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# The Effect of Financial Flexibility on Payout Policy

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## Abstract

We use variation in real estate prices as exogenous shocks to firms' debt capacity to study the causal effect of financial flexibility on payout policy. We show that an increase in financial flexibility results in higher dividends, share repurchases, and payout flexibility. We find that a 1-standard-deviation increase in a firms' collateral value results in 0.26- and 0.55-percentage-point increases in nondiscretionary and discretionary payouts, respectively. This effect is stronger for firms with few investment opportunities. Moreover, highly leveraged firms are more likely to cut dividends in response to a sharp decrease in their financial flexibility.

## I. Introduction

Financial flexibility, a firm's ability to access financing in order to fund investment opportunities and unexpected expenses, has a significant impact on the decisions made by the firm's managers. In this article, we investigate the causal effect of financial flexibility on payout decisions. We use variation in real estate prices as an experiment that generates exogenous shocks to firms' debt capacity and, therefore, to their financial flexibility. Most firms need real estate assets to run their businesses, and they need to choose between owning or leasing these

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assets.[1] One of the most important characteristics of corporate real estate (CRE) assets is that they can be used as collateral to obtain debt financing. In a world without asymmetric information between firms' managers and lenders, the value of the assets that can be used for collateral would be irrelevant. However, in the presence of information frictions, these assets can be used as collateral to help reduce lending costs. As a result, the value of CRE assets affects firms' borrowing capacity, their financial flexibility, and, ultimately, their payout policies.

We use firm-level data for 4,994 U.S. firms from 1993 to 2013 to examine whether changes in a firm's financial flexibility has any effect on its payout policy. Our fundamental empirical analysis can be summarized in four sets of results. First, we document the effects of financial flexibility on a firm's cash dividend payments. More specifically, we show that an increase in financial flexibility (i.e., a positive shock to real estate prices) leads to an increase in the dividends paid to shareholders. Second, we reveal the implications of financial flexibility for share repurchases. Third, we show that shocks to financial flexibility have different effects on dividends and share repurchases. We find that an increase in financial flexibility leads to more payout flexibility, which is defined as the ratio of share repurchases to the total payout. Fourth, we demonstrate that the impact of shocks to financial flexibility is higher for discretionary payouts than for nondiscretionary payouts. Overall, we document that an increase in financial flexibility has a significant effect on firms' payout: A 1-standard-deviation increase in the value of firms' pledgeable collateral translates to a 0.26-percentage-point increase in nondiscretionary payout (i.e., 7.0% of a standard deviation) and a 0.55-percentage-point increase in discretionary payout (i.e., 9.5% of a standard deviation) for a typical U.S. firm.

Moreover, we study the mechanisms that generate payout responses to financial flexibility. Increases in real estate prices raise the level of financial flexibility and affect firms' payouts through two channels. First, a positive "collateral" effect is driven by increases in real estate prices, which relax firms' borrowing constraints. Second, a positive "substitution" effect arises when a firm substitutes capital from real estate services in the future with payouts in the present. The economic intuition is as follows: Firms use CRE assets as collateral to obtain debt financing. Through this collateral channel, positive shocks to the value of CRE assets allow firms to increase their leverage in order to finance an increase in investments. In addition, firms can shift part of the cash flow generated by their businesses from investments to payout. If the collateral and substitution channels are in play, then we should expect i) a weaker or negative effect of real estate prices on payouts in highly leveraged firms when financial flexibility is lower and ii) a stronger effect in firms with few investment opportunities.

[1] To own corporate real estate (CRE), firms must usually make a major investment, which has a significant impact on their financial statements. Zeckhauser and Silverman (1983) find that real estate assets represent 25%–41% of total corporate assets, depending on the industry. Veale (1989) reports that corporate real estate accounts for about 15% of firms' operating expenses or 50% of their net operating income. Chaney, Sraer, and Thesmar (2012) show that 59% of public firms in the United States own at least some real estate and that the market value of real estate among these firms accounted for 19% of these firms' total market value in 1993.

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We test these two propositions. First, we show that highly leveraged firms are likely to decrease their payouts when the value of their pledgeable collateral decreases (i.e., financial flexibility is lower). Second, we demonstrate that firms with few investment opportunities (i.e., firms with low Tobin's $Q$) increase their payouts more when they experience an increase in their financial flexibility. We also show that among firms with fewer investment opportunities, financially constrained firms make more use of the collateral channel to increase their payouts than do unconstrained firms.

Our goal is to identify the causal effect of financial flexibility on firms' payout policies using variation in real estate prices as an exogenous shock to financial flexibility. However, two main sources of endogeneity may affect our empirical analysis. First, variation in local real estate prices may be correlated with a firm's payout decisions. For example, an unobserved local economic shock could affect both real estate prices and a firm's payout policy. Such an unobserved shock would act as an omitted variable that could bias our estimates. As a positive local economic shock would increase both real estate prices and a firm's payout, this potential bias would be positive. To address this endogeneity issue, we adapt the instrumental variables (IV) approach developed by Himmelberg, Mayer, and Sinai (2005) and Mian and Sufi (2011) to our specific problem. Our goal is to isolate the variation in local real estate prices by making this variation orthogonal to the potentially omitted variables. We instrument local real estate prices using the interaction between the supply elasticity of the local real estate market and long-term interest rates, which enables us to pick up changes in housing demand. We also address Davidoff's (2016) criticism of this instrument by controlling for the interaction between the supply constraint and time in the first- and second-stage IV specifications. The second main source of endogeneity is that the decision to own or rent (lease) real estate assets could be correlated with a firm's payout policy. As we do not have a suitable instrument to tackle this endogeneity problem, we study the effects of the decision to own CRE assets on a firm's payout. Specifically, we control for the observable determinants of CRE ownership decisions, and we find that our estimates do not change when we implement these controls.

We focus on other potential concerns in our robustness checks. First, we address the possibility that payouts by large firms could increase local real estate prices. Second, we focus on the concern that firms may not be able to use their increased borrowing capacity immediately after an increase in CRE value. Third, we run a robustness test to address the concern that firms that pay higher dividends may choose to locate in areas experiencing high growth in real estate prices. Moreover, we show that our results are not driven by the fact that remotely located firms pay higher dividends because shareholders cannot perfectly monitor managers' decisions. Finally, we address the concern that the collateral channel might be used only to finance investments but not payouts.

This article contributes to the literature in two main ways. First, we contribute to a growing body of literature that focuses on financial flexibility as a determinant of corporate financing decisions. Chen, Harford, and Lin (2017) document that an increase in a firm's financial flexibility lowers its cash holdings and its marginal value of cash holdings. Bonaime, Harford, and Moore (2017) study the tradeoff between commitment and financial flexibility in firms' payout policies

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using U.S. Securities and Exchange Commission (SEC) Rule 10b5-1 preset repurchase plans. They find that these repurchases plans, which allow firms to establish a preset repurchase plan with a third party, increase the commitment and reduce the financial flexibility provided by the open-market repurchases. Bonaime, Hankins, and Harford (2014) shows that both risk management and payout decisions affect financial flexibility. Their study differs from ours because they focus on how payout decisions, together with risk management, affect financial flexibility. They argue that the choice of more repurchases relative to dividends increases a firm's financial flexibility. We focus on the reverse analysis. We examine how financial flexibility affects payout choices in a general context.

Second, this article also relates to a vast stream of literature on the characteristics of payout flexibility and a firms' reluctance to decrease dividends. Brav, Graham, Harvey, and Michaely (2005) survey chief financial officers (CFOs) and document that they prefer decreasing investments rather than dividends. This rigidity in dividend payouts is consistent with the findings in Guay and Harford (2000), Jagannathan, Stephens, and Weisbach (2000), and Lie (2005), who show that firms with permanent operating cash flows tend to pay dividends, while firms with temporary cash flows tend to repurchase shares. In a complementary way, Leary and Michaely (2011) document that financially unconstrained firms present a high level of dividend smoothing, but they do not attempt to smooth share repurchases. Bliss, Cheng, and Denis (2015) document that firms with higher leverage are more likely to reduce their payouts during a shock to the supply of credit. Farre-Mensa, Michaely, and Schmalz (2018) show that firms use external capital (both equity and debt) to finance their payouts. Our results are consistent with their findings as we show that firms use collateralizable assets to raise debt, which increases their financial flexibility and finance payout. However, none of these studies analyze the causal relationship between financial flexibility, induced through the collateral channel, and payout policy.

The remainder of the article is structured as follows: Section II develops our principal hypotheses and predictions. Section III describes the empirical data and presents summary statistics. Section IV provides a detailed description of the empirical strategy. Section V presents our empirical findings and Section VI provides additional robustness tests. Finally, Section VII concludes.

## II. Theoretical Predictions

In the Modigliani–Miller (MM) model, the split in retained earnings between dividends and new investments does not have any influence on a firm's value. This "dividend irrelevance" to firm value arises because shareholders are indifferent between obtaining dividends and investing the retained earnings in new opportunities with the same level of risk. Among other assumptions, the MM model assumes that firm managers and shareholders have access to free information and that there are no information asymmetries among them. As a result, the value of collateralizable assets is irrelevant.

However, in the presence of information frictions, collateralizable assets can be pledged to lenders to reduce the costs of those frictions. Therefore, positive shocks to real estate prices make firms' collateral more valuable, which increases

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their debt capacity and financial flexibility.[2] Cvijanovic (2014) shows that most firms increase their leverage when they experience a positive shock to the value of their CRE assets (i.e., the "collateral" effect). Chaney et al. (2012) and Chen et al. (2017) demonstrate that these firms use this extra debt to finance part of their investments and reduce their cash holdings, respectively. As a result, these firms can shift some of their income from investments and/or cash reserves to payouts, which we call the "substitution" effect.[3] Therefore, the "collateral" and "substitution" effects serve as transmission mechanisms between financial flexibility and payouts in the form of dividends and share repurchases. We use variation in the value of collateralizable assets as exogenous shocks to firms' debt capacity and, consequently, to their financial flexibility. Hypotheses 1 and 2 summarize these basic predictions.

*Hypothesis 1.* Cash dividends increase in the market value of firms' collateralizable assets.

*Hypothesis 2.* Share repurchases increase in the market value of firms' collateralizable assets.

These hypotheses raise the question of which form of payout (i.e., dividends or share repurchases) is more affected by changes in firms' financial flexibility. The extant corporate finance literature shows that firms are much more reluctant to cut dividends than to increase them because the negative reaction to a dividend decrease is stronger than the positive reaction to a dividend increase of the same magnitude (Ghosh and Woolridge (1988), Denis, Denis, and Sarin (1994), and Yoon and Starks (1995)). This stream of literature also finds that this reaction is weaker for share repurchases (Jagannathan et al. (2000)). As a result, firms are more conservative when it comes to increasing dividends than when it comes to increasing share repurchases. Equivalently, repurchases provide managers with more discretion in terms of payout amount and timing. If the main portion of a positive shock in real estate prices is temporary, then the increase in a firm's financial flexibility is not permanent and we should expect greater increases in share repurchases than in dividends. Hypothesis 3 formalizes this prediction. To test this hypothesis, we use the measure of "payout flexibility," defined by Bonaime et al. (2014) as the ratio of share repurchases to total payout.

*Hypothesis 3.* Payout flexibility increases in the market value of firms' collateralizable assets.

[2]Besides, positive shocks to the value of CRE assets produce a negative "income" effect in the firm. As firms that own real estate are effectively paying rents to themselves, an increase in the value of real estate prices increases their implicit rents. At the same time, firms that own real estate experience a positive "endowment" effect. Standard economic theory (e.g., Sinai and Souleles (2005), Buiter (2010)) shows that the income and endowment effects cancel each other out because the increase in real estate wealth (i.e., a positive endowment effect) offsets the increase in the cost of real estate services (i.e., a negative income effect).

[3]Note that without an increase in payouts, an increase in the value of collateralizable real estate assets would only reduce leverage if a firm does not incur in any changes in other costly corporate finance decisions (e.g., investments, cash holdings, working capital, etc.).

Leary and Michaely (2011) show that firms are well aware of the penalties associated with dividend cuts. As a result, they smooth their dividend payouts.[4] They are usually conservative about increasing their dividends during periods of increasing real estate prices because they are reluctant to cut them later if bad times come. On the other hand, the costs of reducing share repurchases are lower and firms manage them in a more discretionary manner. Share repurchases are usually more volatile than dividends because firms increase their share repurchases when their financial flexibility improves (e.g., during periods of increasing real estate prices) and decrease them when their financial flexibility is lower (e.g., during periods of decreasing real estate prices). Therefore, we expect positive and negative shocks in financial flexibility to have different effects on dividends and share repurchases. Specifically, one might wonder whether the magnitude of the decrease in share repurchases resulting from the decrease in financial flexibility (i.e., the decrease in the value of CRE assets) is higher than the magnitude of the decrease in dividends. Therefore, we also study whether a decrease in financial flexibility has a higher effect on share repurchases than on dividends.

We have previously discussed that firms use collateralizable assets to borrow from lenders. Notably, the collateral channel is highly used during periods of increasing real estate prices, but this channel is less powerful in periods of decreasing real estate prices. In these periods, highly leveraged firms find it difficult to increase their debt to finance payouts. For these firms, the collateral channel is no longer viable because real estate prices have decreased. Consequently, we expect these firms to cut their dividends and share repurchases in response to their decreased financial flexibility. On the other hand, less leveraged firms can use cash or raise debt to finance part of their dividend payout. Hence, we expect less leveraged firms to maintain their dividend payments in order to avoid the penalties associated with dividend cuts. As the costs associated with decreasing share repurchases are lower, we expect a smaller effect than the effect that we observe for cash dividends. Our fourth hypothesis summarizes these predictions. We make use of the recent bust in real estate prices (2008–2011) to study this effect.

*Hypothesis 4.* Highly leveraged firms are more likely to decrease their payouts in response to a decrease in the value of their collateralizable assets.

Finally, one may argue that when firms experience positive shocks in the value of their collateralizable assets, they should invest all of the extra capital that they can borrow in positive net present value projects instead of increasing their payouts. If firms have enough projects in which to invest, then this would be true. Therefore, firms with very few investment opportunities should use the collateral channel to increase their payouts when their financial flexibility improves (i.e., the value of their CRE assets increases). Hypothesis 5 formalizes this conjecture.[5]

*Hypothesis 5.* The magnitude of the payout increase that occurs when the value of collateralizable assets increases is greater for firms with few investment opportunities.

[4]The Supplementary Material provides a detailed analysis of the impact of real estate prices on dividend smoothing.

[5]We provide additional evidence to motivate this hypothesis in the Supplementary Material.

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## III. Data

Our sample contains 21 years of firm-level observations. We use all active firms listed in Compustat as of 1993 for which data on total assets was available. This provided us with a sample of 10,215 firms and 116,044 firm-year observations over the 1993–2013 period. We omitted firms not headquartered in the United States and firms not present in the sample for at least 3 consecutive years. As is standard practice in the literature, we also omitted firms that belong to the finance, insurance, real estate, construction, or mining industries as well as nonprofit and governmental organizations. This reduced our sample to 4,994 firms and 67,836 firm-year observations. Table 1 reports summary statistics for the variables used in our empirical analysis.

TABLE 1
Summary Statistics

Table 1 reports summary statistics for our main variables. $\delta_{DIV}$ and $\delta_{REP}$ are dummy variables that take the value of 1 if the firm pays cash dividends or repurchases shares, respectively, and 0 otherwise. DIV_TO_LAGGED_PPE is the ratio of cash dividend to previous-year property, plant, and equipment (PPE). SHARE_REPURCHASE_TO_LAGGED_PPE is the ratio of shares repurchased to previous-year PPE. DISCRETIONARY_PAYOUT is the sum of i) extra dividends (above the regular dividend), ii) special dividends, and iii) share repurchases. NONDISCRETIONARY_PAYOUT is the minimum of i) the firm's regular dividend and ii) its prior-year regular dividend. RETA is the ratio of retained earnings to the book value of assets. LEVERAGE is the sum of short- and long-term debt normalized by the book value of assets. ASSET_GROWTH is the difference in the current and lagged book values of assets divided by the lagged book value of assets. FIRM_SIZE is defined as the book value of total assets. MARKET_TO_BOOK is the ratio of the market value of equity plus the book value of assets minus the book value of equity, all divided by the book value of assets. SALES_GROWTH is the ratio of the difference in the current and lagged values of sales divided by the lagged value of sales. ROA is the operating income before depreciation minus depreciation and amortization, all divided by the book value of assets. CASH_HOLDINGS accounts for cash and short-term securities. FIRM_AGE is the number of years since the firm first appeared in the Compustat database. RE_VALUE is the ratio of the market value of real estate normalized by previous-year PPE. Residential real estate prices are the Federal Housing Finance Agency's (FHFA) house price index (HPI) and commercial real estate prices are Real Capital Analytics commercial property price index (CPPI). SUPPLY_ELASTICITY is the local housing supply elasticity in Saiz (2010).

| | Mean | Median | Std. Dev. | P25 | P75 | No. of Obs. |
|---|---|---|---|---|---|---|
| $\delta_{DIV}$, firms paying dividends | 0.350 | 0.000 | 0.477 | 0.000 | 1.000 | 26,643 |
| $\delta_{REP}$, firms repurchasing shares | 0.417 | 0.000 | 0.493 | 0.000 | 1.000 | 26,643 |
| $\delta_{PAYOUT}$, firms paying dividends or repurchasing shares | 0.558 | 1.000 | 0.497 | 0.000 | 1.000 | 26,643 |
| DIV_ON_COMMON_EQUITY (all firms) | 46.516 | 0.000 | 285.770 | 0.000 | 3.547 | 26,504 |
| DIV_ON_COMMON_EQUITY (only $\delta_{DIV}=1$ firms) | 134.140 | 11.140 | 473.020 | 3.066 | 57.223 | 9,191 |
| DIV_TO_LAGGED_PPE | 0.025 | 0.000 | 0.046 | 0.000 | 0.030 | 26,504 |
| SHARE_REPURCHASE | 66.704 | 0.000 | 497.660 | 0.000 | 1.388 | 25,002 |
| SHARE_REPURCHASE (only $\delta_{REP}=1$) | 175.960 | 5.450 | 796.320 | 0.583 | 49.430 | 9,478 |
| SHARE_REPURCHASE_TO_LAGGED_PPE | 0.027 | 0.000 | 0.048 | 0.000 | 0.027 | 25,002 |
| DISCRETIONARY_PAYOUT | 0.028 | 0.000 | 0.058 | 0.000 | 0.030 | 26,643 |
| NONDISCRETIONARY_PAYOUT | 0.020 | 0.000 | 0.037 | 0.014 | 0.023 | 26,643 |
| RETA | −0.331 | 0.113 | 1.204 | −0.374 | 0.359 | 26,339 |
| LEVERAGE | 0.272 | 0.209 | 0.318 | 0.047 | 0.373 | 26,518 |
| ASSET_GROWTH | 0.096 | 0.046 | 0.334 | −0.054 | 0.174 | 23,939 |
| FIRM_SIZE | 2,232.900 | 143.950 | 11,531.000 | 26.640 | 801.220 | 26,587 |
| MARKET_TO_BOOK | 2.046 | 1.486 | 1.567 | 1.101 | 2.289 | 23,790 |
| SALES_GROWTH | 0.239 | 0.068 | 3.380 | −0.032 | 0.191 | 23,648 |
| ROA | 0.001 | 0.069 | 0.245 | −0.013 | 0.122 | 26,496 |
| CASH_HOLDINGS | 191.320 | 9.581 | 1,199.000 | 1.417 | 52.382 | 26,582 |
| FIRM_AGE (years) | 20.303 | 17.000 | 13.311 | 9.000 | 30.000 | 26,643 |
| RE_VALUE (state resid. prices) | 0.864 | 0.364 | 1.329 | 0.000 | 1.105 | 26,643 |
| RE_VALUE (MSA resid. prices) | 0.787 | 0.318 | 1.145 | 0.000 | 1.060 | 23,198 |
| RE_VALUE (city comm. prices) | 0.776 | 0.314 | 1.129 | 0.000 | 1.047 | 23,184 |
| State resid. price index | 0.735 | 0.677 | 0.218 | 0.564 | 0.922 | 26,643 |
| MSA resid. price index | 0.767 | 0.708 | 0.240 | 0.560 | 0.954 | 23,209 |
| City comm. price index | 0.708 | 0.670 | 0.244 | 0.524 | 0.871 | 23,196 |
| SUPPLY_ELASTICITY | 1.284 | 1.100 | 0.708 | 0.650 | 1.940 | 20,277 |

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## A. Accounting Data

### 1. Corporate Real Estate Assets

We follow the methodology used by Chaney et al. (2012) to calculate the market value of corporate real estate assets. The accumulated depreciation on buildings (Compustat mnemonic: DPACB) is not reported in Compustat after 1993, which is why we restricted our sample to firms active in 1993 when measuring the market value of real estate assets.

To measure the market value of a firm's real estate collateral, we define a firm's real estate assets as the sum of the three major categories of property, plant, and equipment (PPE): PPE land and improvement at cost (Compustat mnemonic: FATP), PPE buildings at cost or historical cost of buildings (mnemonic: FATB), and PPE construction-in-progress at cost (mnemonic: FATC). As these assets are valued at historical cost rather than marked-to-market, we determine their Compustat market value by calculating their average age and estimating their current market value using market prices.

More specifically, we take the following steps to determine the market value of a firm's real estate assets: First, we calculate the ratio of the accumulated depreciation of buildings (Compustat mnemonic: DPACB) to the historical cost of buildings and multiply it by the assumed mean depreciable life of 40 years (see Nelson, Potter, and Wilde (2000)). This calculation approximates the age or the acquisition year of a firm's real estate assets. Second, to adjust real estate prices, we retrieve the state-level real estate price index from the U.S. Federal Housing Finance Agency (FHFA) for the period starting in 1975, which was when the index became available. We use the consumer price index (CPI) for the period prior to 1975. We use the table that maps ZIP codes to metropolitan statistical area (MSA) codes provided by the U.S. Department of Labor's Office of Workers' Compensation Programs (OWCP) as well as the ZIP codes for each firm from Compustat. Thereafter, we use the ZIP code as an identifier to match the MSA code and the MSA-level real estate price index with accounting data for each firm from Compustat. As a result, we obtain the yearly adjusted real estate price index. Finally, we estimate the market value of each firm's real estate assets for each year in the sample period (1993–2013) by multiplying the book value of the assets at acquisition (mnemonics: FATP + FATB + FATC) with the real estate price index for the given year.

### 2. Dividends and Share Repurchases

We use the ratio of dividends (Compustat mnemonic: DVC) to the previous year's property, plant, and equipment (PPE, lagged) (mnemonic: PPENT) as our main measure of dividends. Similarly, we calculate the ratio of share repurchases (mnemonic: PRSTKC) to the previous year's property, plant, and equipment (PPE) and use it as the main measure of repurchases. By normalizing both dividends and share repurchases by PPE, we make it easier to interpret the regression coefficients, as our independent variable (the market value of CRE assets) is also normalized by PPE.[6] In the corporate finance literature, the dividend

[6]This normalization by PPE is standard in the literature (see, e.g., Kaplan and Zingales (1997), Almeida, Campello, and Weisbach (2004)). An alternative specification is to normalize all variables

payout ratio (i.e., dividends/net income) and the dividend yield (i.e., dividend per share/stock price) are the most commonly used measures of dividend payments. We do not use these measures, because changes in the market value of CRE assets may also affect share prices and net income, thereby making it difficult to identify the channel in which we are interested. Finally, we use the ratio of share repurchases to total payout (i.e., cash dividend + share repurchases) as the measure of payout flexibility.

### 3. Other Accounting Data

We employ a set of variables commonly used in the corporate finance literature as part of our analysis. Retained earnings to total assets are computed as the ratio of retained earnings (Compustat mnemonic: RE) to the book value of assets (mnemonic: AT). Leverage is defined as the sum of short-term (mnemonic: DLC) and long-term (mnemonic: DLTT) debt divided by the book value of assets. The asset growth ratio is computed as the difference between the current and lagged book values of assets divided by the lagged book value of assets. Firm size is defined as the book value of total assets (mnemonic: AT). In line with Leary and Michaely (2011), we compute the market-to-book ratio as the market value of equity (product of mnemonics PRCC and CSHO) plus the book value of assets minus the book value of equity, all divided by the book value of assets. The book value of equity is computed as the book value of assets minus the book value of liabilities (mnemonic: LT) minus preferred stock plus deferred taxes (mnemonic: TXDITC). The sales growth ratio is defined as the difference in the current and lagged values of sales divided by the lagged value of sales (mnemonic: SALE). Return on assets (ROA) is computed as operating income before depreciation minus depreciation and amortization normalized by total assets (mnemonic OIBDP minus mnemonic DP, all divided by mnemonic AT). Cash holdings are defined as cash and short-term securities that can readily be converted to cash (mnemonic: CHE). Firm age is computed as the number of years since the firm first appeared in the Compustat database. As a measure of long-term interest rates, we use the "contract rate on 30-year, fixed rate conventional home mortgage commitments" from the Federal Reserve Web site (https://www.federalreserve.gov/releases/h15/data.htm).

We follow Chaney et al. (2012) in using firms' initial characteristics to control for potential heterogeneity among our sample firms. These controls, measured in 1993, are firm size (book value of total assets (Compustat mnemonic: AT)), ROA (i.e., operating income before depreciation (mnemonic: OIBDP) minus depreciation (mnemonic: DP) divided by assets (mnemonic: AT)), age measured as the number of years since the firm's initial public offering (IPO), 2-digit Standard Industrial Classification (SIC) codes, and the state in which the firm's headquarters are located.

Finally, to ensure that our results are robust to the definition of the main payout and real estate variables, we winsorize all variables defined as ratios by

by lagged asset value (Compustat mnemonic: AT), as in Rauh (2006). However, this delivers notably lower ratios.

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using the median ±5 times the interquartile range as thresholds. Table 1 reports summary statistics for the accounting variables used in the empirical analysis.

### B. Real Estate Data

#### 1. Real Estate Prices

We use both commercial and residential real estate prices in our empirical analysis. We obtain residential real estate indices at the state and MSA levels from the FHFA. The FHFA provides a house price index (HPI) that measures the dynamics of single-family home prices in the United States. State-level HPIs became available in 1975, and they were made available for most MSAs between 1977 and 1987. We match the state-level HPI to our accounting data using the state identifier from Compustat. To match the MSA-level HPI to our accounting data, we assign MSA codes to all Compustat items using an MSA ZIP-code-lookup file. Then, we use the MSA code of each firm to merge the MSA-level HPI information with Compustat's firm-level data.

Moreover, we use the Moody's/RCA commercial property price indices (CPPI), which are provided by Real Capital Analytics (RCA). City-level CPPI are available from 2001 until 2013. These weighted, repeat-sales indices are computed using contemporaneous transaction-price-based data on private deals. Monthly CPPI data are available for the aggregate U.S. housing market and for different property types, while quarterly data are available for the main MSAs in the United States. As CPPI are not available from the first year of our sample period, we use the state-level residential price index from 1993 until 2000 to calculate the market value of real estate assets. From 2001 onward, we use city-level CPPI to estimate the market value of CRE assets.

#### 2. Measures of Land Supply

To address the potential endogeneity problem of local real estate prices, we follow Himmelberg et al. (2005) and Mian and Sufi (2011) in instrumenting local real estate prices using the interaction of long-term interest rates and local housing supply elasticity. We use the local housing-supply elasticities provided in Saiz (2010) and Glaeser, Gyourko, and Saiz (2008). These measures capture the amount of developable land in each MSA and are estimated by processing satellite-generated data on elevation and the presence of water bodies.

## IV. Empirical Strategy

The variation in real estate prices provides an excellent natural setting to study the effects of financial flexibility on payout policy. As previously discussed, variation in real estate prices represent exogenous shocks to firms' debt capacity and, therefore, exogenous shocks to their financial flexibility. In this section, we describe our main specification and discuss how to address potential endogeneity issues. Our empirical strategy adapts the analysis in Chaney et al. (2012) for the study of corporate investments to an analysis of payout policies. Consequently, we run the following specification for the payout of firm $i$ with headquarters located

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in area $l$ at year $t$:

$$\begin{aligned} (1) \qquad \text{PAYOUT}^{l}_{it} &= \alpha_i + \delta_t + \beta \times \text{RE_VALUE}^{l}_{it} \\ &\quad + \gamma \times P^{l}_{t} + \text{CONTROLS}_{it} + \epsilon_{it}, \end{aligned}$$

where $\text{PAYOUT}^{l}_{it}$ represents two dependent variables: the ratio of the dividend to lagged PPE and the ratio of share repurchases to lagged PPE; $\text{RE_VALUE}^{l}_{it}$ denotes the ratio of the market value of the corporate real estate assets that firm $i$ owns in location $l$ in year $t$ to the lagged PPE; and $P^{l}_{t}$ controls for the level of prices in location $l$ (state, MSA, or city) in year $t$. Additionally, $\text{CONTROLS}_{it}$ denotes a set of firm-level controls. In line with the extant literature on payout policy, we control for: i) earned/contributed capital mix (ratio of retained earnings to total assets); ii) LEVERAGE; iii) asset growth rate (AGR); iv) FIRM_SIZE; v) market-to-book ratio; vi) sales growth ratio; vii) ROA; viii) cash holdings; and ix) FIRM_AGE. We also control for firm fixed effects, $\alpha_i$, and year fixed effects, $\delta_t$. Errors, $\epsilon_{it}$, are clustered at the state, MSA, and city levels depending on the regression.

In the specification in equation (1), there are two possible sources of endogeneity. First, real estate prices could be correlated with the firm's payout policy. Second, a decision to hold real estate may not be random and could be related to the firm's payout policy. We adapt the empirical strategy found in Himmelberg et al. (2005) and Mian and Sufi (2011) to address the first endogeneity problem. More specifically, we instrument local real estate prices as the interaction between the elasticity of supply on the local real estate market and long-term interest rates to capture changes in real estate demand. We estimate the following first-stage regression to predict real estate prices, $P^{l}_{t}$, for location $l$ at time $t$:

$$(2) \qquad P^{l}_{t} = \alpha^{l} + \delta_t + \gamma \times \text{ELASTICITY}^{l} \times \text{IR} + u^{l}_{t},$$

where $\text{ELASTICITY}^{l}$ measures constraints on land supply at the MSA or city level; IR is the nationwide real interest rate at which banks refinance home loans; $\alpha^{l}$ is a location (MSA or city) fixed effect; and $\delta_t$ captures macroeconomic fluctuations in real estate prices, from which we want to abstract.[7]

One may argue that the orthogonality condition of supply of elasticity is unlikely to be satisfied because land availability and land-use regulations are likely to be correlated with local demand for real estate assets and, therefore, the instrument does not isolate the supply effects of real estate assets (see Davidoff (2016)). To address this concern, we control for the interaction of the supply constraint and year dummies in both first- and second-stage regressions of our IV specification, as discussed in Davidoff. Given that the interaction term *supply constraint* × *real interest rate* is highly correlated with *supply constraint* × *year*, we control for the interaction term (*supply constraint* × *year*) in the IV specification to ensure that our results are not purely due to the passage of time during the boom period during which firms would increase payout.

To address the second endogeneity problem, we control for interaction between the initial characteristics of firms and real estate prices. If these controls

[7]Results for the first-stage regression are provided in the Supplementary Material.

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identify characteristics that make firm $i$ more likely to own real estate and if those characteristics also make firm $i$ more sensitive to fluctuations in real estate prices, then controlling for the interaction between these controls and contemporaneous real estate prices allows us to separately identify the channels in which we are interested. Control variables that might play an important role in the ownership decision are age, assets, ROA, and 2-digit industry and state dummies. We perform two analyses in this regard. First, we run cross-sectional ordinary least squares (OLS) regressions of a dummy equal to 1 when the firm owns real estate, REOwner, and 0 otherwise, on the initial characteristics mentioned previously. Second, we run the same regression using the market value of the firm's real estate assets as the dependent variable.[8] Both analyses show that larger, more profitable, and older firms are more likely to own real estate. Our concerns about the second endogeneity problem are mitigated by controlling for these characteristics in interaction with the real estate prices in our main specifications.

Throughout our empirical analyses, we estimate the following IV specification while controlling for the observed determinants of real estate ownership to ensure that any interaction between CRE value changes and the firm's payout policy comes only from shocks to the values of the firm's collateral:

$$\begin{aligned} (3) \qquad \text{PAYOUT}_{it}^{l} &= \alpha_i + \delta_t + \beta \times \text{RE_VALUE}_{it}^{l} + \gamma \times P_t^{l} \\ &\quad + \sum_k \kappa_k X_k^i \times P_t^{l} + \text{CONTROLS}_{it} + \epsilon_{it}, \end{aligned}$$

where $X_k^i$ denotes the controls that might play an important role in the decision to own real estate assets. Real estate prices, $P_t^l$, are obtained from the first-stage regression.[9]

Finally, to test the effect of a change in the value of CRE assets on payout flexibility, we replace the dependent variable in equation (3) with payout flexibility, which is defined as the ratio of share repurchases to total payout.

## V. Main Results

In this section, we use the firm-level data described in Section III and the empirical strategy developed in Section IV to test the five hypotheses developed in Section II. The following subsections present our results.

### A. Effect of Financial Flexibility on Dividends

First, we test whether cash dividends increase in line with financial flexibility (i.e., with the market value of firms' collateralizable assets (Hypothesis 1)) by estimating different specifications of baseline equation (3). Table 2 reports the results of this test. Specifications 1–3 use state-level residential price indices to compute the value of collateralizable real estate assets, specifications 4–6 use MSA-level residential price indices, and specifications 7–9 use city-level commercial price

[8] In the Supplementary Material, we provide the results of both analyses.

[9] Our results are robust to the use of land-supply elasticity interacted with the lagged nationwide real interest rate as an alternative IV.

TABLE 2
Financial Flexibility and Dividends

Table 2 reports the results of the ordinary least squares (OLS) and instrumental variables (IV) estimates of the specifications in equations (1)–(3). The dependent variable is cash dividends over lagged property, plant, and equipment (PPE). RE_VALUE is the ratio of the market value of real estate normalized by previous-year PPE. Residential real estate prices at the metropolitan statistical area (MSA) and state levels are obtained from the Federal Housing Finance Agency (FHFA). City-level commercial real estate prices are provided by Real Capital Analytics. SUPPLY_ELASTICITY is the local housing supply elasticity in Saiz (2010). Columns 1–4 and 7 report the results of the ordinary least squares (OLS) specification. Columns 5–6 and 8–9 report the results of instrumental variables (IV) estimation. The instrument in the first stage is land supply elasticity interacted with the nationwide real interest rate. IV specifications in columns 6 and 9 also control for the interaction of housing supply elasticity and year. Columns 2–9 control for initial firm-level characteristics interacted with real estate prices. All the regressions except for those in columns 1 and 2 control for the ratio of retained earnings to total assets, leverage, asset growth ratio, firm size, market-to-book ratio, firm age, sales growth ratio, return on assets (ROA), and cash holdings. All the specifications include firm and year fixed effects (FE). *t*-statistics are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

| | OLS | | | | IV | | OLS | IV | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| RE_VALUE (state resid. prices) | 0.0030*** (11.21) | 0.0032*** (11.60) | 0.0033*** (10.40) | | | | | | |
| RE_VALUE (MSA resid. prices) | | | | 0.0034*** (8.51) | 0.0044*** (9.57) | 0.0044*** (9.57) | | | |
| RE_VALUE (city comm. prices) | | | | | | | 0.0035*** (8.49) | 0.0040*** (9.06) | 0.0040*** (9.03) |
| State resid. prices | 0.0043* (1.65) | 0.3325*** (8.37) | 0.3453*** (7.60) | | | | | | |
| MSA resid. prices | | | | 0.0091 (0.10) | 0.0206 (0.29) | −0.0167 (−0.22) | | | |
| City comm. prices | | | | | | | −0.0100 (−0.11) | −0.0087 (−0.12) | −0.0340 (−0.45) |
| SUPPLY_ELASTICITY × year | | | | | | −0.0003 (−1.36) | | | −0.0003** (−2.78) |
| Firm-level controls | No | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Initial controls × state resid. prices | No | Yes | Yes | No | No | No | No | No | No |
| Initial controls × MSA resid. prices | No | No | No | Yes | Yes | Yes | No | No | No |
| Initial controls × city comm. prices | No | No | No | No | No | No | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| No. of obs. | 26,481 | 25,898 | 20,795 | 18,323 | 15,973 | 15,973 | 18,326 | 15,976 | 15,976 |
| $R^2$ | 0.739 | 0.751 | 0.780 | 0.784 | 0.781 | 0.781 | 0.783 | 0.780 | 0.781 |

indices. In support of Hypothesis 1, we find positive and significant RE_VALUE coefficients in all specifications.[10]

Column 1 of Table 2 displays the results of the simplest specification of equation (3) without any additional controls. The RE_VALUE coefficient in column 1 is 0.0030, which is significant at the 1% confidence level. This indicates that a $1 increase in real estate value increases cash dividends by 0.30 cents. Column 2 includes initial controls interacted with real estate prices, which accounts for observed heterogeneity in ownership decisions. In column 3, we add the set of firm-level controls typically used in the payout literature (see Section III.A.3). Column 4 is the same as column 3 except that we calculate real estate value using MSA-level residential indices. Columns 5, 6, 8, and 9 implement the IV strategy, in which real estate prices are instrumented using the interaction between interest rates and local constraints on land supply. In columns 6 and 9, we also control for the interaction *supply constraint* × *year dummies* to address the possibility that

[10]The RE_VALUE coefficient captures the average response of the firm's payout to increases and decreases in the value of CRE assets. Note that these coefficients are relative to the firm's mean value during the sample period.

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our instrumental variable might be correlated with local demand for real estate assets and, as such, may not isolate the supply effects of these assets. By controlling for the interaction *supply constraint* × *year*, we ensure that our findings are not the result of the passage of time.

We also present the results obtained when estimating the market value of corporate real estate assets using city-level commercial price indices instead of residential price indices. Columns 7–9 of Table 2 use the same specifications as those used in columns 4–6, respectively, except that in the former we estimate the market value of CRE assets using the Moody's/RCA CPPI instead of residential real estate indices. The RE_VALUE coefficients are positive and significant at the 1% confidence level.[11]

Overall, these results indicate that an increase in financial flexibility as a result of increasing real estate prices leads to an increase in cash dividends. This effect is quantitatively important because real estate represents a sizable fraction of the tangible assets that firms hold on their balance sheets.

## B. Effect of Financial Flexibility on Share Repurchases

Second, we test whether share repurchases increase with financial flexibility (i.e., with the market value of collateralizable assets (Hypothesis 2)). Table 3 presents the results of this test. The regression specifications are the same as in Table 2 except that the dependent variable is share repurchases over lagged PPE. We use the same control variables, which allows us to compare the magnitude of the estimates in both sets of tests. In support of Hypothesis 2, we find that an increase in financial flexibility, induced by an increase in the value of collateralizable real estate assets, results in an increase in share repurchases. Columns 1–3 use the state residential index; columns 4–6 use the MSA residential index; and columns 7–9 use the city-level commercial price index to calculate the market value of real estate assets.

All specifications with firm-level controls result in positive and significant coefficients for the variable RE_VALUE at the 1% confidence level. These results indicate that an increase in financial flexibility as a result of increasing real estate prices leads to an increase in share repurchases. In the robustness section, we show that our results are not driven by the large firms. Small firms might have very few or no CRE assets in their balance sheets, which might raise sample-selection issues. To address this potential concern, we present an additional test in which we separate CRE owners from nonowners. We run our main specification by interacting RE_VALUE with a dummy variable for real estate ownership. We find that the coefficient of the interaction RE_VALUE × CRE ownership is positive and significant for both dividends and share repurchases (see the Supplementary Material).

[11] In a robustness test reported in the Supplementary Material, we show the effect of real estate prices on dividends and share repurchases for firms that are real estate owners by interacting RE_VALUE with a dummy variable for real estate ownership.

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TABLE 3
Financial Flexibility and Share Repurchases

Table 3 reports the results of the ordinary least squares (OLS) and instrumental variables (IV) estimates of the specifications in equations (1)–(3). The dependent variable is share repurchases over lagged property, plant, and equipment (PPE). RE_VALUE is the ratio of the market value of real estate normalized by previous-year PPE. Residential real estate prices at the metropolitan statistical area (MSA) and state levels are obtained from the Federal Housing Finance Agency (FHFA). City-level commercial real estate prices are provided by Real Capital Analytics. SUPPLY_ELASTICITY is the local housing supply elasticity in Saiz (2010). Columns 1–4 and 7 report the results of the ordinary least squares (OLS) specification. Columns 5–6 and 8–9 report the results of instrumental variables (IV) estimation. The instrument in the first stage is land supply elasticity interacted with the nationwide real interest rate. IV specifications in columns 6 and 9 also control for the interaction of housing supply elasticity and year. Columns 2–9 control for initial firm-level characteristics interacted with real estate prices. All the regressions except for those in columns 1 and 2 control for ratio of retained earnings to total assets, leverage, asset growth ratio, firm size, market-to-book ratio, firm age, sales growth ratio, return on assets (ROA), and cash holdings. All the specifications include firm and year fixed effects (FE). *t*-statistics are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

| | OLS | | | | IV | | OLS | IV | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| RE_VALUE (state resid. prices) | 0.0009** (1.99) | 0.0008* (1.72) | 0.0029*** (5.23) | | | | | | |
| RE_VALUE (MSA resid. prices) | | | | 0.0033*** (4.51) | 0.0041*** (4.97) | 0.0041*** (4.97) | | | |
| RE_VALUE (city comm. prices) | | | | | | | 0.0034*** (4.60) | 0.0038*** (4.83) | 0.0038*** (4.83) |
| State resid. prices | −0.0080* (−1.88) | 0.0354 (0.53) | 0.1194 (1.42) | | | | | | |
| MSA resid. prices | | | | −0.0841 (−0.50) | −0.0063 (−0.05) | −0.0759 (−0.53) | | | |
| City comm. prices | | | | | | | −0.0932 (−0.55) | 0.0048 (0.03) | −0.0043 (−0.03) |
| SUPPLY_ELASTICITY × year | | | | | | −0.0005 (−1.45) | | | −0.0001 (−0.58) |
| Firm-level controls | No | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Initial controls × State resid. prices | No | Yes | Yes | No | No | No | No | No | No |
| Initial controls × MSA resid. prices | No | No | No | Yes | Yes | Yes | No | No | No |
| Initial controls × city comm. prices | No | No | No | No | No | No | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| No. of obs. | 24,986 | 24,480 | 19,620 | 17,235 | 15,035 | 15,035 | 17,239 | 15,039 | 15,039 |
| $R^2$ | 0.397 | 0.410 | 0.444 | 0.449 | 0.455 | 0.455 | 0.450 | 0.455 | 0.455 |

## C. Effect of Financial Flexibility on Payout Flexibility and Discretionary Payout

Third, we test whether payout flexibility (i.e., the ratio of share repurchases to total payout) increases in line with the market value of collateralizable assets (Hypothesis 3). Table 4 reports the results of this test. Panel A presents the results for payout flexibility. We obtain a positive and significant coefficient for RE_VALUE using different specifications. As payout flexibility is measured as the ratio of share repurchases to total payout, a positive RE_VALUE coefficient means that the effect of financial flexibility is higher for share repurchases than for dividends.

These results are consistent with the payout policy literature, which demonstrates that markets impose higher penalties on dividend cuts than on equivalent decreases in share repurchases (e.g., Denis et al. (1994), Yoon and Starks (1995)) and that managers are therefore reluctant to decrease dividends (DeAngelo and DeAngelo (1990), Leary and Michaely (2011)). Guay and Harford (2000) show that firms choose dividend increases to distribute relatively permanent cash-flow shocks, while they rely on repurchases to distribute more transient shocks.

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TABLE 4

Financial Flexibility, Payout Flexibility, and Discretionary Payout

Table 4 tests the effect of financial flexibility on payout flexibility (Panel A) and discretionary and nondiscretionary payout (Panel B). Payout flexibility is defined as the ratio of share repurchases to total payout. Discretionary payout is the sum of regular dividend increase, special dividends, and share repurchases. Nondiscretionary payout is defined as the minimum of a firm's regular dividend and its prior-year regular dividend. RE_VALUE is the ratio of the market value of real estate normalized by previous-year property, plant, and equipment (PPE). BUST_DUMMY is equal to 1 if the real estate return falls from its historical average by at least 1 standard deviation, and 0 otherwise. Metropolitan statistical area (MSA) residential real estate prices are obtained from the Federal Housing Finance Agency (FHFA). Columns 1, 3, and 5 in Panel A and columns 1 and 3 in Panel B report the results of the ordinary least squares (OLS) specification. Columns 2, 4, and 6 in Panel A and columns 2 and 4 in Panel B report the results of instrumental variables (IV) estimation using land supply elasticity interacted with the nationwide interest rate as the instrumental variable. All the regressions control for initial firm-level characteristics interacted with real estate prices and for the ratio of retained earnings to total assets, leverage, asset growth ratio, firm size, market-to-book ratio, firm age, sales growth ratio, return on assets (ROA), and cash holdings. All the specifications include firm and year fixed effects. *t*-statistics are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

*Panel A. Payout Flexibility*

| | OLS | IV | OLS | IV | OLS | IV |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| RE_VALUE (MSA resid. prices) | 0.0315*** | 0.0358*** | 0.0299*** | 0.0343*** | 0.0286*** | 0.0331*** |
| | (4.26) | (4.29) | (4.03) | (4.10) | (3.84) | (3.94) |
| BUST_DUMMY | | | −0.0322** | −0.0326** | −0.0943*** | −0.0820*** |
| | | | (−2.16) | (−1.97) | (−3.30) | (−2.61) |
| BUST_DUMMY × RE_VALUE | | | | | 0.0371** | 0.0305* |
| | | | | | (2.55) | (1.85) |
| MSA resid. prices | 0.1413 | −0.1173 | 0.2233 | −0.0563 | 0.1789 | −0.0656 |
| | (0.09) | (−0.09) | (0.14) | (−0.04) | (0.11) | (−1.05) |
| No. of obs. | 9,599 | 8,284 | 9,599 | 8,284 | 9,599 | 8,284 |
| $R^2$ | 0.656 | 0.657 | 0.656 | 0.658 | 0.656 | 0.658 |

*Panel B. Discretionary and Nondiscretionary Payouts*

| | Discretionary Payout | | Nondiscretionary Payout | |
|---|---|---|---|---|
| | OLS | IV | OLS | IV |
| | 1 | 2 | 3 | 4 |
| RE_VALUE (MSA resid. prices) | 0.0039*** | 0.0049*** | 0.0017*** | 0.0023*** |
| | (4.45) | (4.98) | (5.65) | (6.97) |
| MSA resid. prices | −0.2463 | −0.3592 | −0.0063 | 0.0023 |
| | (−0.30) | (−0.32) | (−0.02) | (0.01) |
| No. of obs. | 18,341 | 15,990 | 18,341 | 15,990 |
| $R^2$ | 0.391 | 0.396 | 0.825 | 0.822 |

Because many shocks to real estate prices are not permanent, managers have an incentive to allocate more of the increases in debt capacity to share repurchases than to dividends.

We also show that changes in financial flexibility have asymmetrical effects on payout flexibility. In other words, while firms increase both dividends and share repurchases when financial flexibility improves, they do not cut dividends to a similar extent (to avoid the penalty of a dividend cut) when financial flexibility worsens. We test this conjecture by including a dummy, BUST_DUMMY, for a decrease in real estate prices in the base specifications of this panel. The dummy is equal to 1 if the real estate return falls from its historical average by at least 1 standard deviation, and 0 otherwise. Columns 3–6 of Table 4 present the results for both the OLS and IV specifications when including BUST_DUMMY. We find that periods of sharply decreasing real estate prices negatively affect payout flexibility when compared to other periods. The positive coefficient obtained for the interaction of the BUST_DUMMY with real estate value indicates that a decrease

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in the value of collateralizable assets (i.e., a decrease in financial flexibility) results in less payout flexibility.

Moreover, Farre-Mensa et al. (2018) show that many firms increase their debt level in order to directly finance their dividend payments. They split payout into two parts (discretionary and nondiscretionary) and show that firms increase their debt level to finance discretionary payouts. The discretionary payout is the sum of i) extra dividends (above the regular dividend), ii) special dividends, and iii) share repurchases. A nondiscretionary payout is defined as the minimum of i) the firm's regular dividend and ii) its prior-year regular dividend. Given these results, we test the effect of changes in firms' financial flexibility on their discretionary and nondiscretionary payouts. By definition, discretionary payouts are flexible because they are not expected to be maintained. As shocks to real estate prices tend to be temporary in nature, we expect the effect of financial flexibility on discretionary payouts to be higher than their effect on nondiscretionary payouts. Panel B of Table 4 reports the test of this conjecture.

We show that the effect of financial flexibility on discretionary payouts has a magnitude more than twice that of the effect on nondiscretionary payouts. Specifically, a 1-standard-deviation increase in the value of the firm's pledgeable collateral translates to a 0.26-percentage-point increase in nondiscretionary payout (i.e., 7.0% of a standard deviation increase) and a 0.55-percentage-point increase in discretionary payout (i.e., 9.5% of a standard deviation increase).[12]

## D. Leverage Effect during Periods of Decreasing Real Estate Prices

Fourth, we study how the impact of financial flexibility on payout is affected by a firm's leverage. More specifically, we test whether highly leveraged firms are more likely to decrease their payouts in response to decreasing financial flexibility during the periods of decreasing real estate prices (Hypothesis 4). High-leverage firms do not have much flexibility to increase their level of debt in order to finance dividend payments. Moreover, the collateral channel is weak during periods of decreasing real estate prices, which may lead highly leveraged firms to cut their dividends. On the other hand, low-leverage firms are still capable of raising funding from capital markets even when collateral channel cannot be used. Hence, such firms are unlikely to decrease their dividends when real estate prices fall.

During our sample period, the U.S. economy experienced a strong decrease in real estate prices from 2008 to 2011. This allows us to provide empirical evidence of the leverage effect using the recent period of bust in real estate prices. Table 5 reports the effect of a decrease in financial flexibility (i.e., a reduction in the pledgeable collateral) and firms' leverage on payout during this period. In Panel A, the dependent variable is cash dividends over lagged PPE. Columns 1 and 2 report that RE_VALUE coefficients become statistically insignificant during this period of decreasing real estate prices. These results are aligned with the

[12] The RE_VALUE coefficient for nondiscretionary payout is 0.0023 (i.e., the IV specification in column 4 of Panel B in Table 4) and for discretionary payout is 0.0049 (i.e., column 2). The standard deviation of the RE_VALUE/PPE ratio is 1.129. Therefore, a 1-standard-deviation increase in the value of the firm's pledgeable collateral has an effect of a 0.26 increase ($0.0026 = 0.0023 \times 1.129$) percentage points and 0.55 percentage points ($0.0055 = 0.0049 \times 1.129$) in nondiscretionary and discretionary payouts, respectively.

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fact that firms are reluctant to cut their dividends and the potentially low use of the collateral channel during periods of decreasing real estate prices. However, high-leverage firms show a negative effect (i.e, positive sign for decreasing real estate prices in columns 3 and 4 while low-leverage firms show a positive effect (i.e., negative sign for decreasing real estate prices in columns 5 and 6) during the period of 2008–2011.

Panel B of Table 5 presents the equivalent results for share repurchases. The RE_VALUE coefficients for the different specifications are not significant. Columns 3–6 present the results for share repurchases for high- and low-leverage firms during the bust period in real estate prices (2008–2011). These two classes of firms are defined in the same manner as in Panel A. The dependent variable is share repurchases over lagged PPE. Columns 3 and 4 present the results of our main specification for highly leverage firms, while columns 5 and 6 present the results for low-leverage firms. We find that the RE_VALUE coefficients are positive for highly leveraged firms. This suggests that these firms cut share repurchases when real estate prices fall. On the other hand, the RE_VALUE coefficients in columns 5 and 6 are negative, which suggests the opposite effect for low-leverage firms during the same years. Unlike the estimates for dividends in Panel A, the estimates for share repurchases are not significant.

TABLE 5

Dividends and Share Repurchases:
Effect of Firm Leverage in the 2008–2011 Real Estate Bust

Table 5 reports the effect of financial flexibility on dividends and share repurchases during the recent real estate bust (2008–2011) period. It also reports the effect of financial flexibility on dividends and share repurchases for very high- and very low-leverage firms during this period. Leverage is defined as the sum of short- and long-term debt normalized by the book value of assets. High- (low-) leverage firms are defined as those in the top (bottom) 3 deciles of leverage. The dependent variable in Panel A is cash dividend over lagged property, plant, and equipment (PPE) and in Panel B is share repurchase over lagged PPE. The regressions used are the same as those presented in columns 4–5 of Table 2 (for Panel A) and Table 3 (for Panel B). Columns 1, 3, and 5 report the results of the ordinary least squares (OLS) specification. Columns 2, 4, and 6 report the results of instrumental variables (IV) estimation. RE_VALUE is the ratio of the market value of real estate normalized by previous-year PPE. Metropolitan statistical area (MSA) residential real estate prices are obtained from the Federal Housing Finance Agency (FHFA). All the regressions control for initial firm-level characteristics interacted with real estate prices and for ratio of retained earnings to total assets, leverage, asset growth ratio, firm size, market-to-book ratio, firm age, sales growth ratio, return on assets (ROA), and cash holdings. All the specifications include firm and year fixed effects. *t*-statistics are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

| | Full Sample | | High-Leverage Firms | | Low-Leverage Firms | |
|---|---|---|---|---|---|---|
| | OLS | IV | OLS | IV | OLS | IV |
| | 1 | 2 | 3 | 4 | 5 | 6 |
| *Panel A. Dividends* | | | | | | |
| RE_VALUE | −0.0002 | −0.0016 | 0.0065* | 0.0054 | −0.0193*** | −0.0270*** |
| (MSA resid. prices) | (−0.09) | (−0.59) | (1.76) | (1.19) | (−2.59) | (−3.14) |
| MSA resid. prices | 0.3879 | −0.0113 | 0.4253 | −0.1801 | −6.8753 | 3.6221 |
| | (0.60) | (−0.05) | (0.41) | (−0.54) | (−1.41) | (0.18) |
| No. of obs. | 2,196 | 1,922 | 611 | 532 | 661 | 583 |
| $R^2$ | 0.898 | 0.893 | 0.961 | 0.955 | 0.881 | 0.882 |
| *Panel B. Share Repurchases* | | | | | | |
| RE_VALUE | 0.0069 | 0.0056 | 0.0069 | 0.0083 | −0.1060 | −0.0097 |
| (MSA resid. prices) | (1.58) | (1.18) | (0.90) | (0.93) | (−0.85) | (−0.68) |
| MSA resid. prices | 1.4966 | −0.7364* | −0.5357 | −0.5313 | 3.5702 | 5.9283 |
| | (1.31) | (−1.72) | (−0.22) | (−0.80) | (0.44) | (0.19) |
| No. of obs. | 2,100 | 1,842 | 587 | 508 | 624 | 550 |
| $R^2$ | 0.691 | 0.685 | 0.841 | 0.835 | 0.708 | 0.770 |

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Given this evidence of the leverage effect of decreasing financial flexibility on payout using the recent period of real estate bust, we provide a formal test of Hypothesis 4 in Table 6. To test this hypothesis, we define a dummy variable, BUST_DUMMY, which is equal to 1 if the real estate return falls from its

TABLE 6

Dividends and Share Repurchases: Real Estate Busts and Firm Leverage

Table 6 tests the differential effect of financial flexibility on dividends and share repurchases for high-leverage firms during the periods of high decrease in real estate prices. BUST_DUMMY is equal to 1 if the real estate return falls from its historical average by at least 1 standard deviation, and 0 otherwise. Leverage is defined as the sum of short- and long-term debt normalized by sum of the market value of equity and the book value of debt. HIGH_LEVERAGE_DUMMY is defined as firms with above-median leverage. The dependent variable in Panel A is cash dividend over lagged property, plant, and equipment (PPE) and in Panel B is share repurchase over lagged PPE. The regressions used are the same as those presented in columns 4–5 of Table 2 (for Panel A) and Table 3 (for Panel B). Columns 1 and 3 report the results of the ordinary least squares (OLS) specification. Columns 2 and 4 report the results of instrumental variables (IV) estimation. RE_VALUE is the ratio of the market value of real estate normalized by previous-year PPE. Metropolitan statistical area (MSA) residential real estate prices are obtained from the Federal Housing Finance Agency (FHFA). All the regressions include firm and year fixed effects and control for firm characteristics: the ratio of retained earnings to total assets, leverage, asset growth ratio, firm size, market-to-book ratio, firm age, sales growth ratio, return on assets (ROA), cash holdings, and the interaction between the initial controls and MSA residential real estate prices. *t*-statistics are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

| | OLS | IV | OLS | IV |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| *Panel A. Dividends* | | | | |
| RE_VALUE (MSA resid. prices) | 0.0030*** | 0.0039*** | 0.0042*** | 0.0052*** |
| | (7.27) | (8.43) | (9.09) | (10.02) |
| BUST_DUMMY | −0.0073*** | −0.0085*** | −0.0029 | −0.0041 |
| | (−2.78) | (−2.87) | (−1.05) | (−1.33) |
| HIGH_LEVERAGE_DUMMY | −0.0016** | −0.0021*** | 0.0014* | 0.0011 |
| | (−2.41) | (−2.90) | (1.73) | (1.34) |
| BUST_DUMMY × HIGH_LEVERAGE_DUMMY | | | −0.0087*** | −0.0089*** |
| | | | (−6.11) | (−5.83) |
| HIGH_LEVERAGE_DUMMY × RE_VALUE | | | −0.0025*** | −0.0026*** |
| | | | (−5.75) | (−5.51) |
| BUST_DUMMY × RE_VALUE | | | −0.0016*** | −0.0006 |
| | | | (−2.63) | (−0.94) |
| BUST_DUMMY × HIGH_LEVERAGE_DUMMY × RE_VALUE | | | 0.0031*** | 0.0017* |
| | | | (3.36) | (1.69) |
| MSA resid. prices | 0.0089 | 0.0182 | 0.0040 | 0.0104 |
| | (0.10) | (0.26) | (0.05) | (0.15) |
| No. of obs. | 18,323 | 15,973 | 18,323 | 15,973 |
| $R^2$ | 0.785 | 0.782 | 0.786 | 0.783 |
| *Panel B. Share Repurchases* | | | | |
| RE_VALUE (MSA resid. prices) | 0.0021*** | 0.0029*** | 0.0035*** | 0.0047*** |
| | (2.92) | (3.52) | (4.29) | (5.05) |
| BUST_DUMMY | 0.0039 | 0.0030 | 0.0066 | 0.0067 |
| | (0.84) | (0.57) | (1.36) | (1.25) |
| HIGH_LEVERAGE_DUMMY | −0.0028** | −0.0026** | 0.0002 | 0.0012 |
| | (−2.34) | (−2.00) | (−0.14) | (0.76) |
| BUST_DUMMY × HIGH_LEVERAGE_DUMMY | | | −0.0031 | −0.0054** |
| | | | (−1.21) | (−1.98) |
| HIGH_LEVERAGE_DUMMY × RE_VALUE | | | −0.0024*** | −0.0029*** |
| | | | (−3.10) | (−3.52) |
| BUST_DUMMY × RE_VALUE | | | −0.00003 | 0.0002 |
| | | | (−0.03) | (0.15) |
| BUST_DUMMY × HIGH_LEVERAGE_DUMMY × RE_VALUE | | | −0.0021 | −0.0021 |
| | | | (−1.34) | (−1.19) |
| MSA resid. prices | −0.0895 | −0.0118 | −0.0911 | −0.0200 |
| | (−0.51) | (−0.09) | (−0.54) | (−0.15) |
| No. of obs. | 17,235 | 15,035 | 17,235 | 15,035 |
| $R^2$ | 0.455 | 0.461 | 0.456 | 0.462 |

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historical average by at least 1 standard deviation, and 0 otherwise. We also define a HIGH_LEVERAGE_DUMMY, which is equal to 1 if the firm has above-median leverage, and 0 otherwise. We obtain a negative and significant coefficient for BUST_DUMMY for all of the specifications, which indicates that the effect of sharply decreasing CRE prices (i.e., a real estate bust) on payout is the opposite of the effect of nonbust periods. The negative and significant sign for HIGH_LEVERAGE_DUMMY for all of the specifications shows that high-leverage firms tend to pay out less. We add the triple interaction among BUST_DUMMY, HIGH_LEVERAGE_DUMMY, and RE_VALUE. Overall, we find a strong effect of a decrease in financial flexibility on dividends for highly leveraged firms during periods of sharp decrease in the value of collaterizable assets.

### E. Availability of Investment Opportunities and Financial Constraints

Fifth, we examine why firms use the collateral channel to fund not only their investments but also their payouts. More specifically, we empirically test whether the magnitude of the payout increase resulting from an increase in financial flexibility is higher for firms with fewer investment opportunities (Hypothesis 5). We do so by categorizing firms based on the availability of investment opportunities. Firms with the most (least) investment opportunities are defined as firms in the top (bottom) 3 deciles of the Tobin's $Q$ distribution. Table 7 presents the results of this test. Panel A examines the effect of financial flexibility on dividends, and Panel B examines this effect on share repurchases. In both panels, columns 1 and 2 report the specifications for firms with more investment opportunities, while columns 3 and 4 report the specifications for firms with fewer investment opportunities.

We find that the RE_VALUE coefficients in columns 3 and 4 of Panel A in Table 7 are significantly higher than the coefficients in columns 1 and 2. This indicates that firms pay higher dividends when they have fewer investment opportunities. This finding supports the extant literature, which shows that firms prefer investments to payouts. However, when firms do not have enough positive net present value (NPV) projects available in which to invest, they make payouts to shareholders, which might reduce the agency problems associated with holding cash.

Similarly, Panel B of Table 7 presents the results for share repurchases. The coefficients for RE_VALUE in columns 3 and 4 are consistently higher than their counterparts in columns 1 and 2. This suggests that firms with fewer investment opportunities make more share repurchases than firms with more investment opportunities. Interestingly, the coefficients for RE_VALUE in columns 1 and 2 are negative (albeit insignificant). Therefore, in the presence of enough investment projects, firms either do not repurchase shares or decrease the number of shares they repurchase.

These results show that changes in financial flexibility have significant effects on dividends and share repurchases only when firms have fewer investment opportunities. We further study the effects of financial constraints in firms with fewer investment opportunities. In the event of increase in the market value of CRE assets, constrained firms increase their debt level more than unconstrained firms (Cvijanovic (2014)). Hence, we expect a higher effect on payouts for

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TABLE 7

Financial Flexibility, Dividends, and Share Repurchases: Investment Opportunities and Financial Constraints

Table 7 tests the effect of financial flexibility on dividends and share repurchases conditioned on the availability of investment opportunities. Firms in the bottom 3 deciles of Tobin's *Q* are defined to proxy for fewer investment opportunities. Similarly, firms in the top 3 deciles of Tobin's *Q* are defined to proxy for high investment opportunities. The table also presents the relative effect for financially constrained firms. Firms in the top 3 deciles of the SA index are defined as financially constrained firms. The dependent variable in Panel A is cash dividend over lagged property, plant, and equipment (PPE) and in Panel B is share repurchase over lagged PPE. The regressions used are the same as those presented in columns 4–5 of Table 2 (for Panel A) and Table 3 (for Panel B). Columns 1, 3, and 5 report the results of the ordinary least squares (OLS) specification. Columns 2, 4, and 6 report the results of instrumental variables (IV) estimation. RE_VALUE is the ratio of the market value of real estate normalized by previous-year PPE. Metropolitan statistical area (MSA) residential real estate prices are obtained from the Federal Housing Finance Agency (FHFA). All the regressions include firm and year fixed effects and control for firm characteristics: the ratio of retained earnings to total assets, leverage, asset growth ratio, firm size, market-to-book ratio, firm age, sales growth ratio, return on assets (ROA), cash holdings, and the interaction between the initial controls and MSA residential real estate prices. *t*-statistics are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

| | Firms with More Investment Opportunities | | Firms with Fewer Investment Opportunities | | | |
|---|---|---|---|---|---|---|
| | Full Sample | | Full Sample | | Financially Constrained Firms | |
| | OLS | IV | OLS | IV | OLS | IV |
| | 1 | 2 | 3 | 4 | 5 | 6 |
| *Panel A. Dividends* | | | | | | |
| RE_VALUE (MSA resid. prices) | 0.0007 | 0.0011 | 0.0016*** | 0.0021*** | 0.0034** | 0.0060*** |
| | (0.82) | (1.14) | (2.47) | (2.85) | (1.98) | (2.94) |
| MSA resid. prices | −0.0007 | −0.1951 | 0.0461 | 0.2835 | −0.0018 | −0.5040 |
| | (−0.00) | (−0.45) | (0.07) | (0.41) | (−0.00) | (−0.28) |
| No. of obs. | 5,494 | 4,835 | 5,494 | 4,697 | 1,442 | 1,265 |
| $R^2$ | 0.903 | 0.905 | 0.747 | 0.736 | 0.688 | 0.687 |
| *Panel B. Share Repurchases* | | | | | | |
| RE_VALUE (MSA resid. prices) | −0.0005 | −0.0008 | 0.0042*** | 0.0051*** | 0.0071** | 0.0068** |
| | (−0.26) | (−0.40) | (3.71) | (3.94) | (2.67) | (2.29) |
| MSA resid. prices | −0.1953 | −0.1780 | −0.1653 | 0.0060 | −0.0028 | 3.4850 |
| | (−0.44) | (−0.13) | (−0.14) | (0.01) | (−0.00) | (1.29) |
| No. of obs. | 5,027 | 4,450 | 5,273 | 4,494 | 1,360 | 1,207 |
| $R^2$ | 0.626 | 0.635 | 0.488 | 0.49 | 0.608 | 0.607 |

constrained firms. Columns 5 and 6 in Table 7 provide the results of this analysis. As this study focuses on payouts, we utilize Hadlock and Pierce's (2010) SA index as the measure of financial constraint.[13] Financially constrained firms are defined as firms in the top 3 deciles of the SA index. Columns 5 and 6 present the results of our main specification for financially constrained firms. In both Panels A and B, the RE_VALUE coefficient for constrained firms is higher than the coefficient for the entire sample (i.e., columns 3 and 4). This suggests that financially constrained firms make greater use of the collateral channel to increase their payouts when they have few or no investment opportunities.

## VI. Robustness Tests

In this section, we discuss five robustness tests of the main results presented in Section V. First, we address the concern that large firms' dividends and share

[13]The SA index for financial constraints is calculated as $(-0.737 \times \text{SIZE}) + (0.043 \times \text{SIZE}^2) - (0.040 \times \text{FIRM_AGE})$, where SIZE equals the log of inflation-adjusted book assets and FIRM_AGE is the number of years the firm is listed with stock prices on Compustat. In calculating this index, firm size is winsorized (i.e., capped) at (the log of) $4.5 billion and age is winsorized at 37 years.

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repurchases could increase real estate prices in their respective MSAs. Second, we analyze the possibility that firms may not be able to use their increased borrowing capacity immediately after an increase in CRE value. Third, we address whether firms that pay higher dividends choose to locate in areas experiencing high growth in real estate prices. Fourth, we study whether our results are driven by the fact that firms located far from metropolitan areas pay higher dividends because it is costly for shareholders to monitor managers. Finally, we address the concern that the collateral channel might be used to finance investments but not payouts.

## A. Large versus Small Firms

First, we analyze whether payouts by large firms may increase local real estate prices. We categorize firms as small or large according to their total assets, and we categorize MSAs as small or large based on their population. More specifically, we classify firms in the lowest 3 quartiles of size as small, and we categorize MSAs as large if they are among the top 20 MSAs by population. Columns 1 and 3 in Table 8 report the estimates of equation (3) for a subsample of small firms in large MSAs for the dependent variables cash dividends and share repurchases.[14] We find that RE_VALUE coefficients are positive and significant at the 1% confidence level for both specifications. Therefore, our results are robust when we only consider small firms and large MSAs in our sample.

TABLE 8

Financial Flexibility and Payout: Robustness Tests 1 and 2

In Table 8, we test the robustness of the effect of financial flexibility on the firm's payout policy. The baseline regression is the specification in column 4 of Table 2. Dependent variables in columns 1 and 3 are the ratio of cash dividend to lagged property, plant, and equipment (PPE) and share repurchases to lagged PPE, respectively, in the lower 3 quartiles of firm size and in the largest 20 metropolitan statistical areas (MSAs). Dependent variables in columns 2 and 4 are the average dividend over the next 3 years normalized by lagged PPE and average share repurchases over next 3 years normalized by lagged PPE, respectively. RE_VALUE is the ratio of the market value of real estate normalized by previous-year PPE. MSA-level residential real estate prices are obtained from the Federal Housing Finance Agency (FHFA). All regressions use MSA-level residential prices, include year and firm fixed effect, and control for the ratio of retained earnings to total assets, leverage, asset growth ratio, firm size, market-to-book ratio, firm age, sales growth ratio, return on assets (ROA), cash holdings, and initial controls interacted with MSA-level residential prices. *t*-statistics are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

| | Dividends | | Share Repurchases | |
|---|---|---|---|---|
| | Large MSAs and Small Firms | 3-Year Mean Dividend | Large MSAs and Small Firms | 3-Year Mean Repurchase |
| | 1 | 2 | 3 | 4 |
| RE_VALUE (MSA resid. prices) | 0.0054*** | 0.0068*** | 0.0035*** | 0.0117*** |
| | (8.09) | (12.09) | (2.95) | (6.24) |
| MSA resid. prices | −0.2469 | 0.0653 | −0.4036 | 0.0979 |
| | (−0.40) | (0.07) | (−0.38) | (0.03) |
| No. of obs. | 7,890 | 14,933 | 7,401 | 13,260 |
| $R^2$ | 0.778 | 0.784 | 0.457 | 0.579 |

## B. Payout over Subsequent 3 Years

In a second robustness test, we address the concern that firms may not be able to use their increased borrowing capacity immediately after an appreciation in real estate value. The renegotiation of debt contracts may take time, such that

[14] The baseline specification is denoted by column 4 of Tables 2 and 3 for cash dividends and share repurchases, respectively.

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firms could benefit from an increase in their borrowing capacity in the years after a positive shock to real estate prices. Columns 2 and 4 of Table 8 display the estimates of equation (3) when considering the average cash dividends and share repurchases over the subsequent 3 years as the dependent variables. In line with our previous results, the RE_VALUE coefficients remain positive and significant.

## C. Choice of Firm Location

Our third robustness test addresses the concern that firms that pay higher dividends may choose to locate in a state or MSA experiencing high growth in real estate prices. To address this possible endogeneity problem, we follow Almazan, De Motta, Titman, and Uysal (2010) and present regressions that replicate our main results for a sample of firms that have been listed on the stock exchange for at least 10 years. To the extent that unobserved characteristics that may influence a firm's location choice become less important over time, we argue that the observed effect on the payout decisions of older firms that chose locations many years ago are unlikely to reflect a location-selection effect. For the same reason, we run our main specification for older firms to test the robustness of our results.

Table 9 displays the results of this robustness test. The dependent variables are cash dividends over lagged PPE in columns 1–3 and share repurchases over lagged PPE in columns 4–6. Columns 1–3 in Panel A report that an increase in real estate value results in an increase in dividend payouts for older firms. These coefficients are similar in magnitude to the baseline results presented in Table 2. Column 1 uses real estate values based on state-level residential prices. In column 2, real estate values are calculated using MSA-level residential prices. Column 3 presents the results using an IV estimation. Panel B reports the results from

TABLE 9

Financial Flexibility and Payout: Robustness Test 3

In Table 9, we test the robustness of the effect of financial flexibility on firms' payout policies for older firms to mitigate the endogeneity problem associated with choice of being located in a particular state or metropolitan statistical area (MSA). The dependent variable is cash dividend over lagged property, plant, and equipment (PPE) in columns 1–3 and share repurchases over lagged PPE in columns 4–6 . The regressions used in columns 1–3 are the same as those presented in columns 3–5 of Table 2 but run on the sample of firms that have been public for at least 10 years. Similarly, regressions used in columns 4–6 are the same as those presented in columns 3–5 of Table 3 but run on the sample of older firms. Columns 1, 2, 4, and 5 report the results of the ordinary least squares (OLS) specification. Columns 3 and 6 report the results of instrumental variables (IV) estimation. RE_VALUE is the ratio of the market value of real estate normalized by previous-year PPE. All the regressions include firm and year fixed effects and control for firm characteristics: the ratio of retained earnings to total assets, leverage, asset growth ratio, firm size, market-to-book ratio, firm age, sales growth ratio, return on assets (ROA), cash holdings, and the interaction between the initial controls and the state or MSA residential real estate prices. *t*-statistics are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

| | Dividends | | | Share Repurchases | | |
|---|---|---|---|---|---|---|
| | OLS | OLS | IV | OLS | OLS | IV |
| | 1 | 2 | 3 | 4 | 5 | 6 |
| RE_VALUE (state resid. prices) | 0.0031*** (8.65) | | | 0.0029*** (4.88) | | |
| RE_VALUE (MSA resid. prices) | | 0.0036*** (7.86) | 0.0046*** (8.84) | | 0.0031*** (4.01) | 0.0038*** (4.33) |
| State resid. prices | 0.1743** (2.12) | | | 0.0212 (0.15) | | |
| MSA resid. prices | | 0.2026 (0.89) | 0.0646 (0.46) | | −0.4336 (−1.15) | −0.4534* (−1.94) |
| No. of obs. | 16,419 | 14,467 | 12,590 | 15,603 | 13,703 | 11,926 |
| $R^2$ | 0.792 | 0.794 | 0.792 | 0.475 | 0.478 | 0.483 |

equivalent regressions using the ratio of share repurchases to lagged PPE as the dependent variable. As expected, the coefficients for share repurchases in Panel B are of the same magnitude as those in our baseline results (see Table 3).

## D. Geography and Agency Costs

John, Knyazeva, and Knyazeva (2011) show that remotely located firms pay higher dividends because shareholders cannot perfectly monitor managers' decisions. This gives rise to the concern that our results might be derived from agency costs associated with the information asymmetries between firms' shareholders and managers rather than changes in financial flexibility driven by shocks to CRE values. We mitigate this concern by testing our main specification while controlling for a CENTRAL_LOCATION dummy and the interaction of that dummy with real estate value. John et al. (2011) classify firms as centrally located if they are headquartered in 1 of the 10 largest consolidated MSAs based on population size as reported in the 2000 census. These MSAs are New York City, Los Angeles, Chicago, Washington–Baltimore, San Francisco, Philadelphia, Boston, Detroit, Dallas, and Houston, and their suburbs. CENTRAL_LOCATION equals 1 if the firm is located in a top-10 metropolitan area, and 0 otherwise.

Table 10 reports the results of our main specification while controlling for the CENTRAL_LOCATION dummy. The dependent variable is cash dividends over lagged PPE. RE_VALUE coefficients remain positive and significant. Similar to John et al. (2011), CENTRAL_LOCATION is negative and mostly significant.

TABLE 10

Financial Flexibility and Dividend Payout: Robustness Test 4

In Table 10, we test the effect of financial flexibility on the dividend payout accounting for location of firms. The dependent variable is cash dividend over lagged property, plant, and equipment (PPE). The regressions used are the same as those presented in columns 1–5 of Table 2 with the addition of a location dummy (CENTRAL_LOCATION) and the interaction of real estate value with the location dummy. The CENTRAL_LOCATION dummy is equal to 1 if a firm is headquartered in 1 of the 10 largest metropolitan statistical areas (MSAs), and 0 otherwise. All the regressions except those in columns 1 and 2 control for the ratio of retained earnings to total assets, leverage, asset growth ratio, firm size, market-to-book ratio, firm age, sales growth ratio, return on assets (ROA), and cash holdings. Columns 2–5 control for initial firm-level characteristics interacted with real estate prices. Columns 1–4 report the results of the ordinary least squares (OLS) specification. Column 5 reports the results of instrumental variables (IV) estimation. RE_VALUE is the ratio of the market value of real estate normalized by previous-year PPE. All the specifications include firm and year fixed effects. *t*-statistics are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

| | OLS | | | | IV |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| RE_VALUE (state resid. prices) | 0.0026*** | 0.0019*** | 0.0016*** | | |
| | (7.82) | (5.71) | (4.23) | | |
| RE_VALUE (MSA resid. prices) | | | | 0.0025*** | 0.0035*** |
| | | | | (5.32) | (6.26) |
| CENTRAL_LOCATION | −0.0010 | −0.0041* | −0.0061*** | −0.0047** | −0.0049* |
| | (−0.68) | (1.93) | (−2.91) | (−2.17) | (−1.82) |
| CENTRAL_LOCATION × RE_VALUE | 0.0011** | 0.0009* | 0.0013** | 0.0018* | 0.0001 |
| | (2.21) | (1.81) | (2.49) | (1.76) | (0.15) |
| State resid. prices | 0.0081*** | 0.1379*** | 0.1236*** | | |
| | (3.20) | (3.83) | (3.00) | | |
| MSA resid. prices | | | | −0.0070 | −0.0064 |
| | | | | (−0.08) | (−0.10) |
| Firm-level controls | No | No | Yes | Yes | Yes |
| Initial controls × state resid. prices | No | Yes | Yes | No | No |
| Initial controls × MSA resid. prices | No | No | No | Yes | Yes |
| No. of obs. | 24,155 | 23,632 | 19,217 | 18,336 | 15,986 |
| $R^2$ | 0.057 | 0.350 | 0.417 | 0.419 | 0.422 |

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This result shows that firms located in the 10 largest U.S. MSAs (i.e., central locations) pay less dividends compared to firms not located in these largest MSAs.

### E. Investments

In a fifth robustness test, we address the concern that the collateral channel could be used to increase investments but not the firm's payout. To do so, we add a control for investments to the regressions defined by equation (3) for dividends and share repurchases. This control variable is capital expenditure (Compustat mnemonic: CAPX normalized by lagged PPE, mnemonic: PPENT). For dividends and share repurchases, the RE_VALUE coefficient remains positive and significant. This means that the appreciation in the collateral value (and not the investments) explains the higher payouts. Overall, our results are robust to the inclusion of investments as a control variable.[15]

## VII. Conclusions

A change in financial flexibility has a clear impact on the decisions made by a firm's managers, especially decisions related to payouts. This article examines the impact of financial flexibility on firms' payout policies. We use variation in real estate prices as exogenous shocks to firms' debt capacity and, therefore, to their financial flexibility. CRE assets often represent an important part of a firm's total assets, and firms use these assets as collateral to obtain debt financing. Through this collateral channel, positive shocks to the value of CRE assets increase firms' financial flexibility and, as a result, their payouts.

We find strong evidence that an increase in financial flexibility (i.e., an appreciation in the collateral value of CRE assets) leads to an increase in cash dividends, share repurchases, and payout flexibility. Our empirical analysis shows that a 1-standard-deviation increase in the value of firm pledgeable collateral assets results in a 0.26-percentage-point increase in nondiscretionary payouts and a 0.55-percentage-point increase in discretionary payouts.

We also document that as firms are reluctant to decrease their dividends, the decrease in dividends is either small or insignificant when their financial flexibility worsens (i.e., when the value of their CRE assets decreases and during real estate busts). However, we find that high-leverage firms decrease their dividends and share repurchases during periods of decreasing real estate prices (i.e., when the collateral channel is less available for them). We also demonstrate that the effects of financial flexibility on dividends and share repurchases are stronger for firms with few investment opportunities and for financially constrained firms.

## Supplementary Material

Supplementary Material for this article is available at https://doi.org/10.1017/S002210901800114X.

[15] We report the results of this test in the Supplementary Material.

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