The Relation between Reporting Quality and Financing and Investment: Evidence from Shocks to Financing Capacity

Karthik Balakrishnan
kbalakri@wharton.upenn.edu
(215) 898-2610

John E. Core
jcore@mit.edu
(617) 715-4819

Rodrigo S. Verdi*
rverdi@mit.edu
(617) 253-2956

Abstract

We use changes in the value of a firm's real estate assets as an exogenous shock to a firm's financing capacity to examine (i) the relation between reporting quality and financing and investment conditional on this shock, and (ii) firms' disclosure responses to the shock. We find that financing and investment by firms with higher reporting quality is less affected by changes in real estate values than are financing and investment by firms with lower reporting quality. Further, firms increase reporting quality in response to decreases in external financing capacity. Our findings contribute to the literature on reporting quality and investment and on the determinants of disclosure choices.

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1. Introduction

How financing capacity affects investment is the subject of a large literature in corporate finance (see Hubbard [1998] and Stein [2003] for reviews). More recently, researchers have begun to study whether and how reporting quality mitigates under-investment associated with financing constraints (e.g., Biddle et al. [2009]). Despite a growing number of papers in this area, little research directly examines whether reporting quality alleviates constraints on financing capacity. Therefore, one objective of this paper is to address this gap by building on recent studies on the role of collateral assets in mitigating financing constraints and increasing financing capacity. Prior studies show that firms with greater collateral value are able to finance more and to invest more (Gan [2007], Benmelech and Bergman [2009], Chaney et al. [2011]). We extend this literature by predicting that if a firm has higher reporting quality, financing and investment will be less sensitive to changes in collateral value.

Our second objective is to study firms' disclosure responses to changes in external financing capacity. Prior research that examines the impact of reporting quality on investment has implicitly assumed that reporting quality is exogenously determined and that a given level of reporting quality has implications for future investment. However, it is conceivable that a dynamic relation exists—an increase in the likelihood of under-investment (e.g., an decrease in financing capacity) leads to an increase in reporting quality, which ultimately facilitates financing and leads to a reduction in (or avoidance of) under-investment. We also test this hypothesis.

We use shocks to collateral values as an exogenous shock to the financing capacity of a firm. As a proxy for a shock to collateral values, we use variations in a firm's real estate values caused by changes in state-level real estate prices. As we discuss below, changes in state real estate prices are likely to be exogenous to firm level investment choices, allowing us to attribute our findings to changes in financing capacity. Following Chaney et al. [2011], our identification strategy comes from (i) comparing firms within the same state-year that have different levels of real estate assets and (ii) comparing firms with the same level of real estate assets but which are located in different states. In other words, our methodology is akin to a difference-in-difference specification that compares changes in financing, investment, and disclosure activities between treatment firms and a benchmark group of firms less affected by changes in real estate values.

Our analysis of the effect of reporting quality on shocks to collateral builds on the approach of Chaney et al. [2011]. Chaney et al. estimate the sensitivity of investment to exogenous shocks to collateral prices. They find that, over the 1993-2007 period, a positive shock to US real estate values that causes an increase of collateral value by a dollar results in additional new debt of four cents and additional investments of six cents.[1] They interpret this result as collateralizable assets mitigating financing constraints that are associated with under-investment. We extend this analysis by examining the role of reporting quality on the relation between changes in financing and investment and changes in collateral values. We argue that firms with higher reporting quality will have fewer financing constraints because firms with better reporting quality will have less information asymmetry with external capital providers and thus will be less reliant on collateral. We therefore predict that the investment and financing choices of these firms will be less affected by shocks to collateral values.

Consistent with this prediction, we find that firms with higher reporting quality (proxied by accruals quality and by the information asymmetry component of the bid-ask spread) have a lower sensitivity of investment and financing to collateral shocks. For example, while the

[1] A related study, Gan [2007], finds that a negative shock to Japanese real estate values causes significant reductions in financing and investment.

average firm's sensitivity of investment to real estate prices in our sample equals 6.21 (i.e., six cents for each dollar of collateral price changes), the sensitivity for a firm in the highest decile of accruals quality is 2.27 smaller than it is for a firm in the lowest decile of accruals quality (i.e., a reduction of 36%). Using the information asymmetry component of the bid-ask spread yields similar results (in both statistical and economic terms).

To shed light on the mechanism behind the investing result, we examine the role of reporting quality on the effect of collateral shocks on financing. The reason that collateral shocks matter for investing is that changes in collateral affect the amount of capital a firm can raise. If collateral falls, lenders may ration credit or increase rates (Stiglitz and Weiss [1981], Benmelech and Bergman [2009]). Empirically, this manifests as a positive association between collateral changes and financing (Chaney et al. [2011]). We expect reporting quality to mitigate this relation as firms with better reporting quality will have less information asymmetry with external capital providers and thus will be less reliant on collateral. Consistent with this intuition, we find that firms with higher reporting quality have a lower sensitivity of financing to collateral shocks. For example, the sensitivity of total debt and equity financing for a firm in the highest decile of accruals quality is 9.07 lower than it is for firms in the lowest decile of accruals quality. Further, when we separately examine debt and equity financing, the results suggest that reporting quality does not affect debt financing, but that it has a strong effect on equity financing. A possible explanation for this result is that, while collateral shocks affect the amount of secured debt firms can raise, because the financing is secured, firms can raise it regardless of their reporting quality. Thus, when firms need funds due to decreases in their ability to raise debt financing, it is the high reporting quality firms that are relatively more able to obtain equity financing. As before, using the information asymmetry component of the bid-ask spread yields similar results.

We then examine whether and how firms respond to the shock to collateral values by changing their disclosure practices. For this analysis, we focus on disclosure proxies (as opposed to the accruals-based proxy for reporting quality) because the shorter-term nature of these disclosures makes it easier, from an empirical standpoint, to observe the changes in response to the short-term shocks we investigate. We examine several dimensions of disclosure: MD&A discussions, 8K filings, management forecasts, and the information asymmetry component of the bid-ask spread (an ex-post measure of the effect of disclosure on information asymmetry). Our findings are consistent with our hypothesis that firms increase disclosure subsequent to decreases in the values of their real estate assets. Specifically, firms with more real estate assets extend the length of MD&A disclosures in the 10-K, file more 8-Ks, and issue more management earnings forecasts in the year of the shock to collateral values. In terms of economic significance, a one standard deviation reduction in real estate values is associated with a 2.9% increase in MD&A length, a 3.9% increase in the frequency of 8K filings, and a 9% increase in the frequency of management forecasts. Further, the information asymmetry component of the bid-ask spread also decreases, suggesting that management disclosure choices reduce information asymmetry. These findings are robust to controlling for firm performance and to controlling for firm and year fixed effects. Overall, these findings show that firms change their disclosure practices in response to changes in external financing capacity.

We perform a series of sensitivity analyses. First, we show that the results are driven by firms more likely to suffer from under-investment (as opposed to over-investment). This is important because under-investing firms (as we define) are also more likely to be financially constrained firms, and so we can interpret our results as reporting quality mitigating financing constraints. Second, we show that our results are robust to off-balance sheet investment and financing activities such as operating leases. This mitigates a concern that firms might switch to off-balance sheet financing (such as operating leases) when faced with a reduction in collateralizable assets. Finally, we find similar results when we instrument real estate prices. This mitigates a concern that our results might suffer from reverse causality because increase in investment by a large firm could trigger an increase in state real estate prices.

Our study contributes to three streams of literature. First, it contributes to research that examines the relation between reporting quality and investment. Most of this literature shows that reporting quality serves a monitoring role that mitigates moral hazard problems associated with over-investment (e.g., Francis and Martin [2008], Hope and Thomas [2008], McNichols and Stubben [2008]). However, there is less research on whether reporting quality serves an information role that alleviates financing constraints. Biddle et al. [2009] provide initial evidence of this link by showing that, among firms more likely to under-invest, reporting quality is positively associated with investment. We extend their paper by using an exogenous shock to external financing capacity in order to study a mechanism linking reporting quality and under-investment. Our results are consistent with reporting quality substituting for collateral in mitigating the information asymmetry (and accordingly the financing constraints) associated with under-investment.

Second, our study also adds to the literature that examines the determinants of disclosure policies (e.g., Healy et al. [1999], Leuz and Verrecchia [2000]). Most of these studies examine disclosures around corporate events, such as dividend changes or share repurchases (e.g., Grullon et al. [2002], Kumar et al. [2008]), or they examine disclosure choices when firms access capital markets (e.g., Lang and Lundholm [2000]). In contrast, we identify shocks to external financing capacity as an exogenous event that changes firms' investment, financing, and disclosure decisions.

Our paper is related to two working papers. Leuz and Schrand [2009] use the fall of Enron as a shock to the firms' cost of capital and then study whether changes in disclosure are associated with changes in firms' cost of capital. Frederickson and Hilary [2010] use the 1986 shock to oil prices as a shock to financing constraints and examine how firms with different levels of disclosure respond to the shock. In contrast to these papers, we use collateral shocks as proxies for shocks to external financing capacity that motivate changes in disclosure. Real estate price shocks have the advantage of being distributed over time and across geography in the cross-section, providing us with different treatment and benchmark samples to test our hypotheses. Further, collateral shocks allow us to attribute the effects we find to variation in collateral values. Thus, we also contribute to the literature that studies the impact of the collateral channel to a firm's investment and financing decisions (Gan [2007], Benmelech and Bergman [2009], and Chaney et al. [2011]).

The remainder of the paper proceeds as follows. Section 2 develops our hypotheses. Section 3 describes our research design. Section 4 presents the results and Section 5 concludes.

2. Hypotheses Development

In this section, we describe our hypotheses. Our main predictions are (i) that a shock to collateral value has a greater effect on financing and investment for firms that have lower reporting quality, and (ii) that in response to a shock to collateral, firms change their disclosure practices.

Our hypotheses assume that information frictions affect financing and investment. In contrast, in the neo-classical framework, a firm's growth opportunities are the sole driver of investment policy (e.g., Yoshikawa [1980], Hayashi [1982], Abel [1983]). Managers obtain financing for all positive net present value (NPV) projects, and investment policy is optimal. In other words, information frictions do not affect financing and investment because there are no differences in information. Outsiders can observe the value of growth options as easily as managers can, and thus outsiders finance all positive NPV projects. However, when there is information asymmetry between managers and outside suppliers of capital, it affects managers' investment and financing choices.

Models of adverse selection such as Myers and Majluf [1984] suggest that if managers are better informed than investors are about a firm's prospects, they will time capital issues to sell overpriced securities. Alternatively, models of moral hazard show that managers may undertake investments that are not in shareholders' best interests (Berle and Means [1932], Jensen and Meckling [1976]). Suppliers of capital rationally anticipate these information frictions and ration capital ex-ante (Myers and Majluf [1984]) and/or increase financing costs (Lambert, Leuz and Verrecchia [2007]). This reduced financing leads to a reduction in investment, as documented by Chaney et al. [2011]. Specifically, given that managers are better informed (relative to investors) about a firm's prospects, capital is rationed, and when firms have less financing capacity (due, for example, to collateral shocks), they are not as able to raise capital and consequently invest less.

We use changes in state-level real estate prices that change the value of firm real estate assets as exogenous shocks to the value of collateral. A decrease in collateral value implies a decrease in a firm's financing capacity. Collateralizable assets increase financing capacity by providing a source of borrowing with low information asymmetry between the lender and the borrower (Stiglitz and Weiss [1981]). Prior research shows that when collateral values fall, so does investment and financing, consistent with a reduction in the firms' external financing capacity and hence an increase in their external financing costs (Gan [2007], Chaney et al. [2011]).

We build on this literature by predicting that if a firm has lower reporting quality, its ability to finance and to invest will be more affected by shocks to collateral. This prediction is based on two assumptions: (1) information asymmetry drives financing frictions, and (2) reporting quality mitigates information asymmetry (Verrecchia [2001]). To see the relation between information asymmetry and financing frictions, consider how financing changes as a function of information asymmetry. In the limit when there is no information asymmetry, the neo-classical model holds, and the firm can finance all its investment opportunities. In this case, collateral values and changes in collateral values have no effect on financing, and therefore no effect on investment.

Once information asymmetry arises, however, changes in collateral value matter because they change financing capacity. Consider a reduction in collateral value. The decrease in collateral value exacerbates the information asymmetry problem between the firm and external sources of finance. Specifically, the shock increases the weighted average information costs associated with the firm's capital (that is, low-asymmetry internal finance declines as a proportion of total capital). For example, less collateral means less security for a loan. In response, lenders increase monitoring, increase rates and ration credit (Stiglitz and Weiss, [1981], Benmelech and Bergman [2009]). Thus, firms will have lower access to debt financing and may have to look for alternative sources of financing such as equity. But also in this case, information asymmetry decreases the ability to raise equity and increases financing costs (Myers and Majluf [1984]).

Our second assumption is that reporting quality mitigates information asymmetry so that firms with higher reporting quality have lower financing frictions. Theoretical models of disclosure provide support for this assumption (Verrecchia [2001], Lambert, Leuz, and Verrecchia [2007]). In addition, empirical papers have linked reporting quality to lower costs of debt financing (Bharat, Sunder and Sunder [2008], Wittenberg-Moerman [2008]), as well as to lower costs of equity financing (Lang and Lundholm [2000], Lee and Masulis [2009]). Further, recent research has also documented a negative association between reporting quality and investment distortions (e.g., Biddle and Hilary [2006], Biddle, Hilary, and Verdi [2009]).

In summary, we hypothesize that the effect of a change in collateral values on financing and investment will be higher for firms with lower reporting quality. This occurs because reporting quality reduces information asymmetry. Thus, when information asymmetry is low (i.e., when reporting quality is high), financing frictions are low and investment approximates the neo-classical model in which variations in collateral values will have a limited (if any) effect on financing and investment policies. On the other hand, as information asymmetry increases (i.e., when reporting quality is lower), financing frictions increase, and investment and financing become more sensitive to fluctuations in collateral values.

This leads to our first hypothesis:

> *H_1: A change in collateral value has a lower impact on financing and investment for firms with higher reporting quality (compared to firms with lower reporting quality).*

Next, we study how a firm changes its disclosure in response to the shock. A firm can choose to ameliorate the information problem by increasing corporate disclosure. That is, the change in collateral value affects internal financing capacity, which causes a shift in the amount of external financing needed. This change can cause a firm to change its reporting practices if managers perceive a higher benefit to disclosure, because disclosure mitigates the potentially higher reduction in financing costs associated with higher information asymmetry (Verrecchia [2001]). The intuition is that firms adjust their reporting choices, including corporate disclosure, based on cost-benefit tradeoffs, and that a shock to collateral values will affect future disclosure choices. In other words, when a shock takes place that affects collateral value, the shock shifts the disclosure cost-benefit tradeoff, and firms may re-optimize reporting quality by adjusting disclosure. We state this hypothesis below:

> *H_2: An increase (decrease) in collateral value is associated with a decrease (increase) in reporting quality.*

Finally, note that we test H_2 using disclosure (as a short-term proxy for reporting quality), as we expect disclosure practices to be more readily measurable by the researcher.

3. Research Design

In this section, we describe our research design and the data used in the paper. We test the above hypotheses using the following reduced-form specifications:

H_1: Investment$_t$ = f(shock$_t$, reporting quality$_{t-1}$, controls)

H_1: Financing$_t$ = f(shock$_t$, reporting quality$_{t-1}$, controls)

H_2: Reporting quality$_t$ = f(shock$_t$, controls)

In the above equations, reporting quality serves both as an explanatory variable and as a dependent variable. The idea is a dynamic setting in which firms choose reporting quality, then choose financing and investment, and then repeat the process by again choosing reporting quality, financing, investment, and so on. Firms choose reporting quality at time t-1 in part based on their expectation of future financing and investment needs, and in part based on other disclosure costs and benefits (e.g., proprietary costs). While this makes reporting quality endogenous with respect to *expected* financing and investment, reporting quality at t-1 is arguably exogenous with respect to a *shock* (an unanticipated change) to financing capacity. We test Hypothesis 1 by investigating whether the effect of the shock on investment and financing is a function of the pre-shock reporting quality. Hypothesis 2 then endogenizes reporting quality by studying how the shock to financing capacity affects the firm's disclosure choices subsequent to the shock.

Our regression specifications follow from the literature on investment (e.g., Richardson [2006], Almeida and Campello [2007], Biddle et al. [2009]), on financing (e.g., Gan [2007], Chaney et al. [2011], Lemmon and Roberts [2010]), and on disclosure (e.g., Healy et al. [1999], Lang and Lundholm [2000], Leuz and Verrecchia [2000]). In addition, our identification strategy follows Chaney et al. [2011], which use changes in state-level real estate prices as a proxy for a firm's change in collateral values and ultimately in its external financing capacity.[2] For that reason, our sample selection and research design closely follows the approach in Chaney et al.

3.1 Data

We start with the sample of active COMPUSTAT firms in 1993 with non-missing total assets. We start the sample period in 1993 because this was the last year of an SEC requirement that firms report the accumulated depreciation of buildings, and, as discussed below, we need the historic depreciation of buildings to estimate the current value of real estate. We retain firms whose headquarters are located in the United States, leaving us with a sample of 8,459 unique firms. We exclude from the sample those firms operating in the finance, insurance, real estate, construction, and mining industries, as well as firms involved in major takeovers. We retain firms that appear for at least three consecutive years in the sample. This leaves us with 2,795

[2] Following Chaney et al. [2011], we measure the real estate shock and financing and investment in the same fiscal year. That is, our specifications assume that the firm financing and investment response is in the same year as the shock. However, it is conceivable that firms take time to respond to the shock, so that some of the response occurs in the following year. To address this possibility, we re-estimate our analyses by measuring the real estate shock in t-1 so that there is a one-year difference between the shock and financing and investment (and also for disclosure). We find that our inferences are unchanged.

firms, resulting in a sample of 25,839 firm-year observations for the sample period of 1993 to 2009.[3]

The key construct for our study is the effect of the change in state-level real estate prices on the value of a firm's real estate assets. To compute this variable, we first measure the market value of a firm's real estate assets. We define real estate assets as buildings, land and improvement, and construction in progress. In essence, this is the property and plant subset of property, plant, and equipment. These assets are not marked-to-market, but are valued at historical cost. To estimate their market value, we follow Chaney et al. [2011] and estimate the average time since their acquisition. To do this, we measure the ratio of the accumulated depreciation of buildings to the historic cost of buildings, which gives us the proportion of the original value of a building that has been depreciated. Assuming that, on average, the depreciable life is 40 years, the average age of buildings for a given firm is 40 multiplied by the proportion depreciated.[4] An illustration of this approach is provided in Appendix A for International Business Machines (IBM). In this example, we estimate the average age of the buildings to be approximately 19 years.

Next, we use real estate price indices to estimate the market value of real estate assets for 1993 and then track the market value of these assets for each subsequent year in the sample period. Following Chaney et al. [2011], we assume that a preponderance of the firm's real estate assets is located in the same state as the firm's headquarters.[5] We obtain residential price indices

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[3] Our sample includes the period of the financial crisis. This creates a concern that our results could be potentially driven by other factors beyond variations in real estate prices (e.g., supply of lending). In untabulated analysis, we find similar results when we restrict our sample to the 1993 to 2007 period.

[4] The assumption of 40-year useful life might not be applicable to firms such as retail firms that use many assets with shorter lives (e.g., leasehold improvements). As a check, we find that our inferences are unchanged if we exclude retail firms.

[5] To the extent that firms have substantial real assets located their outside their headquarters state, this would reduce the power of our tests. Chaney et al. [2011] examine a random sample of 10Ks, and find that most firms reporting real estate assets in COMPUSTAT have a sizable fraction of these assets located in their headquarters state. To

from the Office of Federal Housing Enterprise Oversight (O.F.H.E.O). We use residential real estate prices as a proxy for commercial real estate prices because office real estate data are not available for the entire country, and even then, these data are not available until 1985 (Chaney et al. [2011]). We use state-level residential prices, for which we have data starting in 1975. For the years before 1975, we use the consumer price index (CPI) to adjust real estate prices.

We estimate the value of real estate assets held in 1993 as the book value at the time of the acquisition multiplied by the state-level cumulative price increase from the acquisition date to 1993. We then estimate the value of these assets for the subsequent years as the book value at 1993 multiplied by the cumulative price increase from 1993 to a given year. Appendix A illustrates this computation for IBM. Note that, following Chaney et al., we do not incorporate the value of any real estate acquisitions or dispositions following 1993. An advantage of this approach is that it helps mitigate any endogeneity between real estate value and investments, since any future variation in the value of real estate assets is driven only by state-level variation in real estate prices (and not by the firm's future investments). However, the downside of this approach is that it introduces noise into our measure because the value of real estate in a given year is not precisely estimated. The trade-off between endogeneity and measurement error is also evident in the IBM illustration in Appendix A. For example, IBM disposed of its PC business in 2005, but this asset sale is ignored by our approach.[6]

3.2 Research Design

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further test this assumption, we exclude retail firms since these firms are more likely to have real estate assets located in multiple states. When we do so, we find that our inferences are unchanged.

[6] In untabulated analysis, we create an alternative measure of the market value of firms' real estate assets that adjusts the value of real estate at the start of each year to include acquisitions and dispositions in the prior year. This approach continues to use state-level variation in prices (our identification strategy) to track the change in asset values, but it has the potential advantage of incorporating a more timely measure of existing real estate assets. The downside (and the reason why it is not included in the main analysis) is that it creates a potential endogeneity issue because investments each year reflect long-term growth opportunities. Using this approach we find that our inferences remain unchanged.

3.2.1 Investments, collateral value, and reporting quality

While our hypothesis predicts effects for financing and investment, empirically observing changes in firms' financing is more difficult than observing changes in their investments. For example, financing varies as a function of amount, interest rate, maturity, and contract terms such as covenants. Further, financing occurs infrequently due to large adjustment costs (Leary and Roberts [2005]). Thus, following Gan [2007] and Chaney et al. [2011], we expect our investment results to be more precise, so we first examine investment and then discuss the financing results.

Our specification to examine the effect of reporting quality and collateral values on investment builds on prior literature. Traditionally, previous research has predicted that investment is a function of growth opportunities (Tobin's q), cash flows, and other explanatory variables (e.g., Fazzari et al. [1988], Hubbard [1998], Lamont [1997], Richardson [2006], Almeida and Campello [2007]). More recent papers have extended this literature by examining specific mechanisms that affect investment. Chaney et al. [2011] estimate a model that includes exogenous fluctuations in collateral prices to study the relation between collateral prices and investment (the "collateral channel"). We extend their approach by examining the effect of collateral changes on investment (as Chaney et al. do), but we interact this effect with reporting quality.

The literature on investment typically models investment as a function of current cash flow and lagged Tobin's Q (e.g., Almeida and Campello [2007]):

$$INV_{it} = \alpha_i + \chi_1 CFO_t + \chi_2 Q_{t-1} + \varepsilon_{it}, \tag{1}$$

where α_i is a firm fixed effect, *INV* is capital expenditures scaled by lagged net PPE, *CFO* is the cash flow for the year t scaled by lagged net PPE, and *Q* is Tobin's q measured at t-1. Chaney et al. [2011] expand this specification to examine investment as a function of changes in collateral value that arise from fluctuations in real estate asset prices. To test their hypothesis, they modify Eq. (1) as follows:

$$INV_{it} = \alpha_i + \beta_1 RE\_Value_{it} + \gamma_1 STATE\_INDEX_{st} + \chi_1 CFO_t + \chi_2 Q_{t-1} + \sum_{j=3}^{J} \chi_j X_{jit-1} + \varepsilon_{it}. \quad (2)$$

X is a vector of additional control variables (measured as of t-1) that includes year fixed effects.

The innovation in Chaney et al. [2011] is to incorporate into Equation (2) a measure of exogenous fluctuations in real estate prices. *RE_Value* is the current market value of real estate held in 1993 scaled by lagged net PPE. Specifically, it is computed as the market value of real estate in 1993 (as illustrated in the IBM example in Appendix A), multiplied by the change in state-level real estate prices from 1993 to year t. This amount is deflated by net PPE in year t-1. *RE_Value* is the product of a firm's real estate and the state-level real estate price index. Accordingly, the identification in Equation (2) comes from (i) comparing firms within the same state-year that have different levels of real estate assets (i.e., variation in a firm's real estate) and (ii) comparing firms with the same level of real estate assets but that are located in different states (i.e., variation in real estate indexes across states). $STATE\_INDEX_{st}$ is a control for the change in real estate prices in state s from 1993 to year t. This variable, in conjunction with year fixed-effects, controls for macroeconomic shocks (e.g., recessions, expansions, and changes in interest rates) that affect the economy as a whole. The firm fixed effects gives the coefficients a changes interpretation, i.e., Chaney et al. find a positive coefficient β_1, and interpret it as evidence that a change in real estate value is associated with a change in investment.

Note that the firm fixed effect in Equation (2) removes the firm mean. It can also be estimated (with an appropriate adjustment to degrees of freedom) as:

$$\widetilde{INV}_{it} = \beta_1 RE\_\widetilde{Value}_{it} + \gamma_1 STATE\_\widetilde{INDEX}_{st} + \chi_1 \widetilde{CFO}_t + \chi_2 \widetilde{Q}_{t-1} + \sum_{j=3}^{J} \chi_j \widetilde{X}_{jit-1} + \varepsilon_{it}, \quad (3)$$

where the "~" above the variable name indicates that the firm mean has been subtracted from the variable, e.g.,

$$\widetilde{INV}_{it} = INV_{it} - \frac{1}{T}\sum_{t=1}^{T} INV_{it}. \quad (4)$$

Our prediction in Hypothesis 1 is that changes in investment will be less sensitive to real estate prices when the *level* of reporting quality is higher (we examine changes in reporting quality in Hypothesis 2). In order to test this prediction, we include an interaction between reporting quality and the effect of interest. Thus, we modify Equation (3) by introducing an interaction between $RE\_\widetilde{Value}_{it}$ and reporting quality. We also include a main effect for reporting quality.[7] Specifically we estimate the following:

$$\begin{aligned}\widetilde{INV}_{it} = {} & \beta_1 RE\_\widetilde{Value}_{it} + \beta_2 RE\_\widetilde{Value}_{it} \times FRQ_{it-1} + \gamma_1 STATE\_\widetilde{INDEX}_{st} + \gamma_2 FRQ_{it-1} + \\ & \chi_1 \widetilde{CFO}_t + \chi_2 \widetilde{Q}_{t-1} + \sum_{j=1}^{J} \chi_j \widetilde{X}_{jit-1} + \varepsilon_{it},\end{aligned} \quad (5)$$

where *FRQ,* measured at year *t-1,* is one of our two proxies for reporting quality (accruals quality, *AQ,* and the information asymmetry component of the bid-ask spread, *IAC_spread*, which are described below). Note that in Equations (3) and (5), we removed the means from the same variables as in Eq. (2), but not from *FRQ*. This specification allows us to interpret β_2 as how the sensitivity of the change in investment to changes in collateral prices varies as a function of the *level* of reporting quality at t-1.

Our approach in Eq. (5) assumes that reporting quality prior to the shock is a pre-determined variable that will affect the increase in information asymmetry due to the shock to

[7] Implicit in our model (and in Chaney et al. [2011]) is the assumption that the firms in the sample are under-investing. We investigate this assumption in Section 4.4, where we further decompose our tests into firms that are more likely to over- and under-invest.

real estate prices. As discussed in the beginning of this section, reporting quality at t-1 is arguably exogenous with respect to a future *shock* (an unanticipated change) to financing capacity (although it may be endogenous with respect to *expected* financing and investment). When we later test Hypothesis 2, we examine whether firms, subsequent to observing their financing capacity following a real estate shock, then adjust their reporting quality.

Following prior literature (e.g., Richardson [2006], Almeida and Campello [2007], Biddle et al. [2009]), in Eq. (5) we control for contemporaneous cash flow (cash flow from operations divided by lagged net PPE) [8], lagged Tobin's Q (measured as the market value of assets divided by the book value of assets), the logarithm of lagged total assets, lagged age (measured as the logarithm of the number of years a firm has a record in Compustat), and lagged leverage (measured as the sum of short-term and long-term debt divided by the book value of assets). In addition to these control variables, all of our specifications include year fixed-effects.

Chaney et al. [2011] show that the sensitivity of changes in investment to changes in collateral prices (i.e., β_1) is positive, a finding that suggests that firms invest more (less) when real estate assets experience an increase (decrease) in value. Thus, if reporting quality attenuates this effect, then we predict that the estimated coefficient β_2 will be negative.

We cluster standard errors using a two-dimensional cluster at the state and year levels, which addresses both cross-sectional and firm-specific dependence. By clustering in this way, our standard errors are conservative, given that the explanatory variables of interest are defined at the firm level (see Bertrand, Duflo, and Mullainathan [2004]).

3.2.2 Financing, collateral value, and reporting quality

[8] We define cash flow as cash flow from operations, which differs from Chaney et al. [2011], who define cash flow as income before extraordinary items plus depreciation and amortization. While this latter definition is widely used in the finance literature, it has potential shortcomings because it includes accruals, which are "investments" in working capital (Bushman et al. [2010]).

To test Hypothesis 1 with respect to financing, we modify Equation (5) by replacing investment as the dependent variable with a measure of external finance raised by the company. Specifically we estimate the following:

$$\begin{aligned} EX\tilde{T}\_FIN_{it} = {} & \beta_1 RE\_\tilde{V}alue_{it} + \beta_2 RE\_\tilde{V}alue_{it} \times FRQ_{it-1} + \gamma_1 STATE\_\tilde{I}NDEX_{st} + \gamma_2 FRQ_{it-1} + \\ & \chi_1 C\tilde{F}O_t + \chi_2 \tilde{Q}_{t-1} + \sum_{j=1}^{J} \chi_j \tilde{X}_{jit-1} + \varepsilon_{it}, \end{aligned} \tag{6}$$

where $EX\tilde{T}\_FIN$ is one of the three measures of net finance raised by a firm – $DEB\tilde{T}\_NET$, $EQUIT\tilde{Y}\_NET$, and $FI\tilde{N}\_NET$. Again, the "~" above the variable name indicates that the firm mean has been subtracted from the variable, as in Equation (4). We focus on debt, equity, and total financing, as prior research has shown that reporting quality can affect both debt and equity financing.

Following Bradshaw, Richardson, and Sloan [2006], we measure net debt financing as the net cash received from (paid for) the issuance (reduction) of debt (Compustat variable DLTIS minus DLTR plus DLCCH, where we set DLCCH to zero if missing). *DEBT_NET* is the ratio of net debt financing in a given year scaled by the lagged value of net PPE. We measure net equity financing as the net cash received from the sale (repurchase) of equity, less common dividends (Compustat variable SSTK minus PRSTKC minus DVC).[9] *EQUITY_NET* is the ratio of net equity financing in a given year (Compustat variable SSTK) scaled by the lagged value of net PPE. *FIN_NET* is the sum of debt and equity financing in a given year scaled by the lagged value of net PPE. As before, the "~" above the variable name indicates that the variable is adjusted for its firm mean. Our hypothesis is that external financing will be less sensitive to a change in real estate prices when reporting quality is higher. Thus we predict that the coefficient

[9] We do not subtract preferred dividends from net equity issuances, as we consider these to be largely nondiscretionary and analogous to interest payments.

β_2 will be negative. We control for contemporaneous cash flow (cash flow from operations divided by lagged net PPE), lagged Tobin's Q (measured as the market value of assets divided by the book value of assets) and the logarithm of lagged total assets, lagged age (measured as the logarithm of the number of years a firm has a record in Compustat).

3.2.3 Disclosure responses to changes in collateral value

In the previous section, we used reporting quality prior to the shock as a conditioning variable that mitigates the effect of real estate price changes on investment. That specification assumes that reporting quality in the prior period is a pre-determined variable (with respect to the shock to financing capacity). However, as discussed in Section 2, a complementary prediction is that firms adjust their reporting choices, including corporate disclosure, based on cost-benefit tradeoffs, and that a shock to collateral values affects future disclosure choices (Hypothesis 2).

We test this hypothesis by estimating a regression of reporting quality (empirically proxied by measures of voluntary disclosure) on shocks to collateral. The model is similar to the one in Equation (2) but uses reporting quality as the dependent variable (as opposed to investment):

$$FRQ_{it} = \alpha_i + \beta_1 RE\_Value_{it} + \gamma_1 STATE\_INDEX_{st} + \sum_{j=1}^{J} \chi_j X_{jit-1} + \varepsilon_{it}, \quad (7)$$

where FRQ_t is one of our proxies for corporate disclosure (*MDA_LENGTH*, *COUNT_8K*, *MGMT_FCST*, and *IAC_SPREAD*, described below). In Eq. (7), consistent with the prior literature (e.g., Leuz and Verrecchia [2000]), we control for *ROA* (measured as operating income before depreciation and amortization divided by total assets) and the logarithm of the market value of equity (*MVE*). The prior literature finds these variables to be associated with disclosure choices. We also control for *Q*, *LEVERAGE*, and *AGE*. Finally, in addition to these control variables, we include year indicator variables.

Our second hypothesis is that firms will increase (decrease) disclosure quality in response to a decrease (increase) in real estate prices. Thus we predict that the coefficient β_1 will be negative. Again, the presence of the firm fixed effect allows the coefficients to be interpreted as changes. Thus, if we find a negative coefficient β_1, we will interpret it as a decrease in the value of real estate assets being associated with an increase in reporting quality.

3.2.4 Measures of reporting quality, disclosure and information asymmetry

We use two proxies for reporting quality when testing Hypothesis 1: accruals quality and the information asymmetry component of the bid-ask spread. Accruals quality (*AQ*) has been previously used in literature that examines the relation between reporting quality and investment efficiency (e.g., Biddle et al. [2009]). The intuition behind this measure is that when accruals quality is higher it is easier to predict future cash flows and thus to estimate the present value of investment opportunities. *AQ* is the measure of accruals quality proposed by Dechow and Dichev [2002] and modified by Francis et al. [2005]. We estimate accruals quality as the standard deviation of residuals from a regression of total current accruals on lagged, current, and one-year-ahead cash flows plus the change in revenue and property, plant, and equipment (all variables are lagged by an extra year to avoid a look-ahead bias due to the inclusion of future cash flows in the model). Prior research (e.g., Aboody et al. [2005], Francis et al. [2005]) suggests that when this variance is higher, earnings quality is lower and information asymmetry is higher. To give the variable the interpretation of increasing reporting quality, we multiply it by negative one. To aid in interpretation, we rank *AQ* into deciles and re-scale it to range from zero to one.

Second, *IAC_spread* measures the extent to which unexpected order flow affects prices and is increasing in information asymmetry. This variable measures the effect of information asymmetry on the stock price (i.e., the price impact or adverse selection that results from information asymmetry among investors). We estimate *IAC_spread* following Madhavan, Richardson, and Roomans [1997] (as described in Armstrong et al. [2011]). We gather trade-by-trade and quote data from the Institute for the Study of Security Markets (ISSM) and the Trades and Automated Quotes (TAQ) database provided by the NYSE. We match trades and quotes using the Lee and Ready [1991] algorithm with a five-second lag to determine the direction of the trade (i.e., buy or sell). We clean trades and quotes using the algorithm described in Appendix B of Ng, Rusticus, and Verdi [2008]. Once trades are classified as either buyer- or seller-initiated, we estimate the following firm-specific regression using intra-day data:

$$\Delta p_t/p_{t-1} = \psi\, \Delta D_t + \lambda\, (D_t - \rho D_{t-1}) + u_t \ , \qquad (8)$$

where p_t is the transaction price, D_t is the sign of trade (+1 if buy and -1 if sell), and ρ is the AR(1) coefficient for D_t. The fitted λ in the equation above is *IAC_spread*. Note that we have deflated the dependent variable by lagged price to allow for cross-sectional comparability. This gives us an estimate of the *IAC_spread* as a percentage of price. Because running the algorithm is very time-consuming, we measure *IAC_spread* for each firm once a year at its fiscal year-end, using all intra-day data for that month. Again, to give the variable the interpretation of increasing reporting quality, we multiply it by negative one. Further, given the noise inherent in the process of estimating *IAC_Spread*, we include this measure as a ranked variable (converted into deciles) in all our tests. We then re-scale it to range from zero to one.

We use four proxies for reporting quality when testing Hypothesis 2: the length of the MD&A, the issuances of 8Ks, the issuance of management forecasts, and the information asymmetry component of the bid-ask spread. The sample for the analyses using the length of the MD&A and 8Ks begins in 1995 because it is the first year with available SEC filings on EDGAR's website. Also, for management forecasts, we follow prior literature and also start the sample in 1995 because First Call coverage improves significantly post-1994 (e.g., Rogers and Stocken [2005], Ng, Tuna, and Verdi [2011]).

We use the length of the Management's Discussion and Analysis (MD&A) section of the 10-K reports filed by firms as a proxy for firm disclosure. We retrieve firms' 10-K filings from SEC EDGAR and then employ text-mining programs to extract the MD&A section. The *MDA_LENGTH* is the number of words in the MD&A section of the 10-K statement. Recent studies that examine management disclosures provide evidence that the forward-looking statements in a firm's MD&A are positively correlated with its future earnings and have explanatory power in addition to other variables that can predict future performance (e.g., Li [2010], Feldman et al. [2010]). This suggests that the MD&A is a reasonable proxy for disclosure quality or reporting quality. Using similar logic, Leuz and Schrand [2009] employ MD&A length as their primary measure of disclosure.

We also employ the number of 8K forms (*COUNT_8K*) filed by the firm as a measure of disclosure. This variable is also used by Leuz and Schrand [2009] when investigating disclosure responses to the Enron event. The SEC requires that firms use the 8K form to disclose material information and to update any information provided in previous SEC filings. While the SEC lays out specific reportable events, the guidelines are generic enough that firms have discretion in filing an 8K for other information.

Our third proxy for disclosure is the issuance of earnings forecasts by the management (*MGMT_FCST*). Several papers have used management forecasts as a proxy for voluntary disclosure activity. Overall, this literature shows that management forecasts provide information to the market and that they are associated with market returns and analyst forecast revisions. Prior research that examines earnings forecasts suggests that managers who wish to enhance transparency issue more frequent, specific, and accurate forecasts (Skinner [1994], Kasznik and Lev [1995], Kim and Verrecchia [1991]). In addition, investors and analysts react to these forecasts, which suggests that they have information content (e.g., Ajinkya and Gift [1984], Waymire [1984], Jennings [1987], Williams [1996]). We acknowledge that all of these disclosure measures are noisy because managers may disclose for reasons other than to improve the information environment; for example, they may disclose in response to abstain-or-disclose rules (Li, Wasley, and Zimmerman [2011]).

In addition to these proxies for disclosure, we also examine the information asymmetry component of the bid-ask spread (*IAC_Spread* as described above) in the year of the shock as a summary measure of the effect of disclosure on information asymmetry.

4. Results

4.1 Descriptive Statistics

Table 1 presents descriptive statistics for the variables used in our analysis. Following Chaney et al. [2011], we winsorize all variables at the 5^{th} and 95^{th} percentiles. We begin with our measures of investment, financing, collateral, and real estate prices. The median value for *INV* suggests that the firms in our sample invest, in a given year, approximately 20% of their lagged net PPE. As a comparison, the current value of real estate (property and plant), when scaled by beginning *total assets*, has a median of 10% of the book value of its lagged assets. This alternative scalar emphasizes that real estate collateral is economically significant for our sample. Another way to see this is to note that the median debt to assets ratio is 20%, a magnitude similar to that of real estate collateral. The median (mean) values for *DEBT_NET* are 0.00% (8.25%) of lagged net PPE; for *EQUITY_NET*, 0.00% (15.42%) of lagged net PPE; and for *FIN_NET*, -0.51% (36.43%) of lagged net PPE. The median annual change in real estate prices ($STATE\_INDEX_{t-1,t}$) equals 4% (the gross value in the table is 1.04), whereas the median cumulative change in our sample ($STATE\_INDEX_{93,t}$) equals 24%. The median *RE_VALUE* equals 0.37, which means that the current value of real estate (property and plant) is equal to 37% of the book value of its lagged net PPE.

We now turn to our proxies for reporting quality and disclosure. Although we use decile-ranked values of *AQ* and *IAC_SPREAD* in our tests, we report unranked values in Table 1 in order to enable a comparison with prior research (e.g., Francis et al. [2005], Armstrong et al. [2011]). The median for *AQ* is -0.04, whereas that of *IAC_SPREAD* is -0.11% (recall that both variables are multiplied by -1). By comparison, Francis et al. [2005] show a median *AQ* of -0.03 for their sample, and Armstrong et al. [2011] show a median *IAC_SPREAD* of 0.1% for their sample. The median number of words in the MD&A (*MDA_LENGTH*) is 4,690. The length of the MD&A compares well with what prior studies have reported (e.g., Li [2008], Feldman et al. [2010]). The median firm in our sample files five 8Ks and issues no management forecasts in a given year. Finally, Table 1 presents some descriptive statistics for the other control variables included in the model.

4.2 Role of Reporting Quality in Investment Response to Collateral Shocks

Table 2 presents the results of our tests of Hypothesis 1. The first column replicates the regression specification in Chaney et al. [2011]. A key result in Chaney et al. is the evidence of the positive and significant coefficient on *RE_VALUE*. This suggests that when firm real estate values increase due to changes in real estate prices, investments increase. Specifically, the estimated coefficient of 6.29 suggests that for each dollar increase in the value of real estate, investment increases by 6.29 cents. The second column shows similar results after controlling for other determinants of investment.

The next two columns provide evidence consistent with Hypothesis 1. The coefficient of interest is the interaction between the value of real estate (*RE_VALUE*) and the proxies for reporting quality (*AQ* and *IAC_SPREAD*). To aid in interpretation, we rank *AQ* and *IAC_SPREAD* into deciles and re-scale them to range from zero to one. This way the coefficient on the interaction between reporting quality and *RE_VALUE* may be interpreted as the difference in sensitivity between firms in the top and bottom deciles of reporting quality. When using *AQ*, the coefficient on the interaction term (=-2.27) is negative and significant at the 1% level. Thus the sensitivity of investment to a change in collateral value is 2.27 lower for firms in the highest decile of accruals quality. Specifically, while the sensitivity of investments to real estate prices is 6.21 for firms in the bottom decile of accruals quality (this number equals the coefficient on *RE_VALUE* in Table 2, Column 3), the sensitivity for a firm in the top decile of accruals quality is only 3.94 (= 6.21-2.27), a decrease of 36%. The specification in the last column uses *IAC_SPREAD* as an alternate measure of reporting quality; the results are consistent. Specifically, the estimated coefficient of -3.11 on the interaction suggests that the sensitivity of investment to a change in collateral value is 3.11 lower (or 52% lower when compared to the coefficient of 5.97 in Column 4) for firms in the highest decile of information asymmetry.[10]

Before we proceed, we discuss two sources of concern about our inferences in Table 3 (and also in Tables 4 and 5 below). The first one is reverse causality: even though large firms

[10] A concern about our reporting quality measures is that they could proxy for operating uncertainty rather than reporting quality. In untabulated analyses, we have controlled for the volatility of cash flow both as a main effect and as an interaction with *RE_VALUE*. When we do so we find that the interaction between *AQ* and *RE_VALUE* remains negative but only marginally significant (t-statistic of -1.50) whereas the interaction between *IAC_SPREAD* and *RE_VALUE* remains significant (t-statistic of -2.22).

have real estate holdings that are small relative to the total state, it is conceivable that an increase in investment by a large firm could trigger an increase in state real estate prices. To address this source of endogeneity, we instrument real estate prices. Following Chaney et al. [2011], Himmelberg et al. [2005], and Mian and Sufi [2011], we use as instruments for real estate prices an interaction between local housing elasticities and changes in the interest rate at which banks refinance home loans. The intuition is that, when interest rates decrease, the demand for real estate increases. If the local supply of land is elastic (inelastic), the increased demand will translate mostly into more construction (and potentially into higher prices). In locations where land supply is more constrained, a drop in interest rate should have a larger impact on real estate prices. When we use these instrumented prices to estimate shocks to collateral value, we continue to find that the interaction term in Table 2 between the measures of reporting quality and *REAL_ESTATE* remain negative and significant.

A second concern is that shocks to real estate values also potentially proxy for shocks to growth opportunities (as opposed to shocks to collateral and external financing capacity). For example, for a homebuilder operating in a given state, an increase in real prices indicates greater growth opportunities as well as greater collateral. We note, however, that we exclude industries that are more likely to be affected by this issue (e.g., real estate and construction). Further, we control for proxies intended to capture growth opportunities such as state-level real estate prices, year fixed-effects, Tobin's q, and cash flows. In addition, while we admittedly do not have an approach to directly address this concern, we note that this effect could work against us finding our results. Specifically, to the extent that increases in real estate values proxy for increases in growth opportunities, prior literature suggests a *positive* relation with reporting quality (e.g., Bushman et al. [2011] that high reporting quality firms have a higher sensitivity of investment to changes in growth opportunities), whereas we predict a *negative* relation with reporting quality under our hypothesis that increases in real estate value proxy for changes in collateral, and that the change in collateral is more meaningful for firms with low reporting quality.

Overall the results in Table 2 are consistent with our first hypothesis that the change in collateral value has a lower impact on investment for firms with higher reporting quality than on firms with lower reporting quality. In other words, investment is more sensitive to collateral values when reporting quality is low.

4.3 Role of Reporting Quality on the Effect of Collateral Shocks on Financing

Table 3 examines the effect of financial reporting quality on the sensitivity of a firm's financing activities to collateral shocks. We present two specifications (one for *AQ* and one for *IAC_SPREAD*, respectively) for each of our three financing variables. The coefficient of interest is the interaction between the value of real estate (*RE_VALUE*) and the proxies for reporting quality (*AQ* and *IAC_SPREAD*), which are predicted to be negative. To aid in interpretation, as we did in Table 2, we rank *AQ* and *IAC_SPREAD* into deciles and re-scale them to range from zero to one.

We examine total net financing, *FIN_NET*, in Columns 1 and 2. When using *AQ*, the coefficient on the interaction term is -9.07 and significant. Thus the sensitivity of financing to a change in collateral value is 9.07% lower for firms in the highest decile of accruals quality. The specification in the last column uses *IAC_SPREAD* as an alternate measure of reporting quality; the results are consistent. Specifically, the estimated coefficient of -8.08 on the interaction suggests that the sensitivity of financing to a change in collateral value is 8.08% lower for firms in the highest decile of information asymmetry. In untabulated analysis, we find similar results for gross total financing (i.e., not including debt reductions, equity repurchases, and dividends).

In this case, the sensitivity of gross financing to a change in collateral value is about 10% lower for firms in the highest decile of information asymmetry.

To shed light on the results in Columns 1 and 2, we separately examine net debt and net equity financing. In Columns 3 and 4, we examine net debt financing (*DEBT_NET*). Contrary to our expectation, the coefficient on the interaction term for *AQ* is positive and significant. The coefficient on the interaction term for *IAC_SPREAD* is statistically insignificant. In addition contrary to our expectation, the main effect on *RE_VALUE* is insignificant in both models. In untabulated analysis, when we examine gross debt financing, we find some evidence of a significant main effect on *RE_VALUE*, but the interaction with reporting quality continues to be insignificant in both models. Taken together, these findings provide some evidence that both high and low reporting quality firms have the same sensitivity of debt financing to collateral shocks.

The final two columns examine net equity financing, *EQUITY_NET*. Here, the coefficient on the interaction term is negative and significant for both *AQ* and *IAC_SPREAD*. Again, the main effect on *RE_VALUE* is insignificant in both models. In untabulated analysis, we find similar results when we examine gross equity financing. These results suggest that low reporting quality firms do not change their equity financing in response to collateral shocks, but that high reporting quality firms do. For example, the coefficient on *AQ* in column 5 suggests that high reporting quality firms issue 7.4% more equity in response to a negative collateral shock.

Overall, the results in Table 3 are consistent with our hypothesis that a change in collateral value has a lower impact on financing for firms with higher reporting quality. Interestingly, the results appear to be driven by equity (as opposed to debt) financing. These findings, although perhaps somewhat counter-intuitive, are potentially explained as follows. A decrease in collateral reduces the ability to raise secured debt, and this reduction in secured debt is not greatly affected by reporting quality. However, ceteris paribus, this reduction in the ability to raise secured debt leads to an increase in the need for new equity. Here, our results are consistent with the intuition of prior research: equity capital is sensitive to reporting quality. However, as discussed above, empirically examining the amount of debt and equity finance raised by a firm is a lower power test of our predictions than the investment regressions; hence, we do not derive strong conclusions from these tests.

4.4 Disclosure Response to Collateral Shocks

Our next set of tests examines our second hypothesis, that firms will adjust their disclosure in response to collateral shocks. Table 4 presents the estimates of Equation (3). Column (1) uses the length of the MD&A section of the one-year-ahead 10-K statement as the measure of disclosure (*MDA_LENGTH*). The negative and significant coefficient on the *RE_VALUE* suggests that a decrease (increase) in real estate prices leads to more disclosure through an increase (decrease) in the length of the MD&A. In terms of economic significance, a one standard deviation increase in *RE_VALUE* is associated with a decrease in the length of the MD&A by 160 words. Given that the mean value of *MDA_LENGTH* is 5,569, this represents a reduction of 2.9%.[11] The next column uses *COUNT_8K* in the year following the shock as the dependent variable. Again, we observe a negative and significant coefficient on *RE_VALUE*, and the effect is stronger in the subsample of firms that own real estate. The coefficient of -0.27 suggests that for a one standard deviation change in *RE_VALUE*, the number of 8Ks filed decreases by 3.9% (based on the average of 6.94 forms per year). The third column presents the

[11] The negative coefficients for *ROA* and *Q* in the *MDA_LENGTH* regression appear, a priori, to be inconsistent with the previous literature. We note, however, that our specification uses a changes specification instead of levels. Leuz and Schrand [2009] also find a negative coefficient on *ROA* and *Q* when looking at the change in disclosure (but a positive coefficient on levels).

results for management forecasts. We observe that the relation between *RE_VALUE* and the number of forecasts is negative and significant at the 10% level. Economically, a coefficient of -0.08 suggests that a one standard deviation increase in *RE_VALUE* results in approximately a 9% reduction in the frequency of management forecasts. The last column uses one-year-ahead *IAC_SPREAD* as the proxy for disclosure; the results are similar to the results obtained with the other proxies for disclosure.

In sum, the evidence in Table 3 is consistent with our second hypothesis, that firms increase (decrease) disclosure when real estate values decrease (increase).

4.5 Sensitivity Tests

4.5.1 Over- vs. under-investment

The analysis thus far has examined the impact of the collateral shocks on investments and disclosure; it attributes this impact to reporting quality mitigating financing constraints. Implicit in this conclusion is an assumption that these firms, on average, have constrained financing capacity and are therefore under-investing, and that an increase in collateral value mitigates the under-investment problem. However, it is possible that some of our sample firms do not face financing constraints, and that some of these firms might be over-investing. In this case, when collateral values increase, any extra investment might reflect empire building instead of efficient investment.

In order to examine the sensitivity of our results to potential over-investment, we follow Biddle et al. [2009]) and categorize firms into two sub-samples based on their propensity to under- or over-invest. Specifically, we first rank firms into deciles based on their cash balance and their leverage (we multiply leverage by minus one before ranking so that, as for cash, it is increasing with the likelihood of over-investment) and re-scale them to range between zero and one. We create a composite score measure as the average of the ranked values of the two partitioning variables and compare firms in the extreme quartiles of the distribution. We classify firms in the highest quartile as those that are likely to over-invest; those in the bottom quartile are firms that are likely to under-invest.

We then examine the effect of collateral shocks on investments, financing and disclosure in both these subsamples. In terms of our predictions, firms in the bottom quartile have low cash and/or high leverage and are likely to be financially constrained. These are the firms to which the above hypotheses are most likely to apply. For the firms in the highest quartile (classified as more likely to over-invest), however, the predictions are less clear. On one hand, Biddle et al. [2009] and others provide evidence consistent with the notion that reporting quality affects investment through both the over-investment and under-investment channels. In such a case, the results could hold for this sample as well. However, firms in this group have rich internal resources, so that it is unclear whether a collateral shock would affect their investing and disclosure choices.

Table 5, Panels A, B, and C present the results for investment, financing, and reporting quality, respectively.[12] For the over-investment sample, we observe no evidence that reporting quality affects the effect of collateral shocks on both investment and financing (Panels A and B). We also find generally no evidence that collateral shocks are associated with changes in disclosure. In contrast, for the under-investment sample, the coefficients on the variables of interest in the investment and disclosure regressions (Panels A and C) are always in the expected direction, and are generally statistically significant. The results with financing (Panel B) are also

[12] We use the full sample to divide firms based on their likelihood of over-investing. Thus, when we intersect this ranking with our reporting quality measures, it results in different numbers of observations across the four columns.

in the expected direction but are insignificant. Collectively, the results in Table 5 provide support for the role of reporting quality in mitigating an under-investment problem.[13]

4.5.2 Including Operating Leases

In our investment and financing regressions, we include capital expenditures and the financing costs of capital leases (which are included in financial statements under U.S. accounting rules), but we exclude capital expenditures and the financing costs of operating leases (which are excluded from financial statements under U.S. accounting rules). While this is the approach followed by the literature, it raises a concern that firms might switch away from on-balance-sheet to off-balance-sheet investment and financing when faced with a reduction in collateralizable assets. Further, Beatty, Liao and Weber [2010] find that low accounting quality firms have a higher propensity to engage in operating lease financing rather than purchasing assets. If the propensity to lease increases for low accounting quality firms faced with collateral shocks, then our results might be affected by these firm choices.

To test the sensitivity of our results to this possibility, we employ an alternate definition of financing and investment that includes operating leases. Specifically, following Beatty et al. [2010], we estimate the asset/liability associated with operating leases.[14] We then estimate the change in asset/liability associated with operating leases as the change in the asset/liability of "capitalized" operating leases over the course of the year. This change is our estimate of the investment and financing associated with operating leases. We then re-define investment as capital expenditures plus the change in the operating lease asset, and debt financing as the

[13] As a second approach, Gan [2007] uses quantile regressions (at the 90th percentile of the investment distribution) to study whether collateral affects major investments, on the assumption that major investments are less likely to capture moral hazard (over-investment) problems. In untabulated analysis, we follow a similar methodology and find that our results on investment continue to hold, providing additional evidence on under-investment.

[14] Following Beatty et al. [2010], we estimate the total operating lease asset/liability by dividing the next-year operating leasing payment (Compustat item *MRC1*) by 0.10. This assumes an interest rate of 10% and that the payment has an infinite horizon. Beatty et al. show that this approach results in similar inferences as alternative, more complex methodologies.

change in short- and long-term debt plus the change in the operating lease liability. Consistent with our earlier approach, we scale these variables by the total lagged PPE. We then re-estimate the investment and financing regressions in Tables 2 and 3 with these adjusted measures, which include the effects off-balance sheet leases.

With respect to investment, in untabulated tests we find that the estimated coefficient of 6.29 on *RE_VALUE* observed in Table 2 increases to 10.64 cents, suggesting that for each dollar increase in the value of real estate, the investment inclusive of leases increases by 10.64 cents. The coefficients of interest, the interaction between the value of real estate (*RE_VALUE*) and the proxies for reporting quality (*AQ* and *IAC_SPREAD*), remain negative and significant. For example, when using *AQ*, the coefficient on the interaction term (=-6.64) is negative and significant at the 1% level. For total net financing, we find similar results. The coefficients of interest, the interaction between the value of real estate (*RE_VALUE*) and the proxies for reporting quality (*AQ* and *IAC_SPREAD*), remain significant, but become more negative. For example, when using *AQ*, the coefficient on the interaction term decreases from -9.07 to -17.24, and remains significant at the 1% level.

5. Conclusions

Whether and how reporting quality affects financing and investment is an area that has seen a great deal of recent academic study. We contribute to this literature by identifying an exogenous shock to the financing capacity of a firm to study a mechanism linking reporting quality to investment and financing. Specifically, we use the effect of state-level variation in real estate prices on the value of a firm's real estate holdings as a proxy for a shock to collateral values and hence to the firm's external financing capacity. We then examine the relation between reporting quality and financing and investment conditional on this shock to financing capacity. We also examine the firm's disclosure response to shocks to its collateral values.

Our analyses build on the approach in Chaney et al. [2011]. Chaney et al. estimate the sensitivity of capital investment to exogenous shocks to collateral prices and find that, over the 1993-2007 period, a positive shock to U.S. real estate values that causes an increase of collateral value by a dollar results in additional investments of six cents. However, after conditioning on financing reporting quality, we find that firms with higher reporting quality have a lower sensitivity of investment to collateral shocks. For example, the firm's sensitivity of investment to real estate prices in our sample is 36% lower for firms with a higher level of accruals quality. The results with financing show that firms with higher reporting quality have a lower sensitivity of equity financing to collateral shocks.

We then look at whether and how firms respond to the shock to their collateral values by changing their disclosure practices. We find evidence consistent with our hypothesis that firms increase disclosure subsequent to decreases in the values of their real estate assets. Specifically, voluntary disclosure (proxied by the length of the MD&A, the filing of 8Ks and the issuance of management forecasts) increases and the information asymmetry component of the spread decreases in the year subsequent to the decrease in collateral values.

Our study contributes to the literature that examines the relation between reporting quality and investment by better identifying the relation between these variables. We provide evidence consistent with reporting quality mitigating the adverse section problems that give rise to under-investment. In addition, we show that firms change their disclosure practices in response to a change in collateral values. This result contributes to the literature on the association between voluntary disclosure and external financing by providing a specific mechanism (external financing capacity) that drives the disclosure choice.

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Appendix A: Sample Calculations for International Business Machines (IBM) (millions of dollars)

Step 1: Obtain Age and Purchase Year of Real Estate

Fiscal Year 1993 data:

Property, Plant, and Equipment for Buildings at Cost = $13,314
Accumulated Depreciation for Buildings = $6,553
Proportion of Buildings Used = $6,553 / $13,314 = 0.492
Age = 40 * Proportion Used = 19.68
Purchase_year = 1993 – age = 1974

Step 2: Estimate Book Value of Real Estate

Book Value of Real Estate = Buildings at Cost + Construction in Progress at Cost + Land and Improvements at Cost = $14,736

Step 3: Estimate Market Value of Real Estate as of 1993

Market Value of Real Estate as of 1993
= RE_total * (HPI_1993/HPI_1975) * (CPI_1975/HPI_purchase_yr)
= RE_total * (HPI_1993/HPI_1975) * (CPI_1975/HPI_1974)
= $58,291

Step 4: Estimate Impact of Real Estate Shocks on Market Value of Real Estate from 1993 to 2009

Year	RE_value_1993	State Index	Mkt_RE_VALUE
1993	58,291	1.00	58,291
1994	58,291	0.98	57,082
1995	58,291	0.97	56,687
1996	58,291	0.99	57,793
1997	58,291	1.00	58,434
1998	58,291	1.05	61,451
1999	58,291	1.11	64,953
2000	58,291	1.22	70,855
2001	58,291	1.33	77,659
2002	58,291	1.47	85,883
2003	58,291	1.63	94,735
2004	58,291	1.84	107,061
2005	58,291	2.08	121,107
2006	58,291	2.23	130,004
2007	58,291	2.26	131,884
2008	58,291	2.22	129,462
2009	58,291	2.15	125,218

Table 1 - Summary Statistics

This table presents the summary statistics and correlation matrices for the variables used in this study. *INV* is capital expenditures scaled by the lagged book value of net PPE expressed in percentage points. *DEBT_NET* is net debt issuances in a given year scaled by the lagged book value of net PPE. *EQUITY_NET* is net equity financing (issuances minus repurchases minus common dividends) in a given year scaled by the lagged book value of net PPE. *FIN_NET* is the ratio of the sum of net debt issuances plus net equity issuances in a given year to the lagged book value of net PPE. $STATE\_INDEX_{93,t}$ measures the growth in real estate prices in that state from 1993 until that year. $STATE\_INDEX_{t-1,t}$ measures the growth in real estate prices in that state from the previous year. *RE_VALUE* is the market value of the firm's real estate assets as of year t scaled by the lagged book value of net PPE. *AQ* is the measure of accruals quality proposed by Dechow and Dichev [2002] and modified by Francis et al. [2005]. *IAC_SPREAD* is the adverse selection component of the bid-ask spread estimated following Madhavan et al. [1997] (in percentage points). *MDA_LENGTH* is the number of words in the MD&A section of the 10-K statement. *MGMT_FCST* is the number of management earnings forecasts in a year. *COUNT_8K* is the number of 8K forms filed by the firm in a year. *CASH FLOW* is the cash flow from operations scaled by the lagged book value of net PPE. *Q* is the market value of assets divided by their book value. *ASSET* is the book value of assets in millions of US$ in a given year. *AGE* is the number of years a firm has a record in Compustat. *LEVERAGE* is the sum of short-term and long-term debt divided by the book value of assets. *ROA* is operating income before depreciation and amortization divided by lagged total assets. *MVE* is the market value of equity assets in millions of US$ in a given year.

Variable	Mean	Median	Std	P25	P75	N
INV_t (%)	27.63	19.58	24.21	11.05	35.20	25,839
$DEBT\_NET_t$	8.25	0.00	47.12	-9.82	12.06	24,368
$EQUITY\_NET_t$	15.42	0.00	64.14	-5.85	4.31	25,472
FIN_NET_t	36.43	-0.51	126.81	-16.55	26.27	23,872
$STATE\_INDEX_{93,t}$	1.40	1.24	0.42	1.05	1.65	25,839
$STATE\_INDEX_{t-1,t}$	1.05	1.04	0.06	1.02	1.07	25,839
RE_VALUE_t	0.86	0.37	1.20	0.00	1.20	25,839
AQ_{t-1}	-0.06	-0.04	0.04	-0.07	-0.03	17,880
IAC_SPREAD_t (%)	-0.23	-0.11	0.30	-0.28	-0.03	21,721
MDA_LENGTH_t	5.56	4.69	4.02	2.57	8.10	15,388
$MGMT\_FCST_t$	1.14	0.00	2.27	0.00	1.00	19,391
$COUNT\_8K_t$	6.94	5.00	6.16	2.00	10.00	14,450
$CASH\ FLOW_t$	0.12	0.25	1.19	0.03	0.55	25,839
Q_{t-1}	1.93	1.47	1.24	1.08	2.28	25,839
$ASSET_{t-1}$	1736	146	9494	33	729	25,839
AGE_{t-1}	20.05	16.00	14.07	9.00	29.00	25,839
$LEVERAGE_{t-1}$	0.23	0.20	0.20	0.05	0.36	25,839
ROA_{t-1}	0.04	0.08	0.15	0.01	0.13	25,958
MVE_{t-1}	1,023	130	2,143	28	715	25,967

Table 2 - Role of Reporting Quality on the Effect of Collateral Shocks on Investment

This table examines the role of information quality in the effect of collateral shocks on investment. The dependent variable is *INV*, the ratio of capital expenditures to the past year's net PPE expressed in percentage points. *AQ* is a measure of accruals quality proposed by Dechow and Dichev [2002] and modified by Francis et al. [2005]. *IAC_SPREAD* is the adverse selection component of the bid-ask spread estimated following Madhavan et al. [1997] (in percentage points). $STATE\_INDEX_{93,t}$ measures the growth in real estate prices in that state from 1993 until that year. *RE_VALUE* is the market value of the firm's real estate assets as of year t scaled by the lagged book value of net PPE. *CASH FLOW* is the cash flow from operations scaled by the lagged book value of net PPE. *Q* is the market value of assets divided by their book value. *LN_ASSET* is the natural logarithm of the book value of assets in a given year. *LN_AGE* is the natural logarithm of the number of years a firm has a record in Compustat. *LEVERAGE* is the sum of short-term and long-term debt divided by the book value of assets. We also include year indicator variables (not tabulated). All variables, except *AQ* and *IAC_SPREAD*, are de-meaned at the firm level so that the model is equivalent to a model with firm fixed-effects. We rank *AQ* and *IAC_SPREAD* into deciles and re-scale them to range from zero to one. Standard errors are clustered at the state-year level. *t*-statistics are presented beneath the coefficients within parenthesis. *, **, *** denote significance at 10%, 5%, and 1%, respectively.

VARIABLES	Expected Sign	(1)	(2)	(3)	(4)
RE_VALUE_t	+	6.29***	4.34***	6.21***	5.97***
		(16.25)	(10.96)	(8.84)	(8.75)
$STATE\_INDEX_{93,t}$	?	-1.72	0.17	-2.30	-0.41
		(-0.85)	(0.10)	(-1.23)	(-0.29)
$CASH\ FLOW_t$	+		0.21	0.51**	0.51
			(0.65)	(1.98)	(1.04)
Q_{t-1}	+		6.51***	6.13***	6.54***
			(22.53)	(27.43)	(22.79)
LN_ASSET_{t-1}	+		0.40	2.24***	0.84
			(0.61)	(3.01)	(1.03)
LN_AGE_{t-1}	-		-5.77***	-3.48	-6.93***
			(-4.76)	(-1.44)	(-5.90)
$LEVERAGE_{t-1}$	-		-26.37***	-25.58***	-26.87***
			(-12.74)	(-15.10)	(-12.70)
AQ_{t-1}	?			-0.30	
				(-0.52)	
IAC_SPREAD_{t-1}	?				1.21**
					(2.44)
AQ_{t-1}*RE_VALUE_t	**H_1: -**			**-2.27****	
				(-2.33)	
IAC_SPREAD_{t-1}* RE_VALUE_t	**H_1: -**				**-3.11*****
					(-3.50)
Test of RE_VALUE + RQ*RE_VALUE					
Estimate		-	-	3.940	2.858
t-stat		-	-	5.500	4.527
Observations		25,839	25,839	17,880	21,306
R-squared		0.064	0.165	0.145	0.185

Table 3 - Role of Reporting Quality on the Effect of Collateral Shocks on Financing

This table examines the role of information quality in the effect of collateral shocks on financing. The dependent variables are *FIN_NET*, *DEBT_NET*, and *EQUITY_NET*. *DEBT_NET* is net debt issuances in a given year scaled by the lagged book value of net PPE. *EQUITY_NET* is net equity financing (issuances minus repurchases minus common dividends) in a given year scaled by the lagged book value of net PPE. *FIN_NET* is the ratio of the sum of net debt issuances plus net equity issuances in a given year to the lagged book value of net PPE. *AQ* is a measure of accruals quality proposed by Dechow and Dichev [2002] and modified by Francis et al. [2005]. *IAC_SPREAD* is the adverse selection component of the bid-ask spread estimated following Madhavan et al. [1997] (in percentage points). $STATE\_INDEX_{93,t}$ measures the growth in real estate prices in that state from 1993 until that year. *RE_VALUE* is the market value of the firm's real estate assets as of year t scaled by the lagged book value of net PPE. *CASH FLOW* is the cash flow from operations scaled by the lagged book value of net PPE. *Q* is the market value of assets divided by their book value. *LN_ASSET* is the natural logarithm of the book value of assets in a given year. *LN_AGE* is the natural logarithm of the number of years a firm has a record in Compustat. All variables, except *AQ* and *IAC_SPREAD*, are de-meaned at the firm level so that the model is equivalent to a model with firm fixed-effects. We rank *AQ* and *IAC_SPREAD* into deciles and re-scale them to range from zero to one. Standard errors are clustered at the state-year level. *t*-statistics are presented beneath the coefficients within parenthesis. *, **, *** denote significance at 10%, 5%, and 1%, respectively.

	Exp.	FIN_NET_t		$DEBT\_NET_t$		$EQUITY\_NET_t$	
VARIABLES	Sign	(1)	(2)	(3)	(4)	(5)	(6)
RE_VALUE_t	+	-0.23	-3.67	-1.59	0.97	-0.49	-2.40
		(-0.09)	(-0.94)	(-0.97)	(0.65)	(-0.29)	(-1.35)
$STATE\_INDEX_{93,t}$	?	1.26	5.76	4.19	4.58*	-3.95	-0.60
		(0.16)	(1.07)	(1.09)	(1.86)	(-1.33)	(-0.34)
$CASH\ FLOW_t$	-	-32.67***	-26.38***	-12.39***	-10.10***	-7.38***	-6.03***
		(-15.44)	(-9.14)	(-11.87)	(-8.14)	(-7.68)	(-6.00)
Q_{t-1}	+	22.66***	26.43***	5.03***	5.42***	10.17***	12.28***
		(14.84)	(14.31)	(11.74)	(15.15)	(9.29)	(12.73)
LN_ASSET_{t-1}	-	-29.20***	-36.81***	-4.15**	-3.61*	-15.98***	-20.43***
		(-5.43)	(-6.41)	(-2.34)	(-1.92)	(-6.56)	(-6.59)
LN_AGE_{t-1}	+	3.54	-0.17	-1.88	2.73	-3.43	-4.03
		(0.32)	(-0.03)	(-0.40)	(1.46)	(-0.59)	(-1.06)
AQ_{t-1}	?	-0.48		0.88		-1.01	
		(-0.14)		(1.33)		(-0.53)	
IAC_SPREAD_{t-1}	?		4.21*		2.92***		-0.19
			(1.80)		(2.65)		(-0.14)
$AQ_{t-1}*RE\_VALUE_t$	**H_1: -**	**-9.07*****		**5.91*****		**-7.41*****	
		(-2.74)		**(2.63)**		**(-3.73)**	
$IAC\_SPREAD*RE\_VALUE_t$	**H_1: -**		**-8.08***		**1.71**		**-7.07*****
			(-1.80)		**(0.79)**		**(-2.95)**
Test of RE_VALUE + FRQ*RE_VALUE							
Estimate		-9.300	-11.76	4.321	2.681	-7.908	-9.473
t-stat		-2.996	-4.061	3.084	1.610	-4.419	-5.730
Observations		16,350	19,432	16,718	19,868	17,481	20,833
R-squared		0.150	0.152	0.068	0.060	0.090	0.120

Table 4 –Effect of Collateral Shocks on Disclosure

This table examines the effect of collateral shocks on disclosure. The dependent variables are *MDA_LENGTH, MGMT_FCST, COUNT_8K*, and *IAC_SPREAD*. *MDA_LENGTH* is the number of words in the MD&A section of the 10-K statement. *MGMT_FCST* is the number of management earnings forecasts in a year. *COUNT_8K* is the number of 8K forms filed by the firm in a year. *IAC_SPREAD* is the adverse selection component of the bid-ask spread following Madhavan et al. [1997]. We rank *IAC_SPREAD* into deciles. *RE_VALUE* is the market value of the firm's real estate assets as of year t scaled by the lagged book value of net PPE. $STATE\_INDEX_{93,t}$ measures the growth in real estate prices in that state from 1993 until that year. *ROA* is operating income before depreciation and amortization divided by lagged total assets. *Q* is the market value of assets divided by their book value. *LN_MVE* is the natural logarithm of the market value of equity. *LN_AGE* is the natural logarithm of the number of years a firm has a record in Compustat. *LEVERAGE* is the sum of short-term and long-term debt divided by the book value of assets. We also include year indicator variables (not tabulated). All variables are de-meaned at the firm level so that the model is equivalent to a model with firm fixed-effects. Standard errors are clustered at the state-year level. *t*-statistics are presented beneath the coefficients within parenthesis. *, **, *** denote significance at 10%, 5%, and 1%, respectively.

	Expected	Dependent Variable			
VARIABLES	Sign	MDA_LENGTH_t	$COUNT\_8K_t$	$MGMT\_FCST_t$	IAC_SPREAD_t
$\boldsymbol{RE\_VALUE_t}$	**H_2: -**	**-0.16***	**-0.27****	**-0.08***	**-0.07***
		(-1.75)	**(-2.07)**	**(-1.83)**	**(-1.96)**
$STATE\_INDEX_{93,t}$	?	0.33	-0.47	0.16	-0.40**
		(0.96)	(-1.43)	(0.69)	(-2.22)
ROA_{t-1}	+	-1.50***	-2.01***	0.65***	1.00***
		(-7.09)	(-6.19)	(2.87)	(5.43)
Q_{t-1}	+	-0.13**	-0.17***	-0.13***	0.09***
		(-2.49)	(-3.54)	(-2.85)	(3.13)
LN_MVE_{t-1}	+	0.04	0.23**	0.52***	0.65***
		(0.47)	(2.08)	(10.73)	(14.32)
LN_AGE_{t-1}	+	0.16	-0.25	-0.69***	-0.07
		(0.57)	(-0.67)	(-3.34)	(-0.55)
$LEVERAGE_{t-1}$	-	1.08***	0.18	0.33**	-0.05
		(2.73)	(0.46)	(2.14)	(-0.22)
Observations		15,337	14,411	19,346	21,670
R-squared		0.26	0.58	0.21	0.11

Table 5 – Sub-Sample Analysis where Over-Investment and Under-Investment is Likely

This table examines the role of information quality on the effect of collateral shocks on investment (Panel A) and on financing (Panel B), and the effect of collateral shocks on disclosure (Panel C), conditional on firms' likelihood of over- or under-investing. *OVER* (*UNDER*) are firms in the upper (lower) quartile of a variable that proxies for the likelihood of over- (under-) investment. The variable is the average of a ranked (deciles) measure of cash and leverage (multiplied by minus one). *INV* is the ratio of capital expenditures to the past year's net PPE, expressed in percentage points. *AQ* is a measure of accruals quality proposed by Dechow and Dichev [2002] and modified by Francis et al. [2005]. $STATE\_INDEX_{93,t}$ measures the growth in real estate prices in that state from 1993 until that year. *RE_VALUE* is the market value of the firm's real estate assets as of year t scaled by the lagged book value of net PPE. *CASH FLOW* is the cash flow from operations scaled by the lagged book value of net PPE. *Q* is the market value of assets divided by their book value. *LN_ASSET* is the natural logarithm of the book value of assets in a given year. *LN_AGE* is the natural logarithm of the number of years a firm has a record in Compustat. *LEVERAGE* is the sum of short-term and long-term debt divided by the book value of assets. *MDA_LENGTH* is the number of words in the MD&A section of the 10-K statement. *MGMT_FCST* is the number of management earnings forecasts in a year. *COUNT_8K* is the number of 8K forms filed by the firm in a year. *ROA* is operating income before depreciation and amortization divided by lagged total assets. *LN_MVE* is the natural logarithm of the market value of equity. We also include year indicator variables (not tabulated). *FIN_NET* is the ratio of the sum of net debt issuances plus net equity issuances in a given year to the lagged book value of net PPE. All variables, except *AQ* and *IAC_SPREAD*, are de-meaned at the firm level so that the model is equivalent to a model with firm fixed-effects. We rank *AQ* and *IAC_SPREAD* into deciles and re-scale them to range from zero to one. Standard errors are clustered at the state-year level. *t*-statistics are presented beneath the coefficients within parenthesis. *, **, *** denote significance at 10%, 5%, and 1%, respectively.

Panel A: Investment

VARIABLES	(1) OVER	(2) UNDER	(3) OVER	(4) UNDER
RE_VALUE_t	4.56*	4.12***	5.48***	4.98***
	(1.69)	(3.55)	(3.17)	(6.32)
$STATE\_INDEX_{93,t}$	-4.38	-2.42***	0.11	0.90
	(-1.11)	(-2.91)	(0.04)	(0.83)
$CASH\ FLOW_{t-1}$	0.28	1.08	0.64	-0.09
	(0.47)	(0.84)	(0.97)	(-0.10)
Q_{t-1}	6.06***	5.84***	6.37***	7.69***
	(10.25)	(6.50)	(16.32)	(8.05)
LN_ASSET_{t-1}	4.32**	-0.07	0.51	0.06
	(2.53)	(-0.11)	(0.30)	(0.09)
LN_AGE_{t-1}	-2.15	-1.17	-9.93*	-1.29
	(-0.28)	(-0.55)	(-1.85)	(-1.13)
$LEVERAGE_{t-1}$	-23.36*	-22.71***	-17.18*	-21.61***
	(-1.95)	(-6.54)	(-1.81)	(-6.11)
AQ_{t-1}	-0.45	-0.03		
	(-0.42)	(-0.19)		
IAC_SPREAD_{t-1}			2.28	0.50*
			(1.59)	(1.86)
AQ_{t-1}*RE_VALUE_t	**3.67**	**-0.83**		
	(0.78)	**(-0.59)**		
IAC_SPREAD_{t-1}* RE_VALUE_t			**-0.89**	**-3.46*** **
			(-0.31)	**(-6.23)**
Test of RE_VALUE + RQ*RE_VALUE				
Estimate	8.234	3.286	4.588	1.520
t-stat	2.528	3.464	1.385	1.847
Observations	3,617	5,377	4,957	6,182
R-squared	0.108	0.137	0.144	0.161

Table 5 – cont'd

Panel B: Financing

VARIABLES	(1) OVER	(2) UNDER	(3) OVER	(4) UNDER
RE_VALUE_t	-11.73*	-1.24	0.88	-3.14
	(-1.69)	(-0.29)	(0.12)	(-1.37)
$STATE\_INDEX_{93,t}$	-10.18	8.95	-13.06	17.50**
	(-0.74)	(1.07)	(-1.48)	(2.12)
$CASH\ FLOW_{t-1}$	-18.35***	-58.44***	-11.95***	-56.75***
	(-5.87)	(-10.33)	(-6.36)	(-8.95)
Q_{t-1}	23.25***	17.27***	29.53***	21.37***
	(5.95)	(4.80)	(9.15)	(5.19)
LN_ASSET_{t-1}	-53.92***	-21.29***	-63.40***	-25.56***
	(-8.90)	(-3.84)	(-7.64)	(-4.59)
LN_AGE_{t-1}	29.26	-4.52	-23.38	5.54
	(0.86)	(-0.68)	(-1.31)	(0.95)
AQ_{t-1}	-5.23	1.61***		
	(-1.07)	(3.22)		
IAC_SPREAD_{t-1}			8.39*	4.41**
			(1.84)	(2.30)
AQ_{t-1}*RE_VALUE_t	**6.07**	**-2.42**		
	(0.40)	**(-0.44)**		
IAC_SPREAD_{t-1}* RE_VALUE_t			**-10.02**	**-0.56**
			(-0.72)	**(-0.12)**
Test of RE_VALUE + RQ*RE_VALUE				
Estimate	-5.663	-3.668	-9.140	-3.695
t-stat	-0.471	-0.838	-1.082	-0.762
Observations	3,457	4,808	4,737	5,472
R-squared	0.143	0.232	0.172	0.179

Table 5 – cont'd

Panel C: Disclosure

VARIABLES	*MDA_LENGTH$_t$*		*COUNT_8K$_t$*		*MGMT_FCST$_t$*		*IAC_SPREAD$_t$*	
	OVER	*UNDER*	*OVER*	*UNDER*	*OVER*	*UNDER*	*OVER*	*UNDER*
RE_VALUE$_t$	**-0.12**	**-0.31****	**-0.04**	**-0.25**	**-0.03**	**-0.19*****	**0.04**	**-0.16****
	(-0.97)	**(-2.21)**	**(-0.22)**	**(-1.46)**	**(-0.44)**	**(-2.72)**	**(0.28)**	**(-2.32)**
STATE_INDEX$_{93,t}$	1.40***	-0.39	0.26	0.56	0.95**	0.49	-0.23*	-0.04
	(3.13)	(-0.77)	(0.38)	(1.43)	(2.35)	(1.34)	(-1.65)	(-0.14)
ROA$_{t-1}$	-0.81***	-1.49	-1.01	-1.55	0.27	1.09**	0.86***	1.52***
	(-4.26)	(-1.41)	(-1.44)	(-1.41)	(0.99)	(2.46)	(3.00)	(3.72)
Q$_{t-1}$	-0.04	0.03	-0.17***	0.04	-0.14***	-0.20*	0.11***	0.20***
	(-0.85)	(0.17)	(-3.61)	(0.23)	(-3.71)	(-1.80)	(4.96)	(3.31)
MVE$_{t-1}$	0.22***	-0.17*	0.35***	-0.19**	0.45***	0.48***	0.56***	0.53***
	(4.04)	(-1.94)	(4.28)	(-2.07)	(7.63)	(8.36)	(9.82)	(7.58)
AGE$_{t-1}$	-0.28	0.46	2.01***	0.29	0.25	-0.66**	0.29	0.23
	(-0.70)	(1.28)	(3.20)	(0.69)	(0.80)	(-2.51)	(0.87)	(1.16)
LEVERAGE$_{t-1}$	0.24	0.25	1.68	-0.62	-0.29*	-0.18	0.91***	-0.93**
	(0.38)	(0.37)	(1.23)	(-0.90)	(-1.70)	(-0.47)	(2.68)	(-2.52)
Observations	3,305	4,774	3,071	4,378	4,420	5,719	5,058	6,276
R-squared	0.23	0.25	0.48	0.53	0.17	0.18	0.16	0.09