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Financial Capacity and the Demand for Audit Quality

ABSTRACT

Prior research documents that financial capacity could be positively or negatively associated with the demand for audit quality. We re-examine this relation using changes in local real estate prices as exogenous shocks to corporate financial capacity. Using auditor size, auditor industry specialisation, and auditor fees as measures of audit quality, we find robust evidence that an increase (decrease) in financial capacity significantly reduces (increases) the demand for audit quality, and that this relation is more pronounced when firms are more financially constrained, when external monitoring by institutional investors and financial analysts is weaker, and when there is more negative news about real estate price changes. Our study enriches the related literature by describing a more complete and dynamic relationship between audit quality and financial capacity.

JEL classification: *G12; M41; M42;*
Keywords: Audit Quality; Financial Capacity; Real Estate; Financial Constraint

Financial Capacity and the Demand for Audit Quality

1. Introduction

Recent studies in economics and finance have examined the effect of real estate prices on corporate financing and investment decisions. Since real estate is the most commonly used collateral, exogenous changes in real estate prices affect firms' collateral values, and thus result in exogenous changes in firm's financial capacity.[1] Research finds that firms adjust their investment (Chaney et al. 2012), cash holding (Chen et al 2017), financial reporting quality (Balakrishnan et al. 2014), and capital structure (Cvijanović 2014) in response to the exogenous changes in financial capacity induced by real estate price changes. Following this stream of research, we use changes in local real estate prices to identify exogenous shocks to corporate financial capacity and examine the consequences of changes in financial capacity for the demand for audit quality.

In an ideal world without information asymmetry, there are no financial frictions and firms can borrow as much as needed. In the real world, however, the existence of information asymmetry between managers and outsider stakeholders leads to financial frictions that constrain firms by preventing them from funding all desirable (value-enhancing) investments. Consequently, financial capacity and financial constraints are two sides of the same coin. Firms with high (low) financial capacity are less (more) likely to be financially constrained and, therefore, less likely to forgo desirable investments. To alleviate financial constraints and to access more external financing at lower cost, managers have an incentive to reduce information asymmetry and increase monitoring effectiveness, which creates demand for assurance of

[1] This is labelled as the 'collateral channel' of real estate prices in Chaney et al. (2012).

financial statement information from an independent third party such as an auditor (Jensen and Meckling 1976; Francis and Wilson 1988; Lennox 2005; DeFond and Zhang 2014). When firms have limited financial capacity (i.e. they cannot easily access external financing at relatively low cost), they demand high quality audit in order to reduce agency costs and raise capital at a cheaper rate. However, when firms have large financial capacity and can easily access external financing at relatively low cost, the demand for high quality audit is low because the agency costs between managers and outsider stakeholders are less severe or less relevant. Based on this reasoning, we hypothesise a *negative* relationship between a firm's financial capacity and its demand for audit quality.

This argument is consistent with Jiang and Zhou (2017) who investigate the role of audit verification in the resolution process following debt covenant violation. They report that covenant violation increases the demand for audit services to help control contracting costs post violation. To the extent that debt covenant violation increases future borrowing costs and reduces financial capacity, Jiang and Zhou's results imply a negative relation between financial capacity and audit quality.

Contrary to our prediction, some prior studies suggest that audit quality increases financial capacity. For example, voluntary audit or high-quality audit helps firms to access more debt financing (Allee and Yohn 2009; Kausar et al. 2016) at lower cost (Blackwell et al. 1998; Pittman and Fortin 2004) and receive more favourable bond ratings (Mansi et al. 2004), which suggests that audit quality increases financial capacity. In this study, we revisit the relation between financial capacity and audit quality because the relation is ambiguous.

The major difficulty in testing whether financial capacity affects the demand for audit quality is the endogenous nature of the relationship (DeFond and Zhang 2014). The relation between audit quality and financial capacity could be dynamic; in other words, not only could audit quality affect financial capacity, but financial capacity could also affect audit quality. Also, both financial capacity and audit quality may be affected by other variables.[2] An exogenous instrument and setting to properly control for the potential endogeneity therefore is crucial to distinguish these relationships.

In this study, we rely on changes in local real estate prices to measure exogenous shocks to corporate financial capacity and study the effects of changes in financial capacity on the demand for audit quality. Research suggests that because a firm's decisions do not affect the change in financial capacity caused by variation in local real estate prices, real estate price changes can serve as a measure of exogenous change in the financial capacity of a firm (Chaney et al. 2012; Balakrishnan et al. 2014; Cvijanović 2014).

We conduct our empirical analysis using firm fixed-effects regression on a large sample of firms spanning the period 1993-2018. As indicated in Balakrishnan et al. (2014, p2), this methodology is 'analogous to a difference-in-differences specification' that compares changes in audit quality between firms that are more affected and firms that are less affected by changes in real estate values. Because audit quality is not directly observable, we use several proxies of audit quality that have been used in prior research. Specifically, we use the following three input measures of audit quality in our main analysis: (i) auditor size (Che et al. 2020; Becker et al. 1998; Teoh and Wong 1993; Chang et al. 2009); (ii) auditor industry specialisation (Li et al. 2010; Francis et al. 2005; Reichelt and Wang 2010), and (iii) audit fees (Engel et al. 2010; Choi et al. 2008; Ke et al. 2014; Jiang and Zhou 2017).

We find that an exogenous change in financial capacity significantly alters the demand for audit quality. Specifically, financial capacity is negatively related to auditor size, auditor industry

[2] For example, corporate governance may simultaneously affect both financial capacity and audit quality.

specialisation, and audit fees. We also find that this relation is more pronounced when firms are more financially constrained, when there is weaker monitoring by institutional investors and financial analysts, and when there is more negative news about real estate price changes. Overall, the evidence indicates that decreased (increased) financial capacity leads to increased (decreased) client firm demand for audit quality, especially in instances when information asymmetry is high. This result is consistent with the finding in Jiang and Zhou (2017) that firms that violate debt covenants demand higher audit quality to reduce contracting costs post violation.

Although we use exogenous changes in real estate prices to examine our research question, our study may still suffer from endogeneity and measurement error in real estate values. Although we follow Chaney et al. (2012) and conduct additional tests to address these concerns, we acknowledge that these tests may not fully eliminate the concerns and hence our findings should be interpreted with this caveat in mind.

Notwithstanding the above limitations, our study makes three important contributions. First, it adds to the literature on the demand for audit quality. DeFond and Zhang (2014) identify the demand for audit quality as an important topic of auditing research on which we have 'relatively limited' evidence, and call for 'a deeper understanding of the factors that drive the demand for auditing and audit quality' (DeFond and Zhang 2014, p296). Our research answers their call and investigates the effect of financial capacity on the demand for audit quality.[3] Our study also complements Jiang and Zhou (2017) who focus on a specific event, i.e. covenant violation, whereas we provide corroborative evidence by examining how changes in financial capacity

[3] Two recent studies, Fung, Wang, Zhang, and Zhu (2015) and Gunn, Hallman, Li and Pittman (2017) use brokerage house closures/mergers as a natural experiment to identify exogenous increases in information asymmetry. Their results show that firms' demand for audit quality increases after they experience exogenous reductions in analyst coverage.

resulting from annual changes in real estate values from a broader sample may affect audit quality.

Second, we rely on an exogenous variable developed in the economics literature to measure financial capacity. Previous studies show that financial capacity could be positively or negatively associated with audit quality, which suggests that audit quality and financial capacity are likely to be endogenously determined. By using this exogenous variable, we are able to establish a clearer causal relationship between financial capacity and audit quality. Our evidence indicates that firms strategically choose their audit quality as a response to changes in financial capacity.

Third, our research adds to the growing literature that investigates the effect of real estate price changes on firms' investing and financing decisions (e.g. Gan 2007; Benmelech and Bergman 2009; Chaney et al. 2012) by documenting the effect of real estate price changes on audit quality. Balakrishnan et al. (2014) find that firms improve financial reporting quality in response to a decline in their real estate values. Our results complement Balakrishnan et al. by documenting that the demand for higher audit quality could be a channel through which firms improve their financial reporting quality.

The remainder of the paper is organised as follows. Section 2 discusses the prior literature and develops the hypothesis. Section 3 describes the research design and sample selection. Section 4 presents the results of the empirical analyses. Section 5 concludes the study.

2. Hypothesis Development

As discussed in Modigliani and Miller (1958), there is no financial friction in an ideal world without information asymmetry. Firms can borrow as much as needed to fund all value-increasing investment opportunities. Thus, financial capacity is irrelevant in such an environment.

In the real world, however, there exist information asymmetry and agency conflicts between managers and outsider stakeholders; therefore firms have limited capacity to borrow externally. When external financing cannot meet the needs of investment, firms have to forgo investments with positive NPV (Myers 1977; Stein 2003). According to Lamont et al. (2001), financial frictions that prevent firms from funding all desired investments are ‘financial constraints’; and firms that invest less than the optimal level due to financial constraints are ‘financially constrained firms’. Financial capacity and financial constraints are closely related; firms with high (low) financial capacity are less (more) likely to forgo desired investments and, therefore, are less (more) likely to be financially constrained.

Financial frictions cause firms to choose an investment level that deviates from the optimal level and inevitably leads to deadweight costs. For example, Lamont et al. (2001) find that financially constrained firms earn lower stock returns. Cohn and Wardlaw (2016) report that financially constrained firms have to cut investments in workforce safety, which leads to higher injury rates.

To reduce the adverse effects of financial constraints and to increase financial capacity, firms make strategic choices. For example, Edwards et al. (2016) and Law and Mills (2015) both document that firms facing financial constraints increase internally-generated funds via tax planning. The evidence is consistent with tax avoidance serving as a cheap alternative financing channel. Balakrishnan et al. (2014) argue that firms adjust financial reporting quality in response to a change in financial capacity. When financial capacity decreases, firms are more likely to increase financial reporting quality in order to decrease information and financing costs. They find that firms improve (reduce) their financial reporting quality when financial capacity decreases (increases). Chen et al. (2017) document a negative relationship between changes in firms' cash holdings and financial capacity, which suggests that firms save internal funds to mitigate the adverse effects. Sharpe and Nguyen (1995) find that firms overcome financing constraints by leasing assets instead of purchasing them. Irani and Oesch (2015) document that firms increase voluntary disclosure to alleviate information-based financing frictions in response to an exogenous shock to financial constraints.

In this study, we argue that a change in financial capacity will alter a firm's incentive to hire a high-quality auditor. When a firm faces a decrease in financial capacity, the likelihood that it cannot access sufficient external financing increases, thus increasing the likelihood that the firm has to forgo investment opportunities. Because the basic reason for financial friction is information asymmetry between the firm and outsider investors (see Stein 2003 for a review), firms have strong incentives to reduce information asymmetry and increase monitoring effectiveness. Hiring a high-quality auditor is therefore a viable, effective option.

The audit literature suggests that auditing adds value because it helps to assure that a firm's financial statements faithfully reflect the underlying economics (Jensen and Meckling 1976; DeFond and Zhang 2014). DeAngelo (1981) asserts that a high-quality audit is more likely to 'detect and report errors or irregularities in financial statements,' and thereby to ensure the 'reliability of the accounting information' that is used to price equity and debt, and to assess the 'risk of covenant violation'.

The literature also indicates that voluntary audit or high-quality audit can effectively increase the quality and reliability of financial statement disclosures and reduce information asymmetry, and thereby help firms to mitigate financial frictions and increase access to external financing. For example, Allee and Yohn (2009) find that small, privately held firms with audited financial statements have greater access to credit. Mansi et al. (2004) find that, when compared to clients of non-Big 4 auditors, clients of Big 4 auditors have higher bond ratings and lower bond yield spreads. They suggest that auditing can serve the insurance and information roles, both of which are valuable to capital market participants. Consistent with the Mansi et al. (2004) findings, Blackwell et al. (1998) document that audited firms incur lower cost of debt than non-audited firms, and Pittman and Fortin (2004) report that young firms with a high-quality auditor receive lower cost loans.

Extending this line of reasoning, we expect the demand for audit quality to be correspondingly affected by the change in financial capacity. When a firm's financial capacity decreases (i.e. it cannot easily access external financing), it faces possible loss due to financial constraints. As a result, managers are more likely to engage higher quality auditors to alleviate information asymmetry and the adverse effects of financial constraints. Conversely, when a firm's financial capacity increases (i.e. it can easily access external financing), it has less need to rely on high-quality financial information to reduce agency costs and improve financial capacity, which in turn reduces the demand for audit quality. This argument suggests a *negative* relation between financial capacity and the demand for audit quality. Accordingly, we hypothesise the following:

Hypothesis 1: The demand for audit quality is decreasing in financial capacity.

Although we hypothesise a *negative* relation between financial capacity and demand for audit quality, the relation is not obvious in light of the findings of current auditing research. A major difficulty in testing whether financial capacity affects the demand for audit quality is the endogenous nature of the relationship. As highlighted in DeFond and Zhang (2014), this endogeneity problem is particularly acute in the context of audit quality demand. On the one hand, financial capacity could affect audit quality; on the other hand, audit quality could also affect financial capacity. As discussed earlier, previous audit literature indicates that voluntary audit or higher quality audit helps firms to access more debt financing at a lower cost (Allee and Yohn 2009; Mansi et al. 2004; Blackwell et al. 1998; Pittman and Fortin 2004). In a similar vein, Kausar et al. (2016) report that firms that voluntarily obtain an audit significantly increase their debt and investment. Collectively, these studies suggest that audit quality enhances firms' financial capacity and reduces borrowing cost, which suggests a *positive* relationship between audit quality and financial capacity.

There are also reasons to expect no relationship between financial capacity and the demand for audit quality. Because switching auditors is costly, it is ex-ante unclear whether changes in financial capacity *per se* will lead a firm to appoint a new auditor. When a firm attempts to reduce information asymmetry in order to boost financial capacity, it may rely on other mechanisms to do so, such as making more voluntary disclosures (Balakrishnan et al. 2014a) rather than choosing a high-quality auditor. Further, prior studies show that managers may avoid appointing a higher quality auditor to extract rents by exploiting an increase in information asymmetry to hide their diversionary practices (Wang et al. 2008; Guedhami et al. 2009; Irani and Oesch 2013). Therefore, the relationship between audit quality and financial capacity is ex-ante unclear. In addition, because the relation may be endogenous, an appropriate empirical design is essential to deal with the endogeneity problem.

To overcome the endogeneity problem, we test the relation between financial capacity and audit quality demand using a novel experimental design developed by Chaney et al (2012) that has been used in prior research (e.g. Chen et al. 2017; Balakrishnan et al. 2014). Following these studies, we use variations in the value of a firm's collateral caused by fluctuations in local real estate prices as an external shock to the financial capacity of a firm. This identification approach is efficacious because the financial capacities of firms with different levels of real estate assets will be differentially affected by real estate price changes. In other words, a firm with higher real estate assets will experience a larger change in financial capacity from a given change in real estate prices than will a firm with lower real estate assets. Another advantage of this identification strategy is that it resolves the omitted variables problem because it allows ‘multiple shocks to different firms at different times and at different locations (states or Metropolitan statistical areas (MSA))’ (Chen et al. 2017, p3). Thus, our research design facilitates assessment of the casual effect of financial capacity on audit quality.

3. Research Design and Sample

We begin by discussing the primary variables and then describe the sample and empirical models.

3.1 *Financial capacity*

Following Chaney et al. (2012), we use the change in a firm’s real estate value to represent the change in its financial capacity. Real estate value has been widely used to proxy financial capacity in corporate finance research (Chen et al. 2017; Cvijanović 2014; Kumar and Vergara-Alert 2015; Carvalho 2018; Bennett et al. 2016), and to a lesser extent in accounting research (Balakrishnan et al. 2014). For example, Balakrishnan et al. (2014) use real estate value as a proxy of financial capacity to investigate the role of financial reporting quality in mitigating financial constraints.

We use the market value of real estate assets as our primary variable. First, following Nelson et al. (2000), we define real estate assets as the sum of the following three major categories of property, plant, and equipment: buildings, land and improvements, and construction in progress. Since the values of these assets are reported at historical cost, we need to estimate their market values. Following the procedure outlined in Chen et al. (2017, p6), we estimate the average age of these assets as the product of the ratio of the accumulated depreciation of buildings to their historical cost and the average depreciable life (assumed to be 40 years). This procedure allows us to estimate the year in which the firm purchased the real estate assets. We then use either a state level or a MSA level real estate price index to estimate the market value of a firm's real estate assets for each year of our sample period (i.e. 1993-2018).

As in Chen et al. (2017, p6), we match the state-level real estate price index with our accounting data using the state identifier from Compustat. For the MSA-level real estate price index, we utilise a mapping table between zip code and MSA code maintained by the Department of Labor Office of Workers' Compensation Programs (OWCP), to match with our accounting data from Compustat. This estimation approach implicitly assumes that most of a firm's real estate assets are located in the same place as their headquarters. Chaney et al. (2012) and Cvijanović (2014) indicate that this is a valid assumption.[4] Because Compustat provides only the most current headquarters location and some firms may move their headquarters, we adjust the headquarters location information to that of year 1993 using the SEC filing information from the WRDS SEC Analytics Suite database.

A drawback of this approach is that it ignores new real estate repurchases and sales after 1993. This omission is both beneficial and detrimental. The benefit is that it avoids endogeneity between real estate purchases and investment opportunities; the drawback is that it likely introduces noise into the measure. In robustness tests, we exclude firms that disposed of all their

[4] For example, to check the validity of this approximation, Chaney et al. (2012) manually collect information on the ownership status of a firm's headquarters from the 10K forms filed with the SEC for the year 1997. They find that only 2% of the firms (out of 1,578 firms) that report owning no real estate assets in Compustat, report owning their headquarters in their 10K forms. On the other hand, of the 1,815 firms that report owning some real estate assets in Compustat, 44% actually report owning their headquarters in their 10K forms. This under-representation of real assets in Compustat implies that the assumption that real estate assets are located in a firm's headquarters is conservative and tends to underestimate the impact of a firm's collateral on its investment.

real estate assets during our sample period and firms without real estate assets in 1993 that subsequently acquired real estate during the sample period and find consistent results.

Finally, as in Chen et al. (2017), we divide the real estate asset market value measure for each firm by the firm's total assets. The average market value of real estate to total assets for our sample firms over 1993-2018 is 24.3%, which indicates that real estate assets comprise a large fraction of total assets for our sample firms.

3.2 *Audit quality*

Audit quality requires the use of proxies because it cannot be directly observed. In our main analysis, we use three input-based proxies for audit quality (DeFond and Zhang 2014). Our first proxy is Big N membership (*BIGN*) because several studies document a positive association between Big N auditors and audit quality (e.g. Becker et al. 1998; Teoh and Wong 1993; Chang et al. 2009).[5] Che et al. (2020) show that Big N auditors provide higher audit quality because of their ability to recruit higher quality personnel, increased emphasis on learning, and stronger incentives and monitoring systems.

Another stream of literature suggests that industry specialist auditors and city-level audit specialists offer a higher level of assurance compared to non-specialists (Reichelt and Wang 2010; Li et al. 2010). These studies typically use industry market share, either at the national or the city level, to measure auditor specialisation. The assumption is that higher market share in an industry is associated with a higher level of auditor specialisation. Consistent with these studies, we use the auditor market share at the national level (*MSHARE*) to proxy for auditor industry specialisation. In supplementary analysis, following Reichelt and Wang (2010), we use the

[5] Using a Propensity Score Matching (PSM) research design to control for self-selection, Lawrence et al. (2011) do not find a significant difference in quality between Big N and non-Big N auditors. However, DeFond et al. (2016) report that Lawrence et al.'s results are sensitive to the research design choices inherent in PSM. Using an alternate matching procedure, DeFond et al. (2016) find that Big N auditors have higher audit quality.

following three indicator variables to measure auditor specialization: national level industry specialist (*NSPEC*), city level industry specialist (*CSPEC*), and both national level and city level industry specialist (*BSPEC*). In addition, we use the auditor market share at the city level (*CMSHARE*) to proxy for auditor industry specialisation. We use a continuous market share measure rather than a binary measure in the main analysis because it has more variation and contains more information.

Our third proxy for audit quality is fees paid to the auditor (*AFEE*), which is an input to the audit process that is related to audit quality (DeFond and Zhang 2014). Audit fees have been commonly used in prior studies to measure audit quality (e.g. Engel et al. 2010; Choi et al. 2008; Ke et al. 2014; Jiang and Zhou 2017). We provide details of the various audit quality proxies in Table 1.

3.3 *Sample*

Our sample period spans the 26 years from 1993 to 2018. It begins in 1993 because this is the last year that Compustat provides information about accumulated depreciation on buildings. Our initial sample includes all the firms in Compustat in 1993 with available data on total assets. We retain firms whose headquarters locate in the U.S. These selection criteria result in 188,979 firm-year observations. We remove 46,964 firm-years without data for the financial variables. Following Chaney et al. (2012) and Cvijanović (2014), we exclude 45,693 observations for firms in the finance, insurance, real estate, construction, and mining industries, and 1,305 observations for firms that engaged in major acquisitions. We obtain data on MSA- and state-level residential and land price indices for computing the market value of real estate assets from the Office of Federal Housing Enterprise Oversight (OFHEO). We merge these price indices with the

Compustat firms and eliminate 61,219 firm-years without market values of real estate.[6] We further remove 4,331 firm-years for sample firms that do not have financial information in 1993. Finally, consistent with prior studies (Chaney et al. 2012; Cvijanović 2014; Balakrishnan et al. 2014), we remove 485 firm-years that do not have at least three consecutive years of data during the sample period. Our final sample includes 28,982 firm-year observations for 2,258 unique firms.

3.4 *Empirical model*

We use the following regression model to estimate the relation between financial capacity and audit quality for firm i, with headquarters in location j (state or MSA), in fiscal year t:

$$AuditQuality_{i,j,t+1} = \alpha + \beta_1 RE\ Value_{i,j,t} + \beta_2 RE\ Index_{j,t} + \delta' X + \varepsilon_{i,j,t+1} \quad (1)$$

where *AuditQuality* in fiscal year t+1 is our proxy for audit quality (*BIGN*, *MSHARE*, or *AFEE*), *RE Value* is the market value of real estate assets at the end of fiscal year t, scaled by total assets, and *RE Index* is the state-level or MSA-level real estate price index for location j in fiscal year t.[7]

The vector X includes a set of firm-specific control variables that have been identified in prior research (e.g. Mansi et al. 2004; Francis et al. 2005; Chang et al. 2009; Choi et al. 2008; DeFond and Zhang 2014). The number of control variables used in the regression differs across the audit quality proxies used. These control variables include: (1) *SIZE*, defined as the natural log of total assets; (2) *LEV*, leverage, defined as total liabilities divided by total assets; (3) *LOSS*,

[6] A large portion (about 35%) of our sample firms do not have RE values. We follow Chaney et al. (2012) closely to calculate real estate values, but as in Chaney et al. (2012), there are many missing data to estimate the real asset values. Chaney et al. (2012) start with an initial sample size of 50,858 firm-year observations, but are left with only 27,543 observations with real estate values in their sample. The loss in sample observations is about 45% in their study.

[7] Our proxies of audit quality are measured at one-year after the changes in financial capacity. We assume that firms are able to adjust their demand for audit quality one year after the change in financial capacity. This assumption appears reasonable because the firms could appoint a new auditor or retain the existing auditor at the annual general meeting, which typically occurs at the end of the year. We also repeat the analysis after relaxing this assumption by measuring audit quality at year t+2 instead. Our main results are robust when audit quality is measured over this longer horizon of two years.

an indicator variable that equals 1 if firms report negative income before extraordinary items, and 0 otherwise; (4) *ROA*, return on assets, defined as income before extraordinary items divided by total assets; (5) *CATA*, current assets ratio, defined as current assets divided by total assets; (6) *SG*, sales growth, defined as the difference between sales and lagged sales divided by lagged sales; (7) *ATO*, assets turnover, defined as sales divided by total assets; (8) *CAPINT*, capital intensity, defined as property, plant and equipment (gross) divided by total assets; (9) *Finance*, an indicator variable that equals 1 if a firm issues either debt or equity, and 0 otherwise; (10) *QUICK*, defined as current assets minus inventory divided by current liabilities; (11) *ARINV*, defined as inventory plus receivables divided by total assets; (12) *FOR*, an indicator variable that equals 1 if firms report any foreign pretax income, and 0 otherwise; (13) *NBS*, number of segments, defined as natural log of 1 plus the number of business segments; (14) *GC*, an indicator variable that equals 1 if firm receives going concern audit opinion, and 0 otherwise; (15) *DEC*, an indicator variable that equals 1 if a firm's fiscal year ends in December, and 0 otherwise; (16) *MB*, market-to-book ratio, defined as the ratio of market value of assets to their book value; (17) *Accruals*, defined as income before extraordinary items minus operating cash flow divided by total assets. The detailed definitions of these control variables are provided in Table 1. Finally, we include firm and year fixed effects in the regression model.

In the regression, *RE Index* is the index of real estate prices in the state or city where the firm's headquarters are located from 1993 to year t. This variable, together with the year fixed effects, controls for time-series changes in the economy and in the real estate price index. The inclusion of firm fixed effects gives the coefficients a changes interpretation; that is, a negative coefficient β_1 implies that an increase (decrease) in real estate values and thus the corresponding increase (decrease) in financial capacity are associated with a decrease (increase) in audit quality.

In all regressions, the standard errors are clustered by state-year (or MSA-year). Because *RE Value (State)* and *RE Value (MSA)* are derived from the price index measured at the State or MSA level, the state-year or MSA-year clustering leads to more conservative standard errors (Chaney et al. 2012; Cvijanović 2014; Balakrishnan et al. 2014).

There are two possible sources of endogeneity in the above specification. First, a firm's decision to own real estate may be endogenously determined; for example, a firm that owns real estate may be more sensitive to local demand shocks. Second, although the change in real estate value is exogenous to a firm's decision on audit quality, the endogeneity problem may still exist because these two variables could be affected by some omitted variable. For example, an unobserved economic shock could impact development of the local economy, and hence affect real estate prices and firm activities.

To address the first endogeneity concern, we control for the initial firm characteristics by interacting them with real estate prices. As argued by Kumar and Vergara-Alert (2015, p13), "if these controls identify characteristics that make a firm more likely to own real estate, and if these characteristics also make the firm more sensitive to fluctuations in real estate prices, controlling for the interaction between these characteristics and contemporaneous real estate prices allows us to separately identify the causal relation between financial capacity and audit quality demand." As shown in Chaney et al. (2012), firm age, total assets, return on assets, industry, and state are factors that may affect a firm's decision to own real estate. We estimate regressions using two dependent variables: *RE Owner,* an indicator variable indicating whether the firm owns real estate; and *RE Value* (*State*), which measures the market value of the firm's real estate assets. We use the initial firm characteristics as independent variables. The results are presented in Appendix 1. Consistent with the findings of Chaney et al. (2012) and Kumar and Vergara-Alert

(2015), we find that firms that are older, larger, and more profitable are more likely to own real estate assets. Therefore, we include the interactions between these firm characteristics and real estate prices in all our main analyses.

We address the second endogeneity concern by using the instrumental variable (IV) approach outlined in Chaney et al. (2012). We explain this IV approach in greater detail in a subsequent section of the paper.

4. Empirical Evidence

Table 2 provides descriptive statistics of the variables used in the study. The main variables of interest are *RE Value (State)* and *RE Value (MSA)*, which represent the real estate value of firms using the state price index or the MSA price index, respectively, for computing real estate market values. Following Chaney et al. (2012) and Balakrishnan et al. (2014), we winsorize each of these variables at 5%.[8] The mean *RE Value (State)* and *RE Value (MSA)* are 0.243 and 0.234, respectively. These magnitudes are comparable to prior studies. For example, Chen et al. (2017) report mean values of 0.246 and 0.240 for the two measures based on state and MSA price indices. Balakrishnan et al. (2014) report 0.27 for real estate values based on the state level price index. In the year 1993, on average, 60.9% of the firm's own real estate and the age of the real estate assets is about 13.5 years. As indicated in Table 2, 80.8% of the sample firms employ Big N auditors. The mean market share of an auditor at the national level is about 19.4%. The mean audit fee is 13.504, which in dollar terms, is equivalent to $732,338. The distributions of the other variables used in the regression are also reported in Table 2.

We report the main results in Table 3. The dependent variable is *BIGN* in models (1) and

[8] Other continuous variables, except for State and MSA price index are winsorized at 1%. Our results are similar if we also winsorize State and MSA price index at 1%. This winsorization is needed to prevent extreme values from having an undue influence on the results. Our results are not sensitive to the cut-off used (whether 5% or 1%) in the winsorizing process. We also use Robust Regression to estimate the coefficients of untransformed RE Value following the suggestion in Leone et al. (2019). Our results are generally consistent with this alternative specification.

(2), *MSHARE* in models (3) and (4), and *AFEE* in models (5) and (6). For each dependent variable, we report the results when the market values of real estate are measured at the state and the MSA level. In all regressions, we deal with the ownership endogeneity by controlling for firm characteristics (age, assets, return on assets, industry and state dummies) that might be correlated with real estate ownership and include both these characteristics and their interactions with changes in local real estate prices as control variables. Because our measurement of financial capacity requires the use of firm fixed effects and interactions, we follow recent studies (e.g. Hanlon and Hoopes 2014; Lamoreaux 2016) and use a linear regression model when audit quality is proxied by *BIGN*. The sample size is considerably smaller when audit quality is proxied by audit fees because audit fees are only available after 2000.

Our maintained hypothesis is that firms increase (reduce) the demand for audit quality when there is a decrease (increase) in financial capacity as reflected by changes in the real estate prices. Therefore, we predict that the coefficient β_1 in equation (1) is negative. Because we include firm fixed effects in the regression, we can interpret the coefficients as changes. Accordingly, a negative β_1 indicates that an increase (decrease) in the market value of real estate assets is associated with a decrease (increase) in the demand for audit quality.

Consistent with our prediction, across all six models, we find that *RE Value (State)* and *RE Value (MSA)* have a negative and statistically significant coefficient at the 1% level. This evidence provides strong support for H1 that the demand for audit quality is decreasing in financial capacity (as reflected in the value of real estate assets). The effect is also economically non-trivial. For example, when audit quality is proxied by audit fees, a one standard deviation decrease in *RE_Value (State)* and *RE_Value (MSA)* is associated with a 3.38% (0.104*0.325) and a 2.38% (0.073*0.326) increase in *AFEE*, respectively.[9]

The coefficients on the control variables are generally consistent with prior studies. For example, the demand for Big N auditors is higher for firms that are larger, have lower sales growth, are less profitable, and issue less debt or equity. When audit quality is proxied by *AFEE*, we find that audit quality is higher for firms that are larger, more leveraged, less profitable, and less liquid, have more inventory and receivables, business segments, and foreign operations, and that received a going concern opinion.[10]

4.1 *Instrumental variable analysis*

Although we use exogenous changes in real estate prices to examine our research question, it is still possible that the changes in real estate prices and audit quality demand are jointly determined by an omitted variable. To alleviate this endogeneity concern, we follow Chaney et al. (2012) and Chen et al. (2017) and use the interaction of local housing elasticity with the nationwide mortgage rate that banks use to refinance their home loans as an instrument for MSA real estate prices. This instrument is appropriate because the effect of mortgage rate on real estate prices varies with land supply elasticity. For example, the decrease in demand related to an increase in the mortgage rate in a region with high land supply elasticity will result in lower supply through reduced new construction rather than lower real estate prices. However, an increase in the mortgage rate in a region with inelastic land supply will lead to lower real estate prices rather than lower supply. Thus, the effect of a change in the mortgage rate on real estate

[9] The other comparative statics are computed analogously. When audit quality is proxied by Big N membership, a one standard deviation decrease in *RE_Value (State)* and *RE_Value (MSA)* is associated with a 3.19% and a 2.48% increase in *BIGN*, respectively. When audit quality is proxied by auditor industry specialization, a one standard deviation decrease in *RE_Value (State)* and *RE_Value (MSA)* is associated with a 1.40% and a 1.34% increase in *MSHARE*, respectively.

[10] Although Big N auditors is one of our dependent variables, it may be positively associated with auditor industry specialization and audit fees. Accordingly, as a robustness check, we include an additional control, *BIGN*, in models (3) to (6). The untabulated results indicate that our main inferences remained unchanged after the inclusion of *BIGN*.

prices will be greater when the land supply elasticity is lower. Based on the above reasoning, we formulate the following model to predict the MSA real estate price index in fiscal year *t*:

$$RE\ Price\ Index_{j,t} = \alpha_j + \gamma_t + \beta_1 * Housing\ supply\ elasticity_j * Mortgage\ rate_t + \mu_{j,t} \qquad (2)$$

where *RE Price Index* is the real estate price index, defined at the MSA level, *Housing supply elasticity* measures constraints on land supply at the MSA level, and *Mortgage rate* is the interest rate charged by banks, α_j in equation (2) is the MSA fixed effect, and γ_t is the year fixed effect.

We report the results of estimating two variations of equation (2) in Panel A of Table 4. In this and other subsequent tables, we only report the variables of interest for brevity. The independent variable in Column 1 is a continuous measure of local housing supply elasticity as provided in Saiz (2010), and the independent variables in Column 2 are indicator variables for quartiles 1, 2, and 3 of MSA housing supply elasticity. Inelastic land supply in an MSA indicates lower local housing supply elasticity. Hence, an increase in mortgage rates will produce a smaller decline in housing prices in MSAs with lower elasticity of supply. Consistent with our expectation, we find that the coefficient on the interaction between *Housing supply elasticity* and *Mortgage rate* in Column 1 is significantly positive at the 1% level. The results in Column 2 indicate that a 1% increase in the mortgage rate reduces the residential price index by 3.2% more in the first quartile of MSA housing supply elasticity (i.e. the most constrained) than in the fourth quartile (i.e. the least constrained).

We use the predicted value of *RE Price Index* from equation (2) to calculate *RE Value*, which we denote as *RE Value (MSA)_IV1* and *RE Value (MSA)_IV2*. We then re-estimate equation (1) using *RE Value (MSA)_IV1* or *RE Value (MSA)_IV2* in place of *RE value* and report the results in Panel B of Table 4. In all models, consistent with our main results reported in

Table 3, the coefficient estimates on *RE Value (MSA)_IV1* or *RE Value (MSA)_IV2* are negative and statistically significant at either 1% or 5%. Overall, the results from the instrumental variables approach indicate that our main results still hold after controlling for potential endogeneity due to omitted variables.

4.2 *Measurement errors in real estate values*

We follow the procedures developed in Chaney et al (2012) to infer changes in financial capacity from exogenous changes in the value of a firm's real estate assets. An important concern is that we use estimates of a firm's real estate asset values after 1993. We estimate these values using the financial information from 1993, the last year that the accumulated depreciation for real estate assets is available, and adjusting the values over time based on the changes in real estate prices. A drawback of this approach is that it ignores real estate purchases and sales by a firm after 1993, and thus introduces noise in measuring real estate market values. We therefore conduct two additional tests to address concerns about measurement error. First, as in Balakrishnan et al. (2014), we identify firms that initially had real estate in 1993, but subsequently disposed of it. Our sample includes 1,283 observations where firms disposed of all their real estate assets after 1993. For these firms, the market values of real estate are meaningless and introduce noise in the measure. Hence, we repeat the analysis after deleting firms that disposed of all their real estate assets during our sample period. The results, presented in Panel A of Table 5, show that our main results are qualitatively unchanged after excluding these firms from the sample.

Second, we identify firms that had no real estate in 1993, but subsequently acquired real estate. Our sample includes 4,908 such observations. Again, we repeat the analysis after deleting these observations from the sample. The results, presented in Panel B of Table 5, remain qualitatively unchanged for five of the six models for this reduced sample.

In our sample, firms with no real estate ownership have a value of zero for *RE Value* during the entire sample period.[11] To ensure that our results are not driven by these firms without real estate ownership, we repeat our tests after excluding these observations from the sample and report the results in Panel C of Table 5. The results are robust for audit quality proxied by *BIGN* and *MSHARE* but insignificant for audit quality proxied by *AFEE*.

There may be another potential source of endogeneity because large firms may significantly affect local economic development and, therefore, real estate prices. To mitigate this concern, as in Chen et al. (2017), we estimate our models using a subsample of small firms located in large MSAs. These small firms are not likely to significantly affect the local economy and, hence, real estate prices. We identify small firms as firms in the bottom three quartiles of the size distribution, whose headquarters are located in one of the 20 most populated MSAs. The sample size is reduced and therefore we lose some power in these tests. We report the results in Panel D of Table 5. Despite the smaller sample size, we continue to find significantly negative coefficients on *RE Value*, except when audit quality is measured by *AFEE*. Overall, there is no compelling evidence to suggest that our main results are driven by the large firms in our sample.

4.3 *Alternate proxies of audit quality*

In our main analysis, we use a continuous measure of industry market share at the national level to capture auditor industry specialisation. Prior studies also use indicator variables to capture this construct. For example, Reichelt and Wang (2010) find that auditors who are both national and city-specific industry specialists have clients with the lowest abnormal accruals, suggesting that joint national and city-specific industry specialists have the highest audit quality. As additional robustness checks, we use three indicator variables to measure auditor industry

[11] *RE Value* equals zero for 9,959 observations in our sample.

specialisation. We consider audit quality to be high if the auditor is a national level industry specialist (*NSPEC*), a city level industry specialist (*CSPEC*), or both (*BSPEC*). For completeness, we also use a continuous measure of industry market share at the city level to measure auditor specialisation (*CMSHARE*). The results reported in Table 6 indicate that our main results are robust to these alternative specifications of auditor industry specialisation.

4.4 *Additional analysis on the auditor change sample*

In our main analysis, we use a linear regression model after controlling for firm fixed effects when audit quality is proxied by *BIGN* (Hanlon and Hoopes 2014; Lamoreaux 2016). As a robustness check, we employ logistic regression with firm fixed effects. In this model, we include only firms that changed auditors in the regression; hence the sample size is significantly reduced.[12] We report the results in Table 7. We continue to find significantly negative coefficients on *RE Value (State)* and *RE Value (MSA)*, consistent with the main results.

4.5 *Other robustness checks*

We conduct several additional tests. First, we control for audit committee characteristics, measured by size (*AC_Size*) and independence (*AC_Indep*).[13] The audit committee and external auditor are the potential mechanisms that reduce the agency problem in firms and an audit committee can also affect the choice of an external auditor (Jiang and Zhou 2017; Abbott and Parker 2000; Beasley, Carcello, Hermanson and Neal 2009). We also control for insider ownership proxied by CEO sharholdings (*CEO_Holding*) in the regression.[14] Insider ownership

[12] There are 7,140 observations with auditor changes (change from BigN to Non-BigN auditor or change from Non-BigN to BigN auditor) in our sample.

[13] We obtain audit committee data from the table of Directors and Directors Legacy of the Institutional Shareholder Services (ISS) database. Based on this data, we construct two variables: *AC_Size* is the proportion of audit committee member to total board members. *AC_Indep* is the proportion of independent audit committee members to the total number of audit committee members.

[14] We obtain CEO shareholdings from Thomson Reuters database. *CEO_Holding* is the proportion of shares held by the CEO to the total outstanding shares.

reduces the agency conflict between insiders and shareholders by aligning the interests of insiders with those of shareholders. To the extent that the incentive-alignment effect of insider ownership mitigates the agency conflict, the need for external monitoring decreases. However, at higher levels of ownership, insiders may extract private benefits for themselves at the cost of outside shareholders (Morck et al. 1988). We report the results in Table 8. Our results are robust after controlling for audit committee characteristics and CEO shareholdings.[15,16]

4.6 *Financial constraints and the relation between financial capacity and audit quality demand*

In our main analysis, we find a negative relation between changes in financial capacity and audit quality demand. Most previous research on financial constraints typically examines whether investment at firms with financial constraints is more closely related to cash flows (Stein 2003). Financially constrained firms are likely to be especially adversely affected by declines in real estate values because they are at or close to their borrowing capacity. Owning relatively more liquid and redeployable real estate should be particularly valuable to these financially constrained firms because such assets give them more financial flexibility and potential borrowing capacity. Hence we expect the effect of collateral shocks to be more pronounced for more financially constrained than less financially constrained firms. We use four measures of

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[15] There are many missing data for audit committee variables because the original database only covers S&P 1500 firms. Due to these missing values, we use the modified zero-order regressions suggested by Greene (2003). This method has fewer assumptions about missing values and substitutes a zero for missing values and adds the three indicator variables *DAC_Indep*, *DAC_Size*, and *DCEO_Holding*, which are coded as one if the corresponding variable is missing, to the regression.

[16] We also control for internal control weakness because previous studies report that firms with material internal control weaknesses are generally associated with poor financial reporting quality (Doyle et al. 2007; Ashbaugh-Skaife et al. 2008). The untabulated results are robust to controlling for internal control weaknesses, except in the model where audit quality is measured by *AFEE* and when real estate values are measured at MSA. In addition, we remove clients audited by Arthur Andersen because our results could be confounded by the demise of Andersen in 2002, which is likely to have undue influence on earnings quality and audit quality demand (Krishnan and Visvanatham 2008; Cahan and Zhang 2006). The untabulated results indicate that the removal of Andersen clients from the sample does not change our inferences.

financial constraint, namely, Whited and Wu's (2006) financial constraint index (*WW Index*), Hadlock and Pierce's (2010) financial constraint index (*HP Index*), an indicator variable for the financial crisis (*Crisis*), and an indicator for firms in high-tech industries (*Htech*). We regard a firm as financially constrained if its WW Index (HP Index) falls in the top tercile of the sample distribution, and unconstrained otherwise.[17] We follow the timeline in Kahle and Stulz (2013) and consider the financial crisis as the period between 2007 and 2010, a period when financing constraints are arguably more important. High-tech firms are more financially constrained and have insufficient access to both internal and external resources compared to non-high-tech firms (Cannone and Ughetto 2015; Sasidharan et al. 2015; Tsai et al. 2009).

We expect the relation between changes in financial capacity and audit quality demand to be more significant for firms that are more financially constrained relative to firms that are less financially constrained. Hence, we expect the interaction between *RE Value* and proxies of financial constraint to be negative. We report the results in Table 9. Panels A, B, C, and D show the results when financial constraint is proxied by *WW Index*, *HP Index*, *Crisis*, and *Htech* respectively.[18]

Consistent with our prediction, in all four panels, we find that the coefficients on most of the interactions (18 out of a total of 24) between *RE Value* and the measures of financial constraint are significantly negative at conventional levels. Overall, we find consistent evidence that the negative relation between change in financial capacity and audit quality demand is more pronounced for firms that are more financially constrained.

4.7 *External monitoring and the relation between financial capacity and audit quality demand*

Next, we examine two important external monitoring mechanisms that may affect the

[17] We obtained similar results when we define a firm to be financially constrained if its WW Index (*HP Index*) falls in the top quartile of the whole distribution, and unconstrained otherwise.
[18] The variable *HTECH* is omitted in the table due to collinearity.

extent of information asymmetry. We conjecture that the relation between financial capacity and audit quality is more pronounced when the extent of information asymmetry is higher. The first monitoring mechanism is institutional investors. Because of the sheer size of their investment, institutional shareholders have incentives to actively monitor corporate affairs and quality of financial statement information (Shleifer and Vishny 1986). Boone and White (2015) and Bird and Karolyi (2016) also find that higher institutional ownership is associated with lower information asymmetry manifested in greater and improved management disclosure. We use the magnitude of quasi-index investors, based on Bushee's (2001) classification, to measure institutional ownership. Recent studies report that quasi-indexers are actually active owners with respect to their effects on their investees' corporate governance and transparency (Boone and White 2015; Chen et al. 2019; Khan et al. 2017).[19]

The second monitoring mechanism is financial analysts. Prior studies show that financial analysts are important financial intermediaries that alleviate information asymmetry and monitor managerial rent-seeking behaviour (Jensen and Meckling 1976). Consistent with this notion, firms covered by more analysts are associated with lower earnings management (Yu 2008), and analysts play a significant role in uncovering fraud (Dyck et al. 2010). Fung et al. (2015) and Gunn et al. (2017) report that analyst coverage captures the extent of information asymmetry and that firms demand higher audit quality when there is a reduction in analyst coverage.

Based on the above discussion, we expect that the relation between financial capacity and audit quality is more pronounced when the level of institutional ownership and analyst coverage is lower. We report the results in Table 10. Panels A and B show the results for institutional

[19] Boone and White (2015) argue that the diverse holdings of quasi-indexers make gathering private information on their portfolio firms more costly, leading to greater demand for firm transparency and enhanced public information production to minimize these costs. On the other hand, dedicated investors have less influence on public information production because they likely rely more on private information. Although we use quasi-indexers to measure institutional ownership in our main tests, we also repeat the analyses with total institutional ownership as well as dedicated institutional ownership as alternative measures. Our results are similar with these alternative measures.

ownership (*INST*) and analyst coverage (*ANALYST*), respectively. As expected, we find that the coefficients on the interaction between real estate values and external monitoring are positive and significant when audit quality is proxied by *BIGN* and *AFEE* (but not *MSHARE*). The results provide some evidence that external monitoring by institutional investors and financial analysts moderates the relation between financial capacity and audit quality demand.

4.8 ***Large and negative shocks***

In our main analysis, we find that financial capacity is negatively associated with audit quality demand. We conjecture that this relation is likely to be more pronounced when there is a negative shock to the real estate market. Negative shocks to real estate prices increase the likelihood of financial constraint, therefore firms have to respond quickly and their demand for audit quality is more urgent. By contrast, positive shocks to real estate prices do not necessitate such an urgent response. Following Balakrishnan et al. (2014), we partition firm-years into two groups based on the median yearly change in the real estate index. *Negative News* equals one if the observation is below the median, and zero otherwise. We then interact RE values with *Negative News* and report the results in Panel A, Table 11. As expected, the coefficient estimates of the interaction term between *RE Values* and *Negative News* are negative and mostly significant, though the results are weaker when real estate prices are measured by *RE Value (MSA)*. The evidence suggests that negative shocks to financial capacity have a stronger effect on audit quality.[20]

Next we examine the effect of large changes in real estate values on audit demand. Firms are not likely to significantly change their corporate decisions due to small changes in financial capacity. Following Balakrishnan et al. (2014), we keep firm-years in the top and bottom terciles

[20] Note *RE Value* is still negative and significant, suggesting that positive shocks also have effects.

of annual changes in the state real estate price index and discard firm-years in the middle tercile. Conditional on the size of changes in real estate values, we predict that the effect of negative (positive) news on real estate prices will be more (less) pronounced. We report the results in Panel B of Table 11. As expected, the coefficient estimates on the interaction term between *RE Value* and *Negative News* are significantly negative in five out of six models. Taken together, the above results indicate that the effect of financial capacity on audit quality demand is more pronounced when the news about real estate price changes is negative and when the size of real estate price changes is larger.

4.9 *Firm characteristics and the relation between financial capacity and audit quality demand*

How changes in financial capacity affect audit quality demand may vary across firms. We consider two firm characteristics, namely firm size and investment opportunities. Large firms might have a greater impact on real estate prices (Chaney et al. 2012) and, therefore, can potentially react differently to real estate price changes compared to small firms. Lai (2009) finds that firms with high investment opportunities demand high quality audits for curbing earnings management. Firms are considered large if their total assets are above the sample median in that year. Following Lai (2009), we measure growth opportunities as a principal component extracted from a factor analysis of (i) market-to-book asset, (ii) market-to-book equity, and (iii) gross property, plant and equipment ratio. We summarise our findings here without tabulation. We find that the interactions between the large firm and RE Value (State or MSA) are significantly positive when audit quality is proxied by *BIGN* and *AFEE* (but not *MSHARE*). The results provide some evidence that large firms are less sensitive to real estate price than small firms. We also find that the interaction between audit quality measures and growth opportunities are not significant in all specifications, suggesting that the impact of financial capacity on audit quality does not depend on growth opportunities.

5. Conclusion

Many prior studies find that audit quality helps to increase firms' financial capacity, which suggests a *positive* association between audit quality and financial capacity (Blackwell et al. 1998; Mansi et al. 2004; Pittman and Fortin 2004). By contrast, Jiang and Zhou (2017) find that firms demand higher audit quality after debt covenant violations. Because debt covenant violations increase future borrowing costs and reduce financial capacity, their results imply a *negative* relation between financial capacity and audit quality. Recognising that the relation between audit quality and financial capacity is dynamic, we re-examine the audit quality-financial capacity relation. We posit that, when firms have high (low) financial capacity, the need for audit quality is reduced (enhanced), which suggests a *negative* relation between financial capacity and demand for audit quality.

A major challenge in testing whether financial capacity influences the demand for audit quality is endogeneity. We address this concern by using changes in local real estate prices to measure exogenous changes in corporate financial capacity to examine the implications of financial capacity for the demand for audit quality.

For a large sample of firms spanning the period 1993-2018, we use firm fixed-effects regressions to investigate the effect of financial capacity on the demand for audit quality. We use audit firm size, auditor specialisation, and audit fees as measures of audit quality. We find that an increase (decrease) in financial capacity significantly reduces (enhances) the demand for audit quality. We also find that the financial capacity-audit quality relation is more pronounced when firms are more financially constrained, when external monitoring is weak, and when there is more and negative news about the real estate price changes. Our results are robust to a battery of robustness tests, including using an instrumental variable to control for possible endogeneity associated with real estate price changes, using a different specification to address measurement error in real estate prices, and using alternate proxies for audit quality.

We rely on changes in local real estate prices to measure exogenous changes in corporate financial capacity, and document a *negative* association between financial capacity and audit quality. Our results are more in line with Jiang and Zhou (2017) than other studies that report a positive relation between financial capacity and audit quality. Our study enriches the related literature by documenting a more complete and dynamic relationship between audit quality and financial capacity.

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APPENDIX 1

Determinants of Real Estate Ownership

Variables	*RE OWNER* (1)	*RE Value (State)* (2)
2nd quintile asset	0.165***	0.062***
	(7.10)	(3.78)
3rd quintile asset	0.302***	0.108***
	(12.52)	(6.31)
4th quintile asset	0.460***	0.143***
	(18.08)	(7.96)
5th quintile asset	0.466***	0.123***
	(16.31)	(6.08)
2nd quintile ROA	0.113***	0.056***
	(4.62)	(3.23)
3rd quintile ROA	0.135***	0.043**
	(5.41)	(2.42)
4th quintile ROA	0.136***	0.034*
	(5.48)	(1.95)
5th quintile ROA	0.081***	0.017
	(3.36)	(1.00)
2nd quintile age	0.063***	0.018
	(2.71)	(1.12)
3rd quintile age	0.141***	0.076***
	(5.91)	(4.53)
4th quintile age	0.248***	0.176***
	(10.22)	(10.26)
5th quintile age	0.277***	0.301***
	(10.06)	(15.45)
Industry fixed effect	-0.317	-0.388
State fixed effect	(-0.93)	(-1.61)
Observations	2258	2258
Adjusted R^2	0.53	0.41

The table shows the model for the determinants of the real estate ownership decision in 1993. In Column 1, the dependent variable is *RE Owner*, an indicator variable that equals one if the firm reports any real estate assets on its balance sheet in 1993, and zero otherwise. In column (2), the dependent variable is *RE Value*, which is the firm's real estate assets measured at market value in 1993. The two columns show the results of the cross-sectional regressions in 1993 after controlling for the 5 quantiles of total assets, ROA, firm age, and industry and MSA fixed effects. *, **, *** indicate significance at the 0.1, 0.05 and 0.01 levels, respectively, based on two-tailed tests.

TABLE 1

Variable Definitions

Variables	Definitions
Real Estate Measure	
RE Value (State)	The market value of real estate assets divided by the book value of total assets. The market value of real estate is calculated using the state real estate price index at year t multiplying the initial book value of real estate. Source: Compustat, OFHEO
RE Value (MSA)	The market value of real estate assets divided by the book value of total assets. The market value of real estate is calculated using the Metropolitan statistical areas (MSA) real estate price index at year t multiplying the initial book value of real estate. Source: Compustat, OFHEO
RE Value (MSA)_IV1	Instrumented local real estate prices using the interaction of mortgage rates and local housing supply elasticity (elasticity*mortgage)
RE Value (MSA)_IV2	Instrumented local real estate prices using the interaction of mortgage rates and 4 quantile dummies (4 quantile dummies*mortgage)
State real estate price index	Home Price Index (HPI) at the state level. Source: OFHEO
MSA real estate index	Home Price Index (HPI) at the MSA level. Source: OFHEO
RE OWNER	An indicator variable that equals 1 if the firm owns any real estate~~s~~ in year 1993, and 0 otherwise.
Initial controls	Initial firm characteristics (five quintiles of firm age, total assets, ROA, two-digit industry dummies, and state dummies), interacted with Home Price Index (HPI).
Audit Quality Measure	
BIGN	An indicator variable that equals 1 if the firms' auditor is one of the Big N auditors. Source: Compustat
MSHARE	An auditor's industry market share at the national level, computed as the ratio of the sum of a given auditor's clients' total assets (national level) for a given two-digit industry to the sum of all auditors' clients' total assets (national level) for the same two-digit industry. Source: Compustat
CMSHARE	An auditor's industry market share at the city level, computed as the ratio of the sum of a given auditor's clients' total assets (MSA level) for a given two-digit industry to the sum of all auditors' clients' total assets (MSA level) for the same two-digit industry. Source: Compustat
NSPEC	An auditor is classified as a National industry specialist if it has the largest annual market share (based on MSHARE) in a given two-digit SIC industry, and if its annual market share is at least 10 percentage points greater than its closest competitor in the national audit market
CSPEC	An auditor is classified as a City industry specialist if it has the largest annual market share in a city (based on CMSHARE) in a given two-digit SIC industry, and if its annual market share is at least 10 percentage points greater than its closest competitor in the city
BSPEC	An indicator variable that equals 1 if a company is audited by an auditor that is defined as both a national industry specialist and a city industry specialist (i.e. NSPEC = 1 and CSPEC = 1, and 0 otherwise).
AFEE	The natural log of audit fees in year t+1 (ln(audit fees)) between years 2000 and 2014. Source: Audit Analytics
Control variables	

Size	Natural log of total assets (log(at)).
MB	Ratio of market value of assets to book value of assets ((at-ceq+csho*prcc_f)/at).
ACC	Income before extraordinary items minus operating cash flow divided by total assets ((ib-oancf)/at).
ROA	Income before extraordinary items divided by total assets (ib/at).
LEV	Total liabilities divided by total assets (lt/at).
Quick	Current assets minus inventory divided by current liabilities ((act-invt)/lct).
ARINV	Inventory plus receivables divided by total assets ((invt+rect)/at).
CFO	Operating cash flow divided by total assets (oancf/at).
SG	Difference between sales and lagged sales divided by lagged sales ((sale-lag(sale))/lag(sale)).
CATA	Current assets divided by total assets (act/at).
ATO	Sales divided by total assets (sale/at).
CAPINT	Total property, plant and equipment (gross) divided by total assets (ppegt/at).
FOR	An indicator variable that equals 1 if the firm reports any foreign pretax income (pifo), and 0 otherwise.
NBS	Natural log of 1 plus number of segments (log(1+number of segments)). Source: Compustat Historical Segments database.
GC	An indicator variable that equals 1 if the firm receives a going concern audit opinion.
LOSS	An indicator variable that equals 1 if the firm reports negative income before extraordinary items (ib), and 0 otherwise.
Finance	An indicator variable that equals 1 if there is no merger in the year (merge=0) and either of the following conditions is met: long-term debt increased 20% or more or the number of shares outstanding increased by 10% or more after controlling for stock splits, and 0 otherwise.
DEC	An indicator variable that equals 1 if the firm's' fiscal year ends in December.
ACC	Income before extraordinary items minus operating cash flow divided by total assets ((ib-oancf)/at)

Cross-sectional test variables	
HP Index	The Hadlock and Pierce (2010) financial constraint index, calculated as -0.737*ln(AT) + 0.043* ln(AT) *ln(AT)-0.040*Age. The variable is coded as 1 if a firm's HP index is in the top 33%, and 0 otherwise.
WW Index	The Whited and Wu (2006) financial constraint index, calculated as -0.091*(OANCF/AT) -0.062*(1, if DV>0, 0 otherwise) + 0.021*(DLTT/AT) -0.044*ln(AT)-0.035*[($Sale_t$-$Sale_{t-1}$)/$Sale_{t-1}$]. The variable is coded 1 if a firm's WW index is in the top 33%, and 0 otherwise.
Crisis	An indicator variable that equals 1 if the firm year is 2007, 2008, 2009, or 2010, and 0 otherwise.
Htech	An indicator variable that equals 1 if the firms are in (283, 357, 366, 367, 382, 384, 481, 482, 489, 737, 873) SIC three-digit code, and 0 otherwise.
INST	An indicator variable that equals 1 if firms' quasi-indexer institutional investor shareholding is above the sample median in every year, and 0 otherwise.
Analyst	An indicator variable that equals 1 if the number of firms' analysts is above sample median in every year, and 0 otherwise
Negative news	An indicator variable that equals 1 if the ratio of change of real estate price (HSI_t/HSI_{t-1} -1) is below sample median, and 0 otherwise.
Large news	An indicator variable that equals 1 if the ratio of change of real estate price (HSI_t/HSI_{t-1} -1) is in top or bottom groups (this ratio is divided into three groups), and 0 otherwise.

TABLE 2

Summary Statistics

	Obs	Mean	Std	P25	Median	P75
Real estate variables						
RE Value (State)	28982	0.243	0.325	0	0.112	0.354
State price index	28982	0.65	0.214	0.466	0.615	0.851
RE Value (MSA)	26192	0.234	0.326	0	0.096	0.337
MSA price index	26222	0.631	0.224	0.457	0.596	0.816
Financial variables						
BIGN	27405	0.808	0.394	1	1	1
MSHARE	27413	0.194	0.167	0.064	0.16	0.299
CMSHARE	20779	0.373	0.349	0.053	0.243	0.672
NSPEC	27413	0.147	0.354	0	0	0
CSPEC	20779	0.357	0.479	0	0	1
BSPEC	20779	0.087	0.282	0	0	0
AFEE	14317	13.504	1.472	12.324	13.5	14.57
ACC	28904	-0.061	0.118	-0.094	-0.048	-0.01
SIZE	28982	5.433	2.234	3.733	5.319	7.011
Asset (in million dollars)	28982	2842.553	13257.172	41.808	204.079	1109.154
ROA	28982	-0.014	0.211	-0.017	0.04	0.08
LEV	28937	0.47	0.216	0.303	0.473	0.628
MB	28982	3.34	4.653	1.251	2.064	3.564
Quick	28495	2.172	2.621	0.911	1.39	2.343
ARINV	28735	0.319	0.188	0.181	0.307	0.441
CFO	28904	0.048	0.172	0.018	0.081	0.132
SG	28555	0.133	0.436	-0.023	0.068	0.189
CATA	28643	0.53	0.224	0.368	0.528	0.696
ATO	28982	1.245	0.739	0.767	1.125	1.586
CAPINT	28891	0.556	0.362	0.272	0.504	0.771
FOR	28982	0.385	0.487	0	0	1
NBS	28982	1.38	0.743	0.693	1.386	1.946
GC	14317	0.028	0.166	0	0	0
LOSS	28982	0.288	0.453	0	0	1
Finance	28982	0.264	0.441	0	0	1
DEC	28982	0.55	0.497	0	1	1
Initial firm level data (1993)						
RE OWNER	2258	0.609	0.488	0	1	1
Size	2258	4.386	1.912	3.011	4.153	5.577
ROA	2258	-0.026	0.215	-0.031	0.037	0.077
Age	2258	13.492	12.386	4	8	20

The table presents descriptive statistics. The sample includes Compustat firms that existed in 1993 for the sample period 1993-2013. *RE value* is the market value of real estate assets divided by the book value of total assets. The market value of real estate is calculated using the state level or MSA level real estate price index at year t multiplying the initial book value of real estate. Other variables are defined in Table 1.

TABLE 3

Financial Capacity and Demand for Audit Quality

Variables	*BIGN*		*MSHARE*		*AFEE*	
	(1)	(2)	(3)	(4)	(5)	(6)
RE Value (State)	-0.098***		-0.043***		-0.104***	
	(-6.90)		(-6.47)		(-3.01)	
State price index	-0.026		-0.622***		0.044	
	(-0.17)		(-4.75)		(0.10)	
RE Value (MSA)		-0.076***		-0.041***		-0.073**
		(-4.73)		(-5.65)		(-2.17)
MSA price index		-0.114		-0.445***		-0.813**
		(-0.76)		(-3.92)		(-2.35)
SIZE	0.083***	0.082***	0.022***	0.021***	0.416***	0.414***
	(21.21)	(20.15)	(12.75)	(11.15)	(44.42)	(38.69)
LEV	0.013	0.007	0.002	0.003	0.074***	0.075***
	(1.02)	(0.54)	(0.53)	(0.53)	(2.60)	(2.68)
LOSS	-0.009*	-0.008	-0.002	-0.001	0.036***	0.034***
	(-1.80)	(-1.62)	(-1.01)	(-0.63)	(4.22)	(3.41)
ROA	-0.023	-0.032**	-0.010*	-0.010*	-0.143***	-0.148***
	(-1.53)	(-2.01)	(-1.92)	(-1.80)	(-4.64)	(-4.46)
CATA	-0.035**	-0.047**	-0.025***	-0.023***	-0.053	-0.070
	(-1.96)	(-2.48)	(-3.79)	(-3.16)	(-1.13)	(-1.43)
SG	-0.013***	-0.014***	-0.004***	-0.004***		
	(-3.04)	(-3.30)	(-2.65)	(-2.86)		
ATO	0.025***	0.026***	0.000	-0.001		
	(3.81)	(3.78)	(0.12)	(-0.25)		
CAPINT	-0.016	-0.014	-0.013**	-0.011*		
	(-1.32)	(-1.15)	(-2.44)	(-1.89)		
Finance	-0.010***	-0.011***	-0.004***	-0.005***		
	(-2.71)	(-3.21)	(-2.73)	(-3.04)		
QUICK					-0.020***	-0.018***
					(-6.94)	(-5.91)
ARINV					0.369***	0.382***
					(6.58)	(6.45)
FOR					0.139***	0.145***
					(9.14)	(9.27)
NBS					0.030***	0.035***
					(3.90)	(4.12)
GC					0.054**	0.051*
					(2.03)	(1.79)
DEC					0.064	0.081*
					(1.45)	(1.86)
Constant	0.426***	0.588***	0.088***	0.070**	10.943***	10.781***
	(7.89)	(9.44)	(3.41)	(2.06)	(40.78)	(36.98)
Firm and year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Initial values	Yes	Yes	Yes	Yes	Yes	Yes
Observations	26627	24012	26621	24005	14083	12622
Adjusted R^2	0.72	0.73	0.68	0.68	0.95	0.95

All regressions control for initial firm characteristics (five quintiles of firm age, total assets, ROA, two-digit industry dummies, state dummies) interacted with Home Price Index. See Table 1 for the definitions of variables. t-statistics are presented in parentheses and are based on standard errors clustered at the state-year or MSA-year level. *, **, *** indicate significance at the 0.1, 0.05 and 0.01 levels, respectively, based on two-tailed tests.

TABLE 4
Instrumental Variable Analysis

Panel A: First-stage regression

Variables	MSA Housing Prices (1)	(2)
*Local housing supply elasticity * mortgage rate*	0.014***	
	(5.31)	
*First quartile of elasticity * mortgage rate*		-0.032***
		(-5.75)
*Second quartile of elasticity * mortgage rate*		-0.018***
		(-3.13)
*Third quartile of elasticity * mortgage rate*		-0.004
		(-0.71)
Year fixed effects	Yes	Yes
MSA fixed effects	Yes	Yes
Observations	2275	2275
Adjusted R^2	0.87	0.87

Panel B: Second stage regression

Variables	*BIGN*		*MSHARE*		*AFEE*	
	(1)	(2)	(3)	(4)	(5)	(6)
RE Value (MSA)_IV1	-0.060***		-0.031***		-0.091**	
	(-3.28)		(-3.80)		(-2.17)	
RE Value (MSA)_IV2		-0.060***		-0.031***		-0.094**
		(-3.31)		(-3.80)		(-2.23)
MSA price index	-0.230	-0.231	-0.372***	-0.372***	-1.037***	-1.038***
	(-1.42)	(-1.43)	(-3.24)	(-3.24)	(-2.91)	(-2.91)
Firm and year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Other controls and initial values	Yes	Yes	Yes	Yes	Yes	Yes
Observations	20847	20847	20849	20849	10946	10946
Adjusted R^2	0.73	0.73	0.69	0.69	0.95	0.95

The table reports the results based on the instrumental variable approach. Panel A shows the results of the first stage regression in which we investigate how local housing supply elasticity affects the MSA level housing prices. Column 1 uses a continuous measure of local housing supply elasticity, while column 2 uses quartiles of the elasticity. t-statistics are presented in parentheses and are based on standard errors clustered at the MSA-year level. Panel B reports results for the second-stage regression. We use the predicted RE price index to calculate *RE value*, denoted as *RE Value (MSA)_IV1* and *RE Value_ IV2*. See Table 1 for the definitions of variables. *, **, *** indicate significance at the 0.1, 0.05 and 0.01 levels, respectively, based on two-tailed tests.

TABLE 5

Addressing Measurement Errors in Real Estate Prices

Panel A: Removing Disposer Sample

Variables	*BIGN*		*MSHARE*		*AFEE*	
	(1)	(2)	(3)	(4)	(5)	(6)
RE Value (State)	-0.089***		-0.047***		-0.096**	
	(-6.07)		(-6.65)		(-2.57)	
State price index	-0.070		-0.651***		0.087	
	(-0.49)		(-4.94)		(0.21)	
RE Value (MSA)		-0.059***		-0.046***		-0.065*
		(-3.59)		(-5.82)		(-1.81)
MSA price index		-0.165		-0.478***		-0.704**
		(-1.11)		(-4.17)		(-2.02)
Firm and year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Other control and initial values	Yes	Yes	Yes	Yes	Yes	Yes
Observations	25471	22941	25464	22933	13460	12058
Adjusted R^2	0.72	0.72	0.69	0.69	0.95	0.95

Panel B: Removing Acquirer Sample

Variables	*BIGN*		*MSHARE*		*AFEE*	
	(1)	(2)	(3)	(4)	(5)	(6)
RE Value (State)	-0.095***		-0.041***		-0.075**	
	(-5.89)		(-5.77)		(-2.03)	
State price index	-0.073		-0.633***		0.210	
	(-0.55)		(-4.90)		(0.51)	
RE Value (MSA)		-0.068***		-0.036***		-0.033
		(-3.92)		(-4.75)		(-0.91)
MSA price index		-0.051		-0.433***		-0.869**
		(-0.38)		(-3.85)		(-2.22)
Firm and year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Other control and initial values	Yes	Yes	Yes	Yes	Yes	Yes
Observations	22113	19671	22107	19664	11469	10099
Adjusted R^2	0.74	0.75	0.70	0.70	0.96	0.96

Panel C: Sample with Real Estate Ownership

Variables	*BIGN*		*MSHARE*		*AFEE*	
	(1)	(2)	(3)	(4)	(5)	(6)
RE Value (State)	-0.107***		-0.020**		-0.042	
	(-5.73)		(-2.56)		(-1.00)	
State price index	-0.094		-0.628***		0.250	
	(-0.63)		(-4.66)		(0.58)	
RE Value (MSA)		-0.080***		-0.017**		0.016
		(-4.26)		(-1.99)		(0.42)
MSA price index		-0.091		-0.466***		-1.076***
		(-0.62)		(-4.00)		(-2.65)
Firm and year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Other control and initial values	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17822	15536	17815	15528	9864	8562
Adjusted R^2	0.73	0.73	0.69	0.69	0.96	0.96

Panel D: Small firms located in large MSAs

Variables	*BIGN*		*MSHARE*		*AFEE*	
	(1)	(2)	(3)	(4)	(5)	(6)
RE Value (State)	-0.253***		-0.039**		-0.043	
	(-5.55)		(-2.56)		(-0.56)	
State price index	2.960***		0.895***		-3.684***	
	(7.32)		(4.88)		(-2.99)	
RE Value (MSA)		-0.231***		-0.039***		-0.035
		(-5.10)		(-2.74)		(-0.44)
MSA price index		1.444***		0.572***		-1.701
		(3.16)		(2.92)		(-1.43)
Firm and year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Other control and initial values	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5781	5781	5782	5782	2925	2925
Adjusted R^2	0.72	0.72	0.62	0.61	0.89	0.89

In Panel A, we remove firms from the sample that owned real estate in 1993 but subsequently disposed of it. The sample includes 1,283 observations. In Panel B, we remove firms from the sample that initially owned zero real estate in 1993 but subsequently purchased real estate. The sample includes 4,908 observations. In Panel C, we remove firms that do not have real estate ownership during the sample period. In Panel D, we estimate our results based on a subsample of small firms located in large MSAs. We identify small firms as firms in the bottom three quartiles of the size distribution, whose headquarters are located in one of the 20 most populated MSAs. See Table 1 for the definitions of variables. t-statistics are presented in parentheses and are based on standard errors clustered at the state-year or MSA-year level. *, **, *** indicate significance at the 0.1, 0.05 and 0.01 levels, respectively, based on two-tailed tests.

TABLE 6

Audit Quality Proxied by Auditor Industry Specialisation

	NSPEC		*CSPEC*		*BSPEC*		*CMSHARE*	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
RE Value (State)	-0.034**		-0.113***		-0.056***		-0.092***	
	(-2.03)		(-4.80)		(-3.46)		(-6.84)	
State price index	-0.486**		-1.111***		3.418***		-0.109	
	(-2.39)		(-2.66)		(9.30)		(-0.32)	
RE Value (MSA)		-0.065***		-0.106***		-0.066***		-0.085***
		(-3.10)		(-4.52)		(-3.90)		(-5.67)
MSA price index		2.697***		-0.535		2.990***		-0.266
		(6.78)		(-1.60)		(8.97)		(-1.07)
SIZE	0.008**	-0.005	0.032***	0.031***	-0.008**	-0.014***	0.042***	0.042***
	(1.99)	(-0.95)	(5.59)	(4.46)	(-2.32)	(-3.36)	(12.55)	(10.17)
LEV	0.055***	0.076***	-0.005	-0.005	0.044***	0.045***	-0.018*	-0.022*
	(4.09)	(4.97)	(-0.26)	(-0.29)	(3.69)	(3.64)	(-1.69)	(-1.94)
LOSS	-0.007	-0.006	-0.019**	-0.011	-0.016***	-0.011**	-0.016***	-0.013***
	(-1.34)	(-1.02)	(-2.54)	(-1.53)	(-3.57)	(-2.35)	(-3.75)	(-3.06)
ROA	0.008	0.018	-0.046**	-0.035**	0.005	0.011	-0.029**	-0.022**
	(0.57)	(1.23)	(-2.57)	(-2.03)	(0.52)	(1.13)	(-2.58)	(-1.96)
CATA	-0.033**	-0.024	-0.051**	-0.051**	-0.033**	-0.032**	-0.058***	-0.058***
	(-2.20)	(-1.30)	(-2.46)	(-2.21)	(-2.45)	(-2.13)	(-4.19)	(-4.11)
SG	-0.001	-0.002	0.004	0.004	0.002	0.002	-0.002	-0.003
	(-0.30)	(-0.62)	(0.72)	(0.80)	(0.70)	(0.68)	(-0.57)	(-0.82)
ATO	0.002	-0.000	-0.017**	-0.018**	-0.011**	-0.012***	-0.009**	-0.008*
	(0.43)	(-0.07)	(-2.18)	(-2.36)	(-2.48)	(-2.65)	(-2.07)	(-1.69)
CAPINT	-0.047***	-0.065***	-0.018	-0.018	-0.052***	-0.053***	0.004	0.002
	(-3.86)	(-4.33)	(-1.07)	(-1.07)	(-4.63)	(-4.35)	(0.35)	(0.22)
Finance	-0.007*	-0.007	-0.001	-0.004	-0.002	-0.003	-0.001	-0.003
	(-1.78)	(-1.52)	(-0.19)	(-0.80)	(-0.51)	(-0.72)	(-0.20)	(-0.91)
Constant	0.201***	-0.428***	0.758***	0.312***	0.251***	0.090	0.589***	0.166***
	(3.36)	(-5.90)	(3.80)	(3.51)	(4.11)	(1.49)	(3.07)	(2.81)
Firm and year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Initial values	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	26621	18612	20118	18612	20118	18612	20118	18612
Adjusted R^2	0.52	0.52	0.65	0.65	0.49	0.51	0.78	0.78

The table reports the results using different proxies of auditor industry specialisation. We use three indicator variables to measure auditor industry specialisation. Audit quality is considered high if the auditor is a national level industry specialist (*NSPEC*), a city level industry specialist (*CSPEC*), or both (*BSPEC*). Lastly, we use a continuous measure of industry market share at the city level to measure auditor specialisation (*CMSHARE*). See Table 1 for the definitions of variables. t-statistics are presented in parentheses and are based on standard errors clustered at the state-year or MSA-year level. *, **, *** indicate significance at the 0.1, 0.05 and 0.01 levels, respectively, based on two-tailed tests.

TABLE 7

Additional Analysis on the Auditor Change Sample

Variables	*BIGN*		*MSHARE*		*AFEE*	
	(1)	(2)	(3)	(4)	(5)	(6)
RE Value (State)	-2.872***		-0.047***		-0.221***	
	(-5.82)		(-4.00)		(-3.52)	
State price index	1.117		2.124***		-1.894	
	(1.34)		(5.87)		(-1.55)	
RE Value (MSA)		-1.894***		-0.029**		-0.149**
		(-3.66)		(-2.23)		(-2.36)
MSA price index		1.490*		-0.643***		-1.476*
		(1.82)		(-3.69)		(-1.73)
SIZE	1.397***	1.406***	0.028***	0.028***	0.391***	0.390***
	(13.32)	(12.53)	(9.59)	(9.16)	(22.46)	(20.64)
LEV	-0.261	-0.768**	0.001	-0.003	-0.040	-0.052
	(-0.82)	(-2.26)	(0.12)	(-0.26)	(-0.73)	(-0.88)
LOSS	-0.002	0.005	0.002	0.002	0.021	0.014
	(-0.02)	(0.04)	(0.49)	(0.38)	(1.22)	(0.73)
ROA	-0.002	-0.127	-0.003	-0.003	-0.101*	-0.109*
	(-0.01)	(-0.45)	(-0.38)	(-0.36)	(-1.78)	(-1.95)
CATA	-0.181	-0.355	-0.027**	-0.030**	-0.161**	-0.188**
	(-0.45)	(-0.84)	(-2.25)	(-2.25)	(-2.09)	(-2.35)
SG	-0.219**	-0.240**	-0.005	-0.005		
	(-2.48)	(-2.52)	(-1.57)	(-1.58)		
ATO	0.264**	0.312**	0.004	0.001		
	(2.11)	(2.36)	(0.94)	(0.24)		
CAPINT	0.778***	0.463	-0.015	-0.007		
	(2.63)	(1.46)	(-1.61)	(-0.75)		
Finance	-0.143	-0.210*	-0.006	-0.007**		
	(-1.45)	(-1.96)	(-1.63)	(-2.04)		
QUICK					-0.019***	-0.017***
					(-4.48)	(-3.73)
ARINV					0.329***	0.350***
					(3.54)	(3.78)
FOR					0.081**	0.093***
					(2.35)	(2.62)
NBS					0.025	0.074***
					(1.07)	(2.75)
GC					0.004	-0.002
					(0.09)	(-0.05)
DEC					0.103	0.118
					(1.18)	(1.49)
Constant	-	-	0.145***	0.085***	10.868***	10.836***
			(5.18)	(2.93)	(46.49)	(48.25)
Firm and year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Initial values	No	No	Yes	Yes	Yes	Yes
Observations	6764	6042	6881	6159	3970	3529
Adjusted R^2	-	-	0.47	0.47	0.89	0.88

In column (1) and (2), the dependent variable is *BIGN*, and results reported are based on logistic regression after controlling for firm fixed-effects. See Table 1 for the definitions of variables. t-statistics are presented in parentheses and are based on standard errors clustered at the state-year or MSA-year level. *, **, *** indicate significance at the 0.1, 0.05 and 0.01 levels, respectively, based on two-tailed tests.

TABLE 8
Controlling for audit committee characteristic and CEO shareholdings

Variables	*BIGN*		*MSHARE*		*AFEE*	
	(1)	(2)	(3)	(4)	(5)	(6)
RE Value (State)	-0.094***		-0.041***		-0.103***	
	(-6.62)		(-6.31)		(-2.99)	
State price index	0.049		-0.582***		-0.014	
	(0.33)		(-4.37)		(-0.03)	
RE Value (MSA)		-0.072***		-0.040***		-0.070**
		(-4.50)		(-5.50)		(-2.09)
MSA price index		-0.053		-0.405***		-0.852**
		(-0.35)		(-3.56)		(-2.47)
AC_Size	-0.129***	-0.144***	-0.028**	-0.034***	-0.104*	-0.137***
	(-6.85)	(-7.81)	(-2.43)	(-2.88)	(-1.90)	(-2.76)
AC_Indep	0.076***	0.090***	0.030***	0.034***	0.005	0.005
	(5.79)	(7.75)	(3.85)	(4.09)	(0.14)	(0.12)
CEO_Holding	0.000	0.000	-0.000	-0.000	-0.002***	-0.003***
	(0.15)	(0.61)	(-0.55)	(-0.59)	(-3.39)	(-4.08)
DAC_Size	0.039	0.047	-0.003	-0.002	-0.087	-0.080
	(1.03)	(1.20)	(-0.20)	(-0.12)	(-1.52)	(-1.24)
DAC_Indep	-0.042	-0.040	0.006	0.004	0.080	0.059
	(-1.02)	(-1.00)	(0.37)	(0.24)	(1.18)	(0.81)
DCEO_Holding	-0.017***	-0.019***	-0.001	-0.001	-0.008	-0.006
	(-4.41)	(-4.44)	(-0.30)	(-0.66)	(-0.82)	(-0.56)
Constant	0.426***	0.588***	0.088***	0.070**	10.943***	10.781***
	(7.89)	(9.44)	(3.41)	(2.06)	(40.78)	(36.98)
Firm and year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Other controls and Initial values	Yes	Yes	Yes	Yes	Yes	Yes
Observations	26627	24012	26621	24005	14083	12622
Adjusted R^2	0.73	0.73	0.68	0.69	0.95	0.95

AC_Size is the proportion of audit committee member to total board members. *AC_Indep* is the proportion of independent audit committee members to the total number of audit committee members. *CEO_Holding* is the proportion of shares held by CEO to the total outstanding shares. In the table, we use modified regression approach and set *AC_Size*, *AC_Indep*, *CEO_Holding* equals to 1 if they are missing, and set *DAC_Size* equals to 1 (0) if *AC_Size* is missing (nomissing), *DAC_Indep* equals to 1 (0) if *AC_Indep* is missing (nomissing), and *CEO_Holding* equals to 1 (0) if *CEO_Holding* is missing (nomissing). See Table 1 for the definitions of the other variables. t-statistics are presented in parentheses and are based on standard errors clustered at the state-year or MSA-year level. *, **, *** indicate significance at the 0.1, 0.05 and 0.01 levels, respectively, based on two-tailed tests.

TABLE 9

The Role of Financial Constraints in Moderating the Relation between Financial Capacity and Audit Quality Demand

Panel A: WW Index

Variables	*BIGN*		*MSHARE*		*AFEE*	
	(1)	(2)	(3)	(4)	(5)	(6)
RE Value (State)	-0.022		-0.034***		-0.009	
	(-1.42)		(-4.36)		(-0.25)	
RE Value (MSA)		-0.002		-0.036***		0.044
		(-0.13)		(-4.10)		(1.22)
*RE Value (State)*WW Index*	-0.111***		-0.012		-0.141***	
	(-7.46)		(-1.59)		(-4.45)	
*RE Value (MSA)*WW Index*		-0.103***		-0.006		-0.171***
		(-6.93)		(-0.82)		(-5.53)
WW Index	0.046***	0.045***	0.002	-0.001	0.106***	0.101***
	(7.03)	(7.06)	(0.62)	(-0.27)	(6.09)	(6.02)
Firm and year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Other control and initial values	Yes	Yes	Yes	Yes	Yes	Yes
Observations	26555	23954	26549	23947	13880	12431
Adjusted R^2	0.73	0.73	0.68	0.68	0.95	0.95

Panel B: HP Index

Variables	*BIGN*		*MSHARE*		*AFEE*	
	(1)	(2)	(3)	(4)	(5)	(6)
RE Value (State)	-0.034**		-0.031***		-0.076*	
	(-2.15)		(-3.89)		(-1.95)	
RE Value (MSA)		-0.018		-0.030***		-0.054
		(-1.01)		(-3.39)		(-1.49)
*RE Value (State)*HP Index*	-0.130***		-0.022***		-0.066	
	(-7.18)		(-2.67)		(-1.64)	
*RE Value (MSA)*HP Index*		-0.112***		-0.020**		-0.046
		(-5.65)		(-2.14)		(-1.17)
HP Index	0.037***	0.034***	0.002	0.001	0.051**	0.045**
	(5.07)	(4.27)	(0.58)	(0.20)	(2.45)	(2.15)
Firm and year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Other control and initial values	Yes	Yes	Yes	Yes	Yes	Yes
Observations	26627	24012	26621	24005	14083	12622
Adjusted R^2	0.73	0.73	0.68	0.68	0.95	0.95

Panel C: Financial crisis

Variables	*BIGN*		*MSHARE*		*AFEE*	
	(1)	(2)	(3)	(4)	(5)	(6)
RE Value (State)	-0.090***		-0.039***		-0.095***	
	(-6.25)		(-5.81)		(-2.73)	
RE Value (MSA)		-0.070***		-0.038***		-0.061*
		(-4.27)		(-5.06)		(-1.78)
*RE Value (State)*Crisis*	-0.040***		-0.017***		-0.038**	
	(-2.62)		(-3.02)		(-2.39)	
*RE Value (MSA)*Crisis*		-0.024*		-0.013**		-0.042**
		(-1.67)		(-2.30)		(-2.47)
Crisis	-0.348***	-0.364***	-0.018***	-0.024***	-0.197***	-0.202***
	(-22.44)	(-23.74)	(-2.66)	(-3.21)	(-9.10)	(-9.39)
Firm and year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Other control and initial values	Yes	Yes	Yes	Yes	Yes	Yes
Observations	26627	24012	26621	24005	14083	12622
Adjusted R^2	0.72	0.73	0.68	0.68	0.95	0.95

Panel D: High technological industries

Variables	*BIGN*		*MSHARE*		*AFEE*	
	(1)	(2)	(3)	(4)	(5)	(6)
RE Value (State)	-0.065***		-0.031***		-0.089**	
	(-4.21)		(-4.14)		(-2.38)	
RE Value (MSA)		-0.041**		-0.026***		-0.072*
		(-2.39)		(-3.15)		(-1.93)
*RE Value (State)*Htech*	-0.129***		-0.047***		-0.063	
	(-4.73)		(-4.23)		(-1.05)	
*RE Value (MSA)*Htech*		-0.133***		-0.055***		-0.006
		(-4.48)		(-4.42)		(-0.09)
Htech	-0.002	0.027	-0.020	-0.012	-0.107	-0.230***
	(-0.05)	(0.53)	(-0.89)	(-0.40)	(-1.36)	(-3.50)
Firm and year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Other control and initial values	Yes	Yes	Yes	Yes	Yes	Yes
Observations	26627	24012	26621	24005	14083	12622
Adjusted R^2	0.72	0.73	0.68	0.68	0.95	0.95

The table reports how financial constraints affect the relation between changes in financial flexibility and audit quality demand. We use three proxies of financial constraints, namely, the Hadlock and Pierce (2010) financial constraint index (*HP Index*), the Whited and Wu (2006) financial constraint index (*WW Index*), and an indicator variable for financial crisis (*Crisis*). See Table 1 for the definitions of variables. t-statistics are presented in parentheses and are based on standard errors clustered at the state-year or MSA-year level. *, **, *** indicate significance at the 0.1, 0.05 and 0.01 levels, respectively, based on two-tailed tests.

TABLE 10
The Role of External Monitoring in Moderating the Relation between Financial Capacity and Audit Quality Demand

Panel A: Institutional Ownership

Variables	*BIGN*		*MSHARE*		*AFEE*	
	(1)	(2)	(3)	(4)	(5)	(6)
RE Value (State)	-0.108***		-0.039***		-0.125***	
	(-6.94)		(-5.50)		(-3.36)	
RE Value (MSA)		-0.083***		-0.035***		-0.098***
		(-4.82)		(-4.59)		(-2.69)
RE Value (State) INST*	0.034**		-0.014**		0.066**	
	(2.53)		(-2.06)		(2.33)	
RE Value (MSA) INST*		0.025*		-0.019***		0.077***
		(1.73)		(-2.58)		(2.65)
INST	0.029***	0.036***	0.005*	0.008***	-0.022	-0.029**
	(4.97)	(5.98)	(1.95)	(2.76)	(-1.62)	(-2.01)
Firm and year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Other control and initial values	Yes	Yes	Yes	Yes	Yes	Yes
Observations	26627	24012	26621	24005	14083	12622
Adjusted R^2	0.73	0.73	0.68	0.68	0.95	0.95

Panel B: Analyst following

Variables	*BIGN*		*MSHARE*		*AFEE*	
	(1)	(2)	(3)	(4)	(5)	(6)
RE Value (State)	-0.104***		-0.044***		-0.127***	
	(-6.87)		(-6.41)		(-3.46)	
RE Value (MSA)		-0.081***		-0.042***		-0.108***
		(-4.75)		(-5.43)		(-2.92)
RE Value (State) Analyst*	0.025*		0.006		0.080**	
	(1.88)		(0.93)		(2.05)	
RE Value (MSA) Analyst*		0.021		0.002		0.124***
		(1.46)		(0.30)		(3.50)
Analyst	-0.011**	-0.008	-0.001	0.002	-0.074***	-0.083***
	(-1.99)	(-1.41)	(-0.29)	(0.91)	(-5.03)	(-5.34)
Firm and year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Other control and initial values	Yes	Yes	Yes	Yes	Yes	Yes
Observations	26627	24012	26621	24005	14083	12622
Adjusted R^2	0.72	0.73	0.68	0.68	0.95	0.95

The table reports how institutional investor shareholding affects the relation between changes in financial capacity and audit quality demand. *INST* is an indicator variable that equals 1 if firms' quasi-indexer institutional investor shareholding is above the sample median in every year, and 0 otherwise. The classification of ownership is based on Bushee (2001). *Analyst* is an indicator variable that equals 1 if the number of firms' analysts is above median in every year, and 0 otherwise. See Table 1 for the definitions of variables. t-statistics are presented in parentheses and are based on standard errors clustered at the state-year or MSA-year level. *, **, *** indicate significance at the 0.1, 0.05 and 0.01 levels, respectively, based on two-tailed tests.

TABLE 11

Large and Negative Shocks

Panel A Negative News

Variables	*BIGN*		*MSHARE*		*AFEE*	
	(1)	(2)	(3)	(4)	(5)	(6)
RE Value (State)	-0.089***		-0.038***		-0.088**	
	(-5.68)		(-5.03)		(-2.47)	
RE Value (MSA)		-0.073***		-0.040***		-0.066*
		(-4.20)		(-5.05)		(-1.91)
Negative news (State)	0.006		-0.001		0.011	
	(1.53)		(-0.57)		(1.25)	
Negative news (MSA)		0.007*		0.000		-0.011
		(1.84)		(0.25)		(-1.24)
*RE Value (State)**	-0.023**		-0.011**		-0.042***	
Negative news(State)	(-2.32)		(-2.35)		(-2.68)	
*RE Value (MSA)**		-0.015		-0.004		-0.029*
Negative news (MSA)		(-1.42)		(-0.72)		(-1.67)
Firm and year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Other control and initial values	Yes	Yes	Yes	Yes	Yes	Yes
Observations	24460	22021	24454	22014	14083	12607
Adjusted R^2	0.73	0.73	0.69	0.69	0.95	0.95

Panel B Large and Negative News

Variables	*BIGN*		*MSHARE*		*AFEE*	
	(1)	(2)	(3)	(4)	(5)	(6)
RE Value (State)	-0.087***		-0.043***		-0.072*	
	(-4.67)		(-4.45)		(-1.75)	
RE Value (MSA)		-0.061***		-0.034***		-0.057
		(-2.98)		(-3.45)		(-1.36)
Negative news (State)	0.010**		-0.002		0.025**	
	(2.09)		(-0.64)		(2.57)	
Negative news (MSA)		0.015***		-0.001		-0.009
		(2.84)		(-0.31)		(-0.72)
*RE Value (State)**	-0.033**		-0.012*		-0.061***	
Negative news(State)	(-2.50)		(-1.78)		(-2.94)	
*RE Value (MSA)**		-0.034***		-0.007		-0.051**
Negative news (MSA)		(-2.67)		(-1.23)		(-2.38)
Firm and year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Other control and initial values	Yes	Yes	Yes	Yes	Yes	Yes
Observations	16642	15869	16635	15865	9505	9142
Adjusted R^2	0.73	0.73	0.69	0.68	0.95	0.95

In panel A, we partition firm-years into two groups based on the median yearly change in the real estate index (at state or MSA level). *Negative news* equals 1 if the value is below the median, and 0 otherwise. In Panel B, we include only firm-years in the top and bottom terciles of yearly changes in the real estate price index. See Table 1 for the definitions of variables. t-statistics are presented in parentheses and are based on standard errors clustered at the state-year or MSA-year level. *, **, *** indicate significance at the 0.1, 0.05 and 0.01 levels, respectively, based on two-tailed tests.