Cash/Net Assets		
	OLS	OLS	IV	OLS	OLS	IV
	(1)	(2)	(3)	(4)	(5)	(6)
RE value (using state real estate price index)	-0.037***			-0.045***		
	[0.003]			[0.005]		
RE value (using MSA real estate price index)		-0.038***	-0.046***		-0.047***	-0.059***
		[0.003]	[0.007]		[0.006]	[0.013]
State real estate price index	-0.110***			-0.202***		
	[0.014]			[0.030]		
MSA real estate price index		-0.091***	-0.101***		-0.164***	-0.185***
		[0.011]	[0.029]		[0.024]	[0.064]
Market/book	0.018***	0.018***	0.019***	0.037***	0.037***	0.038***
	[0.001]	[0.001]	[0.001]	[0.002]	[0.002]	[0.003]
Log firm size	-0.003***	-0.003***	-0.002	-0.002	-0.001	0.001
	[0.001]	[0.001]	[0.002]	[0.002]	[0.002]	[0.004]
Leverage	-0.247***	-0.247***	-0.263***	-0.477***	-0.478***	-0.503***
	[0.007]	[0.007]	[0.014]	[0.016]	[0.014]	[0.031]
Capx/assets	-0.500***	-0.509***	-0.527***	-1.035***	-1.058***	-1.107***
	[0.028]	[0.024]	[0.056]	[0.062]	[0.052]	[0.117]
Cash flow	0.016	0.018	0.020	0.023	0.028	0.038
	[0.013]	[0.012]	[0.035]	[0.028]	[0.027]	[0.072]
Dividends paying dummy	-0.032***	-0.035***	-0.036***	-0.077***	-0.082***	-0.078***
	[0.003]	[0.003]	[0.007]	[0.006]	[0.005]	[0.013]
NWC	-0.133***	-0.133***	-0.145***	-0.256***	-0.256***	-0.284***

	[0.009]	[0.008]	[0.019]	[0.019]	[0.018]	[0.042]
Acq. intensity	-2.276***	-2.312***	-2.336***	-4.514***	-4.609***	-4.810***
	[0.131]	[0.130]	[0.259]	[0.290]	[0.285]	[0.547]
R&D/sales	0.434***	0.436***	0.430***	0.954***	0.958***	0.938***
	[0.014]	[0.014]	[0.032]	[0.029]	[0.029]	[0.065]
Ind. cash flow risk	0.026	0.065	0.107	0.242	0.335	0.457
	[0.133]	[0.140]	[0.245]	[0.257]	[0.263]	[0.474]
Ind. fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	26,242	25,275	21,349	26,228	25,261	21,338
Adjusted R^2	0.494	0.493	0.498	0.467	0.465	0.471

Table 3
Robustness Tests: Financial Flexibility and Corporate Cash Holdings

This table reports additional robustness tests for the effect of financial flexibility on corporate cash holdings. The dependent variables are Cash/Assets in columns (1) and (2), Cash/Net Assets in columns (3) and (4), and Log (Cash/Net Assets) in columns (5) to (8) respectively. RE value is the market value of the firm's real estate assets as of year t scaled by the book value of assets, using state real estate price index or MSA real estate price index. In columns (3) to (6), RE value is scaled by the value of net assets for interpretation purpose. State real estate price index measures the growth in real estate prices in that state from 1993 until that year. MSA real estate price index measures the growth in real estate prices in that MSA from 1993 until that year. In instrumental variable regressions, real estate prices are instrumented using the interaction of interest rates and local housing supply elasticity provided in Saiz (2010). All other variables are defined in Appendix A. Industry and year fixed effects are included and not tabulated in the table. All regressions control for year and industry fixed effects, whose coefficient estimates are suppressed. Heteroskedasticity-consistent standard errors clustered at the state-year or MSA-year level are reported in brackets. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

	Dependent Variable					
	Cash/Assets		Cash/Net Assets		Log(Cash/Net Assets)	
	OLS	IV	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)	(5)	(6)
RE value (using state real estate price index)	-0.026***	-0.034***	-0.017***	-0.072***	-0.116***	-0.179**
	[0.003]	[0.007]	[0.006]	[0.013]	[0.031]	[0.072]
RE value (using MSA real estate price index)	0.028	0.045	0.197*	0.195	-0.291	0.025
	[0.069]	[0.688]	[0.116]	[0.644]	[0.953]	[7.364]
Market/book	0.018***	0.019***	0.036***	0.037***	0.168***	0.172***
	[0.001]	[0.002]	[0.002]	[0.003]	[0.007]	[0.016]
Log firm size	0.002	0.003	0.014***	0.014***	-0.020*	-0.018
	[0.001]	[0.003]	[0.003]	[0.005]	[0.011]	[0.024]
Leverage	-0.238***	-0.253***	-0.453***	-0.480***	-2.114***	-2.218***
	[0.006]	[0.013]	[0.013]	[0.030]	[0.055]	[0.132]
Capx/assets	-0.524***	-0.539***	-1.093***	-1.132***	-2.883***	-2.816***
	[0.024]	[0.055]	[0.050]	[0.114]	[0.205]	[0.424]
Cash flow	0.017	0.019	0.024	0.034	0.549***	0.508**
	[0.012]	[0.028]	[0.025]	[0.065]	[0.092]	[0.244]
Dividends paying dummy	-0.017***	-0.017**	-0.038***	-0.037***	-0.083***	-0.087
	[0.003]	[0.007]	[0.005]	[0.014]	[0.028]	[0.074]
NWC	-0.139***	-0.154***	-0.270***	-0.303***	-1.183***	-1.209***
	[0.008]	[0.018]	[0.017]	[0.044]	[0.064]	[0.140]

Acq. intensity	-2.295***	-2.318***	-4.603***	-4.775***	-15.091***	-15.165***
	[0.133]	[0.260]	[0.291]	[0.534]	[1.311]	[2.507]
R&D/sales	0.387***	0.380***	0.849***	0.831***	2.370***	2.313***
	[0.014]	[0.026]	[0.029]	[0.061]	[0.089]	[0.245]
Ind. cash flow risk	0.026	0.102	0.180	0.387	1.038	1.643
	[0.143]	[0.265]	[0.273]	[0.487]	[1.214]	[2.609]
Ind. fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Initial controls × MSA real estate prices	Yes	Yes	Yes	Yes	Yes	Yes
Observations	24,600	20,759	24,587	20,749	24,322	20,551
Adjusted R^2	0.504	0.511	0.478	0.484	0.417	0.426

Table 4
Further Explorations of Financial Flexibility and Corporate Cash Holdings

This table reports the subsample tests for the effect of financial flexibility on corporate cash holdings, based on growth opportunity, financial constraint, corporate governance, and local real estate price volatility in Panels A to D, respectively. In Panels A and D, the dependent variables are Cash/Assets in columns (1) and (2), Cash/Net Assets in columns (3) and (4), and Log (Cash/Net Assets) in columns (5) and (6) respectively. In both Panels B and C, the dependent variable is Cash/Assets. Growth opportunity category assignments use ex ante criteria based on market to book ratio, where firms in the top tercile of the market to book ratio are regarded as those with high growth opportunity and firms in the bottom tercile are assigned as low growth opportunity firms. Financial constraint assignments are based on Hadlock and Pierce (2010) index (HP index), firm dividend payout policy, and bond ratings. A firm is regarded as financially constrained if its HP index falls in the top tercile of the whole distribution, and unconstrained if in the bottom tercile of the distribution. Firms paying dividend are regarded as unconstrained firms, while firms not paying dividend are constrained firms. Firms without a bond rating (splticrm) are categorized as financially constrained, and financially unconstrained firms are those whose bonds are rated. Corporate governance categories are based on institutional holdings and G-index. A firm is regarded as with good governance if its institutional holding (G-index) falls in the top (bottom) tercile of the distribution in the sample, and bad governance if its institutional holding (G-index) falls in the bottom (top) tercile of the distribution. Local real estate price volatility is measured as the standard deviation of the MSA real estate price index in the previous five years for a given MSA. High local real estate price volatility is coded when the local real estate price volatility falls in the top tercile of the sample, and low local real estate price volatility when the local real estate volatility is at the bottom tercile of the sample. RE value is the market value of the firm's real estate assets as of year t scaled by the book value of assets, using state real estate price index or MSA real estate price index. In columns (3) to (6) of Panel A, RE value is scaled by the value of net assets for interpretation purpose. State real estate price index measures the growth in real estate prices in that state from 1993 until that year. MSA real estate price index measures the growth in real estate prices in that MSA from 1993 until that year. All other variables are defined in Appendix A. Industry and year fixed effects are included and not tabulated in the table. All regressions control for year and industry fixed effects, whose coefficient estimates are suppressed. Heteroskedasticity-consistent standard errors clustered at the state-year or MSA-year level are reported in brackets. Test "High Growth Opp. = Low Growth Opp.", Test "Const. = Unconst.", and Test "Good Governance = Bad Governance" report the Wald test of equality of the RE value coefficients between the firms with high growth opportunity and low growth opportunity, with and without financial constraint, and with good and bad corporate governance respectively. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A. High vs. Low Growth Opportunity

	Dependent Variable					
	Cash/Assets		Cash/Net Assets		Log(Cash/Net Assets)	
	Growth Opportunity		Growth Opportunity		Growth Opportunity	
	High	Low	High	Low	High	Low
	(1)	(2)	(3)	(4)	(5)	(6)
RE value (using MSA real estate price index)	-0.080***	-0.025***	-0.117***	-0.028***	-0.497***	-0.072*
	[0.008]	[0.004]	[0.015]	[0.008]	[0.062]	[0.043]

MSA real estate price index	-0.115***	-0.056***	-0.243***	-0.077***	-0.943***	-0.940***
	[0.024]	[0.011]	[0.053]	[0.022]	[0.174]	[0.129]
Log firm size	0.006***	-0.011***	0.020***	-0.020***	-0.000	-0.071***
	[0.002]	[0.001]	[0.003]	[0.002]	[0.010]	[0.011]
Leverage	-0.184***	-0.307***	-0.377***	-0.536***	-1.201***	-3.716***
	[0.008]	[0.011]	[0.017]	[0.021]	[0.061]	[0.110]
Capx/assets	-0.688***	-0.330***	-1.465***	-0.623***	-2.842***	-2.477***
	[0.043]	[0.032]	[0.091]	[0.065]	[0.305]	[0.355]
Cash flow	-0.012	-0.059**	-0.034	-0.131***	0.374***	-0.272
	[0.016]	[0.023]	[0.035]	[0.049]	[0.103]	[0.171]
Dividends paying dummy	-0.085***	-0.007**	-0.199***	-0.018***	-0.425***	-0.119***
	[0.007]	[0.003]	[0.015]	[0.005]	[0.049]	[0.040]
NWC	-0.095***	-0.211***	-0.205***	-0.397***	-0.444***	-1.940***
	[0.012]	[0.012]	[0.026]	[0.024]	[0.086]	[0.110]
Acq. intensity	-4.387***	-0.670***	-9.455***	-1.177***	-26.482***	-2.898
	[0.297]	[0.169]	[0.669]	[0.327]	[2.255]	[2.386]
R&D/sales	0.344***	0.495***	0.777***	1.057***	1.946***	3.059***
	[0.018]	[0.036]	[0.037]	[0.077]	[0.096]	[0.202]
Ind. cash flow risk	0.324	0.145	1.517***	0.378	5.079***	0.716
	[0.373]	[0.214]	[0.559]	[0.401]	[1.803]	[1.693]
Ind. fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Test "High Growth Opp. = Low Growth Opp."	44.71***		33.29***		32.80***	
Observations	8,509	8,416	8,500	8,413	8,445	8,303
Adjusted R^2	0.427	0.451	0.407	0.415	0.357	0.366

Panel B. Financially Constrained vs. Unconstrained

	Dependent Variable					
	Cash/Assets					
	HP Index		Payout Policy		Bond Ratings	
	Const.	Unconst.	Const.	Unconst.	Const.	Unconst.
	(1)	(2)	(3)	(4)	(5)	(6)
RE value (using MSA real estate price index)	-0.050***	-0.024***	-0.040***	-0.027***	-0.043***	-0.009***
	[0.008]	[0.003]	[0.004]	[0.003]	[0.004]	[0.003]
MSA real estate price index	-0.080***	-0.050***	-0.111***	-0.036***	-0.122***	-0.039***
	[0.021]	[0.011]	[0.013]	[0.010]	[0.013]	[0.011]
Market/book	0.019***	0.024***	0.019***	0.020***	0.019***	0.020***
	[0.001]	[0.002]	[0.001]	[0.002]	[0.001]	[0.002]
Log firm size	0.029***	-0.016***	0.004***	-0.019***	0.002**	-0.013***
	[0.003]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Leverage	-0.391***	-0.191***	-0.238***	-0.253***	-0.250***	-0.073***
	[0.018]	[0.010]	[0.007]	[0.011]	[0.007]	[0.009]
Capx/assets	-0.692***	-0.457***	-0.522***	-0.437***	-0.550***	-0.183***
	[0.038]	[0.034]	[0.027]	[0.030]	[0.026]	[0.031]
Cash flow	-0.024	-0.043	0.013	-0.130***	0.012	-0.024
	[0.016]	[0.031]	[0.012]	[0.039]	[0.012]	[0.041]
NWC	-0.251***	-0.232***	-0.136***	-0.247***	-0.148***	-0.111***
	[0.014]	[0.015]	[0.009]	[0.018]	[0.009]	[0.014]
Acq. intensity	-3.930***	-1.288***	-2.629***	-1.448***	-2.801***	-0.816***
	[0.304]	[0.148]	[0.176]	[0.144]	[0.156]	[0.139]
R&D/sales	0.314***	0.675***	0.401***	0.399***	0.416***	0.566***
	[0.019]	[0.042]	[0.015]	[0.070]	[0.014]	[0.068]
Ind. cash flow risk	-0.023	0.015	0.100	0.084	0.081	0.015
	[0.305]	[0.132]	[0.181]	[0.144]	[0.157]	[0.115]
Ind. fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Test "Const.= Unconst."	9.13***		6.51**		58.52***	
Observations	7,883	6,984	18,470	6,805	21,192	4,083
Adjusted R^2	0.523	0.542	0.474	0.511	0.479	0.420

Panel C. Good vs. Bad Corporate Governance

	Dependent Variable			
	Cash/Assets			
	Institutional Holding		G-Index	
	High	Low	High	Low
	(1)	(2)	(3)	(4)
RE value (using MSA real estate price index)	-0.037***	-0.020***	-0.037***	-0.010**
	[0.003]	[0.005]	[0.007]	[0.005]
MSA real estate price index	-0.093***	-0.027	-0.023	-0.013
	[0.014]	[0.018]	[0.024]	[0.018]
Market/book	0.028***	0.014***	0.025***	0.024***
	[0.002]	[0.001]	[0.003]	[0.004]
Log firm size	-0.016***	-0.011***	-0.021***	-0.018***
	[0.001]	[0.002]	[0.002]	[0.002]
Leverage	-0.206***	-0.187***	-0.186***	-0.189***
	[0.011]	[0.008]	[0.020]	[0.021]
Capx/assets	-0.501***	-0.424***	-0.629***	-0.342***
	[0.031]	[0.042]	[0.062]	[0.057]
Cash flow	-0.092***	-0.025*	0.077	-0.233***
	[0.030]	[0.014]	[0.065]	[0.071]
Dividends paying dummy	-0.032***	-0.003	-0.020***	-0.020***
	[0.003]	[0.007]	[0.006]	[0.006]
NWC	-0.249***	-0.062***	-0.360***	-0.148***
	[0.016]	[0.010]	[0.036]	[0.023]
Acq. intensity	-1.755***	-2.076***	-1.243***	-0.940***
	[0.155]	[0.320]	[0.305]	[0.223]
R&D/sales	0.544***	0.304***	0.410***	0.355***
	[0.028]	[0.022]	[0.050]	[0.100]
Ind. cash flow risk	-0.064	-0.237	0.708*	-0.293
	[0.132]	[0.288]	[0.362]	[0.217]
Ind. fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Test "Good Governance = Bad Governance"	6.44**		10.96***	
Observations	8,437	7,791	1,873	1,539
Adjusted R^2	0.650	0.327	0.635	0.442

Panel D. High vs. Low Local Real Estate Price Volatility

	Dependent Variable					
	Cash/Assets		Cash/Net Assets		Log(Cash/Net Assets)	
	Local Real Estate Price Volatility		Local Real Estate Volatility		Local Real Estate Volatility	
	High	Low	High	Low	High	Low
	(1)	(2)	(3)	(4)	(5)	(6)
RE value (using MSA real estate price index)	-0.032***	-0.057***	-0.036***	-0.083***	-0.191***	-0.323***
	[0.005]	[0.007]	[0.009]	[0.013]	[0.041]	[0.059]
MSA real estate price index	-0.134***	-0.108***	-0.225***	-0.209***	-1.611***	-1.186***
	[0.020]	[0.024]	[0.042]	[0.051]	[0.183]	[0.194]
Market/book	0.021***	0.017***	0.042***	0.036***	0.180***	0.144***
	[0.002]	[0.001]	[0.003]	[0.003]	[0.011]	[0.008]
Log firm size	-0.002*	-0.002	0.000	0.002	-0.017*	-0.073***
	[0.001]	[0.002]	[0.003]	[0.003]	[0.009]	[0.013]
Leverage	-0.243***	-0.273***	-0.471***	-0.538***	-1.979***	-2.226***
	[0.009]	[0.015]	[0.020]	[0.031]	[0.082]	[0.111]
Capx/assets	-0.604***	-0.543***	-1.309***	-1.139***	-3.588***	-2.352***
	[0.051]	[0.042]	[0.100]	[0.094]	[0.419]	[0.310]
Cash flow	0.000	0.033	0.010	0.056	0.432***	0.670***
	[0.020]	[0.023]	[0.043]	[0.051]	[0.144]	[0.168]
Dividends paying dummy	-0.034***	-0.038***	-0.082***	-0.091***	-0.210***	-0.193***
	[0.004]	[0.005]	[0.009]	[0.012]	[0.040]	[0.044]
NWC	-0.119***	-0.166***	-0.221***	-0.335***	-0.885***	-1.222***
	[0.014]	[0.016]	[0.029]	[0.035]	[0.101]	[0.119]
Acq. intensity	-2.183***	-2.824***	-4.443***	-5.634***	-12.779***	-17.071***
	[0.193]	[0.281]	[0.422]	[0.629]	[1.935]	[2.405]
R&D/sales	0.417***	0.440***	0.940***	0.954***	2.560***	2.384***
	[0.024]	[0.023]	[0.050]	[0.045]	[0.135]	[0.147]
Ind. cash flow risk	-0.433	0.074	-0.461	0.212	0.873	-3.245
	[0.306]	[0.273]	[0.598]	[0.581]	[2.136]	[2.181]
Ind. fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Test "High Growth Opp. = Low Growth Opp."	12.90***		12.72***		3.43*	
Observations	8653	8213	8646	8208	8572	8133
Adjusted R^2	0.498	0.501	0.469	0.475	0.427	0.424

Table 5

Financial Flexibility and the Marginal Value of Cash Holdings

This table reports the effect of financial flexibility on the marginal value of cash holdings. In columns (1) to (3), the dependent variable is the industry-adjusted excess returns during fiscal year t, and in columns (4) to (6), it is the size and market-to-book adjusted excess returns of the stock during fiscal year t. RE value is the market value of the firm's real estate assets as of year t scaled by the book value of assets, using state real estate price index or MSA real estate price index. State real estate price index measures the growth in real estate prices in that state from 1993 until that year. MSA real estate price index measures the growth in real estate prices in that MSA from 1993 until that year. In instrumental variable regressions, real estate prices are instrumented using the interaction of interest rates and local housing supply elasticity provided in Saiz (2010). All other variables are defined in Appendix A. Industry and year fixed effects are included and not tabulated in the table. All regressions control for year and industry fixed effects, whose coefficient estimates are suppressed. Heteroskedasticity-consistent standard errors clustered at the state-year or MSA-year level are reported in brackets. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

	Dependent Variable					
	Industry-Adjusted Annual Excess Stock Returns			Size and M/B Adjusted Annual Excess Stock Returns		
	OLS	OLS	IV	OLS	OLS	IV
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta Cash_t$	2.051***	2.047***	2.007***	2.166***	2.161***	2.138***
	[0.145]	[0.146]	[0.265]	[0.150]	[0.149]	[0.281]
RE value × $\Delta Cash_t$	-4.665***	-4.952***	-6.549***	-4.389***	-4.824***	-6.569***
	[1.083]	[1.230]	[1.675]	[1.113]	[1.259]	[1.607]
RE value (using state real estate price index)	0.037***			0.013		
	[0.012]			[0.012]		
RE value (using MSA real estate price index)		0.037***	0.040***		0.015	0.012
		[0.011]	[0.018]		[0.012]	[0.018]
State real estate price index	0.082			0.018		
	[0.060]			[0.069]		
MSA real estate price index		0.074*	0.102		0.029	0.065
		[0.043]	[0.082]		[0.044]	[0.085]
$Cash_{t-1}$ × $\Delta Cash_t$	-1.201***	-1.176***	-1.038***	-1.282***	-1.252***	-1.143***
	[0.237]	[0.243]	[0.399]	[0.245]	[0.249]	[0.413]
$Leverage_t$ × $\Delta Cash_t$	-1.923***	-1.833***	-1.900***	-2.075***	-1.966***	-1.995***
	[0.298]	[0.319]	[0.551]	[0.298]	[0.315]	[0.549]
Constrained $(dummy)_t$ × $\Delta Cash_t$	0.150	0.148	0.132	0.093	0.090	0.076
	[0.126]	[0.141]	[0.241]	[0.125]	[0.139]	[0.247]
$Cash_{t-1}$	0.429***	0.439***	0.462***	0.372***	0.385***	0.402***

	[0.038]	[0.040]	[0.069]	[0.043]	[0.043]	[0.072]
$Leverage_t$	-0.482***	-0.474***	-0.457***	-0.637***	-0.626***	-0.620***
	[0.036]	[0.034]	[0.068]	[0.035]	[0.034]	[0.068]
Constrained $(dummy)_t$	-0.032**	-0.032**	-0.026	-0.033***	-0.033***	-0.028
	[0.013]	[0.013]	[0.022]	[0.012]	[0.012]	[0.022]
$\Delta Earnings_t$	0.791***	0.786***	0.782***	0.820***	0.813***	0.809***
	[0.050]	[0.044]	[0.077]	[0.050]	[0.046]	[0.079]
$\Delta NetAssets_t$	0.377***	0.392***	0.390***	0.392***	0.406***	0.403***
	[0.029]	[0.026]	[0.043]	[0.027]	[0.025]	[0.044]
$\Delta R\&D_t$	2.185***	2.220**	2.184	2.763***	2.782***	2.915**
	[0.798]	[0.865]	[1.498]	[0.821]	[0.880]	[1.465]
$\Delta Interest_t$	-3.350***	-3.369***	-3.521***	-3.556***	-3.564***	-3.647***
	[0.508]	[0.528]	[1.118]	[0.512]	[0.532]	[1.089]
$\Delta Dividends_t$	0.160***	0.159***	0.157	0.156***	0.155***	0.153
	[0.025]	[0.025]	[0.359]	[0.025]	[0.025]	[0.377]
$NetFinancing_t$	-0.195***	-0.214***	-0.198**	-0.147***	-0.166***	-0.156*
	[0.050]	[0.052]	[0.087]	[0.050]	[0.052]	[0.091]
Ind. fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17,015	16,380	13,702	17,015	16,380	13,702
Adjusted R^2	0.170	0.169	0.166	0.192	0.191	0.188

Table 6

Further Explorations of Financial Flexibility and the Marginal Value of Cash Holdings

This table reports the subsample tests for the effect of financial flexibility on the marginal value of cash holdings. In columns (1) to (3), the dependent variable is the industry-adjusted excess returns during fiscal year t, and in columns (4) to (6), it is the size and market-to-book adjusted excess returns of the stock during fiscal year t. Financial constraint assignments are based on Hadlock and Pierce (2010) index (HP index), firm dividend payout policy, and bond ratings. A firm is regarded as financially constrained if its HP index falls in the top tercile of the whole distribution, and unconstrained if in the bottom tercile of the distribution. Firms paying dividend are regarded as unconstrained firms, while firms not paying dividend are constrained firms. Firms without a bond rating (splticrm) are categorized as financially constrained, and financially unconstrained firms are those whose bonds are rated. RE value is the market value of the firm's real estate assets as of year t scaled by the book value of assets, using state real estate price index or MSA real estate price index. State real estate price index measures the growth in real estate prices in that state from 1993 until that year. MSA real estate price index measures the growth in real estate prices in that MSA from 1993 until that year. All other variables are defined in Appendix A. Industry and year fixed effects are included and not tabulated in the table. All regressions control for year and industry fixed effects, whose coefficient estimates are suppressed. Heteroskedasticity-consistent standard errors clustered at the state-year or MSA-year level are reported in brackets. Test "Const. = Unconst." reports the Wald test of equality of the coefficients of change in cash and the interaction between RE value and change in cash between the firms with and without financial constraint. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

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	Dependent Variable					
	Industry-Adjusted Annual Excess Stock Returns					
	HP Index		Payout Policy		Bond Ratings	
	Const.	Unconst.	Const.	Unconst.	Const.	Unconst.
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta Cash_t$	2.339***	1.052***	2.227***	1.566***	2.179***	1.690***
	[0.137]	[0.213]	[0.133]	[0.295]	[0.129]	[0.308]
RE value × $\Delta Cash_t$	-6.416***	0.560	-6.594***	-1.344	-5.445***	-3.009
	[1.766]	[1.438]	[1.961]	[1.684]	[1.494]	[1.966]
RE value (using state real estate price index)	0.040**	0.029**	0.053***	0.023	0.045***	0.002
	[0.018]	[0.014]	[0.018]	[0.014]	[0.015]	[0.019]
RE value (using MSA real estate price index)	0.085	0.076	0.128**	-0.032	0.086*	0.038
	[0.055]	[0.053]	[0.060]	[0.048]	[0.049]	[0.063]
$Cash_{t-1}$ × $\Delta Cash_t$	-1.384***	-0.224	-1.245***	-0.694	-1.240***	-0.881
	[0.285]	[0.339]	[0.269]	[0.454]	[0.261]	[0.635]
$Leverage_t$ × $\Delta Cash_t$	-2.071***	-1.069**	-1.866***	-2.125***	-1.966***	-1.201
	[0.369]	[0.472]	[0.338]	[0.619]	[0.344]	[0.774]
$Cash_{t-1}$	0.475***	0.294***	0.475***	0.267***	0.439***	0.587***
	[0.049]	[0.053]	[0.048]	[0.054]	[0.043]	[0.111]
$Leverage_t$	-0.484***	-0.388***	-0.505***	-0.396***	-0.472***	-0.522***

	[0.041]	[0.048]	[0.042]	[0.048]	[0.039]	[0.058]
ΔEarnings$_t$	0.784***	0.767***	0.763***	0.927***	0.809***	0.646***
	[0.050]	[0.074]	[0.049]	[0.093]	[0.049]	[0.075]
ΔNetAssets$_t$	0.459***	0.183***	0.410***	0.295***	0.433***	0.204***
	[0.031]	[0.033]	[0.030]	[0.047]	[0.030]	[0.041]
ΔR&D$_t$	1.995**	4.416***	2.603**	1.211	2.532***	0.735
	[0.993]	[1.214]	[1.015]	[1.437]	[0.924]	[1.913]
ΔInterest$_t$	-3.027***	-4.142***	-3.252***	-3.786***	-3.431***	-2.934***
	[0.627]	[0.806]	[0.600]	[0.867]	[0.625]	[0.782]
ΔDividends$_t$	0.143***	1.053***	0.291	0.168***	0.153***	1.038
	[0.018]	[0.340]	[0.310]	[0.025]	[0.024]	[0.812]
NetFinancing$_t$	-0.218***	-0.192***	-0.223***	-0.159*	-0.192***	-0.201**
	[0.063]	[0.073]	[0.062]	[0.093]	[0.061]	[0.080]
Ind. fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Test "Const.= Unconst."	24.55***		5.28*		2.07	
Observations	5,352	5,632	10,436	5,944	12,656	3,724
Adjusted R^2	0.176	0.182	0.170	0.189	0.172	0.180

Table 7

Financial Flexibility and Cash Flow Sensitivity of Cash

This table reports the effect of financial flexibility on the cash flow sensitivity of cash. The dependent variable is the change in cash to total assets ratio. RE value is the market value of the firm's real estate assets as of year t scaled by the book value of assets, using state real estate price index or MSA real estate price index. State real estate price index measures the growth in real estate prices in that state from 1993 until that year. MSA real estate price index measures the growth in real estate prices in that MSA from 1993 until that year. In instrumental variable regressions, real estate prices are instrumented using the interaction of interest rates and local housing supply elasticity provided in Saiz (2010). All other variables are defined in Appendix A. Industry and year fixed effects are included and not tabulated in the table. All regressions control for year and industry fixed effects, whose coefficient estimates are suppressed. Heteroskedasticity-consistent standard errors clustered at the state-year or MSA-year level are reported in brackets. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

	Dependent Variable					
	Δ(Cash/Assets)					
	OLS	OLS	OLS	OLS	IV	IV
	(1)	(2)	(3)	(4)	(5)	(6)
Cash flow$_t$	0.199***	0.212***	0.199***	0.201***	0.202***	0.208***
	[0.007]	[0.008]	[0.008]	[0.008]	[0.014]	[0.015]
RE value × Cash flow$_t$	-0.139***	-0.124***	-0.133***	-0.085***	-0.155***	-0.093**
	[0.028]	[0.027]	[0.028]	[0.029]	[0.044]	[0.044]
RE value (using state real estate price index)	-0.005**	-0.002				
	[0.002]	[0.002]				
RE value (using MSA real estate price index)			-0.006***	0.009	-0.006	0.004
			[0.002]	[0.014]	[0.004]	[0.004]
State real estate price index	-0.020***	-0.018				
	[0.007]	[0.080]				
MSA real estate price index			-0.021***	-0.005	-0.024**	0.015
			[0.006]	[0.011]	[0.011]	[0.852]
Market/book$_t$	0.013***	0.012***	0.013***	0.013***	0.014***	0.014***
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Log firm size$_t$	0.003***	0.003***	0.003***	0.012***	0.003***	0.011***
	[0.001]	[0.001]	[0.000]	[0.001]	[0.001]	[0.002]
Capx/assets$_t$	-0.312***	-0.310***	-0.316***	-0.315***	-0.330***	-0.311***
	[0.017]	[0.017]	[0.017]	[0.017]	[0.030]	[0.030]
Acq. intensity$_t$	-1.512***	-1.482***	-1.519***	-1.558***	-1.510***	-1.564***
	[0.098]	[0.094]	[0.095]	[0.093]	[0.183]	[0.185]
ΔNWC$_t$	-0.055***	-0.071***	-0.051***	-0.070***	-0.063***	-0.081***

	[0.010]	[0.010]	[0.010]	[0.010]	[0.023]	[0.023]
ΔShort debt$_t$	-0.151***	-0.164***	-0.147***	-0.169***	-0.177***	-0.202***
	[0.021]	[0.021]	[0.020]	[0.020]	[0.035]	[0.036]
Ind. fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Initial controls × state real estate prices	No	Yes	No	No	No	No
Initial controls × MSA real estate prices	No	No	No	Yes	No	Yes
Observations	26,283	25,593	25,316	24,641	21,386	20,796
Adjusted R^2	0.116	0.118	0.117	0.124	0.123	0.126

Table 8

Further Explorations of Financial Flexibility and Cash Flow Sensitivity of Cash

This table reports the subsample tests for the effect of financial flexibility on the cash flow sensitivity of cash. The dependent variable is the change in cash to total assets ratio. Growth opportunity category assignments use ex ante criteria based on market to book ratio, where firms in the top tercile of the market to book ratio are regarded as those with high growth opportunity and firms in the bottom tercile are assigned as low growth opportunity firms. RE value is the market value of the firm's real estate assets as of year t scaled by the book value of assets, using state real estate price index or MSA real estate price index. State real estate price index measures the growth in real estate prices in that state from 1993 until that year. MSA real estate price index measures the growth in real estate prices in that MSA from 1993 until that year. All other variables are defined in Appendix A. Industry and year fixed effects are included and not tabulated in the table. All regressions control for year and industry fixed effects, whose coefficient estimates are suppressed. Heteroskedasticity-consistent standard errors clustered at the state-year or MSA-year level are reported in brackets. Test "High Growth Opp. = Low Growth Opp." reports the Wald test of equality of the coefficients of cash flow and the interaction between RE value and cash flow between the firms with high growth opportunity and low growth opportunity. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

	Dependent Variable			
	Δ(Cash/Assets)			
	Growth Opportunity		Growth Opportunity	
	High	Low	High	Low
	(1)	(2)	(3)	(4)
Cash flow$_t$	0.148***	0.258***	0.148***	0.258***
	[0.009]	[0.015]	[0.010]	[0.016]
RE value × Cash flow$_t$	-0.236***	-0.012	-0.247***	0.002
	[0.055]	[0.042]	[0.057]	[0.044]
RE value (using state real estate price index)	-0.026***	-0.000		
	[0.005]	[0.003]		
RE value (using MSA real estate price index)			-0.027***	-0.000
			[0.005]	[0.003]
State real estate price index	-0.055***	-0.006		
	[0.015]	[0.008]		
MSA real estate price index			-0.049***	-0.009
			[0.014]	[0.006]
Log firm size$_t$	0.005***	0.001	0.005***	0.001
	[0.001]	[0.001]	[0.001]	[0.001]
Capx/assets$_t$	-0.375***	-0.253***	-0.374***	-0.262***
	[0.031]	[0.022]	[0.031]	[0.022]
Acq. intensity$_t$	-1.936***	-1.068***	-1.921***	-1.054***
	[0.214]	[0.126]	[0.217]	[0.129]
ΔNWC$_t$	0.065***	-0.265***	0.068***	-0.262***
	[0.015]	[0.017]	[0.015]	[0.017]
ΔShort debt$_t$	-0.071*	-0.319***	-0.067	-0.311***
	[0.042]	[0.027]	[0.042]	[0.028]
Ind. fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Test "High Growth Opp. = Low Growth Opp."	69.21***		72.20***	
Observations	8,718	8,828	8,534	8,418
Adjusted R^2	0.122	0.177	0.123	0.178

Appendix
Variable Definitions

Variable	Definition *(Compustat data codes are italicized)*
Real estate value	
RE value (using state real estate price index)	The market value of the firm's real estate assets as of year t scaled by the book value of assets, using state real estate price index. Source: Compustat, OFHEO
RE value (MSA real estate price index)	The market value of the firm's real estate assets as of year t scaled by the book value of assets, using MSA real estate price index. Source: Compustat, OFHEO
State real estate price index	Home Price Index (HPI) at the state level, a broad measure of the movement of single-family home prices in the United States. Source: OFHEO
MSA real estate price index	Home Price Index (HPI) at the MSA level, a broad measure of the movement of single-family home prices in the United States. Source: OFHEO
Analysis of Cash Holdings	
Cash/Assets	The ratio of cash and short-term investments to total assets, calculated as *che/at.* Source: Compustat
Cash/Net Assets	The ratio of cash and short-term investments to net assets, calculated as *che/(at-che).*Source: Compustat
Log(Cash/Net Assets)	Log of the ratio of cash and short-term investments to net assets. Source: Compustat
Market/book	Market value of assets over book value of assets: *((at-ceq)+(csho*prcc_f))/at*. Source: Compustat
Log firm size	Log of the real inflation-adjusted book value of total assets (*at*). Source: Compustat
Leverage	All debt (*dltt+dlc*)/*at*. Source: Compustat
Capx/assets	Capital expenditures to total assets: *capx*/*at*. Source: Compustat
Cash flow	Cash flow to total assets: (*oibdp-xint-txt-dvc*)/*at*. Source: Compustat
Dividends paying dummy	Indicator set to 1 if firm pays dividends: Set to 1 if *dvc*>0. Source: Compustat
NWC	Non-cash net working capital to total assets: *(wcap-che)/at.*Source: Compustat
Acq. intensity	Acquisitions to total assets: *aqc/at.* Source: Compustat
R&D/Sales	Expenditures on research and development to sales: *xrd* (set to 0 if missing)/*sale*. Source: Compustat

Ind. cash flow risk	Standard deviation of industry cash flow to firm's total assets. The calculation method follows Bates, Kahle, and Stulz (2009). For each firm-year observation, the standard deviation of cash flow to total assets is calculated for the previous 10 years. We then average the standard deviation of cash flow to total assets each year across each two-digit SIC code. Source: Compustat
Bond ratings	Firms without a bond rating (*splticrm*) are categorized as financially constrained, and financially unconstrained firms are those whose bonds are rated. Source: Compustat
G-index	Taken from Gompers et al. (2003), based on 24 antitakeover provisions. Higher index levels correspond to more managerial power and poorer corporate governance. Source: Gompers et al. (2003)
Institutional ownership	Institutional ownership is measured by the percentage of common shares owned by institutional investors. Source: CDA/Spectrum Institutional 13(f) filings

Analysis of the Marginal Value of Cash Holdings

Industry-adjusted annual excess stock returns	Fama–French (1997) industry value-weighted returns. Source: Ken French's web site
Size and M/B adjusted annual excess stock returns	Fama–French size and book-to-market matched portfolio returns. Source: Ken French's web site
Leverage	All debt (*dltt+dlc*)/Market value of total assets (*(at-ceq)+(csho*prcc_f)*). Source: Compustat
Constrained (dummy)	A dummy variable with one indicating the firm's Hadlock and Pierce (2010) financial constraint index (HP index) is in the top tertile of the sample and zero otherwise. Source: Compustat
$\Delta Cash_t$	Change in cash (*che*). Source: Compustat
$\Delta Earnings_t$	Change in earnings before extraordinary items (*ib+xint+txdi+itci*). Source: Compustat
$\Delta NetAssets_t$	Change in net assets (*at-che*). Source: Compustat
$\Delta R\&D_t$	Change in R&D (*xrd*, set to 0 if missing). Source: Compustat
$\Delta Interest_t$	Change in interest (*xint*). Source: Compustat
$\Delta Dividends_t$	Change in common dividends (*dvc*). Source: Compustat
$NetFinancing_t$	New equity issues (*sstk−prstkc*) + Net new debt issues (*dltis-dltr*). Source: Compustat

Analysis of the Cash Flow Sensitivity of Cash

Δ(Cash/Assets)	Change in the ratio of cash and short-term investments to total assets. Source: Compustat

Cash flow	Cash flow to total assets: (*oibdp-xint-txt-dvc*)/*at*. Source: Compustat
Market/book$_t$	Market value of assets over book value of assets: *((at-ceq)+(csho*prcc_f))/at*. Source: Compustat
Log firm size$_t$	Log of the real inflation-adjusted book value of total assets (*at*). Source: Compustat
Capx/assets$_t$	Capital expenditures to total assets: *capx*/*at*. Source: Compustat
Acq. intensity$_t$	Acquisitions to total assets: *aqc/at.* Source: Compustat
ΔNWC$_t$	Change in NWC. Source: Compustat
ΔShort debt$_t$	Change in debt in current liabilities to total assets (*dlc/at*). Source: Compustat

Appendix B
First-Stage Regressions: The Effect of Local Housing Supply Elasticity and Real Interest Rate on MSA Real Estate Price Index

This table reports the first-stage regression of the MSA real estate price index on the interaction between interest rate and local housing supply elasticity, as defined in Saiz (2009). The table essentially replicates the results in columns (1) and (2) of Table 3 in Chaney et al. (2012). Column (1) uses the raw measure of housing supply elasticity, while column (2) use quartile of the elasticity. All regressions control for year as well as MSA fixed effects. Heteroskedasticity-consistent standard errors clustered at the MSA level are reported in brackets. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

	Dependent Variable	
	MSA Real Estate Price Index	
	(1)	(2)
Local housing supply elasticity × Interest rate	0.028***	
	[0.004]	
First quartile of elasticity × Interest rate		-0.064***
		[0.007]
Second quartile of elasticity × Interest rate		-0.046***
		[0.008]
Third quartile of elasticity × Interest rate		-0.014**
		[0.007]
MSA fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
F-test	39.99***	32.89***
Observations	1,358	1,358
Adjusted R^2	0.94	0.94