Collateral Values and Corporate Employment*

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Abstract

We analyze how local financial shocks influence employment outcomes within firms and how these effects show up in the aggregate. Our empirical strategy uses variation in real estate price growth, real estate holdings, and establishment-level employment from the U.S. Census Bureau. We estimate that employment expenditures increase by \$0.10 per \$1 increase in real estate collateral values among U.S. publicly-traded firms. Within-firm increases in employment occur at establishments away from the location of real estate holdings leading to regional employment spillovers. Our findings indicate that the geography of firms' establishments is an important channel through which local financial shocks spread across U.S. regions.

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1 Introduction

A central topic in macroeconomics and finance is precisely how firm-level credit constraints come about, how they interact with economic conditions, and whether they can have real effects. In an environment with incomplete or unenforceable contracts, firms have limited debt capacity and collateral must be pledged to secure loans (Eisfeldt and Rampini, 2009; Hart and Moore, 1994; Rampini and Viswanathan, 2013; Stiglitz and Weiss, 1981).[1] Such collateral-based credit constraints can provide a link between asset values and factor input use by firms that can translate economic shocks into business cycle fluctuations (Benanke and Gertler, 1989; Kiyotaki and Moore, 1997; Liu et al., 2013). In the wake of the recent collapse of U.S. real estate prices, this collateral lending channel has featured in economic discussions, as well as empirical research attempting to quantify its importance.[2]

While prior empirical research on financial constraints has focused almost exclusively on corporate investment, little evidence exists on the impact on employment.[3] This is surprising given the observational link between financial crises, economic recessions, and job destruction, as well as theoretical work on the relation between corporate finance frictions and employment (e.g., Berk et al., 2010; Jaggia and Thakor, 1994; Titman, 1984). This motivates an important empirical question: Are external financing frictions and corporate employment decisions related and, if so, how? In this paper, we examine this question in the context of the collateral lending channel and the effect of real estate asset values on corporate hiring.

[1] Berger and Udell (1990) show that 70 percent of all commercial and industrial long-term debt and 30 and 40 percent of short-term loans in the United States are secured by collateral assets. In Section 2.2 we show that, in 1993, 64 percent of U.S. publicly traded firms report real estate ownership on their balance sheet, constituting a sizable 85 percent of tangible assets (see also, Chaney et al., 2012; Cvijanović, 2014; **?**).

[2] However, recent empirical analyses of the slump in business investment and employment in the Great Recession primarily focus on the employment effects of household balance sheets (e.g., Mian and Sufi, 2011, 2014) or bank balance sheets (e.g., Chodorow-Reich, 2014; Duygan-Bump et al., 2015).

[3] Important exceptions include Adelino et al. (2015), Benmelech et al. (2011), Chodorow-Reich (2014), Giroud and Mueller (2015a), and Giroud and Mueller (2015b).

From a theoretical perspective, collateral-based financing constraints could impact corporate employment for at least two reasons. First, if collateral value appreciation permits external funding of investment, this could increase both capital and employment if they are complementary inputs in the production function. Second, even if there are no complementarities (or capital) in the production process, employment might still depend on external finance and thus directly on changes in collateral values. For example, employment costs may include an upfront, fixed component associated with hiring or training activities (e.g., Oi, 1962). Alternatively, if the cash flow cycle is mismatched with the timing of operating costs then the firm may need to pay employees from working capital (Benmelech et al., 2011).

Based on such reasoning, we estimate the effect of real estate collateral values on corporate employment. We conduct our analysis using establishment-level data from the U.S. Census Bureau—which, crucially, includes complete information on employment—merged with balance sheet data from Compustat covering publicly traded corporations from 1993 until 2006. These sources link together administrative data on employment and firm locations with real estate holdings. We use an instrumental variables (IV) strategy to identify exogenous variation in local real estate prices and thus collateral value associated with the real estate holdings of local firms. Following Mian and Sufi (2011) and Chaney et al. (2012) among others, we instrument for local real estate prices with the interaction of the land supply elasticity at the Metropolitan Statistical Area (MSA) level with a measure of nationwide mortgage interest rates.[4] To tighten identification, we couple this approach with unique features of the establishment-level data, namely, the geographical dispersion of establishments within a firm. Our approach allows us to control for potential unobserved local economic shocks that may jointly impact real estate prices and the growth opportunities of real estate owning firms, a serious identification challenge in this setting.[5]

[4]This approach has recently become standard in the empirical finance literature. See Adelino et al. (2015), Cvijanović (2014), Giroud and Mueller (2015b), and Lin (2015) for other applications.

[5]A second identification concern is that firms choosing to purchase real estate may be more responsive

We provide micro-evidence that firms significantly increase employment when the market value of their real estate collateral appreciates. On average, firms increase employment expenditures by about \$0.10 per \$1 increase in the value of its collateral, or about a 15.6 percent increase of the standard deviation of employment. This sizable response results from changes in the number of employees, as opposed to adjustments in the average wage. Consistent with prior empirical research (e.g., Cvijanović, 2014; Lin, 2015), we show this additional hiring is funded through debt issues and the effects are stronger for firms likely to be financially constrained. Importantly, our findings hold when we focus our attention on industries least likely to be influenced by local demand shocks, including manufacturers and firms in tradable industries.

We exploit the unique attributes of the establishment-level data to understand precisely how firms choose to expand employment across their portfolio of assets. By considering firms as portfolios of locations, our analysis shows that firms increase hiring at geographically distant locations leading to within-firm spillover effects across geographic regions. We find evidence that financially constrained firms transmit real estate collateral shocks across regions in a way that is quantitatively important at the macro-level. Thus, our evidence lends empirical support to theoretical models identifying financial constraints and their interaction with collateral values providing a channel to spread and potentially amplify economic shocks (e.g., Jermann and Quadrini, 2012; Kiyotaki and Moore, 1997).

Our findings relate to at least two strands of the literature. First, we contribute to the literature on the real effects of financing frictions (e.g., Whited, 1992). Until recently, this literature has focused on investment, however an emerging literature examines the impact of financial market frictions on corporate labor demand. Benmelech et al. (2011) identify the effects on labor—both at the firm- and county-level in the U.S.—using three different quasi-experiments. Adelino et al. (2015) and Schmalz et al. (2015) document the importance of

to local economic conditions. We describe this issue and how we tackle it in Section 2.3.

financial constraints for small business and self-employment, respectively. Other papers focus on the recent financial crisis and Great Recession. Duygan-Bump et al. (2015) document relatively large employment cuts for small firms from industries with higher financing needs. Relatedly, Chodorow-Reich (2014) shows there were significant firm-level employment effects for corporations reliant on credit lines from impaired banks during the 2007 to 2009 U.S. financial crisis (see also Greenstone et al., 2014).[6] Our results complement this literature by examining the impact of financial constraints, specifically, through collateral restrictions, on corporate employment. We show firms use increased availability of pledgeable assets to externally fund additional employment. Also, through exploring the unique aspects of the Census data, we provide new evidence on how firms adjust employment across throughout their internal network of establishments after debt capacity increases.

Second, we contribute to a literature on the real effects of collateral-based lending constraints. From a theoretical perspective, Kiyotaki and Moore (1997) model the relation between firm collateral shocks and investment. Jermann and Quadrini (2012) show collateral constraints can matter in the aggregate, whereas Liu et al. (2013) stress the importance of land prices and real estate collateral dynamics. On the empirical front, we complement recent work linking exogenous variation in real estate collateral to corporate investment, notably Chaney et al. (2012) who also studies the U.S. real estate market from 1993 until 2006. Gan (2007a) investigates the relation between real estate collateral and corporate investment in a quasi-experimental setting. Peek and Rosengren (2000) and Gan (2007b) examine the firm-level investment-effects of a bank credit supply shock resulting from real estate loan exposure. These last three papers all consider a severe negative shock: the 1990s Japanese land market collapse. We instead characterize the effects of firm-level real estate collateral values

[6]There is also a literature on the relation between firm capital structure and employment, including Hanka (1998), Davis et al. (2014), and Agrawal and Tambe (2014). Giroud and Mueller (2015b) examine the impact of firm leverage on unemployment during the Great Recession using establishment-level data from the U.S. Census Bureau.

over a relatively normal business cycle, and provide direct evidence of a link between the commercial real estate sector and the real economy through corporate employment decisions.

The remainder of this paper is organized as follows. Section 2 presents the data and empirical methodology. Section 3 provides our empirical results on relation between collateral and employment. Section 4 concludes.

2 Data and Empirical Methodology

Our data construction and empirical methodology builds on the framework of Chaney et al. (2012), who also study the U.S. real estate market from 1993 until 2006. A key step in our analysis is to incorporate establishment-level data from the U.S. Census Bureau on employment and the internal organization of firms. In this section, we describe these steps in detail.

2.1 Data Sources

We use firm-level data from Compustat. We start with the sample of firms active in 1993.[7] We then apply the following initial filters. We drop firms with missing total assets. We keep firms headquartered in the U.S. and exclude those operating in the following industries: finance, insurance, real estate (SIC 60-67), construction (SIC 15-17), and mining (SIC 10-14). Finally, we keep only firms with the required data for at least three consecutive years.

The establishment-level data comes from the U.S. Census Bureau. The primary data source is the Longitudinal Business Database (LBD), an annual register of all U.S. private sector places of employment ("establishments") with at least one paid employee. The LBD contains longitudinal establishment identifiers as well as data on employment and payroll, industry codes, corporate ownership (used to assign establishments to firms), and, importantly

[7]This is the last year that the accumulated depreciation of buildings in reported in Compustat. As described below in Section 2.2, this item is required to measure the value of real estate assets.

for our purposes, location. Consistent with the standard U.S. statistical agency definition, annual employment is equal to the total number of employees on payroll as of March 12th each year. We retain establishment-year observations with nonmissing and nonzero employment and payroll data, and establishments with at least two consecutive years of data. We merge Compustat firms to establishments in the LBD via the Compustat-SSEL bridge maintained by the U.S. Census Bureau where possible. When this is not possible (e.g., the bridge ends in 2005), we match via the employer identification number (EIN) along with employer name and address.

We obtain data on real estate prices at the MSA-level from the Office of Federal Housing Enterprise Oversight (OFHEO). The OFHEO provides price indices of single-family homes in the U.S. at the MSA-level after 1977.[8] We use these real estate price indices to update the value of firms real estate assets beyond 1993, using information on the location of headquarters from Compustat and establishments from the LBD (see Section 2.2). We match the MSA-level price data to headquarter locations in Compustat using a mapping from Federal Information Processing Standards (FIPS) codes to MSA identifiers provided by the OFHEO.

2.2 Variable Construction and Summary Statistics

Our main dependent variable is the annual dollar change in employment expenditures normalized by lagged plants, property, and equipment (PPE). Employment expenditures are measured using payroll data from the LBD, aggregated to the firm level. We focus on this measure as it gives a straightforward interpretation of a dollar value increase in employment resulting from a $1 increase in the collateral value of a firm.

We also use three alternative measures of the employment decision using employment data from the LBD. First, the annual change in the number of employees scaled by lagged

[8]OFHEO residential real estate prices proxy adequately for commercial real estate prices and have the advantage of being available for a greater number of MSAs (Chaney et al., 2012).

PPE. Second, the annual change in number of employees divided by one half of the sum of current and lagged employment. This latter measure is the symmetric employment growth rate, which can accommodate both entry and exit as well as being less sensitive to outliers (Chodorow-Reich, 2014; Davis et al., 1998). Finally, the average wage growth, which is defined as the annual change in payroll divided by the number of employees. We use these different employment measures to elicit the channel through which firms adjust employment (i.e., more employees or wages per employee).

We proxy for collateral value using the market value of real estate assets of each firm. To construct this variable we proceed in two steps. We first measure each firm's value of real estate assets as of 1993 using data from Compustat. Then we use time series and geographical variation in real estate prices to isolate changes in these real estate asset values.

To measure the market value of real estate assets of each firm in 1993, we first define real estate assets as buildings, land and improvement, and construction in progress. These assets are reported at historical cost, so their market value as of 1993 must be estimated. This requires two steps. First, we estimate the (average) year that the assets were purchased. To this end, we first divide the accumulated depreciation of buildings by the historical cost of buildings to measure the percent of the historical asset value claimed as depreciation. Then, assuming assets have a depreciable life of 40 years, we can estimate the year in which the assets were purchased. In the second step, we use historical prices to inflate the reported historical cost to a current market value of real estate assets of each firm. In particular, the 1993 value is computed by inflating their historical cost using MSA-level residential real estate prices after 1977 and CPI inflation beforehand. Once we have the 1993 market value, we use a MSA-level residential price index to obtain a market value of real estate assets for each firm-year in our sample from 1993 until 2006.

An important caveat is that our measurement of real estate asset values relies on information on the geographic location (i.e., MSA) of assets owned by each firm. However,

Compustat does not provide this data and instead reports firms' headquarter locations at the ZIP code level. We therefore proxy for the location of real estate using the headquarter MSA.[9] For this to be a valid approximation, we rely on the following two assumptions. First, the location of headquarters and owned real estate assets is the same MSA. Second, firms' headquarters are a large fraction of the value of real estate assets. To empirically assess these assumptions, we use establishment-level data from the LBD on the "true" locations of firms' operations to form alternative measures of exposure to real estate shocks. In a complementary test, we use data hand-collected from SEC 10-K filings—made available online by Chaney et al. (2012)—identifying firms that report owning their headquarters. In each case our results are similar, indicating that our method for calculating the value of real estate assets provides a good quality approximation.

We use standard firm-level variables commonly used in the financial constraints literature to supplement our main analysis. These variables are described here and precisely defined in Appendix A. To account for observable differences among firms in our regressions, we consider the following firm-level characteristics: return on assets, total assets, Tobin's Q, cash flow, age, two-digit SIC industry and MSA of headquarters location fixed effects. We also include several measures of debt issuance and repayment constructed using Compustat data: long-term debt issues, long-term debt repayment, and annual changes in current debt and long-term debt (net), all scaled by total assets. These variables are used as dependent variables to corroborate our central hypothesis that collateral value appreciation leads to hiring funded by additional debt issues. All ratios are winsorized at the 1 percent level to ensure that results are robust to outliers.

With these data requirements in place, particularly the Compustat-SSEL link, we are able to construct a final sample containing 13,000 firm-year observations. Summary statistics are presented in Table I.[10] Importantly, as of 1993, 64.1 percent of firms reported real estate

[9] ZIP codes are matched to MSA identifiers using a correspondence provided by the U.S. Census Bureau.

[10] In accordance with the Census Bureau's disclosure requirements, the numbers of observations in tables

ownership in Compustat data. For the average firm, the market value of real estate assets represents 85 percent of (lagged) PPE. These numbers are in line with previous estimates from the literature, notably Chaney et al. (2012). Thus, we find real estate holdings represent a significant portion of the tangible assets held on the balance sheet of these corporations. Other firm- and establishment-level variables appear broadly consistent with the empirical corporate finance literature (e.g., Giroud and Mueller, 2015a). This indicates that the match to the Census data does not lead to any sample selection issues. This is unsurprising given the data is administrative and should cover the universe of Compustat firms.

Finally, as we shall discuss in detail below, we instrument local real estate price growth using the interaction of local land supply elasticity and long-term interest rates. Local land supply elasticities are collected from Saiz (2010). These elasticities attempt to measure the availability of developable land in each MSA based on satellite-generated data. They vary from 0 to 4 with an elasticity of 4 corresponding to an MSA with land supply that is relatively easy to expand. We measure long-term interest rates using the interest rate on 30-year, fixed rate conventional residential mortgage loan. These data are provided by the Federal Reserve.

2.3 Identification and Empirical Model

Changes in the market value of real estate holdings may impact the amount of assets a firm has available to pledge in collateralized borrowing. To examine the implications for corporate employment, we begin with a version of a standard reduced-form investment equation with employment given by:

$$\text{Employment}_{it} = \alpha_i + \alpha_m \times \alpha_t + \beta \text{ RE Value}_{it} + \theta' \mathbf{X}_{imt} + \epsilon_{it}, \quad (1)$$

are rounded off and we do not report any quantile values.

where i indexes firms, m indexes headquarters' locations (i.e., MSAs), t indexes years, Employment_{it} is the annual change in the dollar value of employment expenditures scaled by lagged PPE, and RE Value is the market value of real estate assets scaled by lagged PPE. We incorporate firm fixed effects (α_i) and MSA-year fixed effects ($\alpha_m \times \alpha_t$), where the latter controls for local shocks in growth opportunities. A vector of control variables, $\mathbf{X}$, includes the ratio of cash flow to PPE, the one-year lagged Tobin's Q, and other initial firm characteristics interacted with the MSA-year fixed effects (as described below). The error terms, ϵ_{it}, are clustered at the MSA-year level, which is conservative given the main independent variable, RE Value, is measured at the firm level (Bertrand et al., 2004).

The main coefficient of interest, β, measures how a firm's employment responds to an extra dollar of real estate holdings. If some firms face financial constraints, the coefficient β will be strictly positive. The null hypothesis that collateral values are irrelevant for employment behavior (because financial constraints are not binding or additional real estate collateral cannot be pledged), which corresponds to expecting that β will be zero.

Identification of β comes from both between- and within-MSA-year variation in the response of corporate hiring to real estate valuations between firms owning and leasing real estate. The key concern is that real estate values could proxy for an omitted variable such as the state of the local economy. For example, a positive demand shock could lead to increased production and hence demand for all factors of production including labor, as well as greater demand for housing. Alternatively, higher real estate prices could increase demand for goods and prompt growth in corporate hiring, say because households feel wealthier or withdraw home equity (Mian and Sufi, 2014). Either way, if firms with greater real estate holdings are *more* sensitive to local demand shocks then could lead to a spurious positive estimate of β.

Following Chaney et al. (2012), we use an instrumental variables (IV) approach to identify exogenous variation in the value of firms' real estate holdings.[11] We first instrument for

[11] This approach has now become standard in the literature, e.g., Adelino et al. (2015), Cvijanović (2014),

real estate market prices using the interaction of land supply elasticities with shifts in the nationwide mortgage interest rate. The intuition for this approach is as follows: for a given increase in real estate demand—proxied by a decrease in mortgage interest rates—the extent to which local real estate prices rise is determined by the slope of the local land supply curve. If the local land supply curve is flat (elastic), then greater demand will result in additional land development as opposed to higher land prices. On the other hand, if land supply is inelastic then greater demand will result in higher prices.[12] We therefore expect in MSAs with more inelastic local land supply elasticities, falls in mortgage interest rates should result in greater real estate price appreciation. To illustrate this logic, Figure 1 plots the real estate price index from 2000 until 2006 separately for MSAs with high and low land supply elasticities along with a nationwide mortgage interest rate. Evidently, low elasticity MSAs experience a more pronounced boom in the real estate market than high elasticity MSAs.

Accordingly, the first-stage of our IV approach predicts real estate prices by:

$$\text{RE Price Index}_{mt} = \alpha_m + \alpha_t + \psi \text{ Elasticity}_m \times \text{Mortgage Rate}_t + \nu_{mt}, \tag{2}$$

where m indexes MSAs, t indexes years, α_m are MSA fixed effects, and α_t year fixed effects. Elasticity_m is the MSA-level local land supply elasticity and Mortgage Rate_t is the nationwide rate at which banks finance 30-year, fixed rate conventional residential mortgage loans. The error terms, ν_{it}, are clustered at the MSA-level.[13] The second-stage of the IV regression modifies (1), with employment now given by:

$$\text{Employment}_{it} = \alpha_i + \alpha_m \times \alpha_t + \beta \widehat{\text{RE Value}}_{it} + \theta' \mathbf{X}_{imt} + \epsilon_{it}, \tag{3}$$

Giroud and Mueller (2015b), Lin (2015), and Mian and Sufi (2011).

[12]This intuition is consistent with empirical evidence from the house price booms of the 1980s (Glaeser et al., 2008), as well as the most recent episode (Mian and Sufi, 2011).

[13]The results of this first-stage estimation, deferred to the Internet Appendix IA.I for breity, are in line with the aforementioned studies: the coefficient, ψ, is economically large and statistically significant, and the F-test indicates the instrument is not weak (the test statistics are all greater than 10).

where the market value of real estate holdings as of 1993 is now inflated by the instrumented MSA-level price index from 1993 to year t, giving $\widehat{\text{RE Value}}_{it}$. We will refer to this as our baseline specification throughout the remainder of the paper.

Estimation of equation (3) is also subject to reverse causality, whereby firms increasing hiring might have a positive impact on the local economy and thus boost real estate prices. We investigate this concern by simply re-estimating the model on a subsample of small firms located in large MSAs. Since these firms are unlikely to push up local real estate prices, it allows us to address the reverse causality issue directly.

The final identification concern with this estimation is the real estate ownership decision and how it may relate to different firm-types. In particular, if firms choosing to purchase real estate are also more responsive to local economic conditions, our estimate of β could be biased. We approach this issue following the literature (Chaney et al., 2012; Cvijanović, 2014): we control for the interaction of observable firm characteristics that determine real estate ownership with MSA-year fixed effects. If real estate owners' fundamentals are more sensitive to fluctuations in local economic conditions then controlling for this interaction allows us to identify the collateral lending channel. Note that heterogeneity in the ownership decision should partly be controlled for through the inclusion of firm fixed effects, but controlling for the observable determinants of real estate holdings will improve identification.

We focus on the real estate ownership decision as of 1993 and the following determinants: five quintiles of return on assets, total assets, age, and industry and MSA fixed effects. Consistent with the literature, we find firms with higher return on assets, larger firms, and older firms are more likely to purchase real estate in our sample.[14] These firm-level characteristics, measured as of 1993 and interacted with the contemporaneous local real

[14]We demonstrate the importance of these firm characteristics two ways. First, we estimate a cross-sectional regression of the firm-level market value of real estate and an ownership indicator—a variable equal to one if the firm reports real estate assets in Compustat—on firm characteristics as of 1993. Second, we simply show the differences in summary statistics between owners and renters. These findings are deferred to the Internet Appendix IA.II.

estate price index, are thus included in the vector of controls, $\mathbf{X}$, in every employment regression model. Thus, our final identifying assumption is that the ownership decision is orthogonal to the sensitivity of employment to local real estate prices, once we control for these observable determinants and how they interact with prices.

In the second part of the analysis, we extend this framework to consider specifications where unit of observation are individual establishments. We examine how employment adjusts at the establishment level in response to changes in the market value of real estate assets measured at the firm level under the maintained assumption that owned assets are located in the same MSA as the firm's headquarters. We estimate the following model where establishment-level employment is given by:

$$\text{Employment}_{ijt} = \alpha_j + \alpha_m \times \alpha_t + \beta \widehat{\text{RE Value}}_{it} + \theta' \mathbf{X}_{ijmt} + \epsilon_{ijt}. \tag{4}$$

The unit of observation is an establishment-year. Here, j indexes the establishments of firm i, m indexes the MSA in which the firm is headquartered, α_j denotes establishment fixed effects, and $\alpha_m \times \alpha_t$ denote MSA-year fixed effects. Since establishment and headquarters locations need not be the same we have another source of variation to identify β. In particular, we can tighten identification by examining how establishments located in the same MSA—each with different headquarters locations—respond to contemporaneous local shocks. Notice that in order to include establishment fixed effects in this model we must have its ownership (i.e., by firm i) remain unchanged from year t to $t+1$. Thus, our establishment-level analysis considers the intensive margin of employment and not hiring through acquisitions or establishment openings.

3 Empirical Results

This section provides estimates of the impact of real estate collateral values on the employment outcomes. In Section 3.1, we conduct the baseline firm-level analysis, as well as robustness tests. Section 3.2 documents within-firm spillovers of local financial shocks across geographical regions using the establishment location information. Section 3.3 investigates whether these regional spillovers matter for employment at the MSA level.

3.1 Real Estate Collateral Values and Corporate Employment

Table II provides the results of estimating the relation between employment and collateral based on equations (1) and (3). Column [1] shows the results from the estimation of (1) using OLS and without any time-varying firm controls. The coefficient on RE Value is equal to 0.107 and significant at the 1 percent confidence level. The direction of this estimate is consistent with our expectation that firms with greater real estate holdings increase their employment more when real estate prices rise. In terms of economic magnitudes, the estimate implies that increasing the market value of real estate holdings by one standard deviation (this is, roughly a 1.121 increase) leads to a 0.119 increase in employment, which constitutes about 16.3 percent of its standard deviation (0.733). In dollar terms, an extra dollar of real estate collateral increases employment expenditures by about \$0.107.

Column [2] shows the results of the OLS estimation once we add controls for investment opportunities: cash flow and Tobin's Q. We find both Cash Flow and Q have a positive impact on employment, in line with expectations, although only the latter is statistically significant. Column [3] further saturates this specification with MSA-year fixed effects. Note that the coefficient on RE Price index is no longer identified once we include these fixed effects. This is our preferred specification, as β is now identified off firms operating in the same MSA and industry in the same year that are exposed to the same real estate price shock, but have

different real estate holdings. In both columns, we see the resulting coefficient is unchanged in terms of magnitude and significance.

Column [4] now conducts the IV estimation of equation (3) with real estate prices instrumented using the interaction of the local land supply elasticity and nationwide mortgage rate. Section 2.3 provides details of the IV strategy and first-stage results, so here we focus on the second-stage equation. The column shows the IV estimation yields a similar coefficient of 0.098, which is also significant at the 1 percent level. Thus, the IV and OLS estimates are similar both in terms of magnitude and significance.[15]

To confirm this evidence consistent with the collateral lending channel theory (e.g., Almeida and Campello, 2007), we examine changes in debt financing decisions. In particular, we re-estimate the model in column [4] with debt issuance as the dependent variable. We uncover a positive impact of real estate collateral values on long-term debt issuance and repayment consistent with utilization of greater debt capacity.[16] The micro-estimates in this section therefore indicate that the collateral lending channel has a strong impact on employment.

3.1.1 Robustness Checks

To examine the robustness of the baseline firm-level estimates in Table II, we conduct a number of additional tests. The results of these tests are presented in Table III.

As described earlier, our approach isolates exogenous variation in real estate collateral values, which addresses the concern that real estate assets may proxy for growth opportu-

[15]In Internet Appendix IA.III, we examine the possibility that our employment results are mechanical driven by capital-labor complementarities in production and capital adjusting to financial constraints. Following Benmelech et al. (2011), we augment our regression with the contemporaneous level of investment over assets and annual investment growth. As the table shows, complementarities between labor and capital do play a role—the measures of investment are all positive and highly significant—and the coefficients on RE Value attenuate (e.g., from 0.098 to 0.067 in our preferred specification). Nevertheless, after taking these complementarities into account, our results continue to hold.

[16]The results on debt financing are in the Internet Appendix IA.IV. For more detailed evidence on how these firms adjust leverage and debt contracting, see Cvijanović (2014) and Lin (2015).

nities. However, our measurement of the market value of real estate assets relies on several assumptions that may introduce measurement error into the regression analysis. Columns [1] to [4] of Table III address this issue directly.

We first investigate our assumption that the location of all real estate assets is the same MSA as headquarters. This assumption may be problematic if the majority of real estate holdings are located elsewhere. In this case, the baseline estimates reported in Table II might be subject to measurement error and biased either downwards or upwards. On the one hand, if the measurement error is independent of the true market value of real estate assets then the estimate of β may be biased towards zero. On the other hand, if the measurement error is positively correlated with the true value of real estate—say, if firms with the largest real estate holdings also have the lowest fraction of their holdings in the headquarters MSA—then β may be upwards biased.

We gauge the importance our location assumption using establishment-level data on the location of firms' operations from the LBD. While the LBD does not provide information on the ownership of establishments, it does provide establishment-level employment data that can be used to construct weights that indicate how exposed each firm is to each MSA-level real estate market.[17] We consider two such weighting schemes. First, for each firm, we weight according to the fraction of the firm's total employment located in each MSA ("Employment-Weighted"). Second, we assign a 100 percent weight to the MSA with the greatest fraction of the firm's employment ("Employment-Maximum"). These weights are then interacted with appropriate MSA-level real estate price indices and aggregated to the firm-year level to give a quasi-real estate price index. This firm-year level price index can then be used to inflate the market value of real estate assets as of 1993, as described in Section 2.2, and provide a more refined measure of collateral value.

[17]This is only relevant for ("multi-unit") firms with more than one establishment. Such firms comprise more than 84 percent of the observations in our sample. The Internet Appendix provides detailed summary statistics for both single- and multi-unit firms (see Internet Appendix IA.V).

Columns [1] and [2] show the results of the IV estimation of equation (3) using these two alternative weighting schemes. In both cases, the coefficient on RE Value is positive and statistically significant at the 1 percent confidence level. The point estimates—0.094 and 0.082 for employment-weighted and employment-maximum, respectively—are consistent with Table II, although slightly smaller in magnitude. This suggests the location assumption may introduce measurement error in our baseline regression leading to (slightly) inflated estimates of the impact of collateral on employment. One explanation mentioned above is that firms with the largest real estate ownership may also have more dispersed holdings.

To further investigate the location assumption, we use data on which firms own their headquarters hand-collected from SEC 10-K filings by Chaney et al. (2012). In particular, we restrict the sample to firms where we know with certainty whether the firm did or did not own their headquarters in 1997, the first year when filings were available in electronic format. This reduces the sample size to approximately 9,000 firm-year observations. We calculate the market value of real estate assets following the usual procedure and perform IV estimation of equation (3) on this subsample. Column [3] shows the results of this test. The coefficient of interest is now 0.110 and remains significant at the 1 percent confidence level, which conforms well with the baseline IV estimates.

Next, we take a simpler approach and replace RE Value with RE Owner—an indicator variable equal to one if the firm reports any real estate holdings in 1993—as the main independent variable in equation (3). This indicator variable is interacted with the MSA-level real estate price index corresponding to each firm's headquarters location. If collateral values matter for employment then we would expect that the coefficient on RE Owner $\times$ RE Price Index should be positive. This approach complements the baseline regression analysis by using a simpler method to calculate real estate exposure. It also allows us to investigate whether previous estimates are driven by a small number of large real estate holders. Column [4] shows a positive coefficient on the interaction, which is consistent with our expectation.

One remaining concern is our estimates may be affected by reverse causality in real estate holding decisions: hiring by large firms might impact local real estate prices by increasing local demand for housing. To address this issue, we repeat our baseline IV estimation on a subsample of small firms located in large MSAs. We define small firms as those belonging to the bottom three quartiles of the size distribution and large MSAs are restricted to the top 20 (ranked on population). The estimated coefficient reported in column [5], is 0.166 and is statistically significant at the 1 percent confidence level, thus alleviating the reverse causality concern. In fact, the point estimate for the small firms is quite a bit larger than the baseline estimate, a fact we will revisit when we discuss the role of ex ante financial constraints in Section 3.1.4.

3.1.2 Alternative Measures of Employment

In IV ne now consider several alternative measures of employment. The results serve as both robustness checks and also shed light on the channel through which firms expand employment (i.e., more employees or wages per employee). First, we re-estimate equation (3) using industry-adjusted employment expenditures as a dependent variable. More precisely, each firm's employment expenditures is demeaned by the expenditures of the other firms in the same two-digit SIC industry and year. This adjustment mitigates the concern that employment growth might occur in industries concentrated in areas experiencing greater real estate price appreciation, and firms in these industries have greater real estate holdings. Column [1] shows the coefficient of interest remains unchanged (0.094 versus 0.098 in the corresponding baseline estimation) and remains significant at the 1 percent confidence level.

We explore three additional measures that are each calculated using employment data from the LBD. Column [2] uses the annual change in the number of employees scaled by lagged PPE as the dependent variable. Columns [3] uses the annual change in number of employees divided by one half of the sum of current and lagged employment, i.e., the

symmetric employment growth rate. In each of these two columns the coefficient on RE Value is positive and statistically significant at the 1 percent level, consistent with the increase in collateral value leading to hiring of new employees. Column [4] uses the average wage growth (payroll divided by the number of employees) and shows the coefficient of interest is essentially zero and insignificant. Thus, we find the change in real estate collateral value results in incremental hiring, but not higher wages for existing or new employees.

3.1.3 Comparing Tradable and Non-Tradable Industries

In this section, we perform sample splits at the industry level to further address the possibility that local demand shocks give rise to a spurious correlation between real estate prices, real estate holdings, and corporate employment. While a local demand shock associated with real estate price appreciation should affect all firms similarly, the collateral lending channel is only relevant for firms with real estate holdings. However, it is still possible that real estate holding firms respond more to local demand shocks. To examine this possibility, we separate out industries most likely to benefit from local demand shocks ("non-tradable" industries, such as construction and restaurants) from all others ("tradable" industries, such as heavy manufacturing). Naturally, firms from tradable industries are less likely to make employment decisions in response to local demand shocks.

We partition industries on the basis of tradability three ways and rerun our main specification separately on each subsample. The results of this analysis are reported in Table V. We first split industries based on the average distance of shipments following Adelino et al. (2015), who use shipment distance data from the 2007 Census Commodity Flow Survey for their classification. In particular, we classify three-digit NAICS industry-state pairs as tradable if the median reported shipment distance is above 600 miles. Columns [1] and [2] show the results of the IV estimation. For both columns, we see that the coefficient of

interest is positive and significant at at least the 5 percent level.[18] Most importantly, the coefficient for the "Tradable" subsample is positive (0.104) and highly significant, indicating that the collateral effect is still strong once we remove firms most likely to be sensitive to local demand shocks from the sample.

We next repeat our tests simply classifying manufacturing firms as belonging to tradable industries and all other firms as non-tradable. The same pattern emerges: employment expenditures of firms from tradable industries, here manufacturers, show a strong dependence on real estate collateral values. This indicates that the relationship we uncovered in our baseline sample is not driven by the inclusion of non-manufacturers. Thus, the interpretation that our real estate collateral effect is proxying for a greater sensitivity to local demand shocks among real estate holding firms does not appear validated by the data.

3.1.4 Impact of Financial Constraints

In this section, we analyze whether the effect of real estate collateral values on corporate employment varies with the extent of financial constraints. Our tests allow us to evaluate whether real estate price appreciation, by increasing available collateral and thus debt capacity, helps alleviate potential inefficiencies resulting from imperfect capital markets (Almeida and Campello, 2007).

We follow the standard approach in the empirical corporate finance literature (e.g., Giroud and Mueller, 2015a), which uses (lagged) measures of financial constraints to sort firms into either "Constrained" or "Unconstrained" groups.[19] We focus on three different measures of financial constraints following the definitions given by Chaney et al. (2012). Our first measure of constraints is firm size. For each year in the sample, we label firms as financially constrained if they are in the bottom three deciles of the asset size distribution

[18] Using a t-test of equality, we find the differences in RE Value point estimates across the tradable and non-tradable firms are insignificant conventional levels for both measures of industry tradability.

[19] The use of lagged values alleviates concerns that the classification might be contaminated by contemporaneous real estate price appreciation.

and unconstrained if they are in the top three deciles. All other firm-years are excluded from the analysis. Second, we use payout policy to classify firms. In particular, for each year we calculate the payout ratio of each firm: total payouts (dividends plus stock repurchases) divided by operating income. Each year, firms in the lowest three deciles of the distribution of payouts are labeled as financially constrained, firms in the highest three deciles of the distribution are considered unconstrained, and all other firms are discarded. Finally, we use long-term bond rating from Compustat (assigned by Standard and Poor's). Among those firms with outstanding long-term debt, we label unrated (rated) firms as financially constrained (unconstrained). Then we estimate equation (3) on the subsamples of firms and compare the coefficient of interest across constrained and unconstrained groups.

Table VI reports the results. The point estimates indicate that there are substantial differences in the responsiveness of firm-level employment to variation in real estate collateral values between the groups. In particular, the size of the coefficient of interest, β, is estimated to be about twice as large for the constrained group in all three cases. Moreover, these differences are significant at at least the 10 percent level for each measure of financial constraints, using a t-test of equality of the RE Value point estimates across the constrained and unconstrained firms. Thus, we find evidence that increases in collateral values are particularly effective at facilitating hiring among the set of financially constrained firms.

3.2 Regional Employment Spillovers through Firms' Internal Networks of Establishments

In this section, we estimate establishment-level regressions using data from the LBD. We measure how employment adjusts among firms' portfolio of establishments in response to changes in the market value of its collateral. We distinguish among establishments primarily among their location of operation. This analysis serves two purposes. First, we corroborate

our main results using more granular data that allow us to improve identification by including powerful controls, such as establishment fixed effects and granular establishment industry identifiers interacted with MSA-Year fixed effects. This allows us to compare employment outcomes in establishments that are observationally similar aside from the location of their respective headquarters. Second, we examine how employment expands within a given firm at locations distant from the financial shock (i.e., the location of headquarters) that are unlikely to be affected by local demand shocks. Moreover, we use this latter test to provide new evidence on how local financial shocks can propagate across U.S. regions through firms internal networks of establishments.

Before examining within-firm labor allocation, we first estimate the effect of real estate collateral values on employment outcomes for individual establishments based on equation (4). The regressions now include establishment fixed effects and establishment controls, in addition to the set of firm controls and MSA-Year fixed effects. We maintain our assumption that owned real estate is located in the same MSA as the firm's headquarters and calculate the firm-level collateral value accordingly.

Table VII shows the results. Columns [1] to [6] show the estimates separately for the establishments of financially constrained and unconstrained firms. We find the effect of real estate collateral on establishment-level employment is positive and highly statistically significant, but only for the establishments of financially constrained firms. In the case of financially unconstrained firms, establishment-level hiring does not appear to respond to additional collateral. This is true whether we sort firms on the basis of size, payout policy, or credit rating, and corroborates our findings from Table VI at a more granular level and with the inclusion of a more powerful set of controls.

We next focus exclusively on the set of constrained firms—since they are the only firms to adjust—and examine how they choose to increase employment across establishments within their portfolio differing in terms of location. We implement our tests by interacting RE Value

with establishment proximity to headquarters and estimating a modified version of equation (4) following Giroud and Mueller (2015a):

$$\begin{aligned}\text{Employment}_{ijt} &= \alpha_j + \alpha_m \times \alpha_t + \beta_1 \widehat{\text{RE Value}}_{it} \times \text{Near}_j + \beta_2 \widehat{\text{RE Value}}_{it} \times \text{Far}_j \\ &\quad + \theta' \mathbf{X}_{ijmt} + \epsilon_{ijt}, \end{aligned} \tag{5}$$

where Near_j (Far_j) is an indicator variable equal to one (zero) if the establishment is (not) in close proximity to headquarters. The coefficients of interest here are β_1 and β_2 which captures the sensitivity of employment outcomes at establishments near to or distant from the shock to collateral values.

We consider two classification schemes for determining if an establishment is in close proximity to headquarters. First, whether an establishment is located in the same MSA as headquarters. Second, based on cutoffs for the physical distance of the establishment to headquarters: an establishment is considered distant if it is located greater than 100, 150, 250, or 500 miles from headquarters (and nearby otherwise). We calculate physical distance by mapping establishment and headquarters ZIP codes into latitude and longitude coordinates and applying the great-circle distance formula (see also, Giroud, 2013).

Table VIII shows the results. We first classify an establishment as in close proximity if they are located in the same MSA as headquarters. As is shown in Columns [1] to [3], the coefficients of interest are positive and always significant at at least the 10 percent level for establishments both near to and far from headquarters. The coefficient of interest for the distant establishments, β_2, is smaller in magnitude than the corresponding coefficient for the close-to-headquarters establishments. In columns [4] to [6], we instead use a 100 mile cutoff to define proximity to headquarters and a similar pattern emerges. Overall, we see that the greater financial slack afforded by positive shocks to debt capacity leads constrained firms to increase employment across the distance spectrum, albeit less so at distant establishments.

Table IX examines the sensitivity of these within-firm employment spillovers to our various assumptions. We focus on the set of firms considered financially constrained due to the lack of a bond rating. In the first three columns of the table, we examine the sensitivity of this result to our collateral location assumption and construction of real estate values. In each case, we use the same-MSA criterion to classify whether an establishment is proximate to the collateral shock or not. Column [1] assumes that real estate assets are located in the MSA with the greatest fraction of the firms' employment. Column [2] considers the subset of establishments belonging to firms that self-report headquarters ownership in the public filings (170,000 out of 335,000 establishments). And in column [3], we perform a simple comparison of establishment-level employment outcomes between real estate owners and renters. For each of these tests, we continue to find a positive relation between collateral values and hiring at both near and far establishments, although the effect tends to be stronger at the former location.

The remaining columns of the table consider alternative physical distance-based classifications of proximity to headquarters. We push the distance cutoffs out progressively farther to 150, 250, and 500 miles. Although the number of observations in the distant cell shrinks—and the point estimate of β_2 becomes noisier—in each case the main result continues to hold.

The analysis presented in this section yields two key takeaways. First, the within-firm expansion of employment at distant locations is inconsistent with hiring being exclusively driven by local demand shocks. Second, firms transmit real estate collateral shocks across their locations of operation resulting in geographical spillovers of collateral shocks to other regions of the economy. In the next section, we explore the potential for these effects to show up in the aggregate, i.e., at the MSA level.

3.3 Do Regional Employment Spillovers Aggregate?

In this section, we investigate whether the corporate balance sheets and the collateral lending channel play a role in the propagation of real estate price changes across regions. We build on the establishment-level results and examine whether the internal capital markets of constrained firms lead to geographic spillover effects that can impact macro-level employment.

It is ex ante unclear whether these effects should aggregate to have a positive or neutral impact on employment. On the one hand, firms experiencing a positive collateral shock could attract employees from other, unaffected establishments leading to neutral overall impact on employment. On the other hand, additional hiring by these firms could stimulate additional local employment. This could occur either directly if these firms tap unemployed labor or indirectly through spillover effects to other firms in the area, for example, in support industries.

Our investigation focuses on MSA-level employment outcomes following Giroud and Mueller (2015b).[20] Our independent variable is designed to capture the potential exposure of a given MSA to out-of-MSA real estate collateral value shocks. For each MSA we define a variable, RE Value$_{-m}$, as the employment-weighted average of the firm-level real estate market value for establishments located in a MSA. To capture a transmission effect from headquarters real estate collateral value, we exclude establishments whose parent firm is headquartered in the MSA. In line with previous literature, we estimate the following log-log specification:

$$\begin{aligned}\text{Log}(\text{Employment}_{mt}) &= \alpha_m + \alpha_t + \beta\ \text{Log}(\widehat{\text{RE Value}}_{(-m)t}) + \gamma\ \text{Log}(\text{RE } \widehat{\text{Price Index}}_{mt}) \\ &\quad + \theta' \mathbf{X}_{mt} + \epsilon_{mt}, \end{aligned} \tag{6}$$

[20] Giroud and Mueller examine the impact of firm leverage on macro-level employment outcomes during the years from 2007 until 2009. We adapt their macro-level empirical approach to our setting.

where m indexes MSAs, t indexes years, Employment_{mt} is the number of employees, and α_m) and α_t are MSA and year fixed effects, respectively. A vector of MSA control variables, $\mathbf{X}$, includes the employment rate and population. Employment is measured by aggregating across all establishments in the MSA using data from the LBD. The regression includes the MSA-level real estate price index to control for the direct effect of local real estate prices on employment. The coefficient of interest, β, captures the effect of out-of-MSA real estate price appreciation on local employment through geographic spillover effects associated with the internal capital markets of constrained firms.

As in our firm-level tests, we attempt to identify the role of constrained firms transmitting real estate shocks. We classify MSAs as financially constrained and unconstrained depending on the fraction of MSA employment that comes from the establishments of constrained firms. If an MSA has an above-median proportion of employment across all MSAs coming from constrained establishments then we call the MSA financially constrained. The remaining MSAs are considered financially unconstrained. We continue to use our three measures of financial constraints—firm size, payout policy, and bond rating—to carry out this classification procedure. We then re-estimate equation (6) separately on the subsamples of constrained and unconstrained MSAs.

Table X reports the main results. Column [1] shows the estimation using IV for the full sample.[21] The coefficient of interest is positive and significant at conventional levels. This indicates the within-firm regional spillover effects documented in Section 3.2 aggregate to the MSA-level and have a positive impact on employment. In Columns [2] to [7], once we partition MSAs according to the presence of constrained establishments we find further supportive evidence. For each measure of financial constraints, the coefficient is positive and significant. Indeed, we observe an increase in MSA-level employment in response to out-of-MSA real estate shocks only among the financially constrained MSAs. For the unconstrained

[21] In IA.VI of the Internet Appendix we report similar results for OLS estimation of equation (6).

MSAs, we observe no sensitivity to out-of-MSA real estate shocks and all of the estimated coefficients are insignificant.[22]

We conduct additional tests to examine the robustness of this result. In Table XI we first examine the set of firms that report headquarters ownership, as the transmission from out-of-MSA real estate price appreciation through the collateral channel is better identified here. As in the firm-level analysis, we sort firms according to whether they do or do not report headquarters ownership in their regulatory filings. In panel A we report the employment outcome for MSAs where we take the out-of-MSA real estate value among headquarters owners. We see a similar pattern in employment outcomes among financially-constrained MSAs, in terms of magnitudes and statistical significance. On the other hand, in panel B where we consider headquarters renters only, we see that the out-of-MSA real estate price appreciation does not translate into an increase in MSA-level employment among the constrained MSAs. Intuitively, there is no propagation of the real estate price shock through the internal network of establishments of firms that do not own real estate.

We next examine the importance of MSA linkages via firms' internal networks of establishments. In our macro-level regression framework, establishments within MSA m are connected to real estate prices in other MSAs $(-m)$ by assigning the firm-level real estate collateral value to other MSAs with weight equal to the within-firm employment distribution in year $t-1$. Therefore the propagation of out-of-MSA real estate price shocks depends on both the price shock and the linkages among MSAs.

In Table XII we test the importance of the linkages generated from internal networks with two placebos. In panel A we randomize the within-firm employment distribution. In particular, for each establishment j of firm i in MSA m we assign weights to all other MSAs $-m$ at random, subject to being between zero and one and adding up to one. In

[22]We also examine alternative distance cutoffs and show the result is still present, although naturally become weaker in magnitude, when we exclude establishments that are farther away from headquarters. These results are deferred to Internet Appendix IA.VII.

panel B, for each firm we randomly assign the within-firm employment distribution (with replacement) from the population distribution. As the results in the table show, for both of these placebos we see there is no significant effect of real estate collateral values on MSA level employment outcomes. This finding underscores the importance of firms' internal organization and geography for the transmission of the financial shocks across U.S. regions.

Overall, we find that MSAs with a larger proportion of establishments belonging to financially constrained firms exhibit a significant response in employment following changes in non-local real estate collateral values. Thus, shocks to the financial constraints in conjunction with firms' internal networks of establishments play an important role for regional employment spillovers at the macro-level.

4 Conclusion

Using comprehensive establishment-level employment data from the U.S. Census Bureau, we measure the sensitivity of firm employment to changes in debt capacity induced by fluctuations in real estate prices over the period from 1993 until 2006. We provide evidence that firms significantly increase employment when the value of real estate collateral appreciates. On average, a publicly traded U.S. corporation increases employment expenditures by about \$0.10 per \$1 increase in the value of its collateral, or about or 15.6 percent of the standard deviation of employment per standard deviation increase in collateral values. In line with previous research on the collateral lending channel, we show this additional hiring is funded through debt issues and the effects are stronger for firms likely to be financially constrained. Crucially, our findings hold when we focus our attention on the industries least likely to respond to local demand shocks, including manufacturers and firms in tradable industries.

We explore the unique features of the establishment-level data to tighten identification and understand how firms choose to expand employment across their portfolio of assets. By

considering firms as portfolios of locations, we further explore these within-firm spillover effects across regions. We find evidence that financially constrained firms can transmit real estate collateral shocks across regions and that this can matter at the macro-level.

Overall, the micro-evidence we present highlights the empirical importance of collateral lending channel as a key determinant of corporate employment decisions. Our evidence is consistent with financial constraints and their interaction with real estate collateral values providing a channel to spread economic shocks, as articulated theoretically in Kiyotaki and Moore (1997), Jermann and Quadrini (2012), and Liu et al. (2013).

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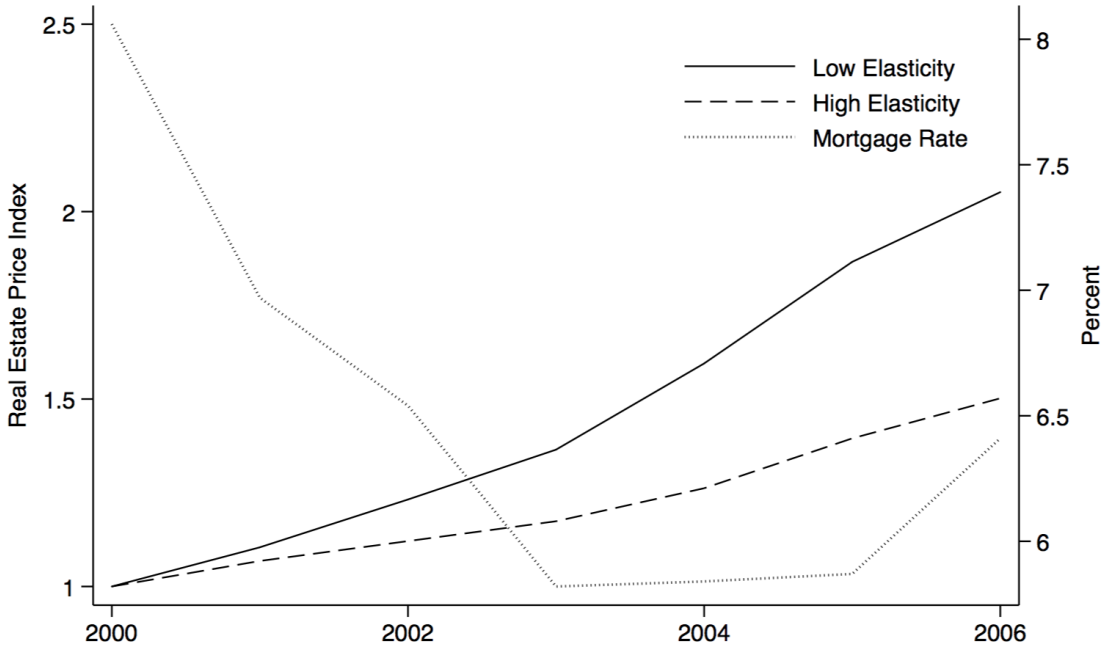

Figure 1: Relative Evolution of U.S. Real Estate Prices. This figure plots the time series average of annual MSA-level real estate prices (residential, single-family home) and the 30-year, fixed rate conventional residential mortgage interest rate. The price index is normalized to one in 2000. The sample period is from 2000 until 2006. The series is plotted separately for MSAs with high (top quartile) and low (bottom quartile) elasticity of land supply.

Table I
Summary Statistics

This table provides sample summary statistics. Panel A provides firm-level statistics. Panel B provides establishment-level statistics. Panel C summarizes MSA-level statistics. The unit of observation in Panel A, B, and C, respectively, is a firm-year, establishment-year, and MSA-year. All variables are defined in Appendix A.

	Rounded N	Mean	Std.
	[1]	[2]	[3]
Panel A: Firm-Level			
Employment Expenditures	13,000	0.193	0.733
Employment Expenditures (IM)	13,000	0.123	0.569
Number of Employees	13,000	2.594	15.795
Number of Employees (Alt.)	13,000	0.011	0.323
Average Wage	13,000	0.002	0.008
RE Value	13,000	0.852	1.121
RE Value (Employment-Weighted)	13,000	0.890	1.215
RE Value (Employment-Maximum)	13,000	0.881	1.207
RE Value (HQ Owner)	9,000	0.781	1.134
RE Owner	13,000	0.641	0.480
Return on Assets	13,000	0.007	0.236
Cash Flow	13,000	-0.265	2.668
Q	13,000	2.087	1.554
Total Assets	13,000	1,511.688	5,910.535
Age	13,000	20.108	14.067
Panel B: Establishment-Level			
Employment Expenditures	912,000	0.097	0.695
Number of Employees	912,000	0.000	0.031
Age	912,000	10.374	8.219
Panel C: MSA-Level			
Number of Employees	1,230	853,971.2	966,523.7
RE Price Index	1,230	0.676	0.192
RE Value$_{-l}$	1,230	7.292	0.830
Elasticity	1,230	1.632	0.860
Employment Rate	1,230	0.948	0.021
Population	1,230	1,720,035	1,866,270

Table II
Real Estate Collateral and Corporate Employment: Firm-Level Analysis

This table presents estimates of the firm-level impact of real estate collateral value on corporate employment. The unit of observation in each regression is a firm-year pair. The dependent variable is the annual change in employment expenditures divided by the lagged value of plants, property, and equipment. The main independent variable is the market value of real estate assets, which is calculated assuming assets are located in the same MSA as firms' headquarters (see Section 2.2). Columns [1]–[3] show the results of the OLS estimation. Column [4] instruments for the market value of real estate using the triple-interaction of the local land supply elasticity, the nationwide mortgage interest rate, and the market value of real estate holdings in 1993. Each regression controls for firm fixed effects, as well as initial firm characteristics (five quintiles of Return on Assets, Total Assets, Age, and two-digit SIC industry dummies) interacted with either MSA-level real estate prices or MSA-year fixed effects. All variables are defined in Appendix A. Standard errors (in parentheses) are clustered at the MSA-year level. ***, **, * denote 1, 5, and 10 percent statistical significance.

Dependent Variable: Employment Expenditures				
	[1]	[2]	[3]	[4]
RE Value	0.107***	0.102***	0.102***	0.098***
	(0.022)	(0.021)	(0.021)	(0.021)
Cash Flow		0.011	0.011	0.011
		(0.009)	(0.009)	(0.009)
Q		0.047***	0.047***	0.047***
		(0.012)	(0.012)	(0.012)
Firm Fixed Effects	Y	Y	Y	Y
Year Fixed Effects	Y	Y	N	N
RE Price Index	Y	Y	N	N
RE Price Index × Init. Controls	Y	Y	N	N
MSA × Year Fixed Effects	N	N	Y	Y
MSA × Year Fixed Effects × Init. Controls	N	N	Y	Y
Rounded N	13,000	13,000	13,000	13,000
R^2	0.55	0.56	0.56	0.56

Table III
Robustness Checks for Firm-Level Analysis

This table presents robustness checks of the baseline estimates of the firm-level impact of real estate collateral value on corporate employment. The unit of observation in each regression is a firm-year pair. The dependent variable is the annual change in employment expenditures divided by the lagged value of plants, property, and equipment. The main independent variable is the market value of real estate assets, which is calculated assuming assets are located in the same MSA as firms' headquarters (see Section 2.2). Column [1] instead assumes that real estate assets are geographically distributed in proportion to establishment-level employment. Column [2] assumes that real estate assets are located in the MSA with the greatest firm-level employment. Column [3] uses the market value of real estate assets for firms that own their headquarters. Column [4] replaces the market value of real estate assets with an indicator variable equal to one if the firm had positive real estate holdings in 1993. Column [5] restricts the sample to firms in the bottom three quartiles in the distribution of total assets and in the largest 20 MSAs by population. All columns use IV estimation, where the market value of real estate is instrumented for using the triple-interaction of the local land supply elasticity, the nationwide mortgage interest rate, and the market value of real estate holdings in 1993. Each regression controls for firm and MSA-year fixed effects, as well as initial firm characteristics (five quintiles of Return on Assets, Total Assets, Age, and two-digit SIC industry dummies) interacted with MSA-year fixed effects. All variables are defined in Appendix A. Standard errors (in parentheses) are clustered at the MSA-year level. ***, **, * denote 1, 5, and 10 percent statistical significance.

Dependent Variable: Employment Expenditures					
	E-Weighted RE Prices	E-Maximum RE Prices	HQ RE Value	RE Owner Indicator	Large MSA, Small Firm
	[1]	[2]	[3]	[4]	[5]
RE Value	0.094***	0.082***	0.110***		0.166***
	(0.019)	(0.017)	(0.031)		(0.035)
RE Owner × RE Price Index				1.005***	
				(0.243)	
Cash Flow	0.011	0.011	0.009	0.010	0.010
	(0.009)	(0.009)	(0.010)	(0.009)	(0.010)
Q	0.047***	0.047***	0.051***	0.048***	0.063***
	(0.012)	(0.012)	(0.016)	(0.012)	(0.016)
Firm Fixed Effects	Y	Y	Y	Y	Y
MSA × Year Fixed Effects	Y	Y	Y	Y	Y
MSA × Year Fixed Effects × Init. Controls	Y	Y	Y	Y	Y
Rounded N	13,000	13,000	9,000	13,000	5,000
R^2	0.56	0.56	0.58	0.56	0.54

Table IV
Alternative Measurement of Firm-Level Employment

This table presents estimates of the firm-level impact of real estate collateral value on alternative measures of corporate employment. The unit of observation in each regression is a firm-year pair. The dependent variable changes across specifications. Column [1] demeans the dependent variable using the mean of all other firms in the same two-digit SIC grouping. Columns [2] use the annual change in number of employees divided by the lagged value of plants, property, and equipment. Columns [3] use twice the annual change in number of employees divided by the sum of current and lagged employment (i.e., the symmetric growth rate). Columns [4] use the change in the average wage (payroll divided by number of employees). The main independent variable is the market value of real estate assets, which is calculated assuming assets are located in the same MSA as firms' headquarters (see Section 2.2). All columns use IV estimation, where the market value of real estate is instrumented for using the triple-interaction of the local land supply elasticity, the nationwide mortgage interest rate, and the market value of real estate holdings in 1993. Each regression controls for firm and MSA-year fixed effects, as well as initial firm characteristics (five quintiles of Return on Assets, Total Assets, Age, and two-digit SIC industry dummies) interacted with MSA-year fixed effects. All variables are defined in Appendix A. Standard errors (in parentheses) are clustered at the MSA-year level. ***, **, * denote 1, 5, and 10 percent statistical significance.

Dependent Variable:	Ind.-Adj. Employment	Number of Employees	Number of Employees (Alt.)	Average Wage
	[1]	[2]	[3]	[4]
RE Value	0.097***	1.520***	0.053***	0.110
	(0.024)	(0.511)	(0.013)	(0.289)
Cash Flow	0.010	0.251	0.005*	0.004
	(0.009)	(0.163)	(0.003)	(0.088)
Q	0.046***	1.918***	0.038***	-1.029***
	(0.012)	(0.216)	(0.004)	(0.154)
Firm Fixed Effects	Y	Y	Y	Y
MSA × Year Fixed Effects	Y	Y	Y	Y
MSA × Year Fixed Effects × Init. Controls	Y	Y	Y	Y
Rounded N	13,000	13,000	13,000	13,000
R^2	0.54	0.53	0.50	0.44

Table V
Employment Effects by Tradable and Non-Tradable Industries

This table presents estimates of the firm-level impact of real estate collateral value on corporate employment across three definitions of tradable and non-tradable industries. The unit of observation in each regression is a firm-year pair. The dependent variable is the annual change in employment expenditures divided by the lagged value of plants, property, and equipment. The main independent variable is the market value of real estate assets, which is calculated assuming assets are located in the same MSA as firms' headquarters (see Section 2.2). Columns [1]–[2], following Adelino et al. (forth.), classifies 3-digit NAICS industry-state pairs as tradable based on the median of the shipment distance distribution (above 600 miles). Columns [3]–[4] defines manufacturing firms as tradable and other firms non-tradable. All columns use IV estimation, where the market value of real estate is instrumented for using the triple-interaction of the local land supply elasticity, the nationwide mortgage interest rate, and the market value of real estate holdings in 1993. Each regression includes firm controls (Cash Flow and Q), firm and MSA-year fixed effects, as well as initial firm characteristics (five quintiles of Return on Assets, Total Assets, Age, and two-digit SIC industry dummies) interacted with MSA-year fixed effects. All variables are defined in Appendix A. Standard errors (in parentheses) are clustered at the MSA-year level. ***, **, * denote 1, 5, and 10 percent statistical significance.

Dependent Variable: Employment Expenditures				
	Shipping Distance		Manufacturing Industry	
	Tradable	Non-Tradable	Tradable	Non-Tradable
	[1]	[2]	[3]	[4]
RE Value	0.104**	0.122***	0.094***	0.207**
	(0.041)	(0.035)	(0.023)	(0.090)
Firm Controls	Y	Y	Y	Y
Firm Fixed Effects	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y
MSA × Year Fixed Effects	Y	Y	Y	Y
MSA × Year Fixed Effects × Init. Controls	Y	Y	Y	Y
Rounded N	5,000	2,000	8,000	5,000
R^2	0.60	0.82	0.58	0.75

Table VI
Impact of Financial Constraints on Firm-Level Employment

This table presents estimates of the firm-level impact of real estate collateral value on corporate employment across ex ante financially constrained and unconstrained firms. The unit of observation in each regression is a firm-year pair. The dependent variable is the annual change in employment expenditures divided by the lagged value of plants, property, and equipment. The main independent variable is the market value of real estate assets, which is calculated assuming assets are located in the same MSA as firms' headquarters (see Section 2.2). Columns [1]–[2] classify firms in the bottom three deciles of the size distribution (lagged total assets) as constrained and firms in the top three deciles as unconstrained. Columns [3]–[4] classify firms in the bottom three deciles of the payout ratio distribution (dividends plus repurchases over operating income) as constrained and firms in the top three deciles as unconstrained. Columns [5]–[6] classify firms with long-term debt outstanding and no bond rating as constrained and firms with a bond rating unconstrained. All columns use IV estimation, where the market value of real estate is instrumented for using the triple-interaction of the local land supply elasticity, the nationwide mortgage interest rate, and the market value of real estate holdings in 1993. Each regression includes firm controls (Cash Flow and Q), firm and MSA-year fixed effects, as well as initial firm characteristics (five quintiles of Return on Assets, Total Assets, Age, and two-digit SIC industry dummies) interacted with MSA-year fixed effects. All variables are defined in Appendix A. Standard errors (in parentheses) are clustered at the MSA-year level. ***, **, * denote 1, 5, and 10 percent statistical significance.

Dependent Variable: Employment Expenditures						
Financial Constraint:	Firm Size		Payout Policy		Bond Rating	
	C	U	C	U	C	U
	[1]	[2]	[3]	[4]	[5]	[6]
RE Value	0.152**	0.022	0.156***	0.049	0.122***	0.004
	(0.071)	(0.022)	(0.058)	(0.034)	(0.040)	(0.026)
Firm Controls	Y	Y	Y	Y	Y	Y
Firm Fixed Effects	Y	Y	Y	Y	Y	Y
MSA × Year Fixed Effects	Y	Y	Y	Y	Y	Y
MSA × Year Fixed Effects × Init. Controls	Y	Y	Y	Y	Y	Y
Rounded N	5,000	5,000	7,000	4,000	8,000	3,000
R^2	0.60	0.72	0.60	0.77	0.65	0.63

Table VII
Establishment Level Analysis

This table presents estimates of the establishment-level impact of real estate collateral value on corporate employment. The unit of observation in each regression is an establishment-year pair. The dependent variable is the annual establishment-level change in employment expenditures divided by the lagged firm-level value of plants, property, and equipment. The main independent variable is the market value of real estate assets, which is calculated assuming assets are located in the same MSA as firms' headquarters (see Section 2.2). Columns [1]–[6] classify firms as financially constrained or unconstrained according to the definitions in Table VI and repeat the estimation on these subsamples. All columns use IV estimation, where the market value of real estate is instrumented for using the triple-interaction of the local land supply elasticity, the nationwide mortgage interest rate, and the market value of real estate holdings in 1993. Each regression includes firm controls (Cash Flow and Q), establishment and MSA-year fixed effects, as well as initial firm characteristics (five quintiles of Return on Assets, Total Assets, Age, and two-digit SIC industry dummies) and establishment characteristics (Age and two-digit SIC industry dummies) interacted with MSA-year fixed effects. Coefficients are scaled up by 1,000 for readability. All variables are defined in Appendix A. Standard errors (in parentheses) are clustered at the firm level. ***, **, * denote 1, 5, and 10 percent statistical significance.

Dependent Variable: Employment Expenditures						
Financial Constraint:	Firm Size		Payout Policy		Bond Rating	
	C	U	C	U	C	U
	[1]	[2]	[3]	[4]	[5]	[6]
RE Value	0.226***	-0.000	0.077***	-0.009	0.145***	-0.013
	(0.073)	(0.025)	(0.030)	(0.050)	(0.036)	(0.033)
Firm Controls	Y	Y	Y	Y	Y	Y
Establishment Controls	Y	Y	Y	Y	Y	Y
Establishment Fixed Effects	Y	Y	Y	Y	Y	Y
MSA × Year Fixed Effects	Y	Y	Y	Y	Y	Y
MSA × Year Fixed Effects × Init. Controls	Y	Y	Y	Y	Y	Y
Rounded N	70,000	1,200,000	290,000	750,000	335,000	827,000
R^2	0.69	0.45	0.44	0.50	0.60	0.47

Table VIII
Regional Employment Spillovers through Firms' Internal Networks

This table shows the impact of real estate collateral value on the within-firm adjustment in employment among financially constrained firms. The unit of observation in each regression is an establishment-year pair. The dependent variable is the annual establishment-level change in employment expenditures divided by the lagged firm-level value of plants, property, and equipment. The main independent variable is the market value of real estate assets, which is calculated assuming assets are located in the same MSA as firms' headquarters (see Section 2.2). Financial constraints are defined in Table VI. Columns [1]–[3] classify establishments as in close proximity to headquarters ("near") if they are located in the same MSA as headquarters (and "far" otherwise). Columns [4]–[6] classify establishments as near if they are within 100 miles of headquarters and far otherwise. All columns use IV estimation, where the market value of real estate is instrumented for using the triple-interaction of the local land supply elasticity, the nationwide mortgage interest rate, and the market value of real estate holdings in 1993. Each regression includes firm controls (Cash Flow and Q), establishment and MSA-year fixed effects, as well as initial firm characteristics (five quintiles of Return on Assets, Total Assets, Age) and establishment characteristics (Age and two-digit SIC industry dummies) interacted with MSA-year fixed effects. Coefficients are scaled up by 1,000 for readability. All variables are defined in Appendix A. Standard errors (in parentheses) are clustered at the firm level. ***, **, * denote 1, 5, and 10 percent statistical significance.

Dependent Variable: Employment Expenditures						
Distance Measure:	Same MSA as HQ			100 Miles Cutoff		
	Firm Size	Payout Policy	Bond Rating	Firm Size	Payout Policy	Bond Rating
	[1]	[2]	[3]	[4]	[5]	[6]
RE Value × Near	0.270***	0.134**	0.270***	0.263***	0.101*	0.246***
	(0.094)	(0.065)	(0.062)	(0.085)	(0.055)	(0.055)
RE Value × Far	0.182*	0.055**	0.086**	0.164*	0.065**	0.082**
	(0.098)	(0.027)	(0.038)	(0.090)	(0.030)	(0.040)
Firm Controls	Y	Y	Y	Y	Y	Y
Establishment Controls	Y	Y	Y	Y	Y	Y
Establishment Fixed Effects	Y	Y	Y	Y	Y	Y
MSA × Year Fixed Effects	Y	Y	Y	Y	Y	Y
MSA × Year Fixed Effects × Init. Controls	Y	Y	Y	Y	Y	Y
Rounded N	70,000	290,000	335,000	70,000	290,000	335,000
R^2	0.69	0.64	0.60	0.69	0.44	0.60

Table IX
Regional Employment Spillovers through Firms' Internal Networks: Robustness Checks

This table presents robustness checks of the impact of real estate collateral value on the within-firm adjustment in employment among financially constrained firms (based on bond rating). The unit of observation in each regression is a establishment-year pair. The dependent variable is the annual establishment-level change in employment expenditures divided by the lagged firm-level value of plants, property, and equipment. The main independent variable is the market value of real estate assets, which is calculated assuming assets are located in the same MSA as firms' headquarters (see Section 2.2). Column [1] assumes that real estate assets are located in the MSA with the greatest firm-level employment. Column [3] uses the market value of real estate assets for firms that own their headquarters. Column [3] replaces the market value of real estate assets with an indicator variable equal to one if the firm had positive real estate holdings in 1993. Columns [5]–[7] consider alternative distance cutoffs (150, 200, and 250 miles) when defining establishment proximity to headquarters. All columns use IV estimation, where the market value of real estate is instrumented for using the triple-interaction of the local land supply elasticity, the nationwide mortgage interest rate, and the market value of real estate holdings in 1993. Each regression includes firm controls (Cash Flow and Q), establishment and MSA-year fixed effects, as well as initial firm characteristics (five quintiles of Return on Assets, Total Assets, Age, and two-digit SIC industry dummies) and establishment characteristics (Age and two-digit SIC industry dummies) interacted with MSA-year fixed effects. All variables are defined in Appendix A. Standard errors (in parentheses) are clustered at the firm level. ***, **, * denote 1, 5, and 10 percent statistical significance.

Dependent Variable: Employment Expenditures				Proximity to HQ		
	E-Maximum RE Prices	HQ RE Value	RE Owner Indicator	150 Miles	250 Miles	500 Miles
	[1]	[2]	[3]	[4]	[5]	[6]
RE Value × Near	0.209***	0.272***		0.229***	0.210***	0.171***
	(0.054)	(0.084)		(0.051)	(0.046)	(0.039)
RE Value × Far	0.069**	0.123**		0.086**	0.086**	0.099*
	(0.031)	(0.060)		(0.041)	(0.044)	(0.055)
RE Owner × RE Price Index × Near			0.738**			
			(0.365)			
RE Owner × RE Price Index × Far			0.735***			
			(0.281)			
Firm Controls	Y	Y	Y	Y	Y	Y
Establishment Controls	Y	Y	Y	Y	Y	Y
Establishment Fixed Effects	Y	Y	Y	Y	Y	Y
MSA × Year Fixed Effects	Y	Y	Y	Y	Y	Y
MSA × Year Fixed Effects × Init. Controls	Y	Y	Y	Y	Y	Y
Rounded N	335,000	170,000	335,000	335,000	335,000	335,000
R^2	0.60	0.64	0.60	0.60	0.60	0.60

Table X
Do Regional Employment Spillovers Matter at Macro Level?

This table presents estimates of the regional spillover of real estate collateral values on employment at the MSA level. In particular, assuming that firms' real estate values lie with their headquarters, the estimates show the transmission from headquarter values to non-headquarters (out-of-MSA) employment. The unit of observation in each regression is an MSA-year pair. The dependent variable is the natural logarithm of total number of employees at the MSA-level. In all regressions, we use the employment-weighted average of out-of-MSA real estate market value for firms that have non-headquarter establishments in the MSA. Column [1] shows the average effect. Columns [2]–[7] classify MSAs as financially constrained if an above-median fraction of MSA-level employment comes from establishments belonging to financially constrained firms, and unconstrained otherwise. All columns use IV estimation, where the each firm's market value of real estate is instrumented for using the triple-interaction of the local land supply elasticity, the nationwide mortgage interest rate, and the market value of real estate holdings in 1993. Each regression controls for MSA-level characteristics (Employment Rate and Population), and MSA and year fixed effects. All variables are defined in Appendix A. Standard errors (in parentheses) are clustered at the MSA level. ***, **, * denote 1, 5, and 10 percent statistical significance.

Dependent Variable: Log(Number of Employees)							
Financial Constraint:		Firm Size		Payout Policy		Bond Rating	
		C	U	C	U	C	U
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Log(RE Value$_{-m}$)	0.062**	0.068**	0.013	0.073**	0.019	0.044**	0.017
	(0.027)	(0.034)	(0.014)	(0.035)	(0.025)	(0.018)	(0.017)
RE Price Index	Y	Y	Y	Y	Y	Y	Y
MSA Controls	Y	Y	Y	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y	Y	Y	Y
MSA Fixed Effects	Y	Y	Y	Y	Y	Y	Y
N	1,230	905	325	717	513	590	640
R^2	0.99	0.99	0.99	0.99	0.99	0.99	0.99

Table XI
Regional Employment Spillovers at Macro Level: HQ Ownership

This table presents estimates of the regional spillover of real estate collateral values on employment at the MSA level based on headquarters ownership status. In particular, assuming that firms' real estate values lies with their headquarters, the estimates show the transmission from headquarter values to non-headquarters (out-of-MSA) employment. The unit of observation in each regression is an MSA-year pair. The dependent variable is the natural logarithm of total number of employees at the MSA-level. In all regressions, we use the employment-weighted average of out-of-MSA real estate market value for firms that have non-headquarters establishments in the MSA. Panel A restricts the sample to firms that are headquarters owners and Panel B to firms that are not. Columns [1]–[6] classify MSAs as financially constrained if an above-median fraction of MSA-level employment comes from establishments belonging to financially constrained firms, and unconstrained otherwise. All columns use IV estimation, where the each firm's market value of real estate is instrumented for using the triple-interaction of the local land supply elasticity, the nationwide mortgage interest rate, and the market value of real estate holdings in 1993. Each regression controls for MSA-level characteristics (Employment Rate and Population), and MSA and year fixed effects. All variables are defined in Appendix A. Standard errors (in parentheses) are clustered at the MSA level. ***, **, * denote 1, 5, and 10 percent statistical significance.

Panel A: HQ Owners

Dependent Variable: Log(Number of Employees)

Financial Constraint:	Firm Size		Payout Policy		Bond Rating	
	C	U	C	U	C	U
	[1]	[2]	[3]	[4]	[5]	[6]
Log(RE Value$_{-m}$)	0.058***	-0.001	0.037**	0.016	0.019**	0.013
	(0.023)	(0.010)	(0.017)	(0.017)	(0.011)	(0.024)
RE Price Index	Y	Y	Y	Y	Y	Y
MSA Controls	Y	Y	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y	Y	Y
MSA Fixed Effects	Y	Y	Y	Y	Y	Y
N	584	573	673	557	672	558
R^2	0.99	0.99	0.99	0.99	0.99	0.99

Panel B: HQ Renters

Dependent Variable: Log(Number of Employees)

Financial Constraint:	Firm Size		Payout Policy		Bond Rating	
	C	U	C	U	C	U
	[1]	[2]	[3]	[4]	[5]	[6]
Log(RE Value$_{-m}$)	0.007	0.001	0.000	0.011	0.003	0.012
	(0.019)	(0.001)	(0.019)	(0.013)	(0.019)	(0.010)
RE Price Index	Y	Y	Y	Y	Y	Y
MSA Controls	Y	Y	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y	Y	Y
MSA Fixed Effects	Y	Y	Y	Y	Y	Y
N	840	390	889	341	828	402
R^2	0.99	0.99	0.99	0.99	0.99	0.99

Table XII
Regional Spillovers at Macro Level: Placebo Linkages

This table presents placebo tests for the regional spillover of real estate collateral values on employment at the MSA level. The unit of observation in each regression is an MSA-year pair. The dependent variable is the natural logarithm of total number of employees at the MSA-level. To generate placebo within-firm employment distributions across MSAs, we randomize the distribution of firm employment across MSAs (Panel A) and draws at random (with replacement) from the actual empirical distribution of within-firm employment (Panel B). Based on these placebo distributions, we use the employment-weighted average of out-of-MSA real estate market value for firms that have non-headquarter establishments in the MSA. Columns [1]–[6] classify MSAs as financially constrained if an above-median fraction of MSA-level employment comes from establishments belonging to financially constrained firms, and unconstrained otherwise. All columns use IV estimation, where the each firm's market value of real estate is instrumented for using the triple-interaction of the local land supply elasticity, the nationwide mortgage interest rate, and the market value of real estate holdings in 1993. Each regression controls for MSA-level characteristics (Employment Rate and Population), and MSA and year fixed effects. All variables are defined in Appendix A. Standard errors (in parentheses) are clustered at the MSA level. ***, **, * denote 1, 5, and 10 percent statistical significance.

Panel A: Randomize Within-Firm Employment Distribution

Dependent Variable: Log(Number of Employees)

Financial Constraint:	Firm Size		Payout Policy		Bond Rating	
	C	U	C	U	C	U
	[1]	[2]	[3]	[4]	[5]	[6]
Log(RE Value$_{-m}$)	0.115	0.025	0.062	0.107	0.060	0.017
	(0.077)	(0.018)	(0.062)	(0.075)	(0.039)	(0.044)
RE Price Index	Y	Y	Y	Y	Y	Y
MSA Controls	Y	Y	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y	Y	Y
MSA Fixed Effects	Y	Y	Y	Y	Y	Y
N	905	325	717	513	590	640
R^2	0.99	0.99	0.99	0.99	0.99	0.99

Panel B: Randomize based on Empirical Distribution

Dependent Variable: Log(Number of Employees)

Financial Constraint:	Firm Size		Payout Policy		Bond Rating	
	C	U	C	U	C	U
	[1]	[2]	[3]	[4]	[5]	[6]
Log(RE Value$_{-m}$)	0.016	0.004	0.000	0.024	0.006	-0.004
	(0.010)	(0.008)	(0.010)	(0.018)	(0.009)	(0.007)
RE Price Index	Y	Y	Y	Y	Y	Y
MSA Controls	Y	Y	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y	Y	Y
MSA Fixed Effects	Y	Y	Y	Y	Y	Y
N	905	325	717	513	590	640
R^2	0.99	0.99	0.99	0.99	0.99	0.99

Appendix A: Variable Definitions

This appendix presents the definitions for the variables used throughout the paper.

Variable	Definition	Source
Panel A: Firm-Level Variables		
Employment Expenditures	Change in payroll summed across establishments over lagged PPE	LBD, Compustat
Employment Expenditures (IM)	Change in payroll summed across current establishments over lagged PPE	LBD, Compustat
Number of Employees	Change in employees summed across establishments over lagged PPE	LBD, Compustat
Number of Employees (Alt.)	Two times the change in employees summed across establishments over sum of current and lagged employment (i.e., symmetric growth rate)	LBD, Compustat
Average Wage	Total payroll divided by total number of employees	LBD
RE Value	Market value of real estate assets assuming located in same MSA as HQ	OFHEO, Compustat
RE Value (Employment-Weighted)	Market value of real estate assets assuming located in proportion to establishment-level employment	OFHEO, Compustat, LBD
RE Value (Employment-Maximum)	Market value of real estate assets assuming located in MSA with greatest firm-level employment	OFHEO, Compustat, LBD
RE Owner	Equal to one if the book value of real estate holdings is greater than zero	Compustat
HQ RE Value	Market value of real estate assets for firms that own their HQ	Chaney et al. (2012)
Return on Assets	Net operating income divided by total assets	Compustat
Cash Flow	Ratio of cash flow (EBITDA) to lagged PPE	Compustat
Q	Ratio of market to book value of assets	Compustat
Total Assets	Book value of assets	Compustat
Age	Number of years since IPO	Compustat
Panel B: Establishment-Level Variables		
Employment Expenditures	Change in establishment-level payroll over lagged firm-level PPE	LBD
Number of Employees	Change in establishment-level employees over lagged firm-level PPE	LBD
Age	Number of years the establishment appears in the LBD	LBD
Panel C: MSA-Level Variables		
Number of Employees	Log number of employees summed across all establishments in a given MSA	LBD
RE Price Index	Residential (single-family home) real estate price index	OFHEO
Elasticity	Local elasticity of land supply	Saiz (2010)
RE Value$_{-m}$	Market value of real estate multiplied by the fraction of employees in a given MSA, summed across all firms whose headquarter are not in that MSA	OFHEO, Compustat, LBD
Employment Rate	Ratio of number of employed to labor force	Bureau of Labor Statistics
Population	Log number of residents in an MSA	Census

Internet Appendix for "Collateral Values and Corporate Employment"

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Appendix IA.I: First-Stage for IV Estimation

This table presents estimates of the impact of land supply elasticity on real estate prices. The unit of observation in each regression is an MSA-year pair. The dependent variable is the real estate price index (single-family home, residential) defined at the MSA-year level. The MSA-level land supply elasticity—taken from Saiz (2010)—is interacted with the interest rate on a 30-year, fixed rate conventional home mortgage. Column [1] uses the land supply elasticity directly. Column [2] uses the quartiles of the land supply elasticity. Each regression is estimated using OLS and controls for year and MSA fixed effects. All variables are defined in Appendix A. Standard errors (in parentheses) are clustered at the MSA level. ***, **, * denote 1, 5, and 10 percent statistical significance.

Dependent Variable: RE Price Index		
	[1]	[2]
Elasticity × Mortgage Rate	0.035	
	(0.004)	
Elasticity (First Quartile) × Mortgage Rate		-0.064
		(0.007)
Elasticity (Second Quartile) × Mortgage Rate		-0.046
		(0.008)
Elasticity (Third Quartile) × Mortgage Rate		-0.014
		(0.007)
Year Fixed Effects	Y	Y
MSA Fixed Effects	Y	Y
N	1,358	1,358
R^2	0.95	0.95

Appendix IA.II: Real Estate Ownership and Firm-Level Characteristics

Panel A presents estimates of the firm-level determinants of the real estate ownership decision in 1993. The unit of observation in each regression is a firm. Column [1] uses Real Estate Owner as the dependent variable, which is an indicator variable equal to one if the firm reports any real estate holdings on its balance sheet in 1993. Column [2] uses the market value of real estate assets in 1993 as the dependent variable. Each regression is estimated using OLS and includes for firm characteristics (five quintiles of Return on Assets, Total Assets, Age) and industry and MSA fixed effects. All variables are defined in Appendix A. Robust standard errors are shown in parentheses. ***, **, * denote 1, 5, and 10 percent statistical significance. Panel B provides summary statistics for renters and owners for the Compustat universe from 1993 until 2006. The unit of observation is a firm-year. Renters (owners) report zero (positive) real estate ownership in a given year.

Panel A: Determinants of Real Estate Ownership		
Dependent Variable:	RE Owner	RE Value
	[1]	[2]
Return on Assets (Second Quintile)	0.128	0.252
	(0.026)	(0.067)
Return on Assets (Third Quintile)	0.151	0.219
	(0.027)	(0.070)
Return on Assets (Fourth Quintile)	0.138	0.189
	(0.027)	(0.069)
Return on Assets (Fifth Quintile)	0.120	0.206
	(0.026)	(0.067)
Total Assets (Second Quintile)	0.173	0.156
	(0.026)	(0.066)
Total Assets (Third Quintile)	0.308	0.203
	(0.026)	(0.068)
Total Assets (Fourth Quintile)	0.484	0.381
	(0.028)	(0.073)
Total Assets (Fifth Quintile)	0.517	0.235
	(0.031)	(0.081)
Age (Second Quintile)	0.057	0.054
	(0.026)	(0.068)
Age (Third Quintile)	0.12	0.120
	(0.02)	(0.066)
Age (Fourth Quintile)	0.227	0.386
	(0.025)	(0.064)
Age (Fifth Quintile)	0.285	0.848
	(0.027)	(0.071)
Industry Fixed Effects	Y	Y
MSA Fixed Effects	Y	Y
N	2,474	2,474
R^2	0.58	0.37

Panel B: Summary Statistics for Renters and Owners

	Renters			Owners		
	N	Mean	Std.	N	Mean	Std.
	[1]	[2]	[3]	[4]	[5]	[6]
RE Value	8,770	0	0	16,230	1.361	1.198
Return on Assets	8,884	-0.144	0.343	16,218	0.066	0.140
Cash Flow	8,708	-1.565	4.433	16,154	0.213	1.132
Q	8,083	2.870	2.087	14,601	1.708	1.111
Total Assets	8,969	144.4	545.7	16,281	2,554	12,163
Age	9,010	11.806	6.774	16,335	24.420	14.873

Appendix IA.III: Complementarities between Capital and Labor

This table presents estimates of the firm-level impact of real estate collateral value on corporate employment controlling for investment. The unit of observation in each regression is a firm-year pair. The dependent variable is the annual change in employment expenditures divided by the lagged value of plants, property, and equipment. The main independent variable is the market value of real estate assets, which is calculated assuming assets are located in the same MSA as firms' headquarters (see Section 2.2). Columns [1]–[3] show the results of the OLS estimation. Column [4] instruments for firms' market value of real estate using the triple-interaction of the local land supply elasticity, the nationwide mortgage interest rate, and the market value of real estate holdings in 1993. Each regression includes firm controls (Cash Flow and Q) and firm fixed effects, as well as initial firm characteristics (five quintiles of Return on Assets, Total Assets, Age, and two-digit SIC industry dummies) interacted with either MSA-level real estate prices or MSA-year fixed effects. All variables are defined in Appendix A. Standard errors (in parentheses) are clustered at the MSA-year level. ***, **, * denote 1, 5, and 10 percent statistical significance.

Dependent Variable: Employment Expenditures				
	[1]	[2]	[3]	[4]
RE Value	0.072***	0.071***	0.071***	0.067***
	(0.023)	(0.023)	(0.023)	(0.023)
ΔInvestment	0.120***	0.116***	0.116***	0.116***
	(0.013)	(0.013)	(0.013)	(0.013)
Investment/Assets	1.266***	1.107***	1.107***	1.110***
	(0.169)	(0.183)	(0.183)	(0.183)
Firm Controls	Y	Y	Y	Y
Firm Fixed Effects	Y	Y	Y	Y
Year Fixed Effects	Y	Y	N	N
RE Price Index	Y	Y	N	N
RE Price Index × Init. Controls	Y	Y	N	N
MSA × Year Fixed Effects	N	N	Y	Y
MSA × Year Fixed Effects × Init. Controls	N	N	Y	Y
Rounded N	13,000	13,000	13,000	13,000
R^2	0.58	0.58	0.58	0.58

Appendix IA.IV: Real Estate Collateral and Debt Financing

This table presents estimates of the firm-level impact of real estate collateral value on corporate debt. The dependent variables in columns [1] to [5] are Debt Issues, Debt Repayment, Net Debt Issues, Changes in Long-Term Debt, and Changes in Current Debt, respectively. The main independent variable is the market value of real estate assets, which is calculated assuming assets are located in the same MSA as firms' headquarters (see Section 2.2). All columns use IV estimation, where the market value of real estate is instrumented for using the interaction of the local land supply elasticity, the nationwide mortgage interest rate, and the market value of real estate holdings in 1993. Each regression includes firm controls (Cash Flow and Q), firm and MSA-year fixed effects, as well as initial firm characteristics (five quintiles of Return on Assets, Total Assets, Age, and two-digit SIC industry dummies) interacted with MSA-year fixed effects. All variables are defined in Appendix A. Standard errors (in parentheses) are clustered at the MSA-year level. ***, **, * denote 1, 5, and 10 percent statistical significance.

Dependent Variable:	Debt Issues	Debt Repayment	Net Debt Issues	Changes in LT Debt	Changes in Current Debt
	[1]	[2]	[3]	[4]	[5]
RE Value	0.069**	0.052***	-0.004	0.057**	0.011**
	(0.034)	(0.020)	(0.021)	(0.023)	(0.005)
Firm Controls	Y	Y	Y	Y	Y
Firm Fixed Effects	Y	Y	Y	Y	Y
MSA × Year Fixed Effects	Y	Y	Y	Y	Y
MSA × Year Fixed Effects × Init. Controls	Y	Y	Y	Y	Y
Rounded N	12,000	13,000	12,000	13,000	13,000
R^2	0.64	0.67	0.54	0.49	0.43

Appendix IA.V: Further Summary Statistics

This table provides sample summary statistics for the LBD universe versus the Compustat-LBD matched sample and for single- and multi-unit firms within the matched sample. Panel A provides firm-level statistics. Panel B provides establishment-level statistics. The unit of observation in Panel A and B, respectively, is a firm-year and establishment-year. All variables are defined in Appendix A.

	Compustat-LBD			Single-Unit			Multi-Unit		
	Rounded N	Mean	Std.	Rounded N	Mean	Std.	Rounded N	Mean	Std.
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Panel A: Firm-Level									
Employment Expenditures	13,000	0.193	0.733	2,000	0.326	1.001	11,000	0.168	0.668
Number of Employees	13,000	2.594	15.795	2,000	3.420	19.126	11,000	2.439	15.087
Number of Employees (Alt.)	13,000	0.011	0.323	2,000	0.013	0.370	11,000	0.010	0.313
Average Wage	13,000	0.002	0.008	2,000	0.002	0.012	11,000	0.002	0.007
RE Value	13,000	0.852	1.121	2,000	0.211	0.748	11,000	0.971	1.139
RE Value (Employment-Weighted)	13,000	0.890	1.215	2,000	0.214	0.759	11,000	1.016	1.242
RE Value (Employment-Maximum)	13,000	0.881	1.207	2,000	0.214	0.759	11,000	1.006	1.234
RE Value (HQ Owner)	9,000	0.781	1.134	2,000	0.174	0.707	7,000	0.923	1.167
RE Owner	13,000	0.641	0.480	2,000	0.127	0.333	11,000	0.737	0.440
Return on Assets	13,000	0.007	0.236	2,000	-0.240	0.373	11,000	0.053	0.163
Cash Flow	13,000	-0.265	2.668	2,000	-2.534	4.803	11,000	0.159	1.730
Q	13,000	2.087	1.554	2,000	3.115	2.196	11,000	1.895	1.316
Total Assets	13,000	1,512	5,911	2,000	46.56	141.5	11,000	1,786	6,402
Age	13,000	20.108	14.067	2,000	10.714	6.451	11,000	21.866	14.406
Panel B: Establishment-Level									
Employment Expenditures	912,000	0.097	0.695	2,000	0.834	1.841	912,000	0.095	0.689
Number of Employees	912,000	0.000	0.031	2,000	0.008	0.078	912,000	0.000	0.030
Age	912,000	10.374	8.219	2,000	12.658	6.365	912,000	10.368	8.223

Appendix IA.VI: Regional Employment Spillovers at Macro Level: OLS

This table presents OLS estimates of the regional spillover of real estate collateral values on employment at the MSA level. In particular, assuming that firms' real estate values lies with their headquarters, the estimates show the transmission from headquarter values to non-headquarters (out-of-MSA) employment. The unit of observation in each regression is an MSA-year pair. The dependent variable is the natural logarithm of total number of employees at the MSA-level. In all regressions, we use the employment-weighted average of out-of-MSA real estate market value for firms that have non-headquarters establishments in the MSA. Column [1] shows the average effect. Columns [2]–[7] classify MSAs as financially constrained if an above-median fraction of MSA-level employment comes from establishments belonging to financially constrained firms, and unconstrained otherwise. Each regression controls for MSA-level characteristics (Employment Rate and Population), and MSA and year fixed effects. All variables are defined in Appendix A. Standard errors (in parentheses) are clustered at the MSA level. ***, **, * denote 1, 5, and 10 percent statistical significance.

Dependent Variable: Log(Number of Employees)							
Financial Constraint:		Firm Size		Payout Policy		Bond Rating	
		C	U	C	U	C	U
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Log(RE Value$_{-m}$)	0.025**	0.040**	-0.001	0.035**	0.010	0.018***	0.012
	(0.010)	(0.019)	(0.006)	(0.014)	(0.009)	(0.006)	(0.009)
RE Price Index	Y	Y	Y	Y	Y	Y	Y
MSA Controls	Y	Y	Y	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y	Y	Y	Y
MSA Fixed Effects	Y	Y	Y	Y	Y	Y	Y
N	5,144	2,366	2,359	2,579	2,565	2,571	2,573
R^2	0.99	0.99	0.99	0.99	0.99	0.99	0.99

Appendix IA.VII: Regional Employment Spillovers at Macro Level: Alternative Distance Cut Offs

This table presents estimates of the regional spillover of real estate collateral values on employment at the MSA level using alternative distance cut offs. The unit of observation in each regression is an MSA-year pair. The dependent variable is the natural logarithm of total number of employees. We use the employment-weighted average of out-of-MSA real estate market value for firms that have establishments in the MSA but more than 100, 250, and 500 miles from the headquarters MSA (Panel A, B, and C, respectively). Columns [1]–[6] classify MSAs as financially constrained if an above-median fraction of MSA-level employment comes from establishments belonging to financially constrained firms, and unconstrained otherwise. All columns use IV estimation, where the each firms market value of real estate is instrumented for using the triple-interaction of the local land supply elasticity, the nationwide mortgage interest rate, and the market value of real estate holdings in 1993. Each regression controls for MSA-level characteristics (Employment Rate and Population), and MSA and year fixed effects. All variables are defined in Appendix A. Standard errors (in parentheses) are clustered at the MSA level. ***, **, * denote 1, 5, and 10 percent statistical significance.

Panel A: 100 Miles Cut Off

Dependent Variable: Log(Number of Employees)

Financial Constraint:	Firm Size		Payout Policy		Bond Rating	
	C	U	C	U	C	U
	[1]	[2]	[3]	[4]	[5]	[6]
Log(RE Value$_{-m}$)	0.089***	0.005	0.106***	0.017	0.055***	0.022
	(0.032)	(0.017)	(0.038)	(0.029)	(0.020)	(0.017)
RE Price Index	Y	Y	Y	Y	Y	Y
MSA Controls	Y	Y	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y	Y	Y
MSA Fixed Effects	Y	Y	Y	Y	Y	Y
N	921	309	771	459	657	573
R^2	0.99	0.99	0.99	0.99	0.99	0.99

Panel B: 250 Miles Cutoff

Dependent Variable: Log(Number of Employees)

Financial Constraint:	Firm Size		Payout Policy		Bond Rating	
	C	U	C	U	C	U
	[1]	[2]	[3]	[4]	[5]	[6]
Log(RE Value$_{-m}$)	0.069**	0.018	0.103***	0.002	0.090**	0.022
	(0.031)	(0.013)	(0.038)	(0.018)	(0.038)	(0.014)
RE Price Index	Y	Y	Y	Y	Y	Y
MSA Controls	Y	Y	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y	Y	Y
MSA Fixed Effects	Y	Y	Y	Y	Y	Y
N	902	328	816	414	720	510
R^2	0.99	0.99	0.99	0.99	0.99	0.99

Panel C: 500 Miles Cut Off

Dependent Variable: Log(Number of Employees)

Financial Constraint:	Firm Size		Payout Policy		Bond Rating	
	C	U	C	U	C	U
	[1]	[2]	[3]	[4]	[5]	[6]
Log(RE Value$_{-m}$)	0.060**	0.002	0.086***	-0.009	0.070**	0.006
	(0.029)	(0.016)	(0.031)	(0.014)	(0.029)	(0.013)
RE Price Index	Y	Y	Y	Y	Y	Y
MSA Controls	Y	Y	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y	Y	Y
MSA Fixed Effects	Y	Y	Y	Y	Y	Y
N	849	381	848	382	805	425
R^2	0.99	0.99	0.99	0.99	0.99	0.99