Geographic financial performance: Implications for local real estate prices and REIT stock returns*

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December 4, 2022

Abstract

We posit and show that profitability changes of firms headquartered within a geographic region manifest in that region's real estate prices and related stock valuation implications. Indeed, regional profitability indices constructed from real-time quarterly financial reports provide timely information about future real estate returns, especially in tight local real estate markets. However, this profitability-housing link is not fully processed in REIT prices exposed to regional real estate values. Overall, this paper shows that firms' profitability performance analyzed at the geographic level has substantial economic implications for real estate and stock valuation.

JEL Classification: E44; G12; R3; M21.

Keywords: geographic profitability; real estate; stock valuation; macroeconomy.

*The paper has benefited from comments and suggestions from Andrew Ang, Mary Barth, Eli Bartov, Nittai Bergman, Jacob Boudoukh, Larry Harris, Ross Levine, Gustavo Manso, Roni Michaely, Andy Rose, Nancy Wallace, Janet Yellen, and workshop participants at BlackRock, IDC, LBS, MIT, Northwestern, SF's Fed, UC Berkeley, UCSD, UNC, USC, Toronto, and U. Penn. We also thank Chief Economist Mark Zandi (Moody's Analytics) and Anne Picker (Econoday) for institutional housing market information as well as the Real Estate and Financial Markets Lab of UC Berkeley's Fisher Center. We acknowledge help from the helpdesks of the Bureau of Economic Analysis, Bureau of Labor Statistics, Econoday, Philadelphia's Fed, Standard & Poor's Capital IQ, and Zillow. UC Berkeley and USC are the only organization that funded this research. Disclaimer: Konchitchki is a Professional Macro Forecaster appointed by the Federal Reserve Bank of Philadelphia. The views expressed in this research paper are those of the authors. They do not necessarily represent the position of the Federal Reserve System or the Federal Reserve Bank of Philadelphia. Any conclusions that readers draw from the content in this research paper or through its additional related resources are not to be attributed to the Federal Reserve System or the Federal Reserve Bank of Philadelphia.

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I Introduction

This paper examines the role of corporate financial performance at the geographic level for understanding real estate markets and associated capital market implications. Indeed, recent fluctuations in U.S. real estate prices have demonstrated the fundamental effects of real estate on the financial sector and the macroeconomy, bringing the topic to the forefront in recent years and attracting attempts to better understand real estate markets and their implications for other markets. Calls for academic help have also emphasized the understanding of financial sector fluctuations and their underlying factors, especially the valuation of real estate, as a major challenge facing our time (e.g., Yellen, 2008a,b; Storch, 2011; Tirole, 2014). Responding to these calls and attempts to better understand real estate price fluctuations and their implications, this paper proposes that geographic information obtained from analyzing quarterly financial reports of U.S. corporations at the geographic level can be useful for understanding fluctuations across regional real estate markets and their equity valuation implications.

The first stage of our analysis examines whether changes to regional firms' profitability constructed using firms headquartered within a geographic region manifest in changes to future real estate values in that region. To extract timely information about regional profitability, we develop real-time regional indices of firms' profitability based on firms headquartered within each region. Specifically, using the regional classification of the Standard & Poor's (S&P)/Case-Shiller Home Price Indices (Case-Shiller, hereafter)—the primary and widely used measure of U.S. residential real estate that tracks changes in real estate prices nationally and across regions—firms are sorted into regions based on their headquarters. Next, the second stage of analysis examines whether the implications of regional profitability for real estate values are incorporated in the prices of real estate investment trusts (REITs) through their exposure to regional changes in real estate values.

We hypothesize that profitability changes of firms headquartered in a region are linked to future real estate valuation. The economic basis for this hypothesis builds on economic theory of principal-agent, wage-effort, and implicit and incentive contracts suggesting that profit sharing is an important part of the employment relationship (e.g., Akerlof and Yellen, 1990). Further, regions with profitable firms often attract new firms to move or get more established in these regions; and vice versa. Empirically, studies provide evidence of (a) performance-related profit sharing with employees and especially with headquarters employees who tend to be more senior, (b) increased/decreased hiring in response to firms' profit changes, and (c) firms' geographic movements/establishments in search of profitable opportunities (e.g.,

Denny and Machin, 1991; Blanchflower et al., 1996; Bronars and Famulari, 2001; Hennessy et al., 2007).[1] In particular, given that housing supply of properties available for sale is not perfectly elastic (there are not infinite real estate properties available for sale), future real estate values will be affected because regional profitability changes can manifest in regional housing demand by firms' current and/or new employees in the region.

We address whether regional performance manifests in housing market implications using two sets of analyses. The first set of analyses investigates the premise of a regional-profitability-housing link by examining economic paths between regional profitability and local real estate markets. It includes examining real estate demand versus supply and probing the link between firms' profits and future estimated employee wages. The second set of analyses employs regression models of future real estate price changes on regional profitability changes. It also uses an impulse response test to probe how regional profitability innovations relate to regional housing price changes over the subsequent 12 months.

Several findings emerge. Regarding the first set of analyses, the demand-supply examination indicates that local corporate employees constitute a considerable marginal demand power relative to the regional supply of available real estate properties. The results show that changes to firms' current profits are intertemporally linked with subsequent changes in estimated employee wages and salaries, especially over the short-run (the two subsequent quarters), providing a mechanism through which firms' profits can result in real estate demand in local markets. The paper also forms an additional prediction regarding how the intertemporal link between regional firms' profits and future real estate valuation is tied to the tightness of local real estate markets in terms of the potential demand from corporate employees relative to the supply of local real estate properties. The findings provide support to the hypothesis that there is stronger regional profitability-housing link in regions with tighter real estate markets.

Regarding the second set of analyses, the results show that profitability changes embed timely information about future real estate price changes at the national composite level. There is also a strong positive link between profitability changes in a region and future real estate price changes in that region, indicating that firms' profitability across different regions can help explain cross-sectional variation in local housing markets. In addition, the profitability-housing link is incremental to variables possibly associated with future real estate

[1]Prior research also shows that households' expenditures including on housing depend on the overall wealth which is dictated by the permanent income rather than by the periodic income only (e.g., Friedman, 1956; Bernanke, 1984), indicating that regional profitability can also manifest in housing demand through employees who anticipate a share in their firms' profits.

prices or economic activity. The impulse response analysis shows that in response to an innovation in firms' profitability, a large part of the associated future regional real estate price change manifests over the subsequent four months.

The analyses thus far have additional implications—for investment strategies involving real estate. In particular, REITs invest in real estate and their shares are listed on major stock exchanges. To the extent that regional profitability has implications for future real estate valuations, REIT managers are likely to incorporate such implications. Nevertheless, obtaining real-time regional profitability information is not trivial. This is because regional profitability indices are not reported, and processing such data is more involved than processing salient data readily presented in financial statements. Since information that is nontrivial to obtain may diffuse slowly into asset prices (e.g., Hong and Stein, 1999), REIT prices may not incorporate the implications of geographic financial statement information for future real estate valuation on a timely basis, leading to predictable returns.

This paper's mechanism dictates an ex ante prediction: a positive shock to regional profitability is a positive event for REITs relying on real estate in that region (because such a shock manifests in higher future real estate values in the region). To test this prediction, the analysis forms portfolios investing in REITs each quarter, based on quarterly changes to regional profitability, and then examines the future performance of these portfolios (that are conditioned on current information). Findings from these return analyses reveal significant abnormal returns, in the direction predicted. The zero-cost hedge strategy, which is available to investors in real time, has statistically and economically significant returns after adjusting for common risk factors. These findings shed light on how geographic firms' financial information is processed by investors, indicating that REIT investors do not incorporate such information in a timely manner. Two notes that should be clarified. First, is there merit for using quarterly financial information rather than alternative data sources? The answer is yes. Timeliness of quarterly financial statement data is important, theoretically and empirically. The evidence above suggests that the timely flow of quarterly financial information enables real-time assessment of future real estate markets. This aspect of corporate reported timelines is also critical for the REIT investment analyses, as these investments are based on assessing future real estate markets based on current quarterly profits available in real time.[2] Second,

[2]Indeed, this paper employs an uncommon approach in various types of real estate and other macroeconomic analyses, highlighting the value added of the quarterly financial reporting system. In particular, although this is the first study to examine profitability-housing-equity linkages, prior research often proxies for personal income or corporate profits by relying on decennial Census data or annual tabulations of income tax returns prepared by the Internal Revenue Service (IRS) with a significant lag (see, e.g., Bureau of Economic Analysis, 2002, 2004; U.S. Census Bureau, 2002; Kopczuk, Saez, and Song, 2010; Mian and Sufi, 2012). As examples,

the objective in the REIT analyses is testing how geographic firms' financial information is processed in prices rather than maximizing returns.

Viewed as a whole, this paper posits and documents that changes in regional corporate performance manifest in changes to real estate values through the increased demand for local real estate properties. Analyzing how the regional profitability-housing link is processed in capital markets reveals that these links are not fully processed in REIT prices. This paper closely relates to extant research on: (a) cross-sectional asset returns and return predictability (e.g., Hong and Stein, 1999, Jacobs, 1999, Fama and French, 1992, Christoffersen and Jacobs, 2004, Jacobs and Wang, 2004), (b) the information content and relevance of firms' financial reports (e.g., Altman, 1968; Marsh and Merton, 1986; Zhang, 2008; Subramanyam, 1996; Lee, 2001; Erkens, 2011; Srivastava, 2014; Florackis et al., 2022), (c) links between financial data and the macroeconomy (e.g., Nallareddy, 2012; Armstrong et al., 2019; Ball et al., 2022, and (d) the relationship between real estate markets and the macroeconomy (e.g., Quan and Titman, 1999). The approach in this paper differs by focusing on regional (rather than firm-level) profitability, on the real estate market (rather than other macro constructs), and the implications for equity investments. We shed new light on the extent to which geographic profitability informs timely understanding of real estate price fluctuations and related asset pricing implications.

This paper contributes to extant research. First, it provides important evidence on the geographic-profitability-housing links and their associated REIT-based investment analysis. Specifically, we show the informational role that firms' profits, aggregated across firms headquartered in a geographic region, play for understanding that region's real estate valuation and associated equity markets (for related research, see, e.g., Ball and Sadka, 2015; Ball, Sadka, and Tseng, 2022; and Kottimukkalur, Nallareddy, and Venkatachalam, 2022). Second, it identifies regional profitability performance as relevant for timely understanding of real estate price fluctuations and, thus, as a primitive source of performance and risk assessment of the financial sector and the macroeconomy. In doing so, it takes a closer, bottom-up look at the actual microeconomic behavior of corporations for understanding the macroeconomy (instead of the almost exclusive top-down approach taken in economic research that uses Dynamic Stochastic General Equilibrium, DSGE, modeling; see, e.g., Smith, 2016; Wolfers, 2016).

corporate profits tabulations are available with a lag of two-three years and published in Statistics of Income: Corporation Income Tax Returns (Bureau of Economic Analysis, 2002), and census data with a lag of up to ten years (U.S. Census Bureau, 2002). Whereas these data lack timeliness, financial statements are reported every quarter, providing important timely information.

From an economic perspective, understanding what drives values of real estate—a major asset class—is not less important than understanding pricing dynamics of other asset classes including stocks, bonds, and commodities. Yet although vast research has focused on how stock returns move in the cross-section and relate to firm-level financial results, little is known about cross-regional real estate valuation and especially its link to regional profitability and associated stock prices.

Section II discusses data, variables, timeline, and sample statistics. Section III discusses the research design, predictions, and evidence regarding the first part of the paper: the link between regional profitability profitability and real estate valuation. Section IV discusses the impact of tightness of local real estate markets on the profitability-housing link. Section V addresses the second part of the paper: the processing of regional financial statement information by investors. Section VI concludes.

II Data

Data and Variable Construction

Financial statement and stock return data for U.S. firms are obtained from the Wharton Research Data Services (WRDS). Financial statement variables are from the Compustat North America Fundamentals Quarterly File (WRDS: FUNDQ). Monthly raw stock returns are from the Center for Research in Security Prices (CRSP), Monthly Stock File (WRDS: MSF). CRSP/Compustat Merged Database Linking Table (WRDS: CCMLINKTABLE) is used to link Compustat observations with returns data from CRSP. In addition, risk-free rate and Fama-French-Carhart factors are from the Fama-French Factors Monthly Frequency File (WRDS: FACTORS_MONTHLY); Treasury bond and bill yields are from the Federal Reserve Board of Governors H15 Report; stock market returns are from the CRSP Monthly Index File; and GDP, inflation, and corporate profits are from the Philadelphia's Fed Real-Time Data Research Center (as explained on the Fed's website, the Fed data are quarterly and stated in annual rates). Stocks are adjusted for possible delisting returns following Shumway and Warther (1999), as detailed in the appendix (available online).

The Case-Shiller Home Price Indices are obtained from the S&P Dow Jones Indices website. These indices have time varying coverage. For example, coverage starts in: January 1972 for Miami; January 1977 for San Diego and Denver; January 1980 for San Francisco, Los Angeles, and New York; and January 2000 for Dallas. This data is used to calculate monthly real estate price changes for each region, varying from 182 observations (Dallas) to

518 observations (Miami). Zip codes for firms' headquarters are obtained from Compustat; ZIP Code longitude and latitude coordinates are from the Census Gazetteer Files of the U.S. Department of Commerce's Census Bureau. To analyze housing supply and demand, each firm's total number of employees is obtained from the Compustat North America Fundamentals Annual file (WRDS: FUNDA), as well as regional supply data for real estate properties available for sale from Zillow.[3]

To execute the analyses, the paper develops real-time measures of regional profitability changes. Specifically, using longitude and latitude coordinates, the distances between each Compustat firm's headquarter and all Case-Shiller regions is calculated. Each firm is assigned into a region based on the minimal distance. This process thus sorts all firms into regions based on the location of their headquarters. For brevity, the online appendix includes detailed information on the construction of the indices. The mean (median) minimal distance is 88 (33) miles. The 5th and 95th quantiles are 1.4 miles and 281 miles, respectively. Using firms in each region, quarterly indices of regional profitability changes are constructed based on earnings reports available prior to calculating future housing and REIT returns. Figure 1 uses Facebook Inc. as an example to illustrate the firm's distances to Case-Shiller regions. The analysis focuses on how firms' profits are spilled over to local employees regardless of where the profits are generated. One potential concern with this sorting mechanism is that it could assign firms to regions where only some of their employees reside. However, to the extent that this is true, this would likely bias against find a regional profitability-housing link. In addition, to assess the validity of the regional indices, we conduct an external validity analysis employing Fed's data (detailed in the online appendix for brevity).

The analyses throughout employ varying samples, to allow for feasible information flows and following the Case-Shiller coverage of the housing data that varies by regions. Specifically, following the Case-Shiller coverage, real estate price changes include 182 to 518 observations depending on the region. In terms of alignment with financial statement data, regional profitability changes using quarterly financial statement observations are calculated from Q4:1972, which is the most recent quarter before housing data begin for Miami. The analyses of stock investment strategies use: (a) quarterly profitability changes over the quarters beginning in Q4:1999, and (b) monthly stock returns on 303 unique REITs beginning in March 2000, one month after all regional profitability quarterly changes are available. The REIT return analysis sample begins in Q4:1999 to allow REIT investors to have information

[3]Data from Zillow on supply of properties available for sale was obtained from http://www.zillow.com/research/data; this is a residential dataset detailed to the zip code level, called "For-Sale Inventory (Raw)".

on the financial-performance-housing link across all regions and given that the first month for which regional housing data are available for all regions is January 2000. The sample ends in Q2:2014 to allow sufficient future monthly and quarterly observations for the analyses ($n = 168$ quarters).

Financial profitability for firm i in quarter q ($Prof_{i,q}$) is measured as scaled quarterly operating income before depreciation, and profitability change ($\Delta Prof_q$) is measured as the year-over-year change in $Prof_q$: $\Delta Prof_{i,q} = Prof_{i,q} - Prof_{i,q-4}$. Financial statement information is taken from fiscal quarters ending in March, June, September, or December. These observations account for the majority of firm fiscal year ends and this approach eliminates the need for observations where there are few (or even no) firms in a region with financial reports in a given time period.[4] To mitigate possible outlier effects, we trim firm's profits and profit changes based on the top and bottom one percentile of each quarterly cross-section. To avoid negative denominator problems, profits are scaled by sales. Regional quarterly time series of profits ($Prof_{region,q}$) and profit changes ($\Delta Prof_{region,q}$) are based on value-weighted cross-sectional averages, with weights based on market value of equity as of the beginning of each quarter. Profit is operationalized as operating income before depreciation because this measure assesses operating performance while abstracting from line items below operating income. Inferences are not sensitive to alternatively using net income or income before extraordinary items. For a firm-quarter to be included in the sample it must not have missing values for market value of equity, $\Delta Prof_q$, and earnings reported by the time that future real estate and stock returns are accumulated. To avoid drawing inferences based on illiquid or very small firms, the analyses include only firms if it has a stock prices higher than \$5 and has sales, book value of equity, total assets, and market value of equity higher than \$10 million.

For the firm-level cross-sectional analysis (following Equations (1–2) and reported in Table 5, below), financial statement data are obtained from Compustat North America Fundamentals Annual and Quarterly datasets. The cross-sectional analysis employs a sample of 359,749 quarterly observations over the period from Q1:1970 until Q4:2015 with data available for this analysis.

[4] In Compustat Quarterly population, 83.2 percent of the observations correspond to fiscal years ending in March, June, September, or December. In other months, only nine out of the 20 regions have an average of more than 10 reports per quarter across the sample. Only four out of the 20 regions have more than 10 reports for at least 75 percent of the months.

Timeline

Figure 2 provides the timeline of the analysis. Attention is limited to quarterly financial reports that are available for predicting future real estate price changes and for making investment decisions without look-ahead bias. Thus, firms' earnings announcement dates are used to retain financial statement data only for firms that announce their quarterly profits within two months after their fiscal quarter-ends so that it can be used in making investment decisions at that time. Future housing price changes and REIT returns are then computed beginning the two months following quarter end so that all information is available.

Sample Statistics

Table 2 provides sample statistics of key variables. The mean monthly regional real estate price changes, $\Delta RealEstate_{region}$, vary across regions (from 0.2 to 0.5 percent); and the median shows about the same magnitude. The standard deviation of the monthly real estate price changes show substantial variation, varying between 0.6 and 1.4 percent across regions.

Regarding the quarterly financial profitability data, the table shows that the mean and median profitability changes aggregated across all regions ($\Delta Prof$) are 0.000 and 0.001 with a standard deviation of 0.020. These findings indicate high variation in profitability changes, and they also show how focusing on the national housing market masks notable heterogeneity in profitability across regions, as positive and negative profitability shocks to different regions are aggregated together. Indeed, the mean regional profitability changes varies considerably across regions (between -0.7 and 1.1 percent). Regarding the other variables, the statistics are similar to those in prior research. For example, mean and median inflation rates are 4.3 and 3.5 percent, respectively (note that the Fed's data are quarterly and stated in annual rates).

III Regional Performance and Future Real Estate Valuation

This section examines how changes in regional profitability relate to future real estate price changes in that region. The main hypothesis is that changes to regional profitability manifest in future changes to real estate prices in that region. The analyses that follow investigate

paths between regional profitability and local real estate markets.[5]

Analyses of Economic Paths through which Regional Profitability Can Manifest in Real Estate Valuation

Several analyses were conducted in order to identify economic paths through which geographic firms' profits can manifest in future housing and equity market implications. First, as always in any cross-sectional study, one needs heterogeneity in profitability and real estate dynamics. That is, regional profitability and regional real estate prices should not move in lockstep across regions. Such heterogeneity is essential to identify geographic variation for the analyses that follow. To examine heterogeneity, correlations across U.S. regions are calculated using changes in regional real estate prices and in regional profitability.

Table 3 reports information about the correlations across regions of monthly and annual real estate price changes as well as correlations of regional profitability. The minimum, maximum, and standard deviation of the pairwise correlations of these quantities are presented in the table. Panel A (B) summarizes Spearman and Pearson correlations in month-over-month (year-over-year) real estate price changes. Panel C summarizes these correlations among regional profitability changes. Panel A shows that the minimum correlation among monthly real estate price changes across U.S. regions varies between 0.211 and 0.392, and the corresponding maximum correlation varies between 0.712 and 0.859. Panel B shows that the minimum correlation among annual real estate price changes across U.S. regions varies between -0.025 and 0.500, and the corresponding maximum correlation varies between 0.793 and 0.970. The appendix includes detailed results on all the pairwise correlations used to construct this table. For example, Portland's housing market is only marginally and negatively correlated (-2.5 percent) with that of Boston in terms of annual real estate price changes. Turning to regional profitability, Panel C shows that the minimum correlation among quarterly profitability changes across U.S. regions varies between -0.239 and -0.042, and the corresponding maximum correlation varies between 0.199 and 0.438, indicating high variation in regional profits across regions. These findings together reveal that both regional real estate markets and regional profits do not move in lockstep across regions. Hence focusing on the national housing market or the overall profitability of the U.S. corporate sector masks substantial heterogeneity in how real estate values and firms' profitability vary across regions.

[5]It is possible to empirically examine several alternative measures of firms' performance, such as revenues, cash flows, or revenue growth. However, this study focuses on firms' profitability because of the vast prior theoretical and empirical literature that establishes firms' profit sharing as an important part of the employment relationship.

The second analysis focuses on the following question: if the fraction of employees residing near their firms' headquarters (i.e., local employees) to total firms' employees or to the regional supply of real estate properties available for sale is immaterial, regional firms' profitability may have an immaterial effect on the corresponding-region real estate demand. Suggestive evidence on the demand-supply relationship is obtained by calculating the ratio of corporate employees relative to the supply of real estate properties available for sale. Briefly, this analysis shows that corporate employees constitute a considerable marginal demand power for the supply of real estate properties available for sale. The appendix provides detailed information about this examination.

Table 4 reports the ratio of corporate employees for firms headquartered in each Case-Shiller region to the regional supply of properties available for sale (the appendix provides more detailed information related to this table). The table refers to the period beginning in 2010 because supply data of properties available for sale is available only beginning in that year. The table shows that, considering all regions together, the number of corporate employees is about 19 to 32 times the supply of real estate properties available for sale. When broken down by Case-Shiller regions, this ratio ranges between 4 (Miami, in 2012) and 174 (San Francisco, in 2014), with high variation across regions. These magnitudes show that corporate employees constitute a considerable marginal demand power for the supply of real estate properties available for sale. The impact of tightness in regional real estate markets and its implications for the regional financial-profitability-housing link is considered further in Section IV.

The third analysis examines intertemporal linkages between firms' profits and future employee wages and salaries. Specifically, consider the cross-sectional (firm-level) regression models of future changes in estimated employee wages and salaries on current-period profit changes, as follows:

$$\Delta W_{i,q\to q+t} = \alpha + \rho \Delta Profg_{i,q} + \sum (\text{control})_{i,q} + \epsilon_{i,q+t} \quad t \in \{1,2,3,4\} \tag{1}$$

$$\Delta W_{i,q+t-1\to q+t} = \chi + \delta \Delta Profg_{i,q} + \sum (\text{control})_{i,q} + \xi_{i,q+t} \quad t \in \{1,2,3,4\} \tag{2}$$

The dependent variable in Equation 1 (Equation 2) is the accumulated (quarter-over-quarter) change in estimated wages and salaries over the subsequent quarters relative to the current quarter. Because Compustat Fundamentals Quarterly does not provide quarterly wages and salaries of employees, this paper develops a procedure to estimate this variable. Specifically, using Compustat Fundamentals Annual, possible proxies for annual wages

and salaries are calculated by subtracting from sales, general, and administrative expense (Compustat: XSGA) seven possible combinations of variables that capture annual expenses unrelated to wages and salaries (i.e., research and development, rental, advertising, pension and retirement, and staff; in Compustat: XRD, XRENT, XAD, XPR, and XLR, respectively). Given that a firm's employee wages and salaries should relate to the firm's number of employees, the analysis uses the variable combination with the highest correlation between the annual number of employees (Compustat: EMP) among each of the seven alternatives. The combination with the highest correlation is XSGA-XRD. This proxy is used at the quarterly frequency using Compustat Fundamentals Quarterly to approximate each firm's estimated quarterly employee wages and salaries. Regarding the independent variables for a firm i at a quarter q: $\Delta Profg_{i,q}$ is the change in profits, where gross profits are used to prevent any possible mechanical relation between operating profits and contemporaneous/subsequent wages and salaries; $LEV_{i,q}$ is leverage, calculated as a firm's total shareholders' equity divided by total assets; $BTM_{i,q}$ is book-to-market ratio, calculated as a firm's total shareholders' equity divided by total market value of equity; $MVE_{i,q}$ is total market value of equity; $HighTech_{i,q}$ is an indicator variable that is equal to one if a firm is in high tech industry, and zero otherwise.[6] Equations (1–2) are estimated using both pooled and Fama-MacBeth specifications. The pooled regressions are estimated using double clustering by firm and quarter. The Fama-MacBeth regressions are estimated each quarter, with industry fixed effects (based on two-digit SIC code, omitted for brevity) following the Fama and MacBeth (1973) procedure.

Table 5 reports results from cross-sectional (firm-level) regression models of future changes in estimated employee wages and salaries on current-period profit changes, following Equation 1 (Equation 2). Panel A shows that a current-quarter change in firms' profits is significantly positively tied to future employee wages and salaries accumulated from the current quarter through each of the four-quarters ahead. Panel B focuses on the marginal quarterly effect in each of the subsequent quarters. It shows that the profits-to-future-wages linkages stem from effects during the subsequent two quarters, with significantly positive estimated coefficients on current profit changes for these horizons (for the one-quarter-ahead horizon, the t-statistic is 3.440 (3.690) in the pooled (Fama-MacBeth) specification; for the two-quarters-ahead horizon, the t-statistic is 3.880 (3.210) in the pooled (Fama-MacBeth) specification). These

[6]Following prior literature (e.g., Kasznik and Lev, 1995), HighTech is equal to one if a firm?s four-digit SIC code falls within the following ranges: 2833 to 2836 (drugs), 3570 to 3577 (computers), 3600 to 3674 (electronics), 7371 to 7379 (computer programming and data processing), or 8731 to 8734 (research, development, and testing services).

findings establish an intertemporal linkage between current firms' profit changes and changes in employee wages and salaries over the subsequent two quarters, thereby further identifying a mechanism through which firms' profits can manifest in real estate valuation implications.

The fourth analysis relating to the economic mechanism focuses on assessing REIT geographic concentration and specialization. Specifically, the REIT return analyses examine whether prices of REITs incorporate the regional profitability-housing link, focusing on real estate markets where REITs are located. Indeed, prior research and anecdotal evidence suggest high regional concentration and specialization in REITs and that REIT managers prefer to hold regionally focused asset bases (e.g., Capozza and Seguin, 1999; Ling et al., 2015). To further examine this institutional feature in the sample, 100 REITs in the sample were randomly selected and their 10-Ks were examined for geographic-related investment strategies. Of these 100 REITs, 84 REITs were found to invest in their local markets, either as their main investment focus or as part of their investment strategy, corroborating prior evidence of regional concentration and specialization in REITs.

An important issue also with REITs is that they often engage in both residential and commercial real estate activities. However, the analysis uses real estate indices that focus on the residential market. Theoretically, prior research from urban economics suggests that the same basic forces affect demand for both residential and commercial real estate (e.g., Rosen, 1979; Roback, 1982). Indeed, prior empirical research suggests that the two assets classes exhibit strong correlation (e.g., Gyourko, 2009; Calanog, 2011). Studies also provide evidence of strong correlations among business activities within each asset class, such as between rental fees and acquisition values of residential real estate as well as between condominium and single-family house prices over the 1996-2012 period and across U.S. regions (e.g., Hughes, 2013). Further, several REIT observations in the sample directly relate to residential businesses, from developing single-family houses and lots to renting single-family and various other types of residential real estate (e.g., American Homes 4 Rent; American Residential Properties; Silver Bay Realty Trust; Starwood Waypoint Residential Trust). Together, the theory and evidence suggest that to a first approximation fluctuations in Case-Shiller indices relate to fluctuations across different types of housing activities and thus capture an assessment of the housing market. Note that here also to the extent that regional residential real estate prices are not related to REIT returns, this would bias the analysis against finding significant results.

Overall, the first set of analyses and discussions above identify a possible economic mechanism through which regional profitability can manifest in real estate valuation implications.

Given that the supply of real estate properties available for sale is not perfectly elastic, even a slight increase in firms' profits shared with employees has the potential to increase marginal demand for real estate. The results also show that changes to firms' current profits are linked with future changes in employee wages and salaries, especially over the two subsequent quarters.

Regression and Impulse Response Analyses

To directly examine the link between regional profitability information and future real estate valuation, ordinary least squares regression analyses are conducted to relate future real estate price changes to financial profitability changes in the corresponding region. The first regression analysis focuses on the overall national housing market, operationalized by returns on the two Case-Shiller composite real estate indices. The second regression analysis focuses on models probing cross-sectional variation across regional housing markets using returns on the Case-Shiller metropolitan indices. Examining real estate valuation across U.S. regions is more insightful in this setting than examining the overall composite housing index, because it analyzes whether variation in profitability changes across regions is tied to variation in the housing market across the corresponding markets.

In particular, consider first the following time-series equation:

$$\Delta RealEstate_{region,m+t} = \lambda + \beta \Delta Prof_{region,q|\Omega_m} + \mu_{region,m+t}, \tag{3}$$

where $\Delta RealEstate_{region,m+t}$ is the change in the regional monthly real estate price from month m to month $m+1$, scaled by the price in month m; region refers to one of the Case-Shiller regions, either composite or metropolitan; $\Delta Prof_{region,q|\Omega_m}$ is the quarterly regional real-time index of financial profitability change in that region, where Ω_m reflects the conditioning on information available as of m; and future months are $m+t$.

This baseline regression is extended sequentially to include conditioning control variables:

$$\Delta RealEstate_{region,m+t} = \lambda + \beta \Delta Prof_{region,q|\Omega_m} + (\text{Controls})_{|\Omega_m} + \mu_{region,m+t}, \tag{4}$$

where all independent variables are calculated strictly conditioned on Ω_m, that is on month m information set. A variety of controls, denoted as *Controls*, are used in different specifications. First is $RETURN$, the quarterly buy-and-hold return on the stock market index (i.e., the S&P Stock Composite Index). Second is $lagCS$, the lagged change on the Case-Shiller Index. Additionally, time and region fixed effects are applied as controls in different specifications.

Note that a number of other aggregate macro-variables are relevant to regional real estate prices such as GDP, the term spread, the risk-free rate, the aggregate market return, corporate profits, and inflation. Indeed, including these shows no change in inferences. The inclusion of time fixed effects in several of the specifications suppresses the need to control for aggregate variables that do not vary across regions.

The objective in Equation (4) is to examine whether regional profits propagate in real estate markets, rather than finding the best predictive model for future real estate valuation. Several additional regressors are included in Equation (4) to assess the incremental effect of regional profitability, including Fed's data for local economic activity – state coincident and leading indicators – that focus on purging "normal" economic activity during each region-period over the sample period. More specifically, the paper includes the Philadelphia's Fed State Coincident Indexes, which summarize in a single statistic current economic conditions using four state-level measures from the Bureau of Labor Statistics, BLS, and the BEA. It also includes the Philadelphia's Fed State Leading Indexes, which predict the six-month growth rate of the state's coincident index. In addition to the coincident index, the Fed's leading models include state-level variables that lead the economy. Every month, the growth rate on the state coincident indices is calculated using the past month or three months, aligned on the recently available state coincident and leading variables on the regions based on the state in which the Case-Shiller region is located.

In estimating Equations (3–4), real estate price changes are aligned with the most recently available profitability quarterly changes for the corresponding region. Figure 2 and Section II provide more details on the timeline used to align future monthly real estate price changes with regional profitability information.

Table 6 reports results from the regression models of subsequent composite real estate price changes on the corresponding regions' profitability changes, following Equation (3). The results show that the estimated coefficients on the regional profitability changes are significant in both models, with t-statistics of 5.88 and 3.74 for the 20-city and 10-city composite regions, respectively. These findings indicate that regional profitability changes are linked to future real estate price changes at the overall composite level.

Table 7 reports results from the regression model focusing on the cross-section of real estate prices following Equation ((4), which examines whether regions with higher profitability are linked to higher future real estate prices. The first column reports estimates from a baseline model, and the next columns report results from estimating models with additional variables as controls. The first column shows that the estimated coefficient on the regional

profitability change is significant, with a t-statistic of 2.36. This finding shows a positive cross-sectional linkage between profitability changes in a region and future real estate price changes in that region.

The next columns show that the estimated coefficients are significant across all models, with t-statistics varying between 2.18 and 3.96. These findings indicate that the cross-sectional linkage between future regional real estate price changes and the corresponding region profitability change is incremental to several variables that can be associated with future real estate prices or economic activity.

Together, findings from Tables 5-7 show that future real estate price changes are predicted by the real-time regional profitability indices, at the overall composite and the cross-sectional levels. The evidence indicates that regional profitability across different regions helps explain cross-sectional variation in overall and regional housing markets, and it demonstrates that processing geographic financial statement information is nontrivial because regional profitability effects vary across regions.

Next, the examination proceeds to impulse response analysis that probes how a change (innovation) in regional profitability affects subsequent real estate price changes in the region. This analysis focuses on accumulated impulse response functions, for a response in $\Delta RealEstate_{region}$ over the 12 months subsequent to an innovation in $Prof_{region}$, at the Case-Shiller composite regional levels. An impulse response function shows how one variable reacts to a perturbation in another variable in the system. Such analysis is common in macroeconomics modeling, where response functions are often used to describe how a macroeconomic variable reacts over time to impulses often modeled as a vector autoregression. The model is implemented as a VARX with one lag, with the endogenous variable $\Delta RealEstate_{region}$ and the exogenous variable $Prof_{region}$.

Table 8 reports results from the impulse response analysis, providing the accumulated impulse response functions from profitability impulses. The table shows that, in response to an impulse to firms' profitability, more than half of the future real estate price changes manifest over the three-four months subsequent to the impulse, on average across U.S. regions, and the effect dissipates almost entirely after seven months. Plots of standard errors surrounding the responses, untabulated for brevity, indicate that these impulse response results are significant. Overall, the table provides evidence of the dynamics of future housing market returns in response to innovations in regional profitability.

IV Tightness in Regional Real Estate Markets

Key in the proposed mechanism driving the regional financial-profitability-housing link is the impact that greater wages will have on housing demand. That is, the main hypothesis is predicated on an increase in local housing demand associated with local profitability. In general equilibrium, a shift in demand is typically accompanied by an increase in supply. However, real estate is an illiquid asset class, as well as requires a significant time for supply to adjust (either in the form of new construction or in the form of existing homeowners placing their properties for sale). These features can result in greater price reactions to shifts in the demand curve.

The analysis in this section investigates the implications of this mechanism to form an additional important hypothesis. Specifically, Table 4 shows that there is substantial cross-sectional variation in the tightness of regional markets. Here tightness is defined as the ratio of the total number of corporate employees for firms in a given region to the supply of residential real estate properties available for sale. For example, in 2015 there was a ratio of 158 employees to each property for sale in San Francisco; at the same time, there was a ratio of 9 employees to each property for sale in Phoenix.

Should the relevant tightness be measured relative to the real estate available for sale or relative to the total number of homes (possibly plus a measure of potential home construction)? To answer this question, consider a potential home buyer in San Francisco. To the extent that there are frictions preventing the housing supply from adjusting to an increased demand in a timely manner, this potential buyer is faced with a decision to either buy now in a tight market or wait and potentially buy later. The first option – of buying in a tight market – is likely to result in greater price impact of the buying transaction. Further, the second option forgoes the consumption value of homeownership that the potential buyer may highly value and even be willing to pay an above-market price to capture her personal consumption surplus. Moreover, when considering the second option the potential buyer is also likely to have extrapolative beliefs based on well-known short-term momentum in real estate markets (e.g., Glaeser and Nathanson, 2017). Under extrapolative beliefs, the homeowner may believe that waiting will result both in forgone consumption surplus and an even higher price later. Together, this economic intuition suggests that the regional profitability-housing link is likely to be stronger in regions with tighter housing markets.

To investigate this mechanism, consider the following regression:

$$\Delta RealEstate_{region,m+t} = \lambda + \beta \Delta Prof_{region,q|\Omega_m} + \gamma \Delta Prof_{region,q|\Omega_m} \times T_{region} \qquad (5)$$

where T_{region} is the regional measure of tightness. Due to limited data availability from Zillow (available since 2010) and for simplicity, the tightness measure for each region is fixed at the average value using data available since 2010 and is equal to the log of the ratio of total number of corporate employees in a region to the supply of the corresponding-region residential real estate properties available for sale. To ease coefficient interpretation, T_{region} uses the de-meaned regional employees-to-available-real-estate ratio. The mechanism discussed above forms a prediction: that the coefficient on the interaction term should be positive. That is, in a tighter regional real estate market, there is a stronger response to increased local profitability. The results from estimating the regression with the same controls used in estimating Equation (3) are given in Table 9. In all of the specifications the interaction term is positive and statistically significant. This finding confirms the hypothesis that there is stronger regional profitability-housing link in regions with tighter real estate markets.

V The Processing of Regional Profitability Information by Equity Investors

If equity investors do not incorporate regional profitability information on a timely basis, future abnormal returns may result. Our hypothesis dictates an ex ante empirical prediction: to the extent that regional profitability changes are linked with future regional house price fluctuations, the diffusion of spikes (drops) in regional profitability will lead to positive (negative) future returns for REITs exposed to the regional real estate market.

This analysis employs asset pricing tests focusing on future REIT returns to investment strategies based on regional firms' profitability, controlling for common risk factors. The investment strategies are ex ante, based on REITs' locations and the regional profitability information (see Figure 2). The basic logic underlying the investment analysis is as follows. Each quarter all U.S. regions are sorted into five groups based on the regional quarterly profitability changes available in real time before making any investments. The lowest (highest) group composes Portfolio 1 (5) and includes regions with the most extreme negative (positive) shock to firms' profits in these regions. Note that, to allow for dissemination of regional profitability information, the sorting into groups is based on quarterly financial statement data fully known by the second month after each fiscal quarter-end, before REITs' monthly returns are examined over the months beginning three months after each fiscal quarter-end. For example, in Q2:2010 the most negative and positive shocks to regional profitability were in Minneapolis and Boston, respectively. The analysis then examines

REIT returns over the quarter subsequent to the month in which all profitability information becomes available. If regional profitability changes affect future regional real estate price changes, the strategy buys (sells) REITs likely to be mostly affected by extreme high (low) regional profitability changes.

We obtain firm-level returns over the quarter subsequent to the month in which firms' profitability information for all regions becomes available, and we calculate mean returns for each quarter in each group. The groups are based on ranking regional profitability changes for all regions each quarter, as described previously. We use the following return metrics: market-adjusted and returns-adjusted for Fama-French, Fama-French-Carhart, and two Fama-French-Carhart-IB factors. The Fama-French factors refer to the *MKTRF*, *SMB*, and *HML* factors of Fama and French (1993), and the Carhart factor refers to the momentum factor (*UMD*) of Carhart (1997). We add two factors as additional controls for possible profitability effects in the cross-section of firms, as prior research suggests that earnings or scaled earnings can be associated with expected or future returns (e.g., Fama and French, 1992, 2015). These profitability factors are based on income before extraordinary items (IB) and denoted as *IB1* and *IB2*. We form the factors by following the procedure Fama and French (1993, 2015) describe for forming their *HML* and *SMB* factors. Thus, these factors refer to returns to factor-mimicking profitability (IB) portfolios.

To obtain abnormal returns, we first calculate raw returns by quarterly compounding each firm's monthly returns. The market-adjusted return is calculated as the quarterly compounded raw return minus the quarterly compounded value-weighted return on all NYSE, AMEX, and NASDAQ stocks in CRSP. Next, we estimate time-series regressions for each firm, of firm monthly returns on the monthly factors, as follows:

$$R_{i,m} - R_{f,m} = \alpha_i + \beta_{i,MKTRF} MKTRF_m + \beta_{i,SMB} SMB_m + \beta_{i,HML} HML_m + \beta_{i,UMD} UMD_m + \zeta_{i,m} \tag{6}$$

where $R_{i,m}$ is the return for firm i in month m. $R_{f,m}$ is the one-month Treasury bill rate; $MKTRF_m$ is the excess return on the market; and SMB_m, and HML_m are the Fama-French factor returns constructed on the basis of the market value of equity (MVE) and the book-to-market ratio (BTM), respectively. We also estimate regression models similar to Equation (6) after sequentially adding as controls the Carhart's (1997) momentum (UMD) and the previously defined (IB1 and IB2) factors. Estimation of Equation (6), and its augmented versions with the additional factors, yields firm-specific betas ($\beta_{i,MKTRF}$, $\beta_{i,SMB}$, $\beta_{i,HML}$, $\beta_{i,MOM}$, $\beta_{i,IB1}$, and $\beta_{i,IB2}$) which we winsorize at the top and bottom one percent. To clarify,

each set of firm betas is based on a different time-series regression for that firm using the factors added in that regression. We obtain abnormal returns by subtracting from raw returns the product of a firm's betas and the respective factor returns, compounded quarterly. We then summarize the time-series quarterly abnormal returns over the sample period.

Table 10 reports results from estimating quarterly abnormal returns following the investment analysis, for each quarter subsequent to portfolio construction in the previous quarter and summarized across all quarters over the sample period. The results reveal that investing in REITs based on current-period regional financial profitability information generates significant future abnormal returns. The key results are that the mean hedge returns across the abnormal return metrics are significant, with t-statistics varying between 2.48 and 3.27. , Overall, the abnormal return findings show significant abnormal returns for the highest and lowest portfolios, with zero-cost hedge investment strategies in REITs that result in statistically and economically significant risk-adjusted returns. Notably, the abnormal returns are obtained conditioned on the availability of all regional profitability information required for the investments in REITs. The return predictability findings reveal consistent evidence of regional firms' profitability information being only gradually incorporated in REIT stock prices. Also, note that the strategies' objective is testing how geographic financial information is processed in REIT stock prices rather than maximizing strategy profits. For the latter objective, the strategies can be refined, e.g., using REITs mostly specialized in each region or mostly affected by residential real estate.

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[7]As an empirical matter, we also calculate betas using rolling-window regressions of the prior 36 months leading to the abnormal return measurement, with unchanged inferences.

[8]Two points worth noting. First, we also consider adding an additional, investment-based factor. However, we stop at five factors to follow the widely accepted asset pricing literature that includes the Carhart's (1997) momentum factor and because controlling for more factors is problematic given that correlations among the underlying variables are likely to result in poor diversification of some of the portfolios used to construct factors (e.g., Fama and French 2015). Second, we provide detailed information about forming the additional factors. Specifically, following Fama and French (1993), we sort all observations at the end of each month into two *IB* groups, with group 1 (2) including observations with low (high) *IB*, and three book-to-market (*BTM*) groups, with group 1 (3) including observations with low (high) *BTM*. We then construct six portfolios (L/L, L/M, L/H, H/L, H/M, and H/H) from the two *IB* groups and the three *BTM* groups intersections, with the

Overall, the abnormal return findings show significant abnormal returns for the highest and lowest portfolios, with zero-cost hedge investment strategies in REITs that result in statistically and economically significant risk-adjusted returns. Notably, the abnormal returns are obtained conditioned on the availability of all regional profitability information required for the investments in REITs. The return predictability findings reveal consistent evidence of regional firms' profitability information being only gradually incorporated in REIT stock prices. Also, note that the strategies' objective is testing how geographic financial information is processed in REIT stock prices rather than maximizing strategy profits. For the latter objective, the strategies can be refined, e.g., using REITs mostly specialized in each region or mostly affected by residential real estate.[9]

VI Conclusion

Across the United States, housing supply is not perfectly elastic and corporate employees constitute a considerable marginal demand power for real estate properties available for sale. This paper posits and documents that (a) regional profitability performance manifests in regional real estate markets and embeds timely information about future real estate valuation, (b) the profitability-housing link is stronger in tight local real estate markets, and (c) the

first letter in each X/X combination referring to the *IB* portfolio (low, high) and the second letter referring to the *BTM* portfolio (low, medium, high). We then calculate monthly value-weighted returns on the six portfolios over the subsequent quarter after the quarterly profitability information becomes available. We calculate the *IB1* factor for each month as the average of the monthly returns on the three high-*IB* portfolios (H/L, H/M, H/H) minus the average of the monthly returns on the three low-*IB* portfolios (L/L, L/M, L/H). As a sensitivity check, we calculate the second factor, *IB2*, using a similar procedure, except that we sort into *IB* deciles only and then each month we use the average of the monthly returns on the three high-*IB* portfolios minus the average of the monthly returns on the three low-*IB* portfolios.

[9]Additional analyses, untabulated for brevity and detailed in the online appendix, further probe the regional-profitability-equity link and the mechanism of how geographic quarterly financial information is processed in stocks. The main findings are as follows. First, an analysis that invests in REITs only after the regional profitability effects are largely incorporated in real estate values yields lower to no predictable stock returns. Second, building on the permanent income theory (e.g., Friedman, 1956; Bernanke, 1984), a possible reason for the stock return patterns is that REIT investors do not adequately internalize permanent wealth implications embedded in geographic profitability changes. Indeed, the abnormal return patterns are consistent with investors not calibrating for the differential persistence of regional profitability changes, which vary across regions. In addition, two additional tests provide same conclusions about the regional-profitability-stocks mechanism. Third,a two-step Fama and MacBeth (1973) analysis reveals that a regional-profitability-based factor is not a significant priced risk factor, suggesting that the return patterns do not appear to be due to an omitted risk factor. Fourth, using real estate price forecasts to test how real estate forecasters process past regional profitability information shows that future real estate forecast errors are correlated with current regional profitability information, which indicates that real estate forecasters do not adequately process available information in regional profitability. This finding is consistent with the stock return evidence documenting that REIT investors do not adequately process regional financial statement information.

implications of regional financial statement information for future real estate valuation are not fully processed in REIT prices. By identifying regional financial statement information as relevant for timely understanding of local real estate market fluctuations and, thus, as a source of performance and risk assessment of the financial sector and the macroeconomy, this study responds to recent calls for academic help in understanding housing markets and their implications.[10] We also bring to the forefront the value add of the quarterly financial reporting system for macroeconomic analyses that have traditionally ignored the timely flow of data from firms' financial reports.

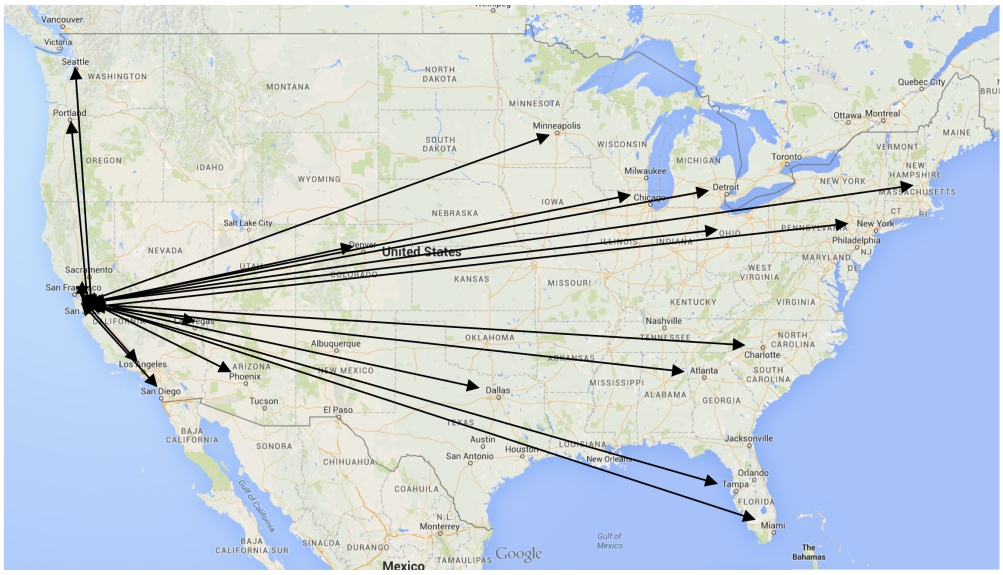
This paper makes a key step towards understanding whether and how regional financial information is tied to local markets. This paper can serve as a starting point for a wide array of related works. For example, in addition to identifying a new role for the quarterly financial reporting system in better understanding housing and equity markets, this paper identifies a major macro-level consequence of corporate governance. Specifically, it suggests that employee compensation and corporate governance in general – which have evolved at the firm level in response to principal-agent dynamics and traditionally been researched at the firm level—can be a source of macro-level consequences such as real estate prices and economic growth. Similar to the work of Bernanke (1983) suggesting that firm-level information asymmetries between banks and borrowers are aggregated into the macro-level effect of the 1930s' financial crisis through changes in bank runs' probabilities prior to the Great Depression, this paper suggests that firm-level agency dynamics between firms and employees through profit sharing are aggregated into a macro-level effect on real estate markets through changes in profits and demand for real estate.

An interesting avenue for future research would be to use this study's framework to probe how regional profitability manifests in other local markets and shapes society, for example in terms of affecting price levels, educational attainments, and possible population inequalities across different regions. In addition, this study focuses on Case-Shiller real estate indices as they are readily available and have attracted high attention from researchers, professionals, and the media. Building on the corporate governance literature suggesting that senior managers enjoy a large fraction of firms' profits, another avenue would be to investigate how the profitability-housing linkages differ when considering luxury real estate properties

[10]Indeed, financial risk is driven by real estate fluctuations and it is the major high-dimensional distinct risk underlying economic growth (e.g., Glaeser, 2013; Joslin et al., 2014). The substantial impact of real estate on the financial sector and the economy stems from leverage and the fact that real estate is the easiest asset to borrow against, especially for households. For example, $9.9 trillion of outstanding debt for home mortgages had been issued against the value of residential real estate (Fed's most recent Z.1 report available as of December 2017, Table B.101, line 33).

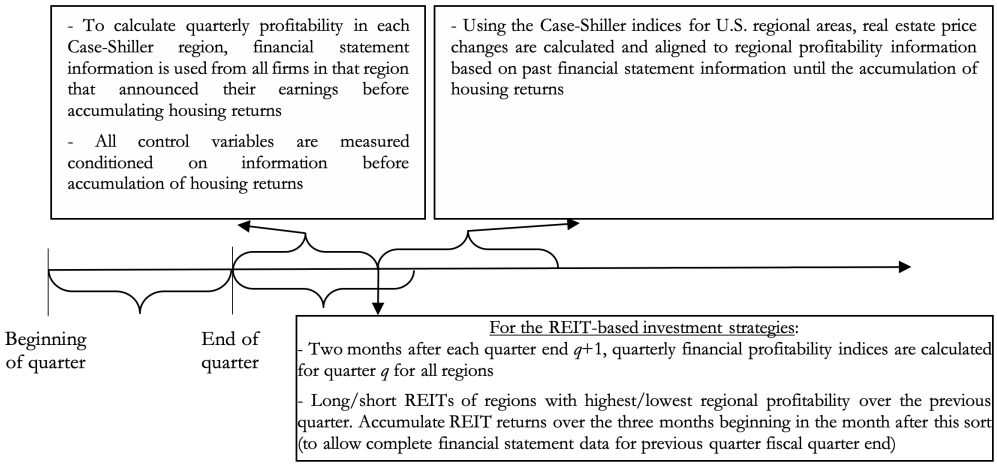
and across varying degrees of executive compensations. Another research direction would be to assess how different factors—such as supply elasticity or labor-versus-capital-intensive regions—affect the propagation of firms' profits in local housing markets. For example, it is likely that regional profitability has stronger housing effects in regions with less efficient zoning laws (that slowly respond to housing demand changes) or with local firms that are more labor than capital intensive (such as service firms versus manufacturing firms that respond differently to changes in profitability in terms of changes in marginal number of employees).

Figure 1: Corporate Headquarters and U.S. Regions: An Example Using Facebook Inc.



Notes: The figure illustrates the distances of a firm to U.S. regions (Case-Shiller) using Facebook Inc. as an example. See Section II for further details.

Figure 2: Timeline of Analysis



Notes: The figure provides key timing aspects of the analysis. See Section II for further details.

Table 1: **Variable Definitions.**

Variable	Definition
$\Delta RealEstate_{region}$	Month-over-month real estate price change on the real estate region index *region*. Case-Shiller Home Price Indices are from the S&P Dow Jones Indices.
$Prof_{region}$	Real-time indices of quarterly profitability change for region *region*. Developed by sorting all firms into regions based on the location of their headquarters. Then, using firms in each region, the quarterly indices of regional profitability changes are based on earnings reports available in real time, where profit for firm i in quarter q ($Prof_{i,q}$) is measured as scaled quarterly operating income before depreciation. Profitability change ($\Delta Prof_{i,q}$) is the year-over-year change in $Prof_{i,q}$. To mitigate the effects of outliers, a firm?s profits and profit changes based on the top and bottom one percentile of each quarterly cross-section are deleted. To avoid negative denominator problems, profits are scaled by sales. Regional quarterly time series of profits (Prof) and profit changes ($\Delta Prof$) are based on value-weighted cross-sectional averages, with weights based on market value of equity as of the beginning of each quarter. For a firm-quarter to be included in the sample it must have nonmissing values for market value of equity, $\Delta Prof_{i,q}$, and the quarterly earnings announcement date.
$region$	The *region* regional classification is as follows: region 1 = DC-Washington; region 2 = MI-Detroit; region 3 = MN-Minneapolis; region 4 = OH-Cleveland; region 5 = CA-San Diego; region 6 = CA-San Francisco; region 7 = CO-Denver; region 8 = IL-Chicago; region 9 = MA-Boston; region 10 = NC-Charlotte; region 11 = OR-Portland; region 12 = WA-Seattle; region 13 = AZ-Phoenix; region 14 = CA-Los Angeles; region 15 = TX-Dallas; region 16 = FL-Miami; region 17 = FL-Tampa; region 18 = GA-Atlanta; region 19 = NV-Las Vegas; region 20 = NY-New York; region 21 = 20-city composite; region 22 = 10-city composite.
$\Delta Prof$	Quarterly profitability change over all firms in the economy.
$RETURN$	Quarterly buy-and-hold return on the stock market index (i.e., the S&P Stock Composite Index).
$W_{i,q}$	Estimated quarterly figure for employee wages and salaries for each firm i in quarter q. Because Compustat Fundamentals Quarterly does not provide quarterly wages and salaries of employees, this variable is estimated using the following procedure. First, using Compustat Fundamentals Annual, possible proxies for annual wages and salaries are calculated by subtracting from sales, general, and administrative expense (Compustat: XSGA) seven possible combinations of variables that capture annual expenses unrelated to wages and salaries (i.e., research and development, rental, advertising, pension and retirement, and staff; in Compustat: XRD, XRENT, XAD, XPR, and XLR, respectively). Second, given that a firm?s employee wages and salaries should relate to the firm?s number of employees, the analysis uses the variable combination with the highest correlation between the annual number of employees (Compustat: EMP) and each of the seven alternatives. Overall, implementing this proxy at the quarterly frequency using Compustat Fundamentals Quarterly results in each firm?s estimated quarterly employee wages and salaries.
$\Delta W_{i,q \to q+t}$ (or $\Delta W_{i,q+t}$)	Accumulated (or quarter-over-quarter) change in estimated wages and salaries over each of the subsequent four quarters relative to the current quarter, where $t = \{1, \ldots, 4\}$.
$\Delta Profg_{i,q}$	Change in profits for firm i in quarter q, for the firm-level cross-sectional regressions of current profit changes and future changes in estimated employee wages and salaries, where gross profits are used in this analysis to refrain from any possible mechanical relation between operating profits and contemporaneous/subsequent wages and salaries.
$LEV_{i,q}$	Leverage for firm i in quarter q, calculated as a firm?s total shareholders? equity divided by total assets.

Table 1: **Variable Definitions and Data Sources (cont.)**

$BTM_{i,q}$	Book-to-market ratio for firm i in quarter q, calculated as a firm?s total shareholders? equity divided by total market value of equity.
$MVE_{i,q}$	Total market value of equity for firm i in quarter q.
$HighTech_{i,q}$	An indicator variable that is equal to one if a firm i in quarter q is in high tech industry, and zero otherwise. Following prior literature (e.g., Kasznik and Lev, 1995), HighTech is equal to one if a firm?s four-digit SIC code falls within the following ranges: 2833 to 2836 (drugs), 3570 to 3577 (computers), 3600 to 3674 (electronics), 7371 to 7379 (computer programming and data processing), or 8731 to 8734 (research, development, and testing services).
T_{region}	Regional measure of tightness. Due to limited data availability from Zillow (available since 2010) and for simplicity, the tightness measure for each region is fixed at the average value using data available since 2010 and is equal to the log of the ratio of total number of corporate employees in a region to the supply of the corresponding-region residential real estate properties available for sale (de-meaned, to ease coefficient interpretation).

Notes: This table provides data sources, data descriptions, and variable definitions for all data employed throughout the paper. See Section II for further details.

Table 2: **Descriptive Statistics.**

	Mean	Median	Std. Dev.	25th Pctl	75th Pctl
$\Delta RealEstate_{region} = 1$	0.004	0.003	0.010	-0.003	0.010
$\Delta RealEstate_{region} = 2$	0.002	0.003	0.013	-0.002	0.008
$\Delta RealEstate_{region} = 3$	0.003	0.003	0.012	-0.001	0.009
$\Delta RealEstate_{region} = 4$	0.002	0.003	0.009	-0.002	0.007
$\Delta RealEstate_{region} = 5$	0.005	0.005	0.011	-0.002	0.012
$\Delta RealEstate_{region} = 6$	0.005	0.005	0.013	-0.002	0.012
$\Delta RealEstate_{region} = 7$	0.004	0.004	0.008	0.000	0.009
$\Delta RealEstate_{region} = 8$	0.003	0.004	0.011	-0.001	0.009
$\Delta RealEstate_{region} = 9$	0.004	0.003	0.010	-0.003	0.011
$\Delta RealEstate_{region} = 10$	0.002	0.003	0.006	-0.001	0.006
$\Delta RealEstate_{region} = 11$	0.004	0.004	0.009	0.000	0.009
$\Delta RealEstate_{region} = 12$	0.004	0.004	0.010	-0.001	0.009
$\Delta RealEstate_{region} = 13$	0.003	0.004	0.013	0.000	0.007
$\Delta RealEstate_{region} = 14$	0.004	0.005	0.011	-0.002	0.011
$\Delta RealEstate_{region} = 15$	0.002	0.002	0.009	-0.002	0.007
$\Delta RealEstate_{region} = 16$	0.004	0.004	0.010	0.000	0.010
$\Delta RealEstate_{region} = 17$	0.002	0.002	0.010	-0.002	0.007
$\Delta RealEstate_{region} = 18$	0.002	0.003	0.011	0.000	0.006
$\Delta RealEstate_{region} = 19$	0.002	0.003	0.014	-0.002	0.008
$\Delta RealEstate_{region} = 20$	0.004	0.004	0.012	-0.002	0.011
$\Delta RealEstate_{region} = 21$	0.003	0.006	0.011	-0.002	0.010
$\Delta RealEstate_{region} = 22$	0.003	0.004	0.009	-0.002	0.010
$\Delta Prof$	0.000	0.001	0.020	-0.006	0.008
$RETURN$	0.020	0.022	0.071	-0.019	0.065
$\Delta Prof_{region}$ =1	0.002	0.003	0.028	-0.008	0.014
$\Delta Prof_{region}$ =2	-0.001	0.000	0.030	-0.013	0.014
$\Delta Prof_{region}$ =3	0.001	0.002	0.042	-0.009	0.014
$\Delta Prof_{region}$ =4	0.000	0.001	0.021	-0.008	0.011
$\Delta Prof_{region}$ =5	0.011	0.007	0.066	-0.014	0.043
$\Delta Prof_{region}$ =6	0.009	0.006	0.035	-0.009	0.027
$\Delta Prof_{region}$ =7	-0.001	0.001	0.066	-0.028	0.026
$\Delta Prof_{region}$ =8	0.002	0.000	0.027	-0.008	0.007
$\Delta Prof_{region}$ =9	-0.001	0.001	0.035	-0.011	0.013
$\Delta Prof_{region}$ =10	-0.002	0.000	0.043	-0.010	0.015
$\Delta Prof_{region}$ =11	-0.002	0.000	0.030	-0.017	0.015
$\Delta Prof_{region}$ =12	0.006	0.007	0.052	-0.022	0.029
$\Delta Prof_{region}$ =13	0.004	0.000	0.291	-0.020	0.020
$\Delta Prof_{region}$ =14	0.002	0.004	0.021	-0.010	0.015
$\Delta Prof_{region}$ =15	-0.003	0.001	0.039	-0.014	0.012
$\Delta Prof_{region}$ =16	0.000	0.000	0.026	-0.013	0.016
$\Delta Prof_{region}$ =17	-0.003	0.001	0.040	-0.008	0.012
$\Delta Prof_{region}$ =18	-0.007	-0.002	0.046	-0.010	0.006
$\Delta Prof_{region}$ =19	0.010	0.008	0.083	-0.015	0.028
$\Delta Prof_{region}$ =20	0.000	0.002	0.029	-0.009	0.012
$\Delta Prof_{region}$ =21	0.002	0.003	0.028	-0.008	0.014
$\Delta Prof_{region}$ =22	0.002	0.003	0.021	-0.007	0.011

Table 2: **Descriptive Statistics (cont.)**

Notes: The table provides descriptive statistics for key variables. $\Delta RealEstate_{region}$ = x is month-over-month real estate price change on the real estate region x index. $\Delta Prof_{region}$ = x is quarterly profitability change for region x, and $\Delta Prof$ is the quarterly profitability change over all firms in the economy. The regional classification is as follows: region 1 = DC-Washington; region 2 = MI-Detroit; region 3 = MN-Minneapolis; region 4 = OH-Cleveland; region 5 = CA-San Diego; region 6 = CA-San Francisco; region 7 = CO-Denver; region 8 = IL-Chicago; region 9 = MA-Boston; region 10 = NC-Charlotte; region 11 = OR-Portland; region 12 = WA-Seattle; region 13 = AZ-Phoenix; region 14 = CA-Los Angeles; region 15 = TX-Dallas; region 16 = FL-Miami; region 17 = FL-Tampa; region 18 = GA-Atlanta; region 19 = NV-Las Vegas; region 20 = NY-New York; region 21 = 20-city composite; region 22 = 10-city composite. *RETURN* is the quarterly buy-and-hold return on the stock market index (i.e., the S&P Stock Composite Index); *GDP* is the quarterly realization of GDP growth in real terms; *TBILL* is the yield on the one-year constant maturity Treasury bill; *INFLATION* is based on the realization of the consumer price index for the quarter; *CORP* is quarterly growth in corporate profits calculated by the Bureau of Economic Analysis; *TERM* is the yield on the ten-year constant maturity Treasury bond minus the yield on the one-year constant maturity Treasury bill. To develop measures of regional profitability changes, wesort firms into regions based on the location of their headquarters. Using firms in each region, weconstruct quarterly indices of regional profitability changes based on earnings reports available in real time. We measure profit for firm i in quarter q ($Prof_{i,q}$) as scaled quarterly operating income before depreciation. We measure profitability change ($\Delta Prof_{i,q}$) as the year-over-year change in $Prof_{i,q}$. To mitigate the effects of outliers, we trim a firm's profits and profit changes based on the top and bottom one percentile of each quarterly cross-section. To avoid negative denominator problems, we scale profits by sales. Regional quarterly time series of profits (Prof) and profit changes ($\Delta Prof$) are based on value-weighted cross-sectional averages, with weights based on market value of equity as of the beginning of each quarter. For a firm-quarter to be included in the sample it must have nonmissing values for market value of equity, $\Delta Prof_{i,q}$, and the quarterly earnings announcement date. Variables are from the Compustat North America Fundamentals Quarterly File (WRDS: FUNDQ) available from WRDS. Treasury bond and bill yields from the Federal Reserve Board of Governors H15 Report; and GDP, inflation, and corporate profits from the Philadelphia's Fed Real-Time Data Research Center, where these Fed's data are quarterly and stated in annual rates. Case-Shiller Home Price Indices are from the S&P Dow Jones Indices website. The analyses throughout employ varying samples, to allow for feasible information flows and following the Case-Shiller coverage of the housing data that vary by regions. Specifically, following the Case-Shiller coverage, real estate price changes include 182 to 518 observations depending on the region. In terms of alignment with data, analyses of stock investment strategies use observations as reported in the related table. For analyses predicting future real estate price changes we calculate regional profitability changes using quarterly observations over the period from Q4:1972 to Q4:2014 (n = 168 quarters).

Table 3: **Characteristics of Regional Housing Markets and Profitability Changes Across U.S. Regions**

		Panel A. Cross-sectional overlap in month-over-month regional real estate returns			Panel B. Cross-sectional overlap in year-over-year regional real estate returns			Panel C. Cross-sectional overlap in regional profitability changes		
		Statistics from summarizing, for each region, all pairwise correlations with all other regions in each panel								
		Min	Max	St.Dev	Min	Max	St.Dev	Min	Max	St.Dev
region1	DC-Washington	0.386	0.828	0.108	0.181	0.903	0.215	-0.09	0.369	0.115
region2	MI-Detroit	0.349	0.796	0.103	0.295	0.843	0.151	-0.091	0.433	0.146
region3	MN-Minneapolis	0.356	0.804	0.101	0.172	0.888	0.141	-0.192	0.369	0.135
region4	OH-Cleveland	0.281	0.751	0.122	0.229	0.793	0.151	-0.082	0.438	0.131
region5	CA-San Diego	0.313	0.859	0.133	0.211	0.94	0.184	-0.239	0.199	0.102
region6	CA-San Francisco	0.33	0.784	0.121	0.241	0.901	0.167	-0.127	0.362	0.127
region7	CO-Denver	0.211	0.841	0.154	0.065	0.933	0.223	-0.092	0.436	0.116
region8	IL-Chicago	0.392	0.804	0.099	0.28	0.888	0.15	-0.205	0.407	0.125
region9	MA-Boston	0.319	0.764	0.115	-0.025	0.885	0.188	-0.099	0.344	0.091
region10	NC-Charlotte	0.233	0.728	0.12	0.112	0.84	0.166	-0.205	0.378	0.119
region11	OR-Portland	0.299	0.72	0.113	-0.025	0.829	0.212	-0.07	0.349	0.096
region12	WA-Seattle	0.373	0.72	0.074	0.295	0.844	0.131	-0.172	0.352	0.118
region13	AZ-Phoenix	0.313	0.84	0.124	0.397	0.928	0.115	-0.067	0.367	0.11
region14	CA-Los Angeles	0.211	0.859	0.151	0.097	0.94	0.211	-0.049	0.381	0.114
region15	TX-Dallas	0.297	0.841	0.15	0.45	0.933	0.113	-0.068	0.436	0.107
region16	FL-Miami	0.233	0.84	0.152	0.279	0.97	0.176	-0.068	0.352	0.102
region17	FL-Tampa	0.305	0.817	0.114	0.259	0.97	0.158	-0.239	0.386	0.148
region18	GA-Atlanta	0.364	0.778	0.091	0.5	0.853	0.081	-0.069	0.438	0.12
region19	NV-Las Vegas	0.214	0.712	0.128	0.328	0.838	0.129	-0.09	0.438	0.119
region20	NY-New York	0.273	0.764	0.142	0.065	0.885	0.207	-0.042	0.438	0.128

Notes: The table summarizes results from analyzing overlaps in real estate price changes and profitability changes across regions. The minimum, maximum, and standard deviation statistics are from summarizing, for each region, all pairwise correlations with all other regions in each panel (excluding the diagonal). Panel A (B) summarizes Spearman and Pearson correlations in month-over-month (year-over-year) real estate price changes. Panel C summarizes these correlations among regional profitability changes. Table 1 provides details on the variables and sample. The appendix provides more detailed results on all the pairwise correlations used to construct this table.

Table 4: **Demand-Supply Analysis of U.S. Corporate Employees Relative to the Related-Region Supply of Available Residential Real Estate Properties**

	Ratio of Corporate Employees divided by the Related-Region Supply of Properties Available for Sale					
Beginning of Year:	2010	2011	2012	2013	2014	2015
All Regions	20	19	21	30	31	32
By Region:						
AZ_Phoenix	7	6	8	10	9	9
CA_LosAngeles	17	18	19	40	36	31
CA_SanDiego	9	7	7	14	14	12
CA_SanFrancis	76	74	88	172	174	158
CO_Denver	9	9	12	19	19	23
DC_Washington	27	25	27	36	37	33
FL_Miami	6	6	4	7	7	8
FL_Tampa	6	6	8	13	13	12
GA_Atlanta	16	16	18	24	26	26
IL_Chicago	25	24	27	37	41	40
MA_Boston	25	24	21	29	32	33
MI_Detroit	20	24	30	38	40	40
MN_Minneapolis	38	35	39	51	52	51
NC_Charlotte	8	8	8	10	11	12
NV_LasVegas	14	14	16	32	26	25
NY_NewYork	36	35	32	43	47	47
OH_Cleveland	34	30	32	39	40	43

Notes: The table reports the ratio of the sum of corporate employees for firms headquartered in Case-Shiller regions across the United States and the related-region supply of residential real estate properties available for sale, for all regions and by region. Data on number of employees (Compustat: EMP) are from the Compustat North America Fundamentals Annual File (WRDS: FUNDA) available from WRDS, where number of employees are summed by fiscal year (Compustat: FYEAR). Housing supply data are from Zillow. Firms' corporate employees and Zillow's real estate supply are classified into Case-Shiller regions following the procedure used for developing the regional profitability indices. That is, based on firms' headquarters location or the Zillow's zip code, respectively, using: (a) a zip-code-coordinates mapping from the Census Gazetteer File, (b) regional coordinates from Google searches, and (c) the spherical distance of a firm's headquarters to its closest Case-Shiller region. Using firms in each region, annual sums of corporate employees are constructed. Both corporate employees and properties supply refer to the beginning of each year, and thus the Compustat data are as of Dec. 31, 2009 through Dec. 31, 2014, and the Zillow data are from beginning of Jan. 2010 through beginning of Jan. 2015. The series begin in Jan. 2010, the first month with available housing supply data. The appendix provides more detailed information about this analysis.

Table 5: **Firm-Level Cross-Sectional Analysis: Current-Period Profit Changes and Future Changes in Estimated Employee Wages and Salaries**

Panel A. Accumulated changes in estimated wages and salaries over the subsequent quarters

	A pooled regression for each horizon (t-statistics are based on standard errors clustered by firm and quarter)				Fama-MacBeth quarterly regressions (mean estimated coefficients and Fama and MacBeth (1973) t-statistics)				
	$\Delta W_{i,q\to q+1}$	$\Delta W_{i,q\to q+2}$	$\Delta W_{i,q\to q+3}$	$\Delta W_{i,q\to q+4}$	$\Delta W_{i,q\to q+1}$	$\Delta W_{i,q\to q+2}$	$\Delta W_{i,q\to q+3}$	$\Delta W_{i,q\to q+4}$	
$\Delta Prof_{i,g}$	0.011	0.025	0.031	0.033		0.013	0.024	0.034	0.039
t-statistic	**3.44**	**5.94**	**6.08**	**5.57**		**3.69**	**5.23**	**5.6**	**6.17**
$LEV_{i,q}$	0.016	0.022	0.028	0.032		0.018	0.029	0.041	0.051
t-statistic	9.05	11.24	13.26	13.65		9.23	12.2	15	15.49
$BTM_{i,q}$	-0.001	-0.001	-0.001	-0.002		-0.006	-0.012	-0.019	-0.026
t-statistic	-3.25	-3.12	-2.97	-2.7		-7.35	-9.96	-11.15	-11.59
$MVE_{i,q}$	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000
t-statistic	0.43	-0.09	-1.94	-3.15		-1.63	-2.48	-2.6	-2.9
$HighTech_{i,q}$	-0.001	-0.002	-0.001	0.002		0	0.001	0.002	0.003
t-statistic	-1.7	-2.66	-0.76	2.05		0.11	0.36	0.99	1.49
Intercept	0	0.003	0.007	0.01		-0.015	-0.015	-0.02	-0.02
t-statistic	-0.5	2.49	5.9	7.64		-2.68	-2.34	-2.57	-2.77
Adj. R^2	0.003	0.005	0.006	0.007		0.076	0.082	0.089	0.093

Panel B. Quarter-over-quarter changes in estimated wages and salaries over the subsequent quarters

	A pooled regression for each horizon (t-statistics are based on standard errors clustered by firm and quarter)				Fama-MacBeth quarterly regressions (mean estimated coefficients and Fama and MacBeth (1973) t-statistics)				
	$\Delta W_{i,q\to q+1}$	$\Delta W_{i,q\to q+2}$	$\Delta W_{i,q\to q+3}$	$\Delta W_{i,q\to q+4}$	$\Delta W_{i,q\to q+1}$	$\Delta W_{i,q\to q+2}$	$\Delta W_{i,q\to q+3}$	$\Delta W_{i,q\to q+4}$	
$\Delta Prof_{i,g}$	0.011	0.013	0.004	0.005		0.013	0.011	0.006	0.006
t-statistic	**3.44**	**3.88**	**1.12**	**1.58**		**3.69**	**3.21**	**1.53**	**1.63**
$LEV_{i,q}$	0.016	0.011	0.008	0.005		0.018	0.015	0.014	0.01
t-statistic	9.05	7.28	5.96	3.69		9.23	9.71	8.15	5.43
$BTM_{i,q}$	-0.001	0.000	0.000	0.000		-0.006	-0.006	-0.007	-0.006
t-statistic	-3.25	-3.16	-2.76	-2.38		-7.35	-8.23	-7.82	-7.81
$MVE_{i,q}$	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000
t-statistic	0.43	-0.72	-1.48	-0.72		-1.63	-1.68	-0.68	-0.28
$HighTech_{i,q}$	-0.001	-0.001	0.000	0.001		0.000	0.000	0.000	0.002
t-statistic	-1.7	-0.86	0.17	1.97		0.11	0.07	0.14	1.58
Intercept	0	0.002	0.003	0.003		-0.015	-0.011	-0.01	-0.006
t-statistic	-0.5	1.88	4.07	4.03		-2.68	-2.1	-1.86	-0.95
Adj. R^2	0.003	0.002	0.001	0.001		0.076	0.072	0.073	0.064

Notes: The table reports results from firm-level cross-sectional regression models of future changes in estimated employee wages and salaries on current-period profit changes, following Equations (1)-(2). See Table 1 for variable definitions The equations are estimated using both pooled and Fama-MacBeth specifications. The pooled regressions are estimated using double clustering by firm and quarter. The Fama-MacBeth regressions are estimated each quarter, with industry fixed effects (based on two-digit SIC code, omitted for brevity), focusing on the means of the estimated coefficients and their t-statistics following the Fama and MacBeth (1973) procedure. Financial statement data are from Compustat North America Fundamentals Annual and Quarterly beginning in the first quarter of 1970. This cross-sectional test employs 120,262 quarterly observations with data available for the analysis (N = 120,262).

Table 6: **Regional Profitability and Future Real Estate Valuation: Analysis at the Overall Composite Level**

	Dependent variable is future real estate price changes for U.S. composite regions	
	region21	region22
	20-City Composite	10-City Composite
Estimate	0.141	0.176
Std. Err	0.024	0.047
t-statistic	**5.88**	**3.735**
Adjusted R^2	0.156	0.071

Notes: The table reports results from the regression models of subsequent composite real estate price changes on the corresponding region quarterly profitability changes. Tables 1-2 provide more details on variable definitions and the sample, $\Delta Prof_{region}$. The number of observations in this analysis is based on the available information about the Case-Shiller indices that vary across regions. For the 20-City Composite there are 182 observations; for the 10-City Composite there are 338.

Table 7: **The Cross-Section of Real Estate Valuation: Regional Profitability and Future Regional Real Estate Price Changes**

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
$\Delta Prof_{region}$	**0.0106**	**0.00907**	**0.0127**	**0.0131**	**0.00424**	**0.00412**	**0.00367**
t-statistic	**2.36**	**2.18**	**3.82**	**3.96**	**3.2**	**3.05**	**2.35**
RETURN	·	0.0331	·	·	·	·	·
t-statistic	·	14.12	·	·	·	·	·
lagged CS	·	·	0.367	0.368	0.243	0.219	·
t-statistic	·	·	19.7	19.6	13.5	10.6	·
Coincident	·	·	·	-2.54	-1.6	0.67	·
t-statistic	·	·	·	-5.92	-2.26	0.58	·
leading	·	·	·	·	1.62	1.86	1.85
t-statistic	·	·	·	·	15	13.9	17.3
Time FE	*No*	*No*	*No*	*No*	*Yes*	*Yes*	*Yes*
Region FE	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Adjusted R2	0.0086	0.054	0.107	0.111	0.571	0.574	0.538

Notes: The table reports results from regression models examining the cross-section of real estate price changes following Equation (4). Because this analysis is estimated cross-regional, the t-statistics and standard errors are obtained using clustering by region and quarter. Tables 1-2 provide more details on variable definitions and the sample. The regressions are based on N=7238. For ease of presentation, the coincident coefficient is multiplied by 10^3 and the leading coefficient is multiplied by 10^5.

Table 8: **Impulse Response Analysis: Future Regional Real Estate Price Responses for Innovations in Quarterly Profitability of Firms Located in Corresponding Regions**

	Accumulated impulse response functions from profitability growth impulses			
Real estate price change response horizon	Region21 20-City Composite		Region22 10-City Composite	
1	0.298	0.036	0.271	0.037
2	0.509	0.061	0.47	0.063
3	0.658	0.079	0.617	0.083
4	0.763	0.091	0.725	0.098
5	0.837	0.1	0.805	0.109
6	0.89	0.106	0.863	0.116
7	0.927	0.111	0.906	0.122
8	0.953	0.114	0.938	0.127
9	0.971	0.116	0.961	0.13
10	0.984	0.118	0.978	0.132
11	0.993	0.119	0.991	0.134
12	1	0.119	1	0.135

Notes: Notes: The table reports results from impulse response analysis of future real estate price responses for changes in quarterly profitability of firms located across U.S. composite regions, where the results provide the accumulated impulse response functions from profitability growth impulses. More specifically, this analysis probes how a change (innovation) in regional profitability affects subsequent real estate price changes in the region, focusing on accumulated impulse response functions, for a response in $RealEstate_{region}$ over the 12 months subsequent to an innovation in $Prof_{region}$ at the Case-Shiller composite regional levels. Tables 1-2 provide more details on variable definitions and the sample.

Table 9: **The Cross-Section of Real Estate Valuation: The Impact of Market Tightness on the Regional Profitability-Housing Link**

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
$\Delta Prof_{region}$	**0.0181**	**0.00156**	**0.02291**	**0.0234**	**0.00824**	**0.00827**	**0.00745**
t-statistic	**5.03**	**4.56**	**6.8**	**6.98**	**3.66**	**3.25**	**3.46**
$\Delta Prof_{region} \cdot T_r$	**5.52**	**4.52**	**7.35**	**7.43**	**2.76**	**2.81**	**2.64**
t-statistic	**2.82**	**2.48**	**4.13**	**4.2**	**2.26**	**1.97**	**2.35**
RETURN	·	0.0329	·	·	·	·	·
t-statistic	·	14.07	·	·	·	·	·
lagged CS	·	·	0.369	0.37	0.243	0.221	·
t-statistic	·	·	19.9	19.8	13.57	10.8	·
Coincident	·	·	·	-2.56	-1.6	0.65	·
t-statistic	·	·	·	-5.94	-2.19	0.56	·
leading	·	·	·	·	1.63	1.86	1.86
t-statistic	·	·	·	·	15.1	13.94	17.34
Time FE	*No*	*No*	*No*	*No*	*Yes*	*Yes*	*Yes*
Region FE	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Adjusted R2	0.011	0.054	0.111	0.115	0.571	0.574	0.539

Notes: Notes: The table reports results from regression models examining the impact of tightness in regional real estate markets on the cross-section of real estate price changes following Equation (5). Because this analysis is estimated cross-regional, the t-statistics and standard errors are obtained using clustering by region and quarter. Tables 1-2 provide more details on variable definitions and the sample. The regressions are based on N=7238. For ease of presentation, the coincident coefficient is multiplied by 10^3, the leading coefficient is multiplied by 10^5, and the $\Delta Prof_{region} \times T_r$ is multiplied by 1000.

Table 10: **Investment Analysis: Summary of Quarterly Series of Future Risk-Adjusted Stock Returns for REIT Investments Based on Lagged Regional Profitability**

	Mean	Standard Error
Market adjusted hedge return	0.014	0.004
t-statistic	**3.267**	
FF adjusted hedge return	0.01	0.004
t-statistic	**2.512**	
FFC adjusted hedge return	0.01	0.004
t-statistic	**2.566**	
FFCIB1 adjusted hedge return	0.01	0.004
t-statistic	**2.475**	
FFCIB2 adjusted hedge return	0.01	0.004
t-statistic	**2.613**	

Notes: Notes: The table reports summary results from time-series quarterly firm-level abnormal returns over the sample period. FF, FFC, FFCIB1, and FFCIB2 refer to quarterly returns adjusted for market, Fama-French, Fama-French-Carhart, and two Fama-French-Carhart-profitability factor returns for the corresponding quarter. We obtain firm-level returns over the quarter subsequent to the month in which profitability information for all regions becomes available, and calculate mean returns for each quarter in each group. The groups are based on ranking regional profitability changes for all regions into quintiles each quarter. To obtain abnormal returns, we first calculate raw returns by quarterly compounding each firm's monthly returns. The market-adjusted return is calculated as the quarterly compounded raw return minus the quarterly compounded value-weighted return on all NYSE, AMEX, and NASDAQ stocks in CRSP. Next, we estimate time-series regressions for each firm, of firm monthly returns on the monthly factors, first for the Fama and French (1993) factors and then sequentially adding as controls the Carhart's (1997) momentum factor and my two constructed profitability-based factors (IB1 and IB2). This estimation yields firm-specific betas, which we winsorize at the top and bottom one percent. Each set of firm betas is based on a different time-series regression for that firm using the factors added in that regression. We obtain abnormal returns by subtracting from raw returns the product of a firm's betas and the respective factor returns, compounded quarterly. We form the two profitability-based factors, IB1 and IB2, by following the procedure described in Fama and French (1993) for forming their HML and SMB factors. Thus, these factors refer to returns to factor-mimicking income before extraordinary items (IB) portfolios. Raw stock returns are from the CRSP Monthly Stock File, adjusted for delisting returns. The risk-free rate and Fama–French-Carhart factors are from the Fama–French Portfolios and Factors dataset available on WRDS. Financial statement data are from Compustat North America Fundamentals Quarterly. To ensure the feasibility of investing in REITs when housing data exist across all regions, this analysis employs quarterly observations for which there are real estate index data for all regions. Accordingly, this analysis uses quarterly data beginning in Q4:1999, because the first month for which real estate regional data are available for all regions is January 2000 (the last region for which data are available is Dallas, TX). The sample consists of U.S. stocks in the intersection of CRSP and Compustat with data available to calculate quarterly changes to regional profitability.

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