The Effect of Financial Flexibility on Payout Policy
ONLINE APPENDIX

Abstract

This online appendix shows the results of the first stage regressions of our IV model and an analysis of the effects of real estate prices on dividend smoothing. This appendix also provides extra results and additional robustness tests for some of the main empirical results.

1 First Stage Results on Endogeneity Issues

As noted in the section 4 of the paper, financial flexibility -induced by variation in real estate prices- could be correlated with the firm's payout policy. To address this endogeneity problem, 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. Table A.1 presents the result of our first-stage regression. Very constrained land supply metropolitan statistical areas (MSAs) and cities present low values of local real estate supply elasticity (i.e., real estate prices in these areas are inelastic.) Therefore, we expect that a decline in interest rates will produce a higher increase in real estate prices in MSAs with lower elasticity of supply. As expected, the interaction between the measure of local real estate supply elasticity and interest rates is positive and significant at the 1% level. The specification in column [4] shows that a 1% decrease in the mortgage rate significantly increases the MSA price index by 3.2% in supply constrained MSAs (top quartile) than in unconstrained MSAs (bottom quartile). In columns [2], [4], [6], and [8] we control for the interaction between local housing supply elasticity and time (i.e., year) in order to address the critique in Davidoff (2016). We find that the coefficient of the interaction between the local housing supply elasticity and the mortgage rate remains robust to the Davidoff's correction across the different specifications.

[Insert Table A.1 around here]

Table A.2 presents the results related to the second endogeneity problem discussed in section 4. Specifically, in our main specification we control for the initial characteristics of the firms (characteristics that make firms more likely to own real estate) interacted with real estate prices. Control variables that might play an important role in the real estate ownership decision are age, assets, and return on assets, as well as two-digit industry dummies and state dummies. In table A.2 we present results of two related analysis. First, we run cross-sectional OLS regressions of a dummy equal to one when the firm owns real estate, REOwner, on the initial characteristics mentioned above. Second, we run the same regression using the market value of the firm's real estate assets as the dependent variable. Positive and significant coefficients across both the specifications show that firm's age, asset size, and return on assets positively affect both the likelihood of owning real estate assets as well as market value of Corporate Real Estate (CRE) assets.

[Insert Table A.2 around here]

2 Effect of Financial Flexibility on Dividend Smoothing

In this section, we reveal the effects of financial flexibility on the firms' dividend smoothing. We show that a positive shock in the firms' financial flexibility -resulting from a shock in the value of their collaterizable assets- leads to a higher level of dividend smoothing, or equivalently, that the measures of speed of adjustment (SOA) in Lintner (1956) and Leary and Michaely (2011) decrease.

The empirical fact that companies smooth dividends has been a subject of debate since Lintner (1956) documented it. However, there is no consensus about the economic drivers for dividend smoothing. Managers strongly believe that market rewards firms with a stable dividend policy (see Black (1976)). As a result, dividend smoothing has steadily increased over the past 80 years (see Brav et al. (2005) and Leary and Michaely (2011).) Some papers argue that it is optimal for the firm to smooth dividends in the existence of asymmetric information. Other papers show that dividend smoothing is a result of the attempt to reduce the agency costs of free cash flows.[1]

Leary and Michaely (2011) examine several characteristics of firms to explain why they smooth dividends. They show that firms that are cash cows, with little growth prospects, weaker governance, and greater institutional holdings, smooth dividends more. On the other hand, younger firms, smaller firms, and firms with more volatile earnings and returns, tend to smooth dividends less. The current literature concludes that dividend smoothing is most common among financially unconstrained firms. Positive shocks to the value of a firms CRE assets allow firms to increase their financing capacity and these firms have more resources at their disposal to implement dividend smoothing policies. We formally test the conjecture: "The average dividend smoothing increases in the market value of firms' collateralizable assets."

[1]The determinants of dividend smoothing have been widely studied. There is a stream of literature that shows that the use of dividends to signal private information about the future cash flows of the firm is one of the drivers of dividend smoothing (e.g., Kumar (1988); Kumar and Lee (2001); Guttman, Kadan, and Kandel (2010)). Other papers suggest that dividend smoothing is driven by the asymmetric information between firms' owners and managers (e.g., Fudenberg and Tirole (1995); De Marzo and Sannikov (2015)). Other studies show that costly external financing generates dividend smoothing since firms may not increase dividends after a positive shock in earnings for precuationary reasons (e.g., Almeida, Campello, and Weisbach (2004); Bates, Kahle, and Stulz (2009)).

2.1 Effect on dividend smoothing. Empirical strategy

We use two measures of dividend smoothing throughout the empirical analysis that studies the effect of changes in the value of CRE assets on the firm's dividend smoothing. First, we consider the speed of adjustment (SOA) from the partial adjustment model of Lintner (1956). This is the most common measure of smoothing used in the dividend policy literature (see, for example, Dewenter and Warther (1998); Brav et al. (2005); and Skinner (2008)). The SOA can be estimated as the coefficient -$\hat{\beta}_1$ from the following regression:

$$\Delta D_{it} = \alpha + \beta_1 \cdot D_{it-1} + \beta_2 \cdot E_{it} + \epsilon_{it}. \tag{1}$$

where D_{it} denotes the dividends paid by firm i at time t and E_{it} denotes earnings. A high value of SOA is interpreted as the firm smoothing less.

The above measure of dividend smoothing presents some limitations. The methodology in Lintner (1956) assumes that firms follow a particular form of payout policy. That is, firms have a target payout ratio and the actual payout ratio reverts continuously towards this target.[2] However, survey evidence in Brav et al. (2005) shows that the payout ratio is a less relevant target today than it was in the 1950s. For example, only 28% of CFOs claim to target the payout ratio, while almost 40% claim to target the level of dividends per share (DPS). As a result, the model in equation (1) does not fully apply to modern payout policies and the estimated SOA may not provide a reliable measure of dividend smoothing.

We also consider the measure of dividend smoothing developed in Leary and Michaely (2011). They set up the following two-step procedure to estimate the SOA:

$$\Delta D_{it} = \alpha + \beta \cdot dev_{it} + \epsilon_{it} \tag{2}$$

[2] The payout ratio refers to the common dividend paid over the net income.

$$dev_{it} = TPR_i * E_{it} - D_{it-1} \tag{3}$$

where the target payout ratio (TPR_i) is the firm median payout ratio over the sample period. Using that estimated TPR_i, an explicit deviation from target, dev_{it}, is constructed for each period. Finally, dividend smoothing is estimated as the coefficient β from the above regression.

Our empirical strategy to analyze the effect of shocks in the firms' financial flexibility on the firm's dividend smoothing is equivalent to the analyses for cash dividends and share repurchases presented in the paper.

Specifically, we run different specifications of the following equation for the two measures of dividend smoothing of firm i with headquarters located in location l at year t, $Div\_smoothing^l_{it}$:

$$Div\_smoothing^l_{it} = \alpha_i + \delta_i + \beta \cdot REValue^l_{it} + \gamma \cdot P^l_t + \sum_k \kappa_k X^i_k \cdot P^l_t + Controls_{it} + \epsilon_{it} \tag{4}$$

2.2 Main results

Table A.3 exhibits the results of the tests for dividend smoothing. It reports various specifications of equation (4). We find that all the β coefficients in columns $[1]$ to $[6]$ are negative and significant, which supports our argument. A firm with lower speed of dividend adjustment smooths its dividend payments more compared to a firm with higher speed of dividend adjustment. Columns $[1]$ to $[3]$ report the results of the test that we obtain using the dividend smoothing measure from the partial adjustment model of Lintner (1956). Columns $[4]$ to $[6]$ report analogous results using the dividend smoothing measure in Leary and Michaely (2011).

Column $[1]$ shows the estimates for equation (4) in its OLS specification where the state residential price index is used to calculate the market value of CRE assets. Column $[2]$ is similar to $[1]$ except that the real estate value is calculated using the MSA level residential price index. The coefficient for $REValue$ in column $[2]$, -0.0380, is significant at the 1% confidence level and suggests that for every 1% increase in the value of collateralizable real estate assets, SOA decreases by 3.80%. Column [3] reports the equivalent results for the IV estimation of equation (4). In all these 3 specifications, the $REValue$ coefficient is negative, significant, and present a similar magnitude. These estimates validate our conjecture that dividend smoothing increases in financial flexiblity.

[Insert Table A.3 around here]

Columns [4], [5] are [6] report the estimates of the same specifications of equation (4) than columns [1], [2], and [3], respectively, for the second measure of dividend smoothing. We find that the estimated coefficients for $REValue$ in all the three columns are negative and significant. Specifically, the $REValue$ coefficient in column [5] can be interpreted as a 1% increase in the value of collateralizable real estate assets results in a decrease in the speed of dividend adjustment by 4.36%. Note that a decrease in the speed of dividend adjustment is equivalent to an increase in dividend smoothing.

3 Extra Results and Additional Robustness Tests

This section provides extra results and additional robustness tests to the paper. In table A.4, we address the concern that the effect of financial flexibility on payout is not derived by the distribution of real estate assets. We test this by interacting $REValue$ with RE Owner dummy (equals to 1 when a firm owns some real estate assets). The dependent variable in columns [1] and [2] is cash dividends over lagged PPE, while it is share repurchases over lagged PPE in columns [3] and [4]. The coefficient for the interaction term remains positive and significant across all the four columns.

[Insert Table A.4 around here]

In table A.5 we run our main specification for dividends (columns $[1] - [3]$) and share repurchases (columns $[4] - [6]$) while controlling for investment. The estimated coefficients are positive and significant across all the columns, indicating that the effect of collateral value on payout is robust to the inclusion of investments as a control variable. Similarly, table A.6 shows the significant effect of $REValue$ on the two measures of dividend smoothing while controlling for the investments.

[Insert Tables A.5 and A.6 around here]

Finally, figure A.1 provides few graphical evidences. In Figure 1.A, we compare the average Tobin's Q of firms that experienced the highest positive shocks in the value of their collateralizable real estate assets to the average Tobin's Q of firms that experience the lowest or negative shocks.[3] We use Tobin's Q as a proxy of the level of profitable (or positive NPV) investments available to each firm. We categorize the firms (top vs bottom half) in terms of change in market value of their CRE assets. Over the sample period, we observe that the firms in the top half group have consistently low Tobin's Q compared to the firms in the bottom half one. A t-test shows that the mean of the Tobin's Q is significantly different for both groups (t = 6.1305).

Moreover, we compare the average debt of firms in the top versus the bottom half in terms of change in value of their collateralizable real estate assets (see Figure 1.B). We find that firms which experienced higher growth in the value of their CRE assets (top half) exhibit a higher level of debt and, therefore, a higher use of the collateral channel when compared to the firms with lower growth in the value of their collateralizable real estate assets (bottom half). We also compare the dividend paid and shares repurchased for firms in the top and bottom half groups

[3]Tobin's Q is defined as the ratio of the market value of a firm to book value of its total assets (Compustat item 6) where the market value of the firm equals the market value of common equity (item 199 [share price at the end of the fiscal year] times item 25 [common shares outstanding]) plus the book value of preferred stock (items 56, 10, 130) plus the book value of total debt (the sum of total short-term debt [item 9] and total long-term debt [item 34]).

(see Figures 1.C and 1.D). Similarly, firms in the top half group present a higher annual mean in dividends paid and shares repurchased.

[Insert Figure A.1 around here]

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Table A.1: **First-stage regression. The impact of local housing supply elasticity on housing prices.** This table provides the results of the first stage regression. It studies the effect of local housing supply elasticity on real estate prices at the MSA and city level. All regressions control for year and firm fixed effects and standard errors clustered at the MSA/city level. T-statistics are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

	MSA Residential Prices				City Commercial Prices			
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Local housing supply elasticity × Mortgage rate	0.025***	0.013***			0.019***	0.013***		
	(5.69)	(4.50)			(5.52)	(4.77)		
First quartile of elasticity × Mortgage rate			−0.056***	−0.032***			−0.042***	−0.028***
			(-7.29)	(-4.09)			(-6.10)	(-3.86)
Second quartile of elasticity × Mortgage rate			−0.038***	−0.019**			−0.027**	−0.016**
			(-4.61)	(-2.38)			(-3.59)	(-2.14)
Third quartile of elasticity × Mortgage rate			−0.010	0.002			−0.007	0.001
			(-1.63)	(0.32)			(-1.17)	(0.12)
Local housing supply elasticity × Year		−0.003***		−0.003***		−0.001**		−0.002***
		(-4.76)		(-4.41)		(-2.17)		(-2.98)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Location FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1953	1953	1953	1953	1869	1869	1869	1869
R^2	0.814	0.815	0.815	0.818	0.820	0.820	0.821	0.822

Table A.2: **Determinants of the real estate ownership decision.** This table provides the characteristics that determine real estate ownership decision in 1993. The dependent variable in column [1] is a dummy that indicates whether the firm reports any real estate asset on its balance sheet in 1993 labeled as *REOwner*. The dependent variable in column [2] is the market value of the firm real estate assets in 1993 labeled as *REValue*. These two columns show the results of the cross-sectional regressions in 1993 controlled by the 5 quantiles of assets, ROA, age, as well as industry and state fixed effects(FE). T-statistics are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

	REOwner [1]	*REValue* [2]
2^{nd} quintile of assets	0.179^{***}	0.125^{*}
	(7.20)	(1.70)
3^{rd} quintile of assets	0.383^{***}	0.203^{***}
	(14.41)	(2.58)
4^{th} quintile of assets	0.533^{***}	0.253^{***}
	(18.8)	(3.01)
5^{th} quintile of assets	0.538^{***}	0.125
	(17.1)	(1.34)
2^{nd} quintile of ROA	0.118^{***}	0.295^{***}
	(4.41)	(3.81)
3^{rd} quintile of ROA	0.154^{***}	0.172^{***}
	(5.71)	(2.15)
4^{th} quintile of ROA	0.158^{***}	0.219^{***}
	(5.80)	(2.71)
5^{th} quintile of ROA	0.130^{***}	0.191^{**}
	(4.90)	(2.43)
2^{nd} quintile of age	0.064^{**}	0.018
	(2.27)	(0.22)
3^{rd} quintile of age	0.120^{***}	0.057
	(4.50)	(0.72)
4^{th} quintile of age	0.217^{***}	0.368^{***}
	(8.38)	(4.80)
5^{th} quintile of age	0.261^{***}	0.741^{***}
	(9.29)	(8.90)
Industry FE	Yes	Yes
State FE	Yes	Yes
Observations	2,163	2,163
R^2	0.538	0.267

Table A.3: **Financial flexibility and dividend smoothing.** This table tests the effect of financial flexibility on dividend smoothing. Columns [1] – [3] use the measure of dividend smoothing in Lintner (1956) as the dependent variable, while columns [4] – [6] use the dividend smoothing measure in Leary and Michaely (2011) as the dependent variable. MSA and state level residential real estate prices are obtained from the website of Federal Housing Finance Association (FHFA). Column [1], [2], [4] and [5] show the results of the OLS specification, while columns [3] and [6] show the results of IV estimation. For the IV specification, the instrument in the first stage is the land supply elasticity interacted with the nationwide interest rate. All the regressions include firm- and year-fixed effects and control for firm characteristics: ratio of retained earning to total assets, leverage, asset growth ratio, firm size, market to book ratio, firm age, sales growth ratio, ROA, cash holdings. T-statistics are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

	Panel A: Dividend Smoothing (1st measure)			Panel B: Dividend Smoothing (2nd measure)		
	OLS	OLS	IV	OLS	OLS	IV
	[1]	[2]	[3]	[4]	[5]	[6]
RE Value (State resid. prices)	−0.0187**			−0.0124**		
	(-2.26)			(-2.13)		
RE Value (MSA resid. prices)		−0.0380***	−0.0292***		−0.0436***	−0.0431***
		(-4.70)	(-3.14)		(-5.68)	(-4.75)
State resid. prices	0.0918			−0.0225		
	(0.04)			(-0.01)		
MSA resid. prices		−0.4425	0.0663		−0.2718	0.7411
		(-0.02)	(0.00)		(-0.01)	(0.05)
Firm level controls	Yes	Yes	Yes	Yes	Yes	Yes
Initial Controls * State resid. prices	Yes	No	No	Yes	No	No
Initial Controls * MSA resid. prices	No	Yes	Yes	No	Yes	Yes
Observations	20,709	18,232	15,891	20,709	18,232	15,891
R^2	0.069	0.100	0.116	0.096	0.106	0.102

Table A.4: **Real estate owners and payout.** This table tests the robustness of the effect of financial flexibility on the payout policy for firms that are real estate owners. The dependent variable in panel A of this table is cash dividend over lagged PPE and in panel B is share repurchase over lagged PPE. *RE OWNER* is a dummy that takes the value of one if the firm owns real estate and zero otherwise. The regressions used in panel A and panel B are same as the ones presented in columns $[4]-[5]$ of table 2 (for panel A) and of table 3 (for panel B) in the paper. MSA level residential real estate prices are obtained from the website of Federal Housing Finance Association (FHFA). All regressions use MSA-level residential prices, year and firm fixed effect, control for ratio of retained earning to total assets, leverage, asset growth ratio, firm size, market to book ratio, firm age, sales growth ratio, ROA, cash holdings, real estate ownership and initial controls interacted with MSA-level residential prices. T-statistics are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

	Panel A: Dividend Paid		Panel B: Shares Repurchased	
	OLS	IV	OLS	IV
	[1]	[2]	[3]	[4]
RE OWNER * RE Value (MSA resid. prices)	0.0037***	0.0047***	0.0032***	0.0040***
	(9.14)	(10.24)	(4.39)	(4.83)
MSA resid. prices	0.0172	0.0390	-0.2676	-0.3676
	(0.05)	(0.07)	(-0.41)	(-0.41)
Firm level controls (incl. RE OWNER)	Yes	Yes	Yes	Yes
Initial Controls * MSA resid. prices	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	18,336	15,986	17,242	15,042
R^2	0.788	0.781	0.449	0.455

Table A.5: **Financial flexibility and payout: Robustness test 5a.** This table tests the robutness of the effect of financial flexibility on the payout policy of the firm while controlling for the investment. The dependent variable in columns [1] − [3] is cash dividend over lagged PPE and in columns [4] − [6] is share repurchased over lagged PPE. The regressions used in columns [1] − [3] are same as the ones presented in columns [3], [4], and [5] of table 2 in the paper with an additional control of investment. Similarly, regressions used in columns [4] − [6] are same as the ones presented in columns [3], [4], and [5] of table 3 in the paper with an additional contol of investment. Investment variable is defined as capital expenditure normalized by lagged PPE. All the regressions uses year- and firm- fixed effects, control for ratio of retained earning to total assets, leverage, asset growth ratio, firm size, market to book ratio, firm age, sales growth ratio, ROA, cash holdings, and initial firm level characteristics interacted with real estate prices. T-statistics are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

	Dividend/lagged PPE			Share Repurchase/lagged PPE		
	OLS	OLS	IV	OLS	OLS	IV
	[1]	[2]	[3]	[4]	[5]	[6]
RE Value (State resid. prices)	0.0030***			0.0026***		
	(9.35)			(4.65)		
RE Value (MSA resid. prices)		0.0034***	0.0044***		0.0030***	0.0039***
		(8.34)	(9.40)		(4.11)	(4.75)
State resid. Prices	0.3445***			0.1187		
	(7.59)			(1.41)		
MSA resid. Prices		0.0103	0.0272		−0.2607	−0.3606
		(0.03)	(0.05)		(-0.40)	(-0.40)
Investment	0.0011	0.0008	0.0006	0.0040***	0.0036***	0.0032**
	(1.59)	(0.14)	(0.80)	(3.35)	(2.81)	(2.36)
Firm level controls	Yes	Yes	Yes	Yes	Yes	Yes
Initial Controls * State resid. Prices	Yes	No	No	Yes	No	No
Initial Controls * MSA resid. Prices	No	Yes	Yes	No	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	20,631	18,194	15,857	19,460	17,106	14,919
R^2	0.781	0.783	0.779	0.445	0.450	0.456

Table A.6: **Financial flexibility and dividend smoothing: Robustness test 5b.** This table tests the effect of financial flexibility on the dividend smoothing while controlling for the investment. The baseline regression is the specification in column [1], [2], and [3] of table A.3. Columns [1] – [3] use traditionally used measure of dividend smoothing as dependent variable, while columns [4] – [6] use dividend smoothing measure as used in Leary and Michaely (2011) as the dependent variable.The regressions used are same as the ones presented table A.3 with an additional control of investment. Investment variable is defined as capital expenditure normalized by lagged PPE. All the regressions uses year- and firm- fixed effects, control for ratio of retained earning to total assets, leverage, asset growth ratio, firm size, market to book ratio, firm age, sales growth ratio, ROA, cash holdings, and initial firm level characteristics interacted with real estate prices. T-statistics are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

	Dividend Smoothing (1st measure)			Dividend Smoothing (2nd measure)		
	OLS	OLS	IV	OLS	OLS	IV
	[1]	[2]	[3]	[4]	[5]	[6]
RE Value (State resid. prices)	-0.0181^{**}			-0.0125^{**}		
	(-2.17)			(-2.11)		
RE Value (MSA resid. prices)		-0.0374^{***}	-0.0283^{***}		-0.0440^{***}	-0.0437^{***}
		(-4.60)	(-3.02)		(-5.68)	(-4.78)
State resid. prices	0.0670			-0.0513		
	(0.03)			(-0.03)		
MSA resid. prices		-0.3876	-0.1153		-0.2012	0.5103
		(-0.02)	(-0.01)		(-0.01)	(0.03)
Investment	0.0431	0.0245	0.0309	0.0332	0.0367	0.0429
	(1.28)	(0.89)	(1.02)	(1.40)	(1.39)	(1.45)
Firm level controls	Yes	Yes	Yes	Yes	Yes	Yes
Initial Controls * State resid. prices	Yes	No	No	Yes	No	No
Initial Controls * MSA resid. prices	No	Yes	Yes	No	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	20,532	18,090	15,762	20,532	18,090	15,762
R^2	0.069	0.101	0.116	0.097	0.107	0.103

Figure A.1: **Trends in firms segregated by change in the market value of their CRE assets.** Panel A shows the average Tobin's Q for firms which experienced the highest positive change in the value of their collateralizable real estate assets (top half) as compared to firms which experienced the lowest or negative change in the value of their collateralizable real estate assets (bottom half). Equivalently, panels B, C, and D exhibit the time series in average debt, average dividend paid, and average shares repurchased by these two groups of firms.