Economic Consequences of Public Pension Accounting Rule Changes:

Evidence from Housing Markets and Local Economies

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Abstract: This paper provides novel evidence that public pension accounting rule changes have real economic consequences on local housing markets and the surrounding economies. After the introduction of pension accounting rules GASB 67 and 68, pension liabilities have to be disclosed on governments' balance sheets, and lower investment returns should be used to calculate the present values of pension liabilities, which significantly increase the salience and magnitude of governments' pension underfunding problems. By applying a contiguous border-county approach, I find that after the GASB rule changes, the housing prices in counties from states with larger pension liabilities as a percentage of total GDP grow more slowly relative to their adjacent counties. Every 10 percent increase in the level of pension underfunding leads to a 0.2 to 0.3% decrease in the annual growth rate, which translates to a 10 to 15% relative decline from a normal growth rate of 2%. I also find that the negative relation between housing price growth and pension underfunding is stronger for states that are expected to be impacted more by the rules. Other local economic variables, including new building permits, business establishments and public employment outcomes are also negatively impacted by the revelation of pension underfunding. This paper sheds light on the channels through which the US pension crisis influences the real economy, and how accounting treatments amplify this effect.

1. Introduction

Do accounting rule changes have real economic effects? In this paper, I examine the impact of two government pension accounting standards, GASB 67 and 68, on the housing market and local economies. By implementing a contiguous border-county approach and a single-state study, I provide novel evidence that the enhanced transparency and quality of states' pension information causes housing prices to grow more slowly in regions with larger pension underfunding. I also find that the surrounding economic activities are negatively affected by the rule changes in these regions. The mechanism is that taxpayers and citizens change their valuation of housing properties in regions with worse pension problems, in fear of the future government actions such as tax increases and spending cuts to fill the funding gap. As the homeownership rate in the United States is close to 65% (Census Bureau, 2019), my paper has important implications for the effect of accounting rules on individual welfare and local economic development.

Public pension plans in the United States, mostly Defined Benefits (DB) plans, have over $4.41 trillion of invested assets and cover the pension benefits of around 14.7 million active public employees (about 13.8% of the US workforce) and 10.3 million retirees as of September 2018 (NASRA, 2019). These plans are set up by sponsoring governments to fulfill their pension obligations to their employees. Although the number of public employees is large, public pension funds have significant influences on the society beyond the benefits of the public employees. When governments allocate funds to the pension systems, less funds are available for other important investments such as local infrastructure and social needs. In fiscal year 2017, state and local governments on average diverted 4.7% of direct general spending to pension plans. Some states, such as Illinois and Connecticut, spent more than 10% of their budgets on these plans (NARSA, 2019).

However, it was historically difficult to estimate the amount of state and local governments' pension liabilities. Under the previous pension accounting rules, GASB 25 and 27 (Government Accounting Standard Board 25 and 27), the governments had discretion in determining the estimated investment returns from the pension assets and could smooth investment losses over future reporting periods. Consequently, these rules enabled governments to understate their pension liabilities. Researchers show that state governments systematically understated their pension funding gaps due to the GASB 25 and 27 approaches (Novy-Marx and Raul, 2009; Naughton et al., 2015). There was also a lack of transparency since the total pension liabilities were not disclosed on the governments' financial statements.[1] Following criticisms of the previous regime, the GASB released two new rules for public pension accounting, GASB 67 and 68, which dramatically increased the transparency and accuracy of pension reporting.

The question of whether accounting policies can have real effects beyond financial reporting has always been of interest to accounting scholars (Dukes, Dyckman and Elliott, 1980; Ball, 1980; Bens and Monahan, 2008; Graham, Hanlon and Shevlin, 2011; Chuk, 2012; Kanodia and Sapra, 2016, etc.). My paper adds to this stream of literature by providing a new perspective to study the individual welfare effect of public pension accounting rule changes. I focus on the taxpayers and citizens, who are important stakeholders of the governments' financial information (SFFAC 1, para.11). The information about a state's pension funding status is relevant for taxpayers and citizens because governments' actions to increase funding to the pension plans, such as tax increases and spending cuts, directly affect their income and living conditions. I expect that following the GASB 67 and 68 rule changes, the taxpayers and citizens will become more aware

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[1] Please see Section 2 of the paper for more details about the GASB rules 25 and 27.

of governments' pension situation, and they will change their expectation of future government actions to fill the pension funding gap.

To better establish this linkage, I provide evidence on the change of individual attention caused by the rule changes, and the channel through which pension issues are communicated to the public. First, I find that there is an increase in individual attention on pension issues. The google search volume of the keywords "pension crisis" and "government pension" significantly increased around the time of the rule changes. Second, I find that there is an increase in media coverage about pension information around the rule changes. I extract newspaper articles in the United States that have mentioned the keyword "pension crisis" from Factiva, and find that (1) the number of news articles spiked around the rule changes; (2) the tones of the articles become more negative, and (3) the use of the words "tax" and "cuts" in these articles becomes more frequent around the rule changes, representing the media's views about future tax and public services outcomes accompanying pension underfunding. The media thus serves as an important channel to communicate pension information to the public, even if most taxpayers and citizens do not read governments' financial statements.

If taxpayers and citizens become more aware of the future negative consequences of pension underfunding, they will try to move away from, or invest less in the worse-funded regions. I hypothesize that the housing price growth in these regions will decline consequently. I focus on the local housing market for the following reasons. Housing prices have the advantage of being timely, transparent, and very sensitive to changes in the real estate market's expectation of property values (Muth, 1960 and 1963; Olsen, 1969; Smith et al., 1988). If citizens want to relocate or invest less in a region, the demand for the houses there will decline, and housing prices will grow more slowly. Thus, relative to changes in population, we are more likely to observe the reaction of

housing prices to the accounting changes more timely. Housing is also one of the most important assets in the US economy. The housing sector accounted for 15.6 percent of total economic activity in the US, and total household real estate holdings worth more than $22.5 trillion in 2015 (National Association of Realtors, 2016). The housing market thus provides a valuable setting to examine the timely reaction of US citizens to the pension accounting rule changes.

To tackle the potential endogeneity problem that a poor economy leads to both a decline in housing prices and worse pension underfunding, or that other factors such as climate or location are driving the housing price growth different, I adopt the contiguous county approach, and compare the housing price growth rates within pairs of two adjacent counties on the state borders around the GASB rule changes. This technique is widely used in economics and finance literature for studying the economic outcomes of state-level regulations, such as US bank branching deregulation (Huang, 2008), minimum wage regulations (Dube et al., 2015; Rohlin, 2011) and foreclosure regulations (Mian et al., 2015). Since the neighboring counties are adjacent to each other, they are very similar in both *observable* aspects such as economic trends, climate and location characteristics, and *unobservable* (to econometricians) aspects, which are impossible, or practically very difficult to measure. In the absence of state-level regulation change, they should share similar growth patterns. The contiguous border counties thus represent good control groups for examining the effect of pension underfunding on housing price growth.

To measure housing price growth, I use the annual change of the Housing Price Index (HPI) developed by the Federal Housing Finance Agency (FHFA). It is a broad measure of the movement of single-family house prices, which measures average price changes in repeat sales or refinancing

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on the same properties.[2] The index is constructed in a way that controls for the type and location of the property, thus it is an effective measure of the level of housing price, and can be readily used to compare the housing price changes in different regions. A larger annual change in the HPI index indicates a higher growth in housing prices.

I hypothesize and find that counties from states with larger pension underfunding have lower housing price growth compared to its adjacent county in another state after the rule changes, but not before. Every 10 percent higher pension underfunding (net pension liabilities as a percentage of state GDP) causes the housing price to grow by 0.2 to 0.3% more slowly, which is equivalent to a 10 to 15% relative decline from an average annual growth rate of 2%. I find similar results when I use the actual reported pension underfunding status by the state pension plans. The results are robust to an alternative housing price index, the Zillow Home Price Index, as well as to various robustness tests. I also find consistent results using an alternative housing market growth indicator, which is the number of new housing permits. The evidence suggests that higher transparency of states' pension underfunding suppresses housing market growth.

As the GASB 67 and 68 rule changes are effective for all the states at the same time, there are concerns that the observed result is not due to the public accounting rule changes, but rather due to other concurrent events. To better attribute the observed results to the accounting rule changes, I design a series of cross-sectional tests. First, I identify states that rely more on debt financing and have a large debt-to-revenue ratio. These states will be more vulnerable to the increase in total liabilities following the rule changes on their balance sheets, since it can lead to a higher cost of

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[2] The data used to construct the index is obtained by reviewing repeat mortgage transactions on single-family properties whose mortgages have been purchased or securitized by Fannie Mae or Freddie Mac since January 1975. The Housing Price Index is available at:https://www.fhfa.gov/DataTools/Downloads/Pages/House-Price-Index-Datasets.aspx#qat

borrowing in the future (Anantharaman and Chuk, 2018; Boyer, 2018). I show that housing price growth becomes more sensitive to pension underfunding in states that have higher debt-to-revenue ratios after the rule changes.

Second, I explore the influence of union power in affecting the relation between pension underfunding and housing price growth. Powerful unions make it harder for the government to renegotiate the pension benefits with both current and future employees (Boyer, 2018). I hypothesize and find that the GASB accounting rule changes strengthen the negative relation between pension underfunding and housing price growth in states with stronger union presence.

Third, I examine the influence of governments' political constraints on renegotiating pension benefits with the employees on housing price growth. Some states face constraints from constitutional provisions or contract/property law provisions that provide explicit or implicit protections to public employees' pension benefits. More explicit pension benefit protections make it harder for a government to reduce pension benefits. I hypothesize and find that the GASB accounting rule changes strengthen the negative relation between pension underfunding and housing price growth in states with more stringent constitutional provisions.

I supplement my analyses with additional evidence on the impact of pension underfunding on public employment and local economies. In terms of public employment, I find that local public payrolls and the number of full-time equivalent public workers decrease after the rule changes for less-funded states. The evidence suggests that the governments cut back their spending on public employees to handle the pension problems after the rule changes. In terms of local economic activities, I find that there are fewer business establishments in counties from states with larger pension underfunding gaps. The effect is stronger after the GASB pension rule changes. Together,

I provide evidence that local economic activities are affected by the transparency and quality of government pension information.

Although the contiguous county approach has many advantages, there are still concerns that the two counties in a pair are not similar enough. To address this caveat, and to provide more insights on the impact of pension underfunding and rule changes, I test my main hypothesis within the state of California. I choose California because the California Public Employees Retirement System (CalPERS) and California State Teachers Retirement System (CalSTRS) are the two biggest pension plans in the United States, with over $360 billion assets, and representing over 10 percent of the US public pension plans assets. The amount of unfunded pension liabilities in California is significant ($846 billion by the end of 2017) and constitutes more than half of the state's total liabilities ($1.5 trillion). I hypothesize and find that the housing price in a city that has a larger pension burden (net pension liabilities per household) grows more slowly than the other cities. Further, the housing price growth is more sensitive to the city's pension burden after the GASB rule changes. I conduct the test both at the city-level and neighboring zip code (zip codes that are within 10 miles or 5 miles distance from each other) level, and find consistent results.

My paper makes several contributions. First, I add to the accounting literature that studies the real effects of accounting standards. I provide novel evidence that the changes in recognition and disclosure of government pensions have real effects in the economy. I find that pension underfunding suppresses housing price growth in the affected regions, and the public accounting rule changes intensify this effect. I also provide additional evidence on the decline of local employment and local public payrolls as a response to more transparent pension underfunding status.

Second, I extend the accounting literature that studies the usefulness of government financial information. Unlike many prior studies that focus on (more sophisticated) municipal bond investors, I focus on taxpayers and citizens as important stakeholders of governments' financial information. I find that information about governments' pension liabilities are relevant and can potentially change citizens' residential and investment decisions. Given that real estate is one of the most important investments for a majority of the US population, my study has important implications for the effect of public pension plan health on individual welfare and local economic growth.

Third, I provide timely evidence on the mechanism of how pension-related information is communicated to taxpayers and citizens. My analysis suggests that the media plays an important role in processing and disseminating pension-related information. The paper thus supplements other accounting studies that demonstrate the role of media and press in disseminating information, including Bushee et al. (2010) and Bushee and Miller (2012).

The rest of the paper is as follows. Section 2 introduces the institutional background of pension accounting; Section 3 presents hypothesis development; Section 4 introduces the identification strategy; Section 5 introduces the data and sample used in this study; Section 6 presents results of the main analyses; Section 7 discusses results of additional tests; Section 8 presents robustness tests results; Section 9 concludes.

2. Institutional Background

2.1 Public Pension Plans in the United States

There are more than 5,500 state and local level pension plans in the United States. These pension plans are mostly defined benefit plans (DB), meaning that the benefits to be paid to

employees are decided ex-ante based on years of service and average salary over a specified period. Table 1 presents the distribution of local plans in different states in the US. Although there are variations in the numbers of local plans, most local plans are very small and only cover a limited number of employees. Most plan members (88%) and assets (83%) are in state systems because many local public employees are covered by state plans (Urban Institute, 2019).

The pension plans are managed and governed by a pension fund board, whose responsibilities include making investment decisions, setting employer contribution rates and providing actuarial valuations of the plan assets and liabilities (Andonov et al., 2018). Public pension plans invest in diversified portfolios, but the most popular asset category is equity. In 2017, state and local pension plans invested 49.9% assets in equities and 21.5% in fixed income assets. Private equity and real estate are also popular investments for the plans. During the financial crisis, global markets of various asset categories (equity, debt, derivatives, etc.) experienced a severe downturn, which directly affected plan returns. A year before the financial crisis (2007), the reported median funding level for state retirement plans was 92%. The reported figure dropped sharply to 68% by 2016 (Reuters, 2018). Depending on different assumptions, the pension funding gap is at least $800 billion and could go up to $4-6 trillion, which is equivalent to more than 20%-30% of the US GDP (Novy-Marx and Rauh, 2009; American Legislative Exchange Council, 2017). The widening funding gap is also due to insufficient contributions from the governments and increasing promised benefits to the employees (Anantharaman and Chuk, 2018). There are concerns that if the investment returns do not catch up, many state and local plans will face severe problems meeting retiree payments.

2.2 Public Pension Accounting Rules Changes

The prior rules governing public pension accounting were GASB 25 and GASB 27, effective since 1994. GASB 25 governed the reporting of pension plans (such as the CalPERS and CalSTRS), and GASB 27 governed the reporting of the employers (state and local governments). Unlike the pension accounting rules equivalent in the corporate setting, SFAS 183, the GASB rules had several distinct features. Under the old rule GASB 25, the government could determine an estimated rate of investment return (ERR) to discount the future pension obligations to present values. The estimations were based on the investment portfolios of the pension funds, the estimated economic conditions and expected rates of return from different asset classes. The choice of using the estimated return from assets to discount future liabilities is due to the GASB's view that governments had taxing power and the ability to operate in perpetuity, thus a long-term view was appropriate when discounting future pension benefits (Brown and Wilcox, 2009). However, in reality, it allowed governments to make unrealistic investment return assumptions and overstated the rates. These accounting rules also encouraged governments to invest in risky assets because a higher expected investment return led to a lower present value of future pension liability (Naughton et al, 2015). Further, the governments were allowed to use one of the six different actuarial cost allocation methods, each of which could be applied in two ways (either as a level dollar amount each year or as a level percentage of payroll in each year). Thus, it was very difficult to compare the pension-funding situation across different governments (Anantharaman and Chuk, 2018).[3]

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[3] Source: GASB's New Pension Standards: Setting the Record Straight.
https://www.gasb.org/cs/ContentServer?c=Page&cid=1176160432178&d=&pagename=GASB%2FPage%2FGASB SectionPage

In 2012, GASB released two new rules, GASB 67 and GASB 68. GASB 67 (*Financial Reporting for Pension Plans*, effective for plan years starting after June 15, 2013) and 68 (*Accounting and Financial Reporting for Pensions*, effective since fiscal year starting after June 15, 2014), completely supersede the previous rules GASB 25 and 27. GASB 67 changes the *measurement* of the pension obligation. Instead of using a single, estimated investment return to discount future pension obligations, GASB 67 requires that a new "blended discount rate" approach be used. For the years in which the projected fiduciary net position (the market value of current assets) and future contributions are anticipated to be sufficient to cover projected benefit payments, the benefit payments should be discounted at the long term assumed rate of return. For the estimated unfunded benefit payments, a 20-year, high quality (AA/Aa or higher) tax-exempt municipal bond yield should be used. The resulting present value of benefits calculated using the two different discount rates is then used to calculate one single discount rate (blended discount rate) as the plan discount rate. I illustrate in Appendix II how the blended interest rate is determined, and provide a numerical example of how pension liabilities are calculated. This blended discount rate approach has typically reduced the discount rate used to calculate the present value of pension liabilities for poorly funded pension plans.

In addition, GASB 67 standardizes the actuarial cost allocation method the governments use to calculate pension obligations. Instead of the 12 methods previously available, now only one type of actuarial cost method, the entry age method, is allowed.[4] The elimination of the many different cost allocation methods improves the comparability of the pension obligations across

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[4] The entry age method is used for calculating the present value of employee benefits (PVB). The entry age method allocates the PVB of a plan member equally over the working lifetime of the member, from his or her entry age, or date of membership, through his or her assumed exit age(s). For more details about the entry age method and other actuarial cost methods, see "GASB 67/68: Calculation specifics on individual entry age normal and recognition of deferred inflows/outflows, PERiScope, 2014".

different pension plans. GASB 67 further eliminates the use of asset smoothing (deferring recognition of asset returns to future years, which can go up to 30 years), so that the reported pension liabilities will be more accurate and relevant.

GASB 68 changes the *reporting* of pension liabilities. Now the pension obligations must be recognized and disclosed for the first time ever on the balance sheet of the participating employers (governments) as a net pension liability (NPL). In addition, pension expenses (PE) must be recognized on the income statement. Also, additional disclosures about details of pension interest rate assumptions and relevant information are required in the footnotes. The measurement and disclosure requirements caused significant changes in the balance sheets of the sponsoring governments. In fiscal year 2015, aggregate state governments' reported pension debt increased by 570% compared to 2014, from $80 billion to $537 billion (Mercatus Center, 2017).

Together, the GASB 67 and 68 rules change the way pension liabilities are measured and reported. They significantly improve the accuracy, comparability, and salience of the pension funding situation in the United States. At the same time, they limit governments' discretion in manipulating the reported size of their pension liabilities. Thus, governments will have more pressure to reduce pension funding gaps.

2.3 Related Research on Public Pension, Housing Market and Accounting Rules
2.3.1 Research on Pension underfunding and Housing Market

This paper is not the first to propose that pension underfunding can be capitalized into housing prices. There are both theoretical and empirical works on this topic, mostly in the economic area. However, most of the prior studies only use limited data and provide mixed results. For example, Epple and Schipper (1981) propose a negative relationship between pension underfunding and

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housing prices in a theoretical setting, but Leeds (1985) does not find the result with a simple OLS regression of 67 cities in Chicago. MacKay (2014) studies the housing market's reaction to negative pension funding news about the city of San Diego in 2006 and finds that housing prices drop following the news. Bagchi (2017) studies the state of Pennsylvania during the year 1990 to 2011 and finds no relation between housing prices and pension underfunding. The mixed results are partially due to limitations in data and econometric methods. However, it is also possible that before the GASB rule changes, important stakeholders only had access to limited and potentially biased information to fully understand the true pension problems of their states, and thus were not able to react properly. This highlights the importance of having updated research on the impact of the enhanced transparency and measurement of pension liabilities following the rule changes.

2.3.2 Research on Public Pension Accounting Rules

There is already a large stream of literature on public pension accounting in the US. Earlier studies examine the drawbacks of the previous pension accounting rules. Novy-Marx and Rauh (2009) point out that under GASB 25, states significantly underestimated their pension underfunding situation. Kido et al. (2012) find that governments underreported unfunded pension liability more during gubernatorial elections periods, identifying pension liabilities as the account that provides flexibility for manipulation. Naughton et al. (2015) find that states use the discretion provided by GASB 25 to underestimate pension liabilities and avoid mid-year tax increases or spending cuts. To conclude, it is well established in the prior literature that the previous pension accounting rules can be subject to opportunistic government manipulation.

Recently, there are a few studies that examine the consequences of the new GASB rules. Allen and Petacchi (2018) find that state governments lobby against adopting the new GASB pension

rules, and there are conflicting incentives between the users and preparers of pension reports. Anantharaman and Chuk (2018) find that after the rule changes, governments divert more money into the state pension plans. However, the paper does not analyze the other consequences of this action, and I try to fill this gap by examining the response of the housing markets and local economies.

3. Hypotheses Development

3.1 GASB Rule Changes and Housing Price Growth

There are several reasons why taxpayers and citizens care and react to the pension obligations of their governments. First, state and local governments contribute to public pension plans using their revenues. Due to the balanced budget requirement in most states, governments have constraints on how much they can spend based on how much they earn. Thus, if the governments need to increase their contributions to the pension plan, one option would be collecting more tax revenues by either expanding taxable bases or increasing existing tax rates, which will reduce taxpayers' incomes (Naughton et al., 2015).[5] If the tax increase is in the form of property tax, it can directly reduce the values of the houses (Bai et al., 2014). Some states have already planned to implement these approaches.[6] Citizens will also be affected if the governments cut spending on

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[5] For example, since 1996, total property tax extensions (total taxes billed) in Illinois have increased by 52 percent after adjusting for inflation. A recent report reveals that the increase is due to the diversion of the state education fund to teacher's pensions, as well as the growth in local government employee pensions and benefits. About 31% of the property taxes go to teacher pension funds, and 14% of those go to employee benefits (Divounguy, Hill and Tabor, 2018)

[6] In a five-year plan released by the Civil Federation in Illinois to stabilize the state's financial condition in 2018, the state proposes an expansion of taxable basis in sales taxes by 14 additional categories, cutting spending growth to 2.1%, and removing all state exclusion on all federal taxable retirement income. See "State of Illinois FY2019 Recommended Operating and Capital Budgets: Analysis and Recommendations, The Institute of Illinois' Fiscal Sustainability, 2018"
https://www.civicfed.org/sites/default/files/state_of_illinois_fy2019_recommended_operating_budget_analysis.pdf

infrastructure and public services to fill the pension gap.[7] The cutback of public services will make the city less attractive to live in and reduce citizens' willingness to invest in properties, which in turn will lower property values.

To conclude, governments' decisions to fill pension gaps can potentially reduce property prices both directly (through increasing property taxes) and indirectly (through introducing higher sales taxes and spending cuts). The pension situation of the state governments becomes more accurate, transparent and comparable after the GASB rule changes. Thus, I expect that there will be increased attention on pension matters from different stakeholders, and taxpayers and citizens will form expectations about governments' future actions and change the preferences of where they want to live and invest, causing housing price growths to decline in regions with worse pension underfunding.

However, it is not clear ex-ante whether the GASB rule changes can lead to the hypothesized effects. First, pension-related information might have already been fully capitalized into property values. For example, some sophisticated investors might be able to unravel the true value of state pension liabilities by adjusting the discount rates themselves before the rule changes, and implement arbitrage strategies that will adjust housing prices to the right level. However, it is unlikely that these arbitrageurs can have sufficient capital to do so.

Second, although GASB 68 requires significant improvement in the disclosure of pension-related information, the taxpayers and citizens might not actually read the governments' financial

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[7] For example, in a budgeting meeting of the City of South Pasadena in California in March 2019, the City Council expected that due to pension underfunding pressure from the CalPERS plan, there will be potential cuts to employees and services in the city. This includes eliminating crime prevention programs, the police cadet program, and certain special events such as Concerts in the Park and junior/senior programs. See "City Budget Facing $1million Deficit, Cuts, Taxes on Horizon", March 15, 2019. https://southpasadenareview.com/city-budget-facing-1-million-deficit/

statements, and might not be sophisticated enough to process the more granular information about pension funding.

Third, taxpayers might not expect the governments to take actions to reduce the funding gap. The GASB explicitly states that its goal was to separate pension accounting from pension funding, and it does not intend to change the funding decision of the government (GASB, 2012). Thus, it is unclear if governments feel the need to react to the rule changes. Also, unlike in the corporate setting where the manager faces direct scrutiny from the board and shareholders, it is not clear whether the government officials who make pension-related decisions face similar negative consequences. Still, prior literature has shown that government officials care about election outcomes and bad performances increase the turnover rate of these officials (Feiock et al, 2001; Rich and Zhang, 2015).

Finally, the government might not have enough discretion to take actions to counter the negative consequences of the GASB rule changes immediately. For example, it might take a considerable length of time for governments to reset budgets and pass new legislation regarding tax increases. However, if the taxpayers form rational expectations about future government actions, I expect that the housing market will be sensitive enough to pick up the effect. This is in line with the macro literature on taxpayers' response to tax policies (Hall and Jorgenson, 1967) and rational economic agents (i.e., Lucas, 1976 and 1988).

To conclude, whether the GASB changes have an effect relies crucially on whether there is a significant change in the attention to pension-related matters from the taxpayers, and whether they have formed expectations of governments' future actions. To give some insight into the issue, I provide evidence on the change of general attention and media coverage of pension issues pre and post the GASB rule changes. Figure 1 presents the Google search trend for the term "*pension crisis*"

and "*government pension*" from 2010 to 2019. From the graphs, we see that there is increased attention about pension crisis/government pension after the year 2013, and the attention grows further after the year 2015, which corresponds to the period after the adoption of GASB 67/68.

Figure 2 shows the numbers of news articles that mentioned "*pension crisis*" in the US from the year 2010 to 2019 from Factiva. As shown in the graphs, the media coverage of the pension crisis spiked around the year 2013-2015, corresponding to the period of GASB pension rule changes. Further, the news articles that have mentioned both "*pension crisis*" and "*cuts (spending cuts or service cuts)*", or "*pension crisis*" and "*tax*", also spiked around the GASB rule changes (which is before the Tax Cuts and Jobs Act in 2017). The mentions are manually checked to make sure that the keywords correspond to the intended meanings. This provides evidence that the media has formed expectations about the potential tax increases and services cuts following the pension underfunding. Figure 3 shows the average sentiment of news articles (measured using the Python NLTK package) from the year of 2010 to 2019. A negative sentiment score indicates a negative tone, and a score lower than -0.5 means the article is very negative. From the graph, we observe that the news articles with the keywords "pension crisis" become more negative around the GASB rule changes, and they become very negative in the current year 2019, reflecting the media's overall pessimistic outlook about the pension problem.

There is also survey evidence supporting the argument that citizens care about tax uncertainties. According to a survey by Gallup in 2013, more than 50% of the residents in Illinois and Connecticut said that they would move to another state if possible, quoting tax concerns as a key driver.[8] Figure 4 shows that since the year 2012, the housing price growth in Illinois has grown

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[8] See https://news.gallup.com/poll/168770/half-illinois-connecticut-move-elsewhere.aspx

49% more slowly than the US housing price growth, reflecting people's relative unwillingness to live and invest in Illinois.

In conclusion, my first hypothesis is:

H1: The negative relation between housing price growth (or the number of new housing permits) and the pension underfunding gap is stronger in periods after the GASB pension rule changes.

3.2 Cross-sectional Differences in the Responses to the GASB Rule Changes

3.2.1 Reliance on Debt Financing

Although the GASB 67 and 68 rules are effective for all state plans/state governments at the same time, there are cross-sectional differences in the level of impact on the state governments. First, Anantharaman and Chuk (2018) find that states with higher debt reliance have greater incentives to contribute more funds into the pension plans. The reason is that GASB 68 required recognition of pension liabilities on the balance sheet, and states that have higher debt will be more concerned about the substantial increase in the liabilities as this might translate into higher costs of borrowing. Consequently, I hypothesize that citizens will react more strongly to pension underfunding in states that rely more on debt financing (having a higher debt-to-revenue ratio), because they will expect governments to take more actions to fill the pension funding gap:

H2a: The negative relation between housing price growth and pension underfunding will be stronger in states that rely more on debt financing in periods after the GASB rule changes.

3.2.2 Union Power

Union power is an important factor in the pension negotiation process. More powerful unions can exert pressure on the governments and argue for increased benefits, and it will be much more

difficult to negotiate down benefits with employees with higher bargaining power (Naughton et al, 2015; Boyer, 2018). Bonsall et al. (2018) show that strong public unions extract generous pension benefits from state governments, and the governments react by selecting a higher discount rate and longer amortization periods to improve the reported funding level. Thus, the GASB rule changes that eliminate the discretion in manipulating reported pension liabilities will affect states with a stronger union presence more, and the taxpayers and citizens will view a large pension-funding gap as more negative. My hypothesis is as follows:

H2b: The negative relation between housing price growth and pension underfunding will be stronger in states with higher union power in periods after the GASB rule changes.

3.2.3 Political Constraints

Some states provide explicit protection of pension liabilities in state constitutional provisions. The list of states includes Illinois, Alaska, Arizona, Hawaii, Louisiana, Michigan, and New York. For example, the constitution of Illinois, Article XIII, Section 5, states that "membership in any pension or retirement system of the State, any unit of local government or school district, or any agency or instrumentality thereof, shall be an enforceable contractual relationship, the benefits of which shall not be diminished or impaired." Some states that do not explicitly guarantee the protection of pension have clauses that are related to contract protections for public employees, such as Alabama. In the Alabama state constitution, there is a statement such as "no ex post facto law, nor any law, impairing the obligations of contracts… shall be passed by the legislature." Historically, as discussed in Brown and Wilcox (2009), there were cases where pension obligations were protected despite the negative fiscal situation of the governments. For example, Orange County in California filed bankruptcy following significant investment losses from its pension

plans during the 1990s, but all defined-benefit obligations were met in full. In essence, the pension obligations had priority over municipal bond investors under this situation.

In conclusion, constitutional protection of pension benefits poses extra risks to the fiscal condition of governments, and the negative influence of pension problems will be even larger for states with strict protection. Following Munnell and Quinby (2012) and Boyer (2018), I identify states with explicit protection and implicit protection of public pension obligations in their constitution for both current and future employees, and I expect that the effect of the rule changes will be larger in these states. My hypothesis is as follows:

H2c: The negative relation between housing price growth and pension underfunding will be stronger in states with a higher level of political constraints to renegotiate pension benefits in periods after the GASB rule changes.

3.3 Pension Underfunding and Public Employment

Although housing price is the most timely and sensitive among the possible outcome variables of the pension accounting change, I expect that public payrolls and the total number of public employees will also be affected by the enhanced transparency of pension liabilities. If governments are concerned about pension underfunding due to pressure from the citizens and media, they will also try to take actions to reduce growth in employee benefits, such as cutting the number of new recruitments and promising fewer benefits. For example, the city of Harvey in Illinois laid off 18 firefighters and 13 police officers in 2018 in order to fulfill a court order to pay back pension benefits. [9] Another possible mechanism is that the new pension rules also provide better information for the governments. The governments become more aware of the actual consequences

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[9] See "Police, firemen and other government workers will be laid off to cover pension costs".
https://www.illinoispolicy.org/harvey-pension-crisis-leads-to-mass-layoffs/

of the pension obligations they promise to the employees, and they are more cautious when making future employment decisions.[10] Although I cannot distinguish between these two mechanisms, I expect that the total public payrolls and the number of total full-time equivalent public employees will decline more in states with more severe pension problems after the GASB rule changes. My hypothesis is as follows:

H3: Total public payrolls and the number of total full-time equivalent public employees will decline more in states with worse funding situation after the GASB rule changes.

4. Identification Strategy

To test my hypotheses, I adopt the contiguous border-county approach, and I examine the relation between county-level housing price growth and state-level pension underfunding within pairs of two adjacent counties on opposite sides of the state borders around the GASB rule changes. The contiguous border-county approach is widely used in the economic and finance literature to study the influence of state-level regulations, such as US bank branching deregulation (Huang, 2008), minimum wage regulations (Dube et al., 2010; Rohlin, 2011) and foreclosure regulations (Mian et al., 2015). Counties are commonly used as the unit of analysis in the literature, because it can minimize the endogeneity problem that the economic performances of a single county (or the counties on the state borders) can lead to state-level policy changes (Huang, 2008). This approach compares the economic performance of adjacent counties separated by state borders, where the two states are differently impacted by the regulation change/policies of interest. Since the counties are immediately adjacent to each other, they are very similar in observable aspects

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[10] Similar effects have been documented in the private sector employee benefits accounting rule changes, SFAS 106. See Mittelstaedt et al,(1995) for more information.

such as geographical locations and climates. What's more, they are very similar in *unobservable* aspects that researchers cannot, or very difficult to control for. Thus, they should share very similar economic growth absent any state-level regulation change or influence. Prior research shows that contiguous border counties provide significantly better control groups than randomly selected counties or counties chosen using a propensity score matching approach (Huang, 2008; Dube et al 2010).

To the extent that the economic activities in the border counties are impacted by state-level pension health, and there is sufficient heterogeneity in the state-level pension underfunding within cross-state county-pairs, I can adopt the contiguous border-county approach to identify the effect of state-level pension underfunding on county-level housing market and economic activities. Taxpayers and citizens living in a county from a state are directly impacted by state taxes and public welfare spending. County governments are also heavily impacted by state-level pension health, because a large number of local government employees participate in the state pension plans, and more than 88% members and 83% assets are in the state plans. Almost 60 percent of local government pension contributions went to state-administered rather than local-administered plans in 2017 (Urban Institute, 2019). In addition, state governments have significant influences on the taxing policies and budget allocations of county-level governments. [11] Hence, it is reasonable to assume that the state-underfunding situation will affect county-level governments' decisions and economic activities. In addition, there are sufficient border county-pairs that exhibit differences in state-level pension underfunding (net pension liabilities as a percentage of the state GDP), and the mean (median) of the absolute differences in pension underfunding within each

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[11] The US constitution does not mention local governments. The Tenth Amendment reserves authority-giving power to the states and states can choose how much authority they want to grant to their local governments. 39 states employ Dillon's Rule, which states that a local government can only engage in an activity only if it is specifically sanctioned by the state governments. (National League of Cities, 2016; Richardson et al,2003)

county-pair is 9.85% (7.37%). Therefore, it is appropriate to adopt the contiguous county approach

for my study. There could be spillover effects between the neighboring counties caused by pension

underfunding. However, such spillover effects will suppress the estimated effect and bias against

finding a significant relationship between pension underfunding differences and housing price

growth discrepancies.

5. Data and Sample

I collect data from a wide range of sources for my study. Appendix I presents the definitions

as well as the sources of all variables. For the main test, I identify adjacent county-pairs along the

state borders using the US Census Bureau County Adjacent file. This generates a total of 1,308

unique county-pairs.[12] Following Dube et al. (2010), I structure the dataset in a way that each

county-year is an observation, and two counties from a same county-pair are identified by a unique

county-pair indicator.[13] Figure 5 presents a map of the US with highlighted adjacent counties along

the state borders. The state of Alaska and Hawaii are excluded from my sample because they do

not share a border with any state.

I obtain the *adjusted* state level pension underfunding status from the Federal Reserve. This

measure is equal to state net pension liabilities divided by state GDP. Net pension liabilities are

the difference between total plan liabilities and total plan assets. The plan liabilities are collected

from the Table L.120.b of *the Financial Accounts of the United States*, and are *adjusted* using the

discount rate equal to AAA-rated corporate bond interest rates. Thus, it is free from the state

governments' manipulation on the discount rates. Total plan assets are collected by the Census

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[12] As of 2016, there are 3,007 counties in the US.

[13] Thus, a county can appear in the datasets as many times as it can be paired with a cross-border county. The standard errors of the regressions are adjusted to handle the multi-paring issue following Dube et al.(2010).

Bureau in the annual survey of state-level defined benefits plans and are marked to market values.[14] The adjustments are also very close to the calculation approach adopted by credit rating agencies such as Moody's when evaluating state governments' financial conditions.[15] As a result, the Federal Reserve state pension underfunding status is a proxy of the *true* pension underfunding status of the state governments. What's more, it has available data for the entire sample period (2012 to 2017). By using this measure, I can test whether the GASB rule changes improve the transparency and revel state governments' true pension underfunding level to the public.

In additional tests, I use the actual *disclosed* pension underfunding status by the state pension plans from the Public Pension Database (PPD) to measure the perceived health of state pension plans. Since the numbers are reported directly by the public pension plans, they were subject to possible manipulation by the state governments, especially before the GASB rule changes in 2014.[16] I use both the level and the changes in the disclosed numbers as information shocks about state governments' pension.

I obtain the annual residential home prices from the Federal Housing Finance Agency (FHFA). The FHFA Housing Price Index (HPI) is a broad measure of the movement of single-family house prices, which measures average price changes in repeat sales or refinancing on the same properties (See footnote 3 for a more detailed explanation). The index is constructed in a way that it controls for the types and locations of houses on sales, making it an effective measure of housing price

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14 For more information about the measurement of pension plan assets, please refer to footnote 7 of the FEDS Notes: State and Local Pension Funding in the Enhanced Financial Accounts, https://www.federalreserve.gov/econresdata/notes/feds-notes/2016/state-and-local-pension-funding-in-the-enhanced-financial-accounts-20160205.html#fn1

15 See "Moody's proposes adjustments to US public sector pension data, 2012,https://www.moodys.com/research/Moodys-proposes-adjustments-to-US-public-sector-pension-data--PR_249988".

16 The correlations between the two different pension underfunding measures were 0.76 before the GASB rule changes and are 0.82 afterwards. This provides some evidence that GASB 67/68 improves the quality of the pension health information.

appreciation. A higher HPI indicates a higher level of housing price in the region. The FHFA HPI is used in many studies about US housing prices, including Kerr et al. (2015) and Main et al. (2015). The drawback of this measure is that it only covers properties under a certain value because Fannie Mae and Freddie Mac mortgages are only available for properties not exceeding the conforming loan limit (ranging roughly from $417,000 to $625,000 for one-unit properties in different counties). Thus, I control for the conforming loan limits in my analysis, and in a robustness test, I use an alternative measure of housing prices, the Zillow Home Prices. I obtain data about building permits and new construction from the US Census Bureau website.

For the control variables, I obtain government financials from the Government Finance Database constructed by Pierson et al. (2015). The database is an organized dataset that contains all the US Census Bureau data about government financials. Please refer to Appendix I for the sources of all the other control variables.

My final sample of contiguous border counties consists of 12,930 county-year observations from 1,308 unique county-pairs, covering the years 2012 to 2017.[17] The observations in each regression may vary according to the data availability of the variables. Table 2 Panel A provides the descriptive statistics of the variables, and Panel B provides the correlations between the variables. I create a variable, *HPGdiff*, which equals the difference of the annual housing price growths between two adjacent counties. From the descriptive statistics, we can see that the absolute value of the mean (median) is only 0.02 (0.02) before the GASB rule changes, but the number becomes 0.06 (0.12) after the rule changes. This suggests that there are significant changes around this period driving the housing price growth discrepancies along the state borders

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[17] Following Dube et al. (2010), I keep unpaired counties that have full information for the regression analysis in the sample as well.

6. Research Design and Results

6.1 Main Test

For the test of H1, I use the contiguous border-county sample for my analysis. I estimate different versions of equation (1) for the three-year period before and after the GASB rule changes, and I estimate different versions of equation (2) for the entire sample period:

$$HPG_{ip,t} = \alpha_1 Underfunding_{ip,t-1} + Controls + Fixed\ Effects + \varepsilon_i \quad (1)$$

$$HPG_{ip,t} = \alpha_1 Underfunding_{ip,t-1} + \beta_1 Underfunding_{ip,t} * POST + \beta_2 POST + Controls + Fixed\ Effects + \varepsilon_i \quad (2)$$

The dependent variable, $HPG_{ip,t}$, is the annual change in the FHFA housing price index (HPI) for county i in county-pair p, denoted in percentage. The key independent variable in equation (1) and (2), $Underfunding_{ip,t-1}$, is the *adjusted* pension underfunding status of state i from Federal Reserve, which equals the ratios of net pension liabilities to state GDP, at year. I choose to use the lagged underfunding because the governments usually release their financial statements with a time lag of six months to one year. Also, it partially alleviates the concern that a bad economy leads to both pension underfunding and a slower housing price growth.

$POST$ is an indicator that equals 1 if the time period is after the year 2014 (2015 to 2017), and 0 for the period between 2012 to 2014.[18] I set the treatment period to start from 2015, because the effective date of GASB 68 is for the reporting period ended June 2014 or later, which is later than the effective date of GASB 67. $Controls$ is a vector of twelve control variables including $lnLoanLimite_{ip,t}$, $PropTaxRate_{ip,t}$, $lnPercapInc_{ip,t}$, $lnRevenue_{ip,t}$, $EduQuality_{ip,t}$, $IncTaxRate_{ip,t}$, $Coindex_{ip,t}$, $Foreclosure_{ip,t}$, $Constraint_{ip,t}$, $Debtratio_{ip,t}$,

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[18] Another reason to limit the sample to the year 2017 is due to the federal tax changes in 2018 that reduce taxpayers' ability to deduct state and local tax from their federal returns.

$pctUnion_{ip,t}$, and $lnMedianPrice_{ip,t}$. These are a set of county and state level variables that are likely to have an influence on housing price growth. County level variables include the conforming mortgage loan limits, property tax rate, per capita income, total revenues, and education quality (proxied by student-to-teacher ratio). State-level variables include the marginal income tax rates, debt-to-revenue ratio, political constraint to negotiate pension benefits, as well as the coincident economic activity index.[19] I also control for the probability of foreclosures in each state, because prior literature shows that having more foreclosures will also depress the growth in housing prices (Main et al., 2015). I create an indicator variable *Foreclosure* which equals 1 if the state in which the county is in requires juridical procedures for foreclosures, and 0 otherwise.[20] Foreclosure is more likely in a state that does not require juridical procedures. I control for the natural log of the median home price in the county-level, since the growth rate of housing price might be affected the level of housing price.

I estimate three different versions of equation (1) and (2) depending on the fixed effects included. In the first specification, I control for the county-pair fixed effect τ_p following the identification strategy described in Mian et al. (2015) and Dube et al. (2010), which is crucial to the research design. The county-pair fixed effects control for time-invariant differences across the border county-pairs. Thus, the model only captures the variance within each county-pair. This is important because some states border one another in very different geographical areas (Mian et al, 2015). In the second specification, I include year fixed effects θ_t in the model together with the

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[19] The Coincident Economic Activity Index includes four indicators: nonfarm payroll employment, the unemployment rate, average hours worked in manufacturing and wages and salaries. The trend for each state's index is set to match the trend for gross state product.

[20] Some states require that a foreclosure sale take place through the courts, and a lender must sue a borrower in court before conducting an auction to sell the property. Other states do not have such a requirement and give lenders the automatic right to sell the delinquent property after providing only a notice of sale to the borrower. For more information, please refer to Mian, Sufi and Trebbi (2015).

county-pair fixed effects τ_p, which control for common time trend that can affect all the county-pairs. The $POST$ indicator thus dropped out due to collinearity. In the third specification, I include county-pair-year fixed effects θ_{pt} only and without the $POST$ indicator. County-pair-year fixed effects θ_{pt} captures the unobserved, time-varying heterogeneity across different county-pairs, so that I could control for pair-specific shocks in a given year. The inclusion of county-pair-year fixed effects ensures that the estimates are robust to a wide range of unobservable omitted variables that could otherwise confound the analysis.

Since one single county can be paired with multiple cross-state counties, it can potentially induce mechanical correlations across county-pairs, and might have an influence on the inferences along the entire state border. Thus, I cluster the standard errors by state-border level and the individual state level separately following Dube et al. (2010) to address the concern.

Table 3 presents the regression results of equation (1) for hypothesis H1. In the first six columns, I present the results of estimating equation (1) and different fixed effects, for the period before and after GASB rule changes (2012-2014 and 2015-2017). In the last three columns, I present the results of estimating different versions of equation (2) for the full period. The results indicate that the relation between the pension underfunding and housing price growth is not significant in the period before the GASB rule changes but becomes significant in the post period. The effect is economically significant, where every 10% higher underfunding status leads to a decline in housing price growth of 0.2-0.3% in absolute terms (which translates to a 10-15% relative decline compared to an average annual growth rate of 2%). In column 6 to 9, where I examine the full period and include the interaction term $Underfunding_{i,t} * POST$, it is negative and significant across different specifications. This supports hypothesis H1 that the negative relation of pension underfunding and housing price growth is stronger after the GASB rule changes.

The above results are robust to alternative measures of pension underfunding information and different model specifications. In Internet Appendix Table A1, I show that the results are consistent when I replace the pension underfunding status from the Federal Reserve to the actual *disclosed* numbers from the Public Plan Database. In Internet Appendix Table A2, I study how the real estate market reacts to the lagged change in the disclosed pension underfunding status, which captures the shock, or news, about state governments' pension health. I find consistent results that in the period before the GASB rule changes, there were no significant relation between housing growth rate to the change of pension underfunding status. However, in period after the GASB rule changes, there are negative and significant relations between the change in disclosed pension underfunding and housing price growth. The above suggest that the public react to the pension information only after the GASB rule changes. In the Internet Appendix Table A3, I use the three-year compounded housing price growth rates from years 2012-2014 and 2015-2017 as the dependent variables, and I find similar results that the negative relation between housing growth rate and pension underfunding only shows up in the years 2015-2017 (Post period). In the Internet Appendix Table A4 and A5, I show that the results are also robust after controlling for one-year lagged housing price growth and county fixed effects.

Table 4 presents the results of estimating different versions of equation (1) and (2) by replacing the dependent variable to $lnNHP_{ip,t}$, which is the natural log of per capita new housing permits. Housing permits refer to the approvals given by a local government before the construction of a new building can legally occur (Census Bureau, 2019). It is another important indicator of the health of the housing market. The results indicate that counties from states with worse funding status in the previous year have fewer new housing permits granted both before and after the GASB rule changes, but the effect is stronger after the GASB rule changes. Taken together, I provide

evidence that pension underfunding suppresses the growth in the local housing market, and the GASB rule changes manifest the effect.

6.2 Cross-sectional tests

In the cross-sectional tests, I exploit the variation in the level of impacts by the GASB rule changes across different states, and I examine the factors that can cause the housing markets to react stronger to states' pension underfunding situation after the rule changes. I estimate different versions of equation (3) for the entire sample period (2012-2017):

$$HPG_{ip,t} = \alpha_1 Underfunding_{ip,t-1} + \beta_1 FACTOR_{ip,t} * Underfunding_{ip,t-1} * POST$$

$$+ \beta_2 FACTOR_{ip,t} * Underfunding_{ip,t-1} + \beta_3 FACTOR_{ip,t} * POST$$

$$+ \beta_4 Underfunding_{ip,t-1} * POST + \beta_5 FACTOR_{ip,t} + \beta_6 POST + Controls$$

$$+ Fixed\ Effects + \varepsilon_i \quad (3)$$

$FACTOR_{ip,t}$ is one of the three factors that are described in section 3.2:

(1) $HighDebt_{ip,t}$, an indicator variable that equals 1 if the debt-to-revenue ratio ($Debtratio_{ip,t}$) of a state is above the sample median in a given year, and 0 otherwise;

(2) $HighUnion_{ip,t}$, an indicator variable that equals 1 if the percentage of public employees that is part of a union ($pctUnion_{ip,t}$) in a state is above the sample median in a given year, and 0 otherwise; and

(3) $HighConstraint_{ip,t}$, an indicator variable that equals 1 if the level of a state's political constraint ($Constraint_{ip,t}$) is above the sample median in a given year, and 0 otherwise.

β_1 is the coefficient of interest, which represents the effect of different factors in affecting the strength of the relationship between pension underfunding and housing price growth. I expect β_1 to be negative. Similar to the main test described in Section 6.1, I estimate three different versions

of equation (3) by including different fixed effects. All the control variables are the same as the ones included in equation (1) and (2).

Table 5 presents the OLS regression results of H2a. The coefficients of the three-way interaction term, *HighDebt*Underfunding*POST* are negative and significant in two of the specifications. The coefficients of the two-way interaction term, *HighDebt*Underfunding*, are consistently negative and is significant in the third specification. This indicates that the level of debt reliance of a state strengthens the negative relation between pension underfunding and housing price growth, and there is some evidence that the GASB rule changes manifest this negative relation.

Table 6 presents the results of the effect of union power (H2b). The coefficients of the three-way interaction term, *HighUnion*Underfunding*POST* are consistently negative and significant. This provides evidence that the GASB rule changes manifest the negative relation between pension underfunding and housing price growth for states that have stronger public-sector union presence. In untabulated results, I use the percentage of employees that are represented by a union as an alternative measure of union power, and obtain very similar results.

Next, I report the results of the tests of hypothesis H2c on the effect of political constraints on the relation between pension funding status and housing price growth. Table 7 Panel A presents the differential constituency protection for public workers' pension benefits that each state has in different horizons. Following Munnel and Quinn (2012) and Boyer (2018), I assign a value from 0 to 3 to different levels of constraints, where 3 represents the highest constraint level. Table 7 Panel B presents the results of the regressions. The coefficients of the interaction term *HighConstraint*Underfunding*POST* are negative and significant across the specifications. The results show that constituency protection of pension strengthens the negative relation between

pension underfunding and housing price growth, especially in the period after the GASB rule changes.

6.3 Public Employment Tests

Table 8 presents the results for the tests of H3 on the impact of pension funding status and GASB rule changes on total public payrolls and full-time equivalent public employees. The results suggest that after the GASB rule changes, the payrolls and the number of public employees in counties with greater pension underfunding decrease relative to their adjacent counties. This suggests that the governments have started to take actions to counter the negative impact by the GASB rule changes by adjusting their employment policy. Specifically, the governments recruit fewer employees, and pay less to the existing employees.

Taken together, the results indicate that the GASB pension accounting rule changes have real economic consequences. Following the rule changes, the pension underfunding at the state level suppresses the growth of local housing markets. The effect is stronger for states that are expected to be more impacted by the rule changes, including states that rely more on debt financing, who have stronger union presence, and for states with more stringent political constraints to renegotiate pension benefits. Also, the results indicate that worse-funded governments start to take actions to cut down employee size and benefits to avoid a larger underfunding problem.

7. Additional Tests on the Impact of GASB Pension Rule Changes
7.1 GASB Accounting Rule Changes and Business Establishments

If taxpayers and citizens are more aware of the pension-funding situation and try to relocate from or invest less in regions with greater pension underfunding, I expect that local economic

activities will be negatively affected consequently. To measure this impact, I study the reaction of county-level business establishments. The number of business establishments is highly related to local economic activities. If more people intend to move out of a county, I expect that the total number of business establishments will decline due to fewer new business starts and more business closures. To obtain the data on business establishments, I use the County Business Patterns (CBP) data from the US Census. The CBP data is an annual series that provides subnational economic data by industry and is available up to the year 2016. This series includes the number of establishments, employment during the week of March 12, first quarter payroll, and annual payroll. According to the US Census, the CBP series is useful for studying the economic activity of small areas and analyzing economic changes over time. Businesses can use the data for analyzing market potential. It is thus a useful measure to evaluate the local economic activities at the county-level.

Table 9 presents the results of the impact of GASB pension rule changes on the number of total business establishments in the county. I control for the variables that are likely to affect county-level business activities from prior literature (Carlino and Mills, 1987). The coefficients on the interaction term of pension underfunding status and the POST indicator are negative, which suggest that the number business establishments is lower in a county from a state with larger pension underfunding in the period after the GASB rule changes. The evidence further supports the argument that pension underfunding situation negatively affects local economies.

7.2 Local Housing Price and Pension Underfunding: California

My previous analyses are conducted at the adjacent county-pair level. Although the adjacent-county approach has many advantages in terms of creating comparable counties, there are still concerns that the adjacent counties are not similar enough. To alleviate this concern, and to provide

more insights to the pension underfunding problem, I supplement my analysis with a test of local housing prices and city pension burdens (total pension liabilities over total city revenues) in the state of California. The cities within the same state are highly similar, but they have different pension burdens because they have different shares in the state's public pension plans. I expect that the housing price in a city with a higher pension burden will grow more slowly compared to another comparable city.

The choice of the state of California is natural, since CalPERS is the biggest public pension plan in the US, with 1.9 million members. In addition, nearly all the cities from California participate in CalPERS, making it possible to conduct the test.[21] California's local governments are also heavily affected by the volatility in pension costs. At least half of the employer contributions to state retirement systems in California come from local governments, which have smaller budgets and fewer ways to generate revenue when faced with higher pension costs. One estimate suggests that city pension costs will nearly double and reach up to 16% of general fund budgets by 2024–25.[22] Thus, it is important to understand the impact of pension underfunding on California cities.

To conduct the tests, I collect information about each California city's pension burden from the Pension Tracker. The Pension Tracker is organized by Joe Nation, a professor of the Practice of Public Policy at Stanford, and it collects information about California cities' funding status from various sources including CalPERS, the State Controller's Office, and the US Census Bureau.[23] I

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[21] Among the 482 cities in California, 427 participated in CalPERS by the end of 2018. Source: California Policy Center, 2018, https://californiapolicycenter.org/much-will-cities-counties-pay-calpers/

[22] Public Pension in California, Public Policy Institute of California, 2019. https://www.ppic.org/publication/public-pensions-in-california/

[23] For more information about Pension Tracker, please visit their website: https://www.pensiontracker.org/about_pension_tracker.php

obtain city-level housing price information from RedFin, a real estate brokerage headquartered in Seattle.[24] The database provides a wide range of housing market related indicators, including the average sales-to-listings ratio, the number of total homes sold, total inventories, median sales prices, and their year-to-year changes.

In order to provide more power to my test, I implement an alternative analysis at the neighboring zip code level. The housing markets in two neighboring zip codes from two different cities should be very similar to each other in terms of both observable and unobservable aspects, but will be exposed to different tax and spending uncertainties due to the differential pension burden of the cities. I obtain zip-code level housing price indexes from the FHFA.[25] Next, I identify neighboring zip codes at the border of two cities. To do this, I first obtain a zip code distance dataset from the National Bureau of Economic Research (NBER).[26] I only keep zip codes from the California cities (where the first two digits of the 5-digit zip codes are from 90 to 96), and I match each zip code to its corresponding cities.[27] I then keep the zip code pairs that are less than 10 miles (or 5 miles) in distance, but are from two different cities. In this way, I can identify zip codes that are close enough but are exposed to different pension risks due to their respective cities' pension burdens.

After applying the criteria and matching with the FHFA housing price dataset, the final sample is highly concentrated around the counties of Los Angeles, Orange, Riverside, San Bernardino and

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[24] For more information about RedFin, please visit their website: http://press.redfin.com/company-timeline

[25] The reason that I do not conduct my main test at the zip code level is that zip code level housing price data are very sparse in most states (especially along the state borders). The availability of the data is better in California and a few other states. Please refer to the FHFA zip code HPI map for a more direct view. https://www.fhfa.gov/DataTools/Tools/Pages/HPI-ZIP5-Map.aspx

[26] See ZIP Code Distance File Database, https://www.nber.org/data/zip-code-distance-database.html

[27] It should be noticed that zip code, which is the coding for the postal delivery area, does not perfectly correspond to the geographical area such as city and county. It is possible that one zip code can be shared by several cities. However, the US States Postal Service assigns a primary city to a certain zip code, which enables a rough matching between zip code and city. Also, biases in matching the cities will only bias against finding a significant result of my test. I refer to the zip code-city link in the zip code database: https://www.zip-codes.com/state/ca.asp.

Ventura. Thus, I further constraint my sample to only zip codes in the county of Los Angeles. This also allows me to avoid some special area such as the Silicon Valley, whose housing market might be very different from other places in California. I expect that the housing prices at the zip code level will grow more slowly if the zip code is situated in a city with a larger pension burden.

Table 10 provides the result of city-level housing price growth and pension burden during the years 2012 to 2017. The coefficients of the variable *lnPensionBurden* (the natural log of the market value or total unfunded pension liabilities per household) are negative and significantly related to average sales-to-listings ratio, total number of homes sold, median sales and their year-to-year changes, and are positively related to the total housing inventories and the growth of total inventories. Taken together, the results show that there are fewer demands and more supplies in the local housing markets of the cities with heavier pension burdens, and the housing price growth dropped as a result. What's more, the effect becomes stronger after the GASB accounting rule changes in 2014.

Table 11 provides the results for the neighboring zip code level test in the county of Los Angeles. I present the results both for zip codes situated within 10 miles and 5 miles from each other, and the results are similar. The housing prices in the zip code situated in a city with larger pension burden grow more slowly than in its neighboring zip code. The effect is stronger in the period after the GASB rule changes. To conclude, California city-level tests offer consistent evidence that pension underfunding suppresses local housing market growth.

8. Additional Robustness Tests

8.1 Alternative Housing Price Measures

In the previous analysis, I use the FHFA Housing Price Index growth to measure housing price growth in different counties. However, the FHFA HPI has the caveat that it does not capture the housing prices for the houses whose values exceed the county-specific conforming loan limits. As a robustness check, I use an alternative housing price measure: the Zillow Home Value. Zillow is an online real estate database company founded in 2003 and is traded on NASDAQ.[28] Zillow provides county-level median home price (single-family, condominium and co-operative homes with a county record) for 1,943 counties from the year 1996 to the year 2019. However, the data include only very limited observations for county pairs on the state borders, so the power of the test is reduced. The correlations between the Zillow Housing Value Index and the FHFA Housing Price Index is 0.85. In Table A6 of the Internet Appendix, I show the results of using Zillow home value as well as Zillow annual housing price growth rate as dependent variables, and in general find consistent results with the tests using FHFA Housing Price Index.

8.2 Excluding County Pairs on the California Border

The state of California is special for several reasons related to my study. In addition to its pension systems, California is the state with the most expensive housing in the United States. Also, it is known to have less new housing than other states due to both political and geographical reasons (Legislative Analyst's Office, 2015). Thus, there is some concern that it will bias the results. I replicate the main tests by excluding counties in California or their neighbors. This

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[28] For more information about Zillow, please visit https://www.zillow.com/

operation excludes 155 observations. In Table B1 of the Internet Appendix, I present the results and all the inferences remain statistically unchanged.

8.3 Excluding County Pairs in the West Region

As noted by previous studies (Dube et al., 2010), the counties situated along the state borders in the west region of the US tend to be bigger and span large geographical areas. Thus, the adjacent counties in a pair are more distant from one another and might be less similar, which can undermine the identification strategy. I replicate the main tests by excluding the county pairs that are situated at the west part of the US, including counties from the state of Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, Wyoming, California, Oregon and Washington from the datasets. This operation reduces the sample size by 1,926 observations, and from Table B2 in the Internet Appendix, all the inferences remain statistically unchanged.

9. Conclusion

In light of the recent dramatic changes in public pension accounting and the heated discussion about the coming pension crisis, I study the economic consequences of pension rules GASB 67 and 68 by examining the reactions of housing markets and local economics to the improved accuracy and transparency of states' pension liabilities. I find that lower pension funding conveys a negative outlook regarding future tax increases and service cuts, leading to lower growth of housing prices in the more affected regions, but only in the period after the GASB rule changes. The negative relation is stronger in states with higher level of debt reliance, stronger union presence, and more stringent political constraints to renegotiate pension benefits. Public employment outcomes (including the number of full-time equivalent public employees and total

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public payroll) and local business activities are also negatively affected by the reporting of pension underfunding.

This paper sheds light on the channel through which accounting rule changes can have real effects on the economy. I provide novel evidence on the impact of GASB 67/68 rule changes on individual welfare and local economic development, and the results should be of interest to policymakers, governments as well as taxpayers and citizens for better decision making. However, the paper does not try to comment on whether the new GASB rules are in general beneficial to society or not. Enhanced transparency on the public pension plan health (or more general, government transparency) could have both positive and negative effects on the governments' budgeting processes and financing abilities (e.g., perhaps encouraging myopia), and I leave the question of the policy implications of the rule changes to future researchers.

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Appendix I Variable Definition

Variable Name	Definition	Source
Underfunding	State-level net pension underfunding position (pension liabilities minus pension assets) as a percentage of total state revenues in year t-1	The Federal Reserve https://www.federalreserve.gov/releases/z1/dataviz/pension/
HPI	FHFA Housing Price Index (available both at the county level and zip code level)	FHFA https://www.fhfa.gov/DataTools/Downloads/Pages/House-Price-Index.aspx
HPG	Annual growth rate of FHFA Housing Price Index (available both at the county level and zip code level)	FHFA https://www.fhfa.gov/DataTools/Downloads/Pages/House-Price-Index.aspx
lnNHP	County-level new housing permits granted per 10,000 population.	US Census Bureau-Building Permits Survey https://www.census.gov/construction/bps/ The Government Finance Database http://willamette.edu/mba/research-impact/public-datasets/index.html
POST	an indicator variable that equals to 1 if the year is after 2014, and 0 for year 2012-2014	
lnLoanLimit	The natural log of county-specific maximum conforming loan limits for mortgages to be acquired by Fannie Mae and Freddie Mac	FHFA https://www.fhfa.gov/DataTools/Downloads/Pages/House-Price-Index.aspx
PropTaxRate	County-level property tax rate	Tax Policy Center, https://money.cnn.com/interactive/real-estate/property-tax/?fbclid=IwAR2zgdKigBMseAz3V6vqhEnaNgH1W9VSlQ0ZfpmX_QcL34UBdFqKdvju0VU
PerCapInc	The natural log of county-level per-capita income	US Census Bureau
lnRevenue	The natural log of total revenues at the county-level	The Government Finance Database http://willamette.edu/mba/research-impact/public-datasets/index.html
EduQuality	County-level pupil/teacher ratios	US Department of Education
Foreclosure	An indicator equals to 1 if the county is in a state which requires a judicial process for foreclosures, and 0 otherwise.	Dagher and Sun(2016)
IncTaxRate	The marginal income tax rates (after mortgage interest deductions) for each state	NBER, Maximum State Income Tax Rates, https://users.nber.org/~taxsim/state-rates/
Coindex	The economic coincident indexes for the two states	US Census Bureau

DebtRatio	The debt-to-total revenue ratio of the state.	The Government Finance Database http://willamette.edu/mba/research-impact/public-datasets/index.html
pctUnion	The percentage of public-sector employees that are part of a union (or represented by a union) in the state.	http://unionstats.gsu.edu/
Constraint	A categorical variable that equals 3 if the state the county resides has explicit constitutional protection for pension benefits for both past and future employees in the form of state constitution, equals 2 if there is protection in the form of contract laws or property laws, equals 1 if there is promissory estoppel protection, and 0 otherwise.	Munnel and Quinn (2012); Boyer(2018)
lnMedianPrice	The natural log of median home value at the county-level	National Association of Realtors https://www.nar.realtor/research-and-statistics/housing-statistics/county-median-home-prices-and-monthly-mortgage-payment
lnEST	The natural log of the total new business establishments in a county	US Census-County Business Pattern https://www.census.gov/programs-surveys/cbp.html
lnPublicPay	The natural log of public payroll in the two counties	Bureau of Labor Statistics https://www.bls.gov/data/#employment
lnFTEEmploy	The natural log of the total number of full-time equivalent public employees of a county.	Bureau of Labor Statistics https://www.bls.gov/data/#employment
TotalWageRate	State-level wage tax rates	The Government Finance Database http://willamette.edu/mba/research-impact/public-datasets/index.html
lnPensionBurden	The natural log of the market value of pension liabilities (discounted using CalPERS' 2017 Termination Liability Discount Rate of 3.0 %) per household in the city in California.	The Pension Tracker, https://www.pensiontracker.org/
AvgSalestoList YoY	The year-to-year growth in the average sales-to-listings ratio of California cities	RedFin, https://www.redfin.com/blog/data-center/
InventoryYoY	The year-to-year growth in the total housing inventories of California cities	RedFin, https://www.redfin.com/blog/data-center/
MedianPriceYoY	The year-to-year growth in the median home sales prices of California cities	RedFin, https://www.redfin.com/blog/data-center/

Appendix II Illustration of Blended Discount Rate Calculation

1. Steps for determining the blended discount rate

Step 1: Determine the projected benefit payments.

Projected benefit payments should include all benefits to be provided to all current active and inactive plan members through the pension plan in accordance with the benefit terms and any additional legal agreements to provide benefits that are in force at the pension plan's fiscal year-end. Benefits expected to be paid to future employees should be excluded.

Projected benefit payments should include the effects of automatic postemployment benefit changes, including automatic COLAs (Cost of living adjustments).

Step 2: Determine the projected pension plan's fiduciary net position.

Projections of the pension plan's fiduciary net position should incorporate all cash flows inflows, (i.e., contributions from employers, non-employer contributing entities, and current active plan members.), and outflows (benefit payments, expenses) intended to finance benefits of current active and inactive plan members (status at the pension plan's fiscal year-end).

Unlike benefit payment projections, expected contributions from future members can be included to the extent that these contributions exceed the expected service cost associated with these new members.

If the plan's contribution rate is set by statue or a formal written funding policy, then professional judgement can be used in projecting the most recent five years of contribution history into the future. If not, then the average contribution over the most recent five-year period is the maximum projected future contribution.

Step 3: Determine the single equivalent discount rate

The discount rate should be the single rate that reflects the following:

a. The long-term expected rate of return on pension plan investments that are expected to be used to finance the payment of benefits, to the extent that (1) the pension plan's fiduciary net position is projected to be sufficient to make projected benefit payments and (2) pension plan assets are expected to be invested using a strategy to achieve that return.

b. A yield or index rate for 20-year, tax-exempt general obligation municipal bonds with an average rating of AA/Aa or higher (or equivalent quality on another rating scale), to the extent that the conditions in (a) are not met.

c. Solve for the single equivalent discount rate that, when applied to all the cash flows, produces the same total present value as the dual discount rate streams described above; this single equivalent discount rate ("blended rate") is used to calculate the total liability per GASB 67/68.

2. Numerical example of calculation of pension liabilities using blended discount rate

Total benefit payments the plan has promised to pay from the year 2020-2030:	$500,000.00
Annual payment:	$50,000.00
Amount of benefit payment the employer has in assets (sufficient for 8 year's payment from the year 2020 to 2028)	$400,000.00
Amount of benefit payment the employer does not have in assets (from 2028-2030)	$100,000.00
The expected investment return of 7.50% is used only on the amount of the employer's liability that it does have in assets to cover:	$292,865.18
The 20-year Municipal Bond Rate is used on the amount of the employer's liability that it does not have an equal number of assets to cover. (The 20-year Municipal Bond Rate for AA+ rate bond is about 4.00%):	$68,907.55
Add these two discounted amounts together to obtain the present value of total benefit payment $292,865.18+$94,304.73=	$361,722.7
Blended discount rate:	6.4%
If calculated using 7.5% discount rate for the full pension liabilities (GASB 25):	$343,204.05
Difference between GASB 67 and GASB 25:	**$18,518.65**
% increase in pension liabilities from GASB 25 to GASB 67:	**5.40%**

The higher the portion of benefit payment the employee does not have in assets, the lower the blended discount rate will be, and the higher the present value of pension liabilities.

References:

1. GASB 67, 2012; Section: Measurement of the Net Pension Liabilities.

https://www.gasb.org/jsp/GASB/Document_C/DocumentPage?cid=1176160220594&acceptedDisclaimer=true

2. Anatharaman and Chuk, 2018; Appendix I. p42-43.

3. Indiana Government presentations, GASB 67&68 and the Changes Impacting Reporting and the Auditing of Pension Data, 2015,
https://www.in.gov/sboa/files/McGladreyGASB_67_68_SBOA_Presentation.pdf

Appendix III Examples of News Articles

Example news: extracted from The Philadelphia Inquirer, "*Pennsylvania lawmakers get real on pensions*". 2010/6/20

Sentiment Score= -1.0 (Very Negative)

What choice did Harrisburg have? The state is broke. School districts, which foot part of the bill, recoiled at the higher property taxes that would be needed to keep the underfunded public-employee and schoolteacher pension plans as solvent as the law demands. But some lawmakers were resolved not to waste this year's pension crisis. And union leaders agreed to meet them part way." I told [Evans], 'All the Republicans will be voting yes. However, we'd like to offer some amendments,'" State Rep. Bill Adolph (R., Delaware) said.

Under Evans' bill, long-term minimum pension subsidies from the state and school districts were increased, in exchange for delaying the balloon payments that had threatened to boost subsidies for the pension systems from $1.4 billion this year to $5.9 billion two years from now. With the new law, they still rise, to $2.5 billion, and more in future years.

Adolph and Rep. Glen Grell (R., Cumberland) said they wanted to go further: Reduce pensions for new workers hired, starting next year. Push most workers' retirement age to 65, from 60. End big up-front payouts as a retirement option. Make workers stay on the job 10 years, instead of five, before qualifying for pensions. And give them 2 percent of their top pay for each year they work, down from 2.5 percent.

…….

"Is it a cure? Absolutely not," said James McAneny, head of the Pennsylvania Public Employees Retirement Commission. It's a way to soften the blow of closing the multibillion-dollar gap between what Pennsylvania owes and what it has set aside to pay.

McAneny blames not just higher pensions and lower payments after the 2001 law, but a 2003 law that further lowered public pension subsidies in hopes the stock market would recover.

"We pretended we didn't need more money for the plans because the systems were going to earn their way out of it," McAneny said. "We almost did." But the stock market collapse of 2008 dropped both plans' assets back to 2001 levels, while their obligations to future retirees kept growing. State revenue also fell, closing off higher state subsidies as a way out of the mess.

Figure 1 Google Search Volume for "Pension crisis" and "Government Pension"

The below graph shows the Google search volume index for the key words "pension crisis" and "government pension" from the year 2010 to 2019. The data is acquired from the google trend website on 2019/07/22.

Figure 1.1

Google Search Volume Index for "Pension Crisis"

Figure 1.2

Google Search Volume Index for "Government Pension"
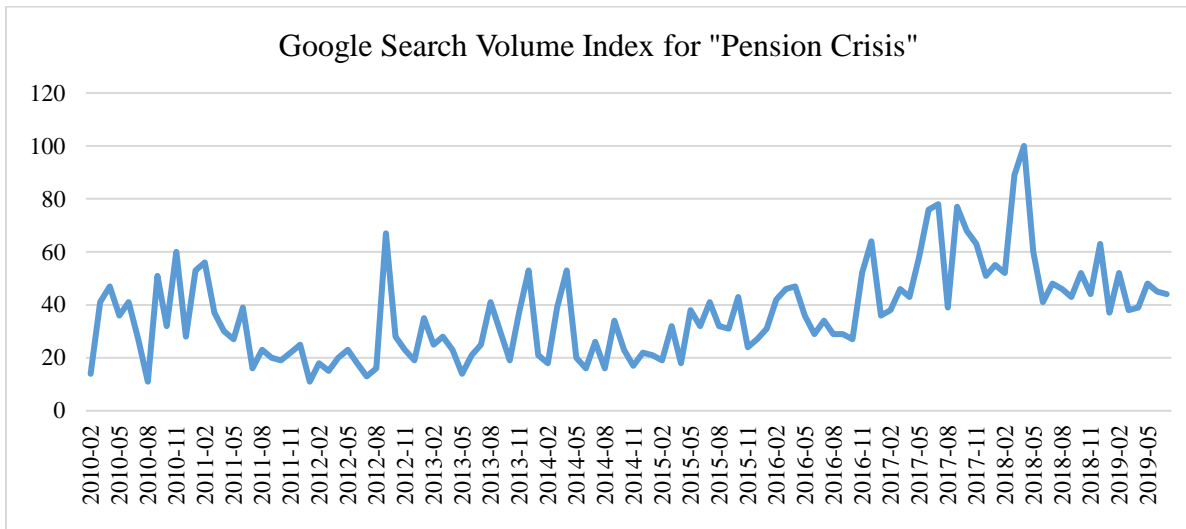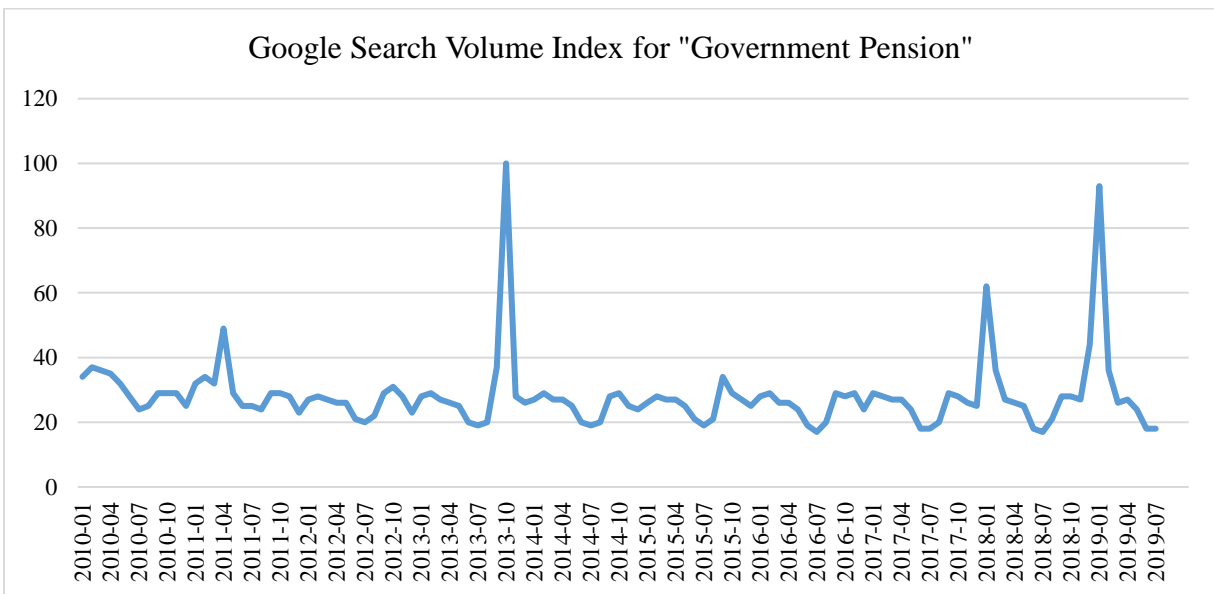
Figure 2 News Relating to "Pension crisis" and

"Public Pension Crisis"

The below graphs show the number of news articles that have mentioned the key word "pension crisis" and "public pension crisis" from the year 2010 to the year 2019 (June). The sources of the news articles are Factiva.
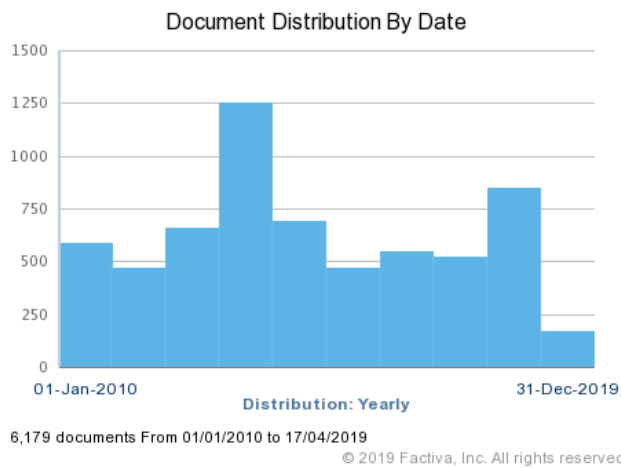
"Pension Crisis"	**"Public Pension Crisis"**
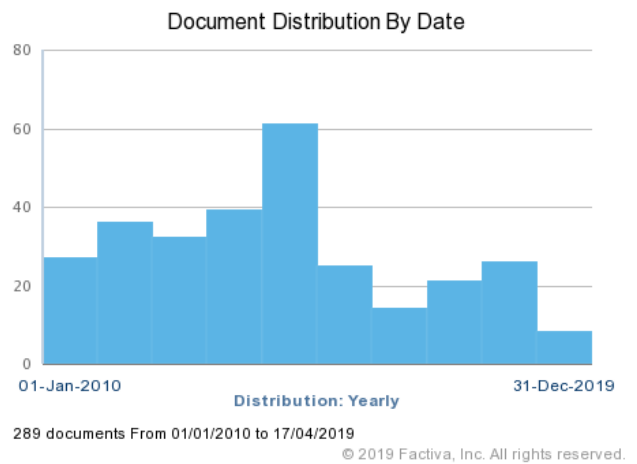
"Pension Crisis + Cuts"	**"Pension Crisis + Tax"**
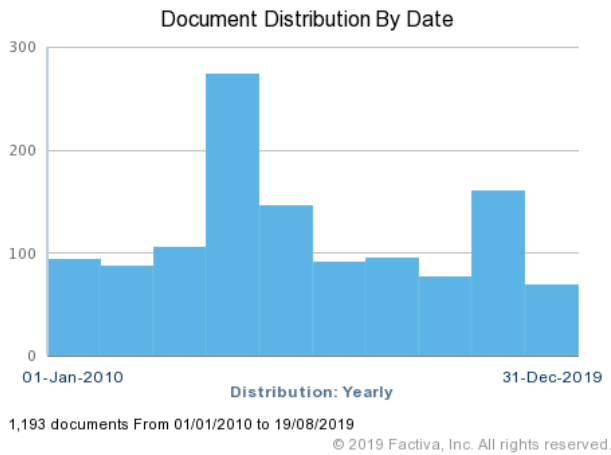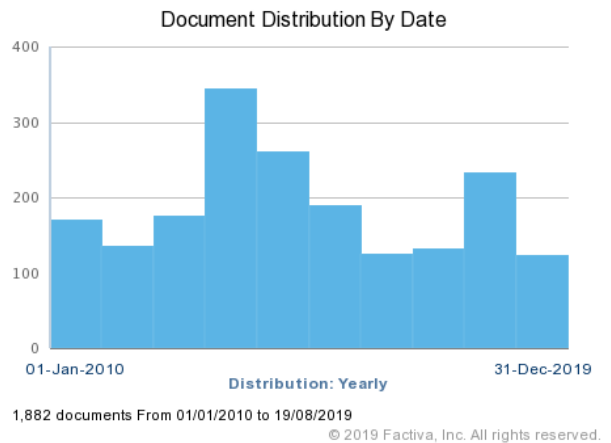
Figure 3

Average News Sentiment of news articles mentioning "Pension Crisis"

The below graph show the average sentiment of news article that have mentioned the key word "pension crisis" from the year 2010 to the year 2019 (June). The newspapers are extracted from Factiva-US Major News and Business Source. The tone of an article is measured using the VADER (Valence Aware Dictionary for Sentiment Reasoning) pre-built in the Natural Language Toolkit (NLTK) in Python. The sentiment score and the news sentiment have the following relation: score > 0.5: Very positive; score between 0 and 0.5: Positive; score=0: Neutral; score between -0.5 to 0: Negative; score < -0.5: Very negative. See Appendix III for examples of articles.

Average News Sentiment by Year
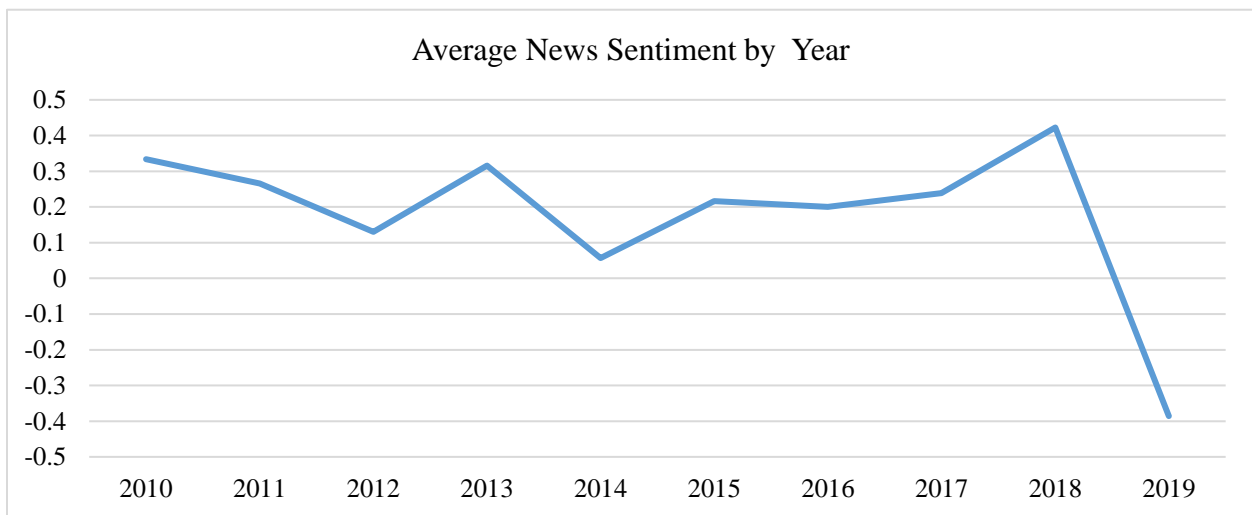
Figure 4 Illinois Housing Price Growth vs US growth

All-Transaction Housing Price Indexes for US and Illinois
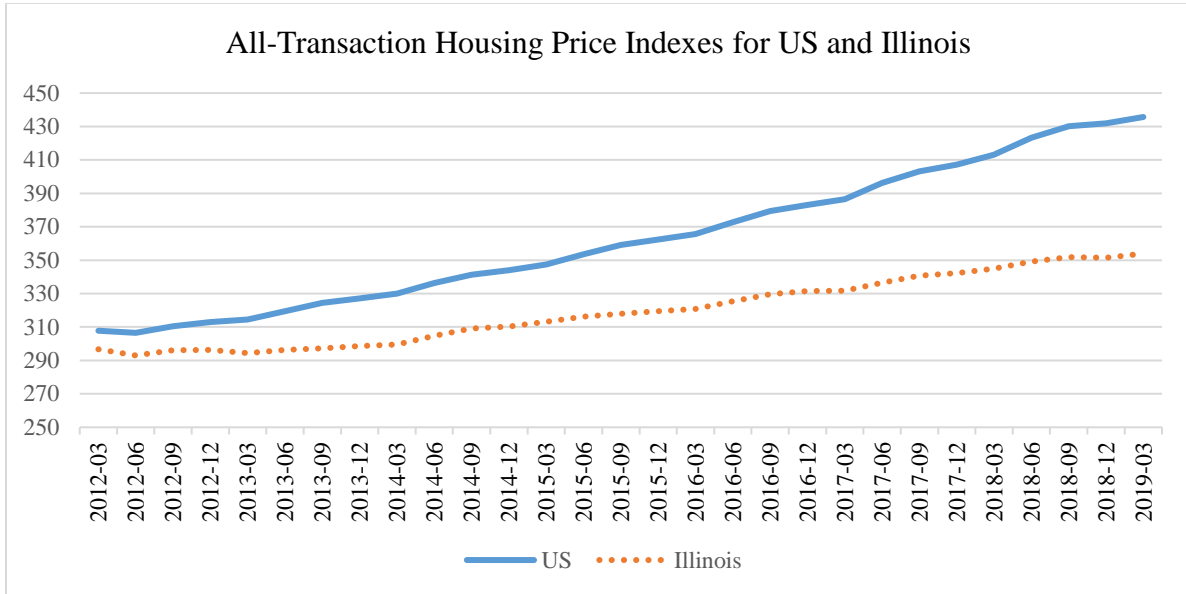
Figure 5 US Adjacent Counties on State Borders
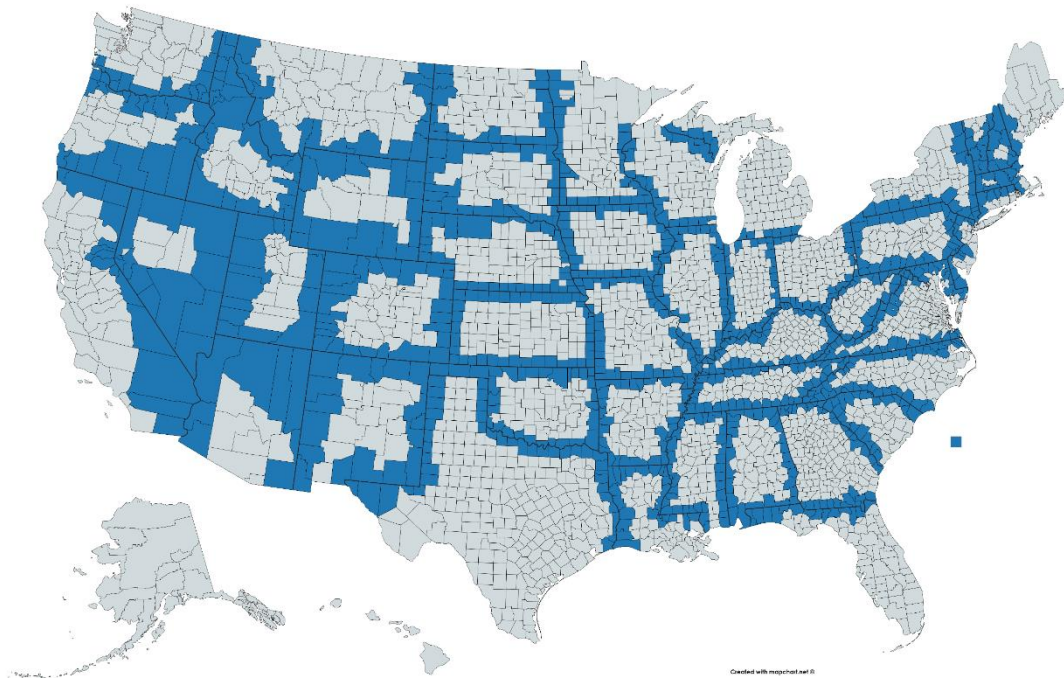
Created using mapchart.net. https://mapchart.net/usa-counties.html

Table 1 Local Employee Retirement Plans by States (FY 2017)

State	Number of Retirement Plans	State	Number of Retirement Plans
Alabama	15	Montana	92
Alaska	2	Nebraska	26
Arizona	80	Nevada	0
Arkansas	151	New Hampshire	3
California	76	New Jersey	9
Colorado	64	New Mexico	0
Connecticut	206	New York	6
Delaware	17	North Carolina	49
District of Columbia	7	North Dakota	14
Florida	476	Ohio	1
Georgia	45	Oklahoma	14
Hawaii	0	Oregon	17
Idaho	3	Pennsylvania	1594
Illinois	651	Rhode Island	34
Indiana	238	South Carolina	6
Iowa	8	South Dakota	1
Kansas	11	Tennessee	39
Kentucky	26	Texas	133
Louisiana	17	Utah	2
Maine	0	Vermont	7
Maryland	72	Virginia	30
Massachusetts	92	Washington	50
Michigan	141	West Virginia	57
Minnesota	567	Wisconsin	3
Mississippi	0	Wyoming	0
Missouri	79	Total	5232

Source: US Census Bureau, State and Locally Administered Defined Benefit Pension Systems, 2017; Annual Survey of Public Pensions, August 2018.

Table 2 Panel A Descriptive Statistics

This table presents the descriptive statistics for different variables used in the study. Please refer to Appendix I for the variable descriptions.

stats	N	mean	sd	min	p25	p50	p75	max
HPG	13,735	2.03	4.88	-24.30	-0.66	1.79	4.39	53.86
HPGdiff(2012-2014)	3,166	0.02	5.11	-30.94	-2.44	-0.02	2.43	37.54
HPGdiff(2015-2017)	3,097	-0.06	6.39	-60.13	-2.87	0.12	2.91	27.60
lnNHP	8,598	2.53	1.14	-1.58	1.92	2.66	3.31	6.09
lnEST	11,939	8.31	1.50	2.48	7.25	8.13	9.22	13.59
Underfunding	13,735	19.49	9.51	0.74	13.21	18.25	23.33	59.47
lnLoanLimit	13,735	12.96	0.09	12.94	12.94	12.94	12.94	13.35
PropTaxRate	13,735	0.05	0.23	0.00	0.00	0.00	0.00	1.00
lnPerCapInc	13,549	10.58	0.24	9.94	10.41	10.55	10.71	12.36
lnRevenue	13,735	17.31	0.82	15.29	16.88	17.31	17.80	19.68
EduQuality	13,129	14.75	2.63	2.52	13.20	14.59	16.10	68.92
IncTaxRate	13,705	-3.45	3.23	-13.30	-6.00	-3.50	0.00	0.78
Coindex	13,705	172.42	26.75	112.16	153.35	168.27	189.62	268.68
Foreclosure	13,735	0.41	0.49	0.00	0.00	0.00	1.00	1.00
Constraint	13,735	0.70	0.92	0.00	0.00	0.00	2.00	3.00
Debtratio	13,735	0.47	0.22	0.11	0.32	0.46	0.57	1.62
pctUnion	13,735	27.29	16.18	3.00	15.00	22.00	37.00	72.00
MedianPrice(,000)	13,658	154.48	86.13	35.77	98.54	130.80	182.17	1,033.67
lnMedianPrice	13,658	11.83	0.45	10.48	11.50	11.78	12.11	13.85
FTEEmployment(,000)	13,518	141.12	114.08	13.34	68.34	123.63	171.86	829.36
PublicPayrol	13,518	19.98	0.85	17.81	19.49	20.05	20.45	22.46
ZillowYOY	1,309	0.05	0.05	-0.11	0.02	0.05	0.07	0.32
ZillowHomePrice(,000)	1,309	240.32	121.83	77.30	149.70	209.80	311.30	985.70

Table 2 Panel B Correlation Matrix

This table presents the pairwise correlations between important variables. Pearson correlations at the bottom diagonal and Spearman correlations at the top diagonal. Please refer to Appendix I for the variable descriptions.

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(1)	HPG		-0.17	0.06	-0.01	-0.09	-0.03	-0.12	0.00	0.01	-0.03	-0.01	-0.12	-0.08	-0.02	-0.07
			(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)	(0.84)	(0.17)	(0.00)	(0.05)	(0.00)	(0.00)	(0.00)	(0.00)
(2)	Underfunding	-0.14		0.05	0.04	0.29	0.07	0.18	-0.11	0.12	0.03	0.20	0.19	0.23	0.32	0.37
		(0.00)		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
(3)	lnLoanlimit	0.07	0.01		0.04	0.12	0.06	0.27	0.07	0.01	-0.04	-0.07	0.20	0.14	0.13	0.15
		(0.00)	(0.02)		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
(4)	IncTaxRate	-0.02	0.09	0.02		0.17	-0.11	0.14	-0.13	0.03	0.08	0.10	0.11	0.16	0.16	0.15
		(0.00)	(0.00)	(0.00)		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
(5)	lnRevenue	-0.07	0.31	0.15	0.09		0.09	0.17	-0.02	0.21	0.13	-0.09	0.08	0.19	0.90	0.92
		(0.00)	(0.00)	(0.00)	(0.00)		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
(6)	Coindex	0.03	0.07	0.02	-0.08	0.08		0.44	0.03	-0.06	-0.29	-0.09	-0.13	-0.34	0.08	0.17
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
(7)	lnPerCapInc	-0.06	0.16	0.35	0.12	0.14	0.39		0.03	-0.09	0.10	-0.07	0.21	0.28	0.09	0.22
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
(8)	PropTaxRate	0.00	-0.11	0.07	-0.14	-0.02	0.00	0.03		-0.13	0.04	0.14	0.01	-0.19	0.00	0.01
		(0.37)	(0.00)	(0.00)	(0.00)	(0.00)	(0.45)	(0.00)		(0.00)	(0.00)	(0.00)	(0.10)	(0.00)	(0.82)	(0.05)
(9)	EduQuality	0.00	0.11	0.01	0.01	0.14	0.01	-0.09	-0.06		0.00	-0.13	0.00	0.07	0.20	0.19
		(0.90)	(0.00)	(0.01)	(0.24)	(0.00)	(0.06)	(0.00)	(0.00)		(0.38)	(0.00)	(0.84)	(0.00)	(0.00)	(0.00)
(10)	Foreclosure	-0.03	0.12	0.01	0.09	0.15	-0.27	0.09	0.04	-0.01		-0.09	0.27	0.24	0.10	0.12
		(0.00)	(0.00)	(0.09)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.04)		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Table 2 Panel B (Continued)

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(11)	Constraint	0.00	0.27	-0.06	0.11	-0.10	-0.06	-0.07	0.08	-0.08	-0.10		0.10	-0.19	-0.03	-0.07
		(0.45)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)		(0.00)	(0.00)	(0.00)	(0.00)
(12)	DebtRatio	-0.12	0.24	0.19	0.15	0.00	-0.10	0.23	-0.03	-0.02	0.19	0.09		0.43	0.09	0.11
		(0.00)	(0.00)	(0.00)	(0.00)	(0.88)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)		(0.00)	(0.00)	(0.00)
(13)	pctUnion	-0.08	0.26	0.21	0.11	0.30	-0.31	0.23	-0.19	0.09	0.22	-0.20	0.41		0.07	0.16
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)		(0.00)	(0.00)
(14)	lnFTEEmployee	-0.03	0.31	0.14	0.06	0.92	0.10	0.05	0.02	0.20	0.10	-0.06	0.00	0.17		0.97
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.92)	(0.00)		(0.00)
(15)	lnPublicPayroll	-0.07	0.36	0.16	0.05	0.93	0.17	0.16	0.02	0.20	0.13	-0.10	0.05	0.24	0.98	
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	

Table 3 Regression Results of Pension Underfunding

and Housing Price Growth in Adjacent Counties

This table presents the results of the test of the relation between pension underfunding and housing price growth in adjacent counties. The dependent variable is HPG, which is the annual growth rate of the housing price index (HPI) of the county; Underfunding is the state-level net pension liabilities (total pension liabilities – total pension assets) as a percentage of total state GDP in year t-1. POST is an indicator variable that equals 1 if the year is after 2014, and 0 for year 2012-2014. lnLoanLimit is the natural log of county-specific maximum conforming loan limits for mortgages to be acquired by Fannie Mae and Freddie Mac; PropTaxRate is the county level property tax rate; lnPerCapInc is the natural log of income per capita at the county level; lnRevenue is the natural log of county total revenues; EduQuality is the pupil/teacher ratios of the county; IncTaxRate is the marginal income tax rate at the state level; Coindex is the coincident index for the state; Foreclosure is the indicator of whether there is juridical foreclosure process in the state, and 0 otherwise; Constraint is a categorical variable that ranges from 0 to 3 depending on the level of political constraint the state face to renegotiate pension benefits; Debtratio is total debt outstanding as a percentage of total revenue at the state level; pctUnion is the percentage of employees in the state that are part of a public Union; lnMedianPrice is the natural log of the median home prices in the county. Standard errors are clustered at the state-border level and individual state level. T-statistics are in parentheses and *** denotes significance at the 1% level, ** at 5% level, and * at 10% level.

	PRE-GASB			POST-GASB			PRE+POST		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
VARIABLES	HPG	HPG	HPG	HPG	HPG	HPG	HPG	HPG	HPG
Underfunding*POST							-0.03***	-0.03***	-0.02**
							(-3.49)	(-3.20)	(-2.56)
Underfunding	0.00	-0.00	-0.01	-0.04**	-0.04***	-0.03**	-0.00	-0.01	-0.01
	(0.11)	(-0.39)	(-0.66)	(-2.47)	(-2.93)	(-2.35)	(-0.20)	(-1.03)	(-1.03)
POST							1.99***		
							(6.50)		
lnLoanlimit	6.23**	6.59***	5.36**	0.99	1.43	-0.73	2.72	2.89**	1.67
	(2.64)	(3.13)	(2.46)	(0.48)	(0.78)	(-0.50)	(1.65)	(2.39)	(1.37)
PropTaxRate	-0.20	-0.39	-0.02	-1.20	-1.16	-0.99	-0.64	-0.67	-0.50
	(-0.32)	(-0.98)	(-0.07)	(-1.52)	(-1.47)	(-1.37)	(-1.26)	(-1.67)	(-1.35)
lnPerCapInc	4.78***	3.63***	3.90***	5.56***	5.67***	3.61***	6.19***	5.54***	3.62***
	(5.34)	(4.68)	(5.42)	(5.66)	(6.07)	(4.50)	(7.49)	(6.69)	(7.00)

Table 3 (Continued)

VARIABLES	PRE-GASB			POST-GASB			PRE+POST		
	(1) HPG	(2) HPG	(3) HPG	(4) HPG	(5) HPG	(6) HPG	(7) HPG	(8) HPG	(9) HPG
lnRevenue	-0.94***	-0.37**	-0.35**	0.08	0.21	0.21	-0.34*	-0.04	-0.05
	(-4.35)	(-2.14)	(-2.19)	(0.28)	(0.73)	(0.78)	(-1.78)	(-0.21)	(-0.25)
EduQuality	0.11	0.09	0.14**	0.14**	0.15**	0.14**	0.09	0.08	0.13***
	(1.52)	(1.37)	(2.10)	(2.18)	(2.32)	(2.58)	(1.58)	(1.45)	(2.85)
IncTaxRate	0.03	0.03	0.04	-0.07	-0.07	-0.05	-0.03	-0.03	-0.01
	(0.59)	(0.96)	(1.36)	(-1.36)	(-1.28)	(-1.03)	(-0.83)	(-0.81)	(-0.41)
Coindex	0.07***	0.01	-0.00	0.04***	0.02**	0.02**	0.05***	0.02***	0.01*
	(5.08)	(1.05)	(-0.40)	(3.91)	(2.13)	(2.02)	(5.88)	(2.87)	(1.69)
Foreclosure	0.36	0.04	-0.04	-0.37	-0.49	-0.46	-0.04	-0.24	-0.26
	(0.85)	(0.17)	(-0.20)	(-0.90)	(-1.21)	(-1.28)	(-0.12)	(-0.94)	(-1.13)
Constraint	-0.07	-0.01	-0.01	-0.12	-0.08	-0.17	-0.08	-0.04	-0.08
	(-0.31)	(-0.05)	(-0.09)	(-0.61)	(-0.44)	(-1.03)	(-0.40)	(-0.26)	(-0.64)
Debtratio	0.13	-0.62	-0.75	1.00	0.45	0.01	0.59	0.02	-0.28
	(0.18)	(-1.06)	(-1.33)	(0.84)	(0.38)	(0.01)	(0.93)	(0.03)	(-0.48)
pctUnion	0.16***	0.00	0.01	0.03	0.01	0.00	0.08	0.02	0.01
	(2.83)	(0.04)	(0.29)	(0.37)	(0.14)	(0.06)	(1.58)	(0.37)	(0.36)
lnMedianPrice	-2.43***	-2.14***	-1.48***	-4.63***	-5.07***	-2.41***	-4.01***	-3.90***	-1.99***
	(-4.04)	(-4.16)	(-3.82)	(-5.71)	(-6.32)	(-4.18)	(-8.13)	(-7.27)	(-5.99)
County-pair FE	Y	Y	N	Y	Y	N	Y	Y	N
Year FE	N	Y	N	N	Y	N	N	Y	N
County-pair-Year FE	N	N	Y	N	N	Y	N	N	Y
Observations	5,878	5,878	5,292	6,225	6,225	5,196	12,540	12,540	10,488
R-squared	0.34	0.39	0.67	0.23	0.23	0.57	0.23	0.26	0.63

Table 4 Regression Results of Pension Underfunding

and New Housing Permits in Adjacent Counties

This table presents the results of the test of the relation between pension underfunding and new housing permits in adjacent counties. The dependent variables is lnNHP, which equals the natural log per capita new housing permits granted by the governments at the county level; Underfunding is the state-level net pension liabilities (total pension liabilities – total pension assets) as a percentage of total state GDP in year t-1; POST is an indicator variable that equals to 1 if the year is after 2014, and 0 for year 2012-2014; lnLoanLimit is the natural log of county-specific maximum conforming loan limits for mortgages to be acquired by Fannie Mae and Freddie Mac; PropTaxRate is the county level property tax rate; lnPerCapInc is the natural lof of income per capita at the county level; lnRevenue is the natural log of county total revenues; EduQuality is the pupil/teacher ratios of the county; IncTaxRate is the marginal income tax rate at the state level; Coindex is the coincident index for the state; Foreclosure is the indicator of whether there is juridical foreclosure process in the state, and 0 otherwise; Debtratio is total debt outstanding as a percentage of total revenue at the state level; pctUnion is the percentage of employees in the state that are part of a public Union; Constraint is a categorical variable that ranges from 0 to 3 depending on the level of political constraint the state face to renegotiate pension benefits; lnMedianPrice is the natural log of the median home prices in the county. Standard errors are clustered at the state-border level and individual state level. T-statistics are in parentheses and *** denotes significance at the 1% level, ** at 5% level, and * at 10% level.

	PRE-GASB			POST-GASB			PRE+POST		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
VARIABLES	lnNHP	lnNHP	lnNHP	lnNHP	lnNHP	lnNHP	lnNHP	lnNHP	lnNHP
Underfunding*POST							-0.01***	-0.01**	-0.01*
							(-2.77)	(-2.55)	(-1.88)
Underfunding	-0.01**	-0.01**	-0.01*	-0.02***	-0.02***	-0.02***	0.00	0.00	-0.00
	(-2.57)	(-2.34)	(-1.88)	(-2.32)	(-2.20)	(-2.20)	(0.62)	(0.62)	(-0.80)
POST							-0.01		
							(-0.27)		
lnLoanLimit	-1.65*	-1.64*	-1.63*	-1.16	-1.27	-1.27	-1.55*	-1.57*	-1.54*
	(-1.89)	(-1.87)	(-1.79)	(-1.33)	(-1.46)	(-1.47)	(-1.96)	(-1.98)	(-1.89)
PropTaxRate	0.10	0.10	0.15	0.31	0.31	0.31	0.13	0.13	0.21
	(1.13)	(1.07)	(1.44)	(1.21)	(1.16)	(1.14)	(1.07)	(1.04)	(1.59)
lnPerCapInc	1.42***	1.42***	1.47***	0.75	0.70	0.62	1.09***	1.08***	0.84**
	(5.73)	(5.75)	(5.73)	(1.60)	(1.47)	(1.23)	(3.58)	(3.50)	(2.36)

Table 4 (Continued)

VARIABLES	PRE-GASB			POST-GASB			PRE+POST		
	(1) lnNHP	(2) lnNHP	(3) lnNHP	(4) lnNHP	(5) lnNHP	(6) lnNHP	(7) lnNHP	(8) lnNHP	(9) lnNHP
lnRevenue	0.00	0.01	0.00	0.01	-0.00	0.01	-0.02	-0.03	-0.00
	(5.73)	(5.75)	(5.73)	(0.13)	(-0.00)	(0.05)	(-0.29)	(-0.30)	(-0.05)
EduQuality	0.05**	0.05**	0.05**	0.05	0.05	0.05	0.05**	0.05**	0.05*
	(2.23)	(2.18)	(2.06)	(1.57)	(1.43)	(1.45)	(2.62)	(2.53)	(1.98)
IncTaxRate	0.03**	0.03**	0.04***	0.03	0.03	0.03	0.02*	0.02*	0.03**
	(2.32)	(2.38)	(3.12)	(1.59)	(1.61)	(1.63)	(1.94)	(1.95)	(2.45)
Coindex	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(1.52)	(1.26)	(1.18)	(0.55)	(0.81)	(0.70)	(1.18)	(1.10)	(1.09)
Foreclosure	0.13	0.13	0.12	0.15	0.16	0.22	0.12	0.12	0.14
	(1.15)	(1.19)	(0.98)	(0.82)	(0.86)	(1.20)	(0.92)	(0.92)	(1.09)
Constraint	-0.14**	-0.14**	-0.17**	-0.07	-0.08	-0.06	-0.12	-0.13*	-0.13*
	(-2.08)	(-2.07)	(-2.46)	(-0.75)	(-0.85)	(-0.63)	(-1.67)	(-1.70)	(-1.85)
Debtratio	0.53**	0.46*	0.42	0.42	0.48	0.48	0.55**	0.55**	0.46
	(2.18)	(1.73)	(1.38)	(1.17)	(1.31)	(1.23)	(2.25)	(2.05)	(1.52)
pctUnion	-0.02	-0.02	-0.02	-0.04*	-0.04*	-0.04*	-0.02	-0.02	-0.03*
	(-1.33)	(-1.25)	(-1.34)	(-1.95)	(-1.97)	(-1.96)	(-1.60)	(-1.64)	(-1.91)
lnMedianPrice	0.74***	0.75***	0.80***	0.64***	0.72***	0.82***	0.64***	0.66***	0.77***
	(4.55)	(4.64)	(4.52)	(2.88)	(3.04)	(2.91)	(4.24)	(4.33)	(4.17)
County-pair FE	Y	Y	N	Y	Y	N	Y	Y	N
Year FE	N	Y	N	N	Y	N	N	Y	N
County-pair-Year FE	N	N	Y	N	N	Y	N	N	Y
Observations	4,176	4,176	3,014	2,667	2,667	1,548	7,302	7,302	4,562
R-squared	0.73	0.73	0.69	0.78	0.78	0.69	0.71	0.72	0.69

Table 5 Debt Reliance, Pension Underfunding and Housing Price Growth

in Adjacent Counties

This table presents the results of the effect of debt reliance on the relation between pension underfunding and housing price growth. The dependent variable is HPG, which is the annual growth rate of the housing price index (HPI) of the county; Underfunding is the state-level net pension liabilities (total pension liabilities – total pension assets) as a percentage of total state GDP in year t-1; HighDebt is an indicator that equals 1 if the states' debt ratio (total debt outstanding divided by total revenue) is above the median debt ratio of all the states for a given year, and 0 otherwise; POST is an indicator variable that equals to 1 if the year is after 2014, and 0 for year 2012-2014; lnLoanLimit is the natural log of county-specific maximum conforming loan limits for mortgages to be acquired by Fannie Mae and Freddie Mac; PropTaxRate is the county level property tax rate; lnPerCapInc is the natural log of income per capita at the county level; lnRevenue is the natural log of county total revenues; EduQuality is the pupil/teacher ratios of the county; IncTaxRate is the marginal income tax rate at the state level; Coindex is the coincident index for the state; Foreclosure is the indicator of whether there is juridical foreclosure process in the state, and 0 otherwise; HighConstraint is an indicator variable equals 1 if the state's political constraint is above the sample median, and 0 otherwise; HighUnion is an indicator variable that equals 1 if the state's percentage of public employees that are public of a union is above the sample median, and 0 otherwise; lnMedianPrice is the natural log of the median home prices in the county. Standard errors are clustered at the state-border level and individual state level. T-statistics are in parentheses and *** denotes significance at the 1% level, ** at 5% level, and * at 10% level.

VARIABLES	(1) HPG	(2) HPG	(3) HPG
HighDebt*Underfunding*POST	-0.06***	-0.05*	-0.01
	(-3.38)	(-1.81)	(-0.40)
HighDebt *Underfunding	-0.12	-0.04	-0.05*
	(-1.64)	(-0.58)	(-1.92)
Underfunding*POST	0.03*	-0.05*	-0.06*
	(1.88)	(-1.76)	(-1.84)
HighDebt *POST	1.94***	0.06	-0.59
	(4.81)	(0.08)	(-0.71)
Underfunding	0.11**	0.05	0.05
	(2.22)	(1.02)	(1.14)
POST	1.87***		
	(5.42)		
lnLoanLimit	6.16*	8.65***	3.45
	(1.77)	(2.76)	(1.18)
PropTaxRate	0.21**	0.13*	0.12*
	(2.08)	(1.79)	(1.95)
lnPerCapInc	-1.13**	-0.55	-0.71**
	(-2.48)	(-1.40)	(-2.48)
lnRevenue	0.07***	0.03*	0.02
	(4.23)	(1.76)	(1.44)
IncTaxRate	6.91***	5.86***	5.51***
	(5.34)	(4.89)	(6.10)

Table 5 (Continued)

VARIABLES	(1) HPG	(2) HPG	(3) HPG
EduQuality	-1.06	-0.46	0.04
	(-0.77)	(-0.46)	(0.04)
Coindex	0.07	0.15	0.29***
	(0.60)	(1.36)	(2.88)
Foreclosure	1.25**	1.36***	1.37***
	(2.06)	(2.88)	(3.65)
HighConstraint	0.24	0.12	-0.66*
	(0.36)	(0.23)	(-1.75)
HighDebt	0.25	0.48	-0.15
	(0.76)	(1.45)	(-0.41)
HighUnion	0.38	0.12	0.34
	(1.01)	(0.35)	(1.01)
lnMedianPrice	-3.99***	-3.94***	-2.00***
	(-8.25)	(-7.76)	(-5.68)
County-pair FE	Y	Y	N
Year FE	N	Y	N
County-pair-Year FE	N	N	Y
Observations	12,135	12,135	10,488
R-squared	0.25	0.27	0.64

Table 6 Union Power, Pension Underfunding and Housing Price Growth

in Adjacent counties

This table presents the results of the effect of union power on the relation between pension underfunding and housing price growth. The dependent variable is HPG, which is the annual growth rate of the housing price index (HPI) of the county; Underfunding is the state-level net pension liabilities (total pension liabilities – total pension assets) as a percentage of total state GDP in year t-1; HighUnion is an indicator that equals 1 if the percentage of the employee in a given state that is part of a public union is above the median debt ratio of all the states for a given year, and 0 otherwise; POST is an indicator variable that equals to 1 if the year is after 2014, and 0 for year 2012-2014; lnLoanLimit is the natural log of county-specific maximum conforming loan limits for mortgages to be acquired by Fannie Mae and Freddie Mac; PropTaxRate is the county level property tax rate; lnPerCapInc is the natural log of income per capita at the county level; lnRevenue is the natural log of county total revenues; EduQuality is the pupil/teacher ratios of the county; IncTaxRate is the marginal income tax rate at the state level; Coindex is the coincident index for the state; Foreclosure is the indicator of whether there is juridical foreclosure process in the state, and 0 otherwise; HighConstraint is an indicator variable equals 1 if the state's political constraint is above the sample median, and 0 otherwise; HighDebt is an indicator that equals 1 if the states' debt ratio is above the median debt ratio of all the states for a given year, and 0 otherwise; lnMedianPrice is the natural log of the median home prices in the county. Standard errors are clustered at the state-border level and individual state level. T-statistics are in parentheses and *** denotes significance at the 1% level, ** at 5% level, and * at 10% level.

VARIABLES	(1) HPG	(2) HPG	(3) HPG
HighUnion*Underfunding*POST	-0.01**	-0.01**	-0.01*
	(-2.10)	(-2.03)	(-1.82)
HighUnion *Underfunding	0.00	0.01	0.02
	(0.15)	(0.31)	(0.74)
HighUnion*POST	1.13*	1.52***	0.68
	(2.34)	(4.20)	(1.66)
Underfunding*POST	0.04	0.04	0.07
	(0.70)	(0.83)	(1.10)
Underfunding	-0.02**	0.02	-0.00
	(-2.10)	(0.95)	(-0.16)
POST	1.94***		
	(5.12)		
lnLoanLimit	-3.58	3.98	-0.89
	(-0.83)	(0.95)	(-0.31)
PropTaxRate	-0.70	-0.33	-0.13
	(-0.24)	(-0.16)	(-0.06)
lnPerCapInc	6.12***	5.56***	5.10***
	(4.71)	(4.52)	(3.85)
lnRevenue	-0.19	0.19	-0.49
	(-0.45)	(0.53)	(-1.51)
EduQuality	0.10	0.09	0.17
	(0.87)	(0.80)	(1.42)
IncTaxRate	0.05	-0.00	0.04
	(0.49)	(-0.01)	(0.34)
Coindex	0.05**	0.01	-0.00
	(2.26)	(0.58)	(-0.08)

Table 6 (Continued)

VARIABLES	(1) HPG	(2) HPG	(3) HPG
Foreclosure	0.82	0.74	0.63
	(1.36)	(1.32)	(0.95)
HighConstraint	0.90**	0.81**	0.37
	(2.40)	(2.45)	(1.09)
HighDebt	0.22	-1.64	-1.29
	(0.14)	(-1.41)	(-0.81)
HighUnion	-6.48**	-0.53	-4.46**
	(-2.04)	(-0.15)	(-2.08)
lnMedianPrice	-3.89***	-3.82***	-1.84***
	(-8.14)	(-7.31)	(-5.38)
County-pair FE	Y	Y	N
Year FE	N	Y	N
County-pair-Year FE	N	N	Y
Observations	12,135	12,135	10,488
R-squared	0.27	0.24	0.64

Table 7 Political Constraint, Pension Underfunding and Housing Price Growth in Adjacent counties

Panel A Legal Basis for Protection of Public Pension Rights under State Laws

Type of Provisions	Accruals Protected			
	Past and Future	Past, and maybe Future	Past only	None
State Constitution (Constraint=3)	AK,IL,NY	AZ	HI,LA,MI	
Contract (Constraint=2)	AL,CA,GA,KS,MA, NE,NV,NH,ND,OR, PA,TN,VT,WA,WV	CO,ID,MD, MS,NJ,RI,SC	AR,DE,FL,IA,KY,MO, MT,NC,OK,SD,UT, VA	
Property (Constraint=2)	ME,WY	CT,NM,OH	WI	
Promissory Estoppel[a] (Constraint=1)	MN			
Gratuity (Constraint=0)				IN,TX[b]

(Table recreated from Table 1 in Munnell and Quinby [2012])

a Promissory estoppel is the protection of a promise even where no contract has been explicitly stated.

b This gratuity approach applies only to state-administered plans. Accruals in many locally administered plans are protected under the Texas constitution.

Sources: Cloud (2011); Monahan (2010); National Conference on Public Employee Retirement Systems (2007); Mumford and Pareja (1997); Reinke (2011); Staman (2011); Simko (1996); and consultations with plan legal counsels when accompanied by a decisive court ruling.

Table 7 Panel B

Regression Results

This table presents the results of the effect of political constraint on the relation between pension underfunding and housing price growth. The dependent variable is HPG, which is the annual growth rate of the housing price index (HPI) of the county; Underfunding is the state-level net pension liabilities (total pension liabilities – total pension assets) as a percentage of total state GDP in year t-1; HighConstraint is an indicator that equals 1 if the political constraint indicator in given state is above the median constraint level of all the states, and 0 otherwise; POST is an indicator variable that equals to 1 if the year is after 2014, and 0 for year 2012-2014; lnLoanLimit is the natural log of county-specific maximum conforming loan limits for mortgages to be acquired by Fannie Mae and Freddie Mac; PropTaxRate is the county level property tax rate; lnPerCapInc is the natural log of income per capita at the county level; lnRevenue is the natural log of county total revenues; EduQuality is the pupil/teacher ratios of the county; IncTaxRate is the marginal income tax rate at the state level; Coindex is the coincident index for the state; Foreclosure is the indicator of whether there is juridical foreclosure process in the state, and 0 otherwise. HighDebt is an indicator that equals 1 if the states' debt ratio is above the median debt ratio of all the states for a given year, and 0 otherwise; HighUnion is an indicator that equals 1 if the percentage of the employee in a given state that is part of a public union is above the median debt ratio of all the states for a given year, and 0 otherwise; lnMedianPrice is the natural log of the median home prices in the county. Standard errors areclustered at the state-border level and individual state level. T-statistics are in parentheses and *** denotes significance at the 1% level, ** at 5% level, and * at 10% level.

VARIABLES	(1) HPG	(2) HPG	(3) HPG
HighConstraint*Underfunding*POST	-0.05**	-0.04*	-0.02*
	(-2.44)	(-1.95)	(-1.75)
HighConstraint *Underfunding	-0.02	-0.02	-0.02**
	(-0.75)	(-1.00)	(-1.66)
Underfunding*POST	-0.06***	-0.05*	-0.04*
	(-3.56)	(-1.73)	(-1.94)
HighConstraint*POST	-2.06**	-1.16	0.35
	(-2.28)	(-1.31)	(-1.09)
Underfunding	0.01	0.00	-0.01
	(0.47)	(0.36)	(-0.58)
POST	1.56***		
	(3.40)		
lnLoanLimit	4.14*	4.15*	0.98
	(1.98)	(1.85)	(0.96)
PropTaxRate	-0.15	-0.22	-0.03
	(-0.27)	(-0.64)	(-0.13)
lnPerCapInc	6.33***	5.52***	2.75***
	(6.74)	(7.00)	(7.97)
lnRevenue	-0.27	0.07	-0.11
	(-1.28)	(0.35)	(-1.47)
EduQuality	0.12**	0.05	0.09***
	(2.32)	(1.35)	(3.83)
IncTaxRate	0.09***	0.03**	-0.01
	(5.85)	(2.24)	(-0.50)

Table 7 Panel B (Continued)

VARIABLES	(1) HPG	(2) HPG	(3) HPG
Coindex	0.14	0.12	0.01***
	(1.48)	(1.28)	(2.74)
Foreclosure	0.96**	0.54*	0.12
	(2.18)	(1.85)	(1.07)
HighConstraint	-3.01	-2.40	0.46***
	(-0.13)	(-0.87)	(3.46)
HighDebt	0.15	-0.89	-0.32
	(0.15)	(-0.99)	(-1.55)
HighUnion	0.11*	0.00	0.05***
	(1.69)	(0.08)	(2.75)
lnMedianPrice	-4.70***	-4.15***	0.01***
	(-7.33)	(-5.82)	(2.74)
County-pair FE	Y	Y	N
Year FE	N	Y	N
County-pair-Year FE	N	N	Y
Observations	12,135	12,135	10,488
R-squared	0.25	0.27	0.64

Table 8 Pension Underfunding and

Public Employment Outcomes in Adjacent Counties

This table presents the results of the test of public employment outcomes and pension underfunding in adjacent counties. lnPayroll is the natural log of total payrolls to public employees in a given county. lnFTEE is the natural log of full-time equivalent public employees at the county level. Underfunding is the difference of the state-level net pension liabilities (total pension liabilities – total pension assets) as a percentage of total state GDP in year t-1. POST is an indicator that equals to 1 if the year is after 2014, and 0 otherwise. lnPerCapInc is the natural log of per-capita income of the county; lnRevenue is the natural log of county total revenues; lnPopulation is the natural log of the total population in a county. Coindex is the coincident index for the state; TotalWageRate is the total wage tax rate of the state; Debtratio is total debt outstanding as a percentage of total revenue at the state level; pctUnion is the percentage of employees in the state that are part of a public Union; Constraint is a categorical variable that ranges from 0 to 3 depending on the level of political constraint the state face to renegotiate pension benefits. Standard errors are clustered at the state-border level and individual state level. T-statistics are in parentheses and *** denotes significance at the 1% level, ** at 5% level, and * at 10% level.

VARIABLES	(1) lnPayroll	(2) lnPayroll	(3) lnPayroll	(4) lnFTEE	(5) lnFTEE	(6) lnFTEE
Underfunding*POST	-0.00**	-0.00***	-0.00	-0.00***	-0.00**	-0.00**
	(-2.13)	(-2.66)	(-1.51)	(-4.04)	(-2.40)	(-2.49)
Underfunding	0.00	0.00	0.00	0.01***	0.01***	0.01**
	(0.36)	(0.40)	(0.31)	(4.62)	(3.61)	(2.45)
POST	0.04***			0.63***		
	(35.74)			(11.80)		
lnPerCapInc	0.00	0.00	-0.00	-0.17*	-0.09	-0.11
	(0.37)	(0.00)	(-0.04)	(-1.74)	(-1.05)	(-0.82)
lnRevenue	0.02***	0.02***	0.02***	0.20***	0.20***	0.22***
	(4.63)	(4.94)	(4.64)	(3.05)	(3.03)	(3.03)
lnPopulation	0.03***	0.02***	0.02***	-0.17***	-0.16***	-0.17***
	(7.26)	(5.11)	(4.13)	(-2.27)	(-2.36)	(-2.26)
Coindex	-0.00	-0.00	-0.00	0.00***	0.01***	0.01***
	(-0.70)	(-1.15)	(-1.23)	(3.36)	(5.20)	(2.68)
TotalWageRate	0.00***	-0.01***	-0.00	0.00	0.05***	0.06***
	(2.76)	(-3.08)	(-1.03)	(0.07)	(3.71)	(2.73)
Debtratio	0.01	0.00	0.01	0.33***	0.41***	0.45***
	(1.36)	(1.12)	(1.22)	(3.35)	(3.90)	(2.70)
pctUnion	0.00	0.00	0.00	0.08***	0.08***	0.08***
	(1.66)	(1.34)	(1.09)	(4.26)	(3.97)	(3.74)
County-pair FE	Y	Y	N	Y	Y	N
Year FE	N	Y	N	N	Y	N
County-pair-Year FE	N	N	Y	N	N	Y
Observations	13,483	13,483	12,018	8,427	8,427	8,427
R-squared	0.97	0.98	0.98	0.82	0.83	0.80

Table 9 Pension Underfunding and

County Business Pattern in Adjacent Counties

This table presents the result of the test of the impact of pension funding status on the number total establishments in adjacent counties. lnEST is the natural log of the number of business establishments in the county in year t; Underfunding is the state-level net pension liabilities (total pension liabilities – total pension assets) as a percentage of total state GDP in year t-1; POST is an indicator that equals to 1 if the year is after 2014, and 0 otherwise. PropTaxRate is the county level property tax rate; lnPerCapInc is the natural log of per-capita income of the county; lnRevenue is the natural log of the county's total revenues; lnPopulation is the natural log of county level population; IncTaxRate is the marginal income tax rate of the state; Coindex is the coincident index of the state; Debtratio is total debt outstanding as a percentage of total revenue at the state level. All standard errors are clustered at the state-border level and individual state level. T-statistics are in parentheses and *** denotes significance at the 1% level, ** at 5% level, and * at 10% level.

VARIABLES	(1) lnEST	(2) lnEST	(3) lnEST
Underfunding*POST	-0.02**	-0.02**	-0.03*
	(-2.07)	(-2.03)	(-1.74)
Underfunding	0.01	0.01	0.01
	(1.48)	(1.48)	(0.17)
POST	0.48**		
	(2.09)		
PropTaxRate	-0.74***	-0.86***	1.11
	(-2.83)	(-3.56)	(0.66)
lnRevenue	-0.20	-1.05**	-1.46
	(-0.49)	(-2.19)	(-0.98)
lnPerCapInc	0.74**	1.04***	1.32**
	(2.24)	(3.20)	(2.48)
lnPopulation	-0.05	0.71	1.21
	(-0.11)	(1.40)	(0.71)
IncTaxRate	-0.00	-0.01	0.04
	(-0.00)	(-0.42)	(0.46)
Coindex	-0.00	-0.00	0.02
	(-0.57)	(-0.26)	(0.95)
Debtratio	0.52	0.65	-1.79
	(1.28)	(1.46)	(-1.18)
County-pair FE	Y	Y	N
Year FE	N	Y	N
County-pair-Year FE	N	N	Y
Observations	10,442	10,442	8,970
R-squared	0.75	0.75	0.73

Table 10 Pension Underfunding and Housing Price Growth: California

This table provides the results of the test of local housing price growth and pension burden of the cities in California. AvgSaletoListYoY is the year-to-year change in the average number of sales divided by total listings in the city. InventoryYoY is the total year-to-year change in the city's total housing inventories. MedSalePriceYoY is the year-to-year change in the median sales price of the houses in the city. lnPensionBurden is the natural log of the total pension liabilities per household of the different cities in California. lnRevenue is the natural log of the per capita revenues of the city. PropTaxRate is the secured property tax rate of the city. The standard errors are clustered at the county-level. T-statistics are in parentheses and *** denotes significance at the 1% level, ** at 5% level, and * at 10% level.

VARIABLES	(1) AvgSaleto ListYoY	(2) AvgSaleto ListYoY	(3) Inventory YoY	(4) Inventory YoY	(5) MedSale PriceYoY	(6) MedSale PriceYoY
lnPensionBurden * POST		-0.01**		0.07***		-0.01*
		(-2.45)		(3.43)		(-2.53)
lnPensionBurden	-0.01***	0.00	0.06***	0.03	-0.01*	-0.00
	(-3.27)	(0.92)	(3.42)	(1.65)	(-1.97)	(-1.06)
lnRevenue	0.00	0.00	-0.05	-0.05*	-0.01**	-0.01**
	(1.53)	(0.96)	(-1.38)	(-1.72)	(-2.23)	(-2.23)
PropTaxRate	0.01	0.00	-0.45	-0.48	-0.02	-0.01
	(0.60)	(0.02)	(-1.21)	(-1.32)	(-0.21)	(-008)
Year FE	Y	Y	Y	Y	Y	Y
County FE	Y	Y	Y	Y	Y	Y
Observations	1,545	1,545	1,545	1,545	1,545	1,545
R-squared	0.19	0.19	0.33	0.34	0.19	0.19

Table 11 Pension Underfunding and Housing Price Growth

in Neighboring Zip Codes in California

This table presents the regression results of the housing price growth difference in neighboring zip code and city-level pension burden. lnPensionBurden is the natural log of the total pension liabilities per household of the different cities in California. lnRevenue is the natural log of the per capita revenues of the city. PropTaxRate is the secured property tax rate of the city. All standard errors are clustered at the city-border level. T-statistics are in parentheses and *** denotes significance at the 1% level, ** at 5% level, and * at 10% level.

Panel A Distance between two zip codes <10 miles

VARIABLES	(1) HPG	(2) HPG	(3) HPG	(4) HPG	(5) HPG	(6) HPG
lnPensionBurden*POST				-0.88***	-1.47***	-1.32*
				(-9.73)	(-3.57)	(-1.86)
lnPensionBurden	-2.30***	-1.01**	-0.47***	-0.54***	-1.00	-1.35
	(-5.04)	(-2.07)	(-3.80)	(-5.94)	(-1.18)	(-1.34)
lnRevenue	0.83*	0.91	0.71*	4.25***	0.77	-15.79*
	(1.95)	(1.58)	(1.96)	(5.05)	(1.27)	(-1.72)
POST				1.42***		
				(14.91)		
PropTaxRate	4.50**	3.02*	3.22**	4.10***	2.70*	2.80
	(2.09)	(1.99)	(2.67)	(6.17)	(1.93)	(1.04)
Zipcode-Pair FE	Y	Y	N	Y	Y	N
Year FE	N	Y	N	N	Y	N
Zipcode-Pair * Year FE	N	N	Y	N	N	Y
Observations	18,519	18,519	10,893	18,519	18,519	10,893
R-squared	0.37	0.59	0.84	0.47	0.59	0.84

Panel B Distance between two zip codes <5 miles

VARIABLES	(1) HPG	(2) HPG	(3) HPG	(4) HPG	(5) HPG	(6) HPG
lnPensionBurden*POST				-0.84***	-1.86***	-1.66*
				(-7.24)	(-4.26)	(-1.91)
lnPensionBurden	-2.79***	-1.67***	-0.11	-0.84	0.82	1.62
	(-7.05)	(-3.19)	(-1.32)	(-1.13)	(0.89)	(1.67)
lnRevenue	1.12***	0.84***	-0.10	0.68***	0.80***	-0.13
	(7.02)	(5.67)	(-0.83)	(4.77)	(5.37)	(-1.05)
POST				2.37***		
				(2.64)		
PropTaxRate	6.49***	3.78**	3.63***	3.71**	2.91*	3.39***
	(4.86)	(2.09)	(3.60)	(2.65)	(2.16)	(3.38)
Zipcode-Pair FE	Y	Y	N	Y	Y	N
Year FE	N	Y	N	N	Y	N
Zipcode-Pair * Year FE	N	N	Y	N	N	Y
Observations	3,741	3,741	2,393	3,741	3,741	2,393
R-squared	0.24	0.48	0.81	0.40	0.48	0.81