Individualism and Housing Bubbles

A Thesis

in

The John Molson School of Business

Presented in Partial Fulfillment of the Requirements for the Degree Master of Science in Administration (Finance Option) at

Concordia University

Montreal, Quebec, Canada

October 2017

© Yawen Mao, 2017

CONCORDIA UNIVERSITY

School of Graduate Studies

This is to certify that the thesis prepared

By: Yawen Mao

Entitled: Individualism and Housing bubbles

and submitted in partial fulfilment of the requirements for the degree of

MASTER OF SCIENCE IN ADMINISTRATION (FINANCE)

complies with the regulations of this University and meets the accepted standards with respect to originality and quality.

Signed by the final Examining Committee:

Dr. SunAh Kim______________ *Chair*

Dr. Ravi Mateti_____________ *Examiner*

Dr. Saif Ulah______________ *Examiner*

Dr. Tingyu Zhou___________ *Supervisor*

Approved by____

Chair of Department or Graduate Program Director

_________2017____

Dean of Faculty

Abstract

This paper investigates the correlation between individualism and housing bubbles. Individualistic culture could affect human behavior by cultivating overconfidence. People in individualistic environments are more confident about themselves and more likely to attribute their success to their own effort than those in collectivist areas. I measure individualism by extending a collectivism index proposed by Vandello and Cohen (1999). Housing bubble/bust is measured as the absolute value of the proportion of housing price unexplained by housing market fundamentals. Based on a panel data of 6,730 observations in 355 U.S. MSAs during 1990-2015, I find that individualism is positively associated with the housing bubble/bust proxy (*HBP*), indicating that housing markets are less efficient and investors are more irrational in more individualistic areas. To mitigate the concern of endogeneity and omitted variables, I construct an instrumental variable (IV) using the total number of local congregations. My findings are robust to IV tests, alternative sample periods and model specifications.

Acknowledgement

First of all, I would like to thank my supervisor Dr. Tingyu Zhou. The door of her office is always open for me whenever I have questions and difficulties with my thesis. Without her suggestions, patience and encouragement, I could not complete this thesis.

I also deeply appreciate my committee members Dr. Saif Ulah and Dr. Ravi Mateti for their insightful comments to help me improve my thesis.

And I would like to thank all my friends in Concordia University for their accompany and help during the recent two years in Montreal. Especially Concordia librarian Rajiv Johal and my good friend Joseph Decoste, interesting discussions with them inspired me a lot.

Last but not least, I want to express my gratitude to my parents for always supporting me when I was writing this thesis. Although they could not accompany me when I was working hard, their selfless love was with me all the time.

Table of Contents

Abstract ii

Acknowledgement iv

1. Introduction 1

2. Literature review & Hypotheses development 3

  2.1 Housing bubbles 3

  2.2 Individualism-collectivism culture dimension 4

  2.3 Overconfidence, inefficient markets and housing bubbles 5

  2.4 Hypotheses development 6

3. Data 6

  3.1 Housing prices measure 7

  3.2 Fundamentals 7

  3.3 Collectivism index 8

  3.4 Instrumental variable 9

4. Methodology 9

5. Results 10

  5.1 Summary statistics 10

  5.2 Fundamental regressions 12

  5.3 Score regressions 14

    5.3.1 Baseline regressions 14

    5.3.2 Regressions of big MSAs sample 15

    5.3.3 Regressions of 2000-2010 sample 15

    5.3.4 Regressions of business cycle sample 16

6. Robustness tests 17

  6.1 Alternative big MSAs sample 17

  6.2 Alternative methods for business cycle 18

  6.3 Clustered standard deviation results 19

7. Conclusion 19

Reference 20

Figures 23

Tables 26

Appendix 42

1. Introduction

Housing bubbles have been a popular topic in real estate studies in recent years especially since the global financial crisis (GFC) in 2008. The term "bubble" indicates that housing markets are not efficient and investors are not rational (Case and Shiller, 1988; Case and Shiller, 1990; Lai and Order, 2010; Abraham and Hendershott, 1996; Ambrose, Eichholtz and Lindenthal, 2013; Anenberg, 2016; Glaeser and Nathanson, 2015; Ling, Ooi and Le, 2015; Soo, 2015). However, the majority of studies in this field focus on the relationship between fundamentals and housing prices (Gelain and Lansing, 2013; Goswami, Tan and Waisman, 2014; Himmelberg, Mayer and Sinai, 2005; Glaeser, Gyourko, and Saiz, 2008; Glaeser and Gyourko, 2006; Mikhed and Zemcík, 2007).

They investigate how fundamentals change during boom and recession periods and rely on the failure of fundamentals in explaining housing prices to identify housing bubbles. There is little literature investigating investors' sentiment and pointing to the origins of irrational behaviour. Understanding determinants of bubbles in a behavioural finance context is still important.

According to culture studies, individualistic culture affects human behavior by cultivating overconfidence. People in individualistic environments are more confident in themselves and more likely to attribute their success to their own effort than those in collectivist areas. The influence of individualism fostered overconfidence has already been confirmed by previous studies in contributing to momentum effects in stock markets (Chui, Titman, and Wei, 2010; Hillert et al., 2014). However, evidence in housing markets has not been found.

In this paper, I test how individualism driven overconfidence affects housing bubbles/busts (unexplained proportions of housing prices). First, I regress housing prices on fundamentals to obtain residuals (the unexplained part). I divide the residual by the local housing price and define the absolute value of this fraction as housing bubble/bust proxy (*HBP*). As for the individualism-collectivism measure, I follow the methodology of Vandello and Cohen (1999) to create a collectivism index. I take the sum of the eight standardized components and linearly transform it into a collectivism score. Second, I regress the unexplained proportions of housing prices on collectivism scores and control variables as my main analysis. I find that collectivism scores are negatively correlated with the housing bubble/bust proxy. Analysis of fixed effects show that the effect is mainly cross-cities, and marginally time-varying.

In order to avoid a potential omitted variable problem, I use the total number of congregations as an instrumental variable to conduct two-stage analysis. The number of local congregations is a valid instrumental variable because it is associated with local individualism-collectivism culture but it is not directly linked to local housing prices. I regress collectivism scores on the IV (total number of congregation) to obtain predicted collectivism scores to replace real collectivism scores in score regressions. My findings are robust in both OLS and 2SLS panels and 2SLS results are more significant than OLS results.

To confirm the consistency of my findings in large MSAs and to show the effect of individualism during different market conditions, I use four different samples of my main analysis: the whole sample, the big MSAs sample, the 2000-2010 period sample and the business cycle sample. Sample results for these last two show that the recent business cycle reduces the effect of individualistic culture on housing market, particularly during expansion and boom periods.

To test the robustness, I conduct alternative tests using 1) an alternative big MSAs sample 2) two different methods for business cycle periods and 3) cluster standard deviation results. The results are robust for my findings.

In sum, this is the first paper investigating the effect of individualism driven overconfidence on housing bubbles/busts to my knowledge. This paper contributes to the sociological and psychological literature of culture dimensions. The findings of this paper imply that individualistic culture affects housing market investors' decision making, which is an evidence of behavioral finance theories. More importantly, this paper identifies individualistic culture as a contributor of housing bubbles/busts, extending housing bubble research. As discussed above, many housing bubble studies focus on the relationship between housing prices and fundamentals, but very little research directly investigates the effect of investors' sentiment on housing market ups and downs. The research that does exist is mainly based on surveys or news and does not point out the true origins and factors of sentiment. Particularly, there is no research applying the individualism driven overconfidence to the housing market nor relating the individualism-collectivism dimension with housing bubbles.

The rest of this paper is structured as follows. Section 2 includes literature review and hypotheses development. Section 3 provides the data source and variable construction. Section 4 illustrates my main methodology. Summary statistics and empirical results are explained in Section 5. Section 6 summarizes robustness tests and Section 7 concludes with an overview of the findings and limitations of this paper.

2. Literature review & Hypotheses development

2.1 Housing bubbles

Although the power of fundamental variables in explaining housing prices has already been justified, a large number of housing market studies show that the housing market is inefficient.

Case and Shiller (1988) investigate the single family market in four Metropolitan areas in the U.S. and find a momentum effect in real housing prices. They confirm that the market is inefficient in later work (Case and Shiller, 1990). Momentum in U.S. housing price appreciation during 1980-2005 period is also identified by Lai and Order (2010). Abraham and Hendershott (1996) construct a fundamental equilibrium model for data of over 30 U.S. cities in 15 years and find that the equilibrium price can explain only two-fifths of the real price appreciation. The mispricing of housing prices can also be long lasting (Ambrose, Eichholtz and Lindenthal, 2013). Anenberg (2016) studies this further and shows the mechanism by which imperfect housing market information affects individual sellers' behaviour and market dynamics.

According to housing market inefficiency research, a housing bubble is identified when fundamental factors fail to explain housing prices (Stiglitz, 1990; Case and Shiller, 2003; Mikhed and Zemcík, 2009; Abraham and Hendershott, 1996). Namely, a housing bubble is the unexplained part of housing prices. There are mainly three ways to compare housing prices to fundamentals.

The first way is to employ a rent-price ratio as an indicator of a bubble. For example, Ambrose, Eichholtz and Lindenthal (2013) investigate the rent-price ratio in Amsterdam from 1650 to 2005 to show that it can take decades for the market to adjust back to benchmark. At the same time, Gelain and Lansing (2013) find that high volatility in the price-rent ratio from 1960 to 2013 in the U.S. cannot be explained by their asset pricing model. A cross-sectional analysis of 22 U.S. regions exhibits persistent unexplained high price-rent ratios after 2002 (Goswami, Tan and Waisman, 2014). However, Himmelberg, Mayer and Sinai (2005) suggest that price-rent ratios at the metropolitan areas level is not an appropriate measure of a local bubble because it ignores the effect of local variables such as housing supply elasticity.

The second approach is to look at the supply side and to use housing construction costs as a benchmark. Glaeser, Gyourko, and Saiz (2008) suggest that there are less frequent and shorter housing bubbles in more elastic housing supply areas. Although in some of these areas, large housing booms happened in 2003-2008 period, the market adjusted to construction costs quickly. The power of construction costs is also confirmed by Gyourko and Saiz (2004) and Mayer and Somerville (2000).

Last but not least, a more intuitive way to see housing bubbles is to apply a local economic model including variables such as population, income and employment, since a housing bubble is a local phenomenon (Himmelberg, Mayer and Sinai, 2005). This notion originates from the urban real estate model proposed by Alonso (1964). The author shows that the equilibrium housing price is determined by local wages and amenities. Following this urban approach, Glaeser and Gyourko (2006) create a model of housing prices including local variables: population, income, interest rates and supply elasticity and they confirm that housing markets are largely local, not national.

Many studies do find empirical evidence of local housing bubbles. Abraham and Hendershott (1996) find that income growth, construction costs, and after tax interest rates cannot support the real housing price appreciation during 1979-1995. They identify housing bubbles/busts as the deviations between real housing prices and their model fundamental prices. Furthermore, Lai and Order (2010) generate an error term as housing bubbles from a local fundamental model and study the errors for different metropolitan areas to understand the price momentum after 1999. They further divide MSAs into bubble and non-bubble groups and show different performance of market variables between groups. Additionally, by examining MSA panel data, Mikhed and Zemcík (2007) develop a bubble indicator based on overlapping 10-year intervals, price-rent ratios, and panel tests for rents and prices.

2.2 Individualism-collectivism culture dimension

Individualism-collectivism is probably the most important dimension of culture in sociology literature (Vandello and Cohen, 1999; Triandis et al., 1988; Triandis, 2001; Mezei, 1974; Mead, 2002).

According to Hofstede (1980), and Markus and Kitayama (1991), individualism is a social framework where people regard themselves more as independent individuals and only care about themselves and their close families. In contrast, collectivism is a community culture where people see themselves as part of a community and feel less differentiated from others. This culture dimension is reflected on local people's attitudes and behavior (Triandis et al., 1988). People in individualistic cultures center on themselves and tend to be independent from the others, while collectivist cultures focus on the group and emphasize on the relationship within communities (Markus and Kitayama, 1991; Triandis, 1995).

Therefore, individualism (usually in North American countries) fosters overconfidence and collectivism (mostly in Asian countries) cultivates modesty (Bond, Leung and Wan, 1982; Triandis, 2001). Markus and Kitayama (1991) point out that individualists tend to be overconfident and self-attributed. One of their main findings is that American people are more confident of their own abilities, thinking them to be above the average, but people from more collectivist countries do not. This is also consistent with implications of Heine et al (1999)'s children research and findings of many others (Bellah et al., 1985; Greenfield and Suzuki, 1998; Markus et al, 1997).

2.3 Overconfidence, inefficient markets and housing bubbles

Overconfidence bias can explain inefficient markets according to previous studies. Odean (1998) develops a traders' overconfidence model based on information distribution. He finds that overconfidence increases trading volume and market depth but harms the utility of overconfident traders. In addition, stock return momentum and excess volatility are found to be consequences of this overconfidence (Daniel, Hirshleifer, and Subrahmanyam, 1998).

More specifically, individualism fostered overconfidence has already been tested and confirmed as a determinant for abnormal returns in stock markets. Chui, Titman, and Wei (2010) use the individualism index developed by Hofstede (2001) as a measure of local culture and find that trading volume, volatility and the magnitude of momentum profits increase with the level of individualism. Similarly, Hillert, Jacobs and Müller (2014) prove that individualism driven overconfidence can explain significant momentum profits and long-term reversals. Specifically, they employ collectivism scores for U.S. states from Vandello and Cohen (1999) to sort the stock portfolios and they find that the momentum effects as well as the long-term reversals in individualistic areas are more pronounced than in collectivist areas.

On the other hand, housing market participants are overconfident and investors' expectations play a role in contributing to housing bubbles/busts. Home buyers are found to be overconfident about themselves so that they fail to forecast housing busts (Glaeser and Nathanson, 2015). Relying on a survey, Ling, Ooi and Le (2015) demonstrate that home buyers, builders and lenders' sentiment affects housing price appreciation and the effect is felt beyond fundamentals. By analysing local news tones, Soo (2015) shows that investors' sentiment has predictive power for future housing prices. In addition, Stiglitz (1990) concludes that housing bubbles come from investors' expectations, not fundamentals. A similar definition is also used by Case and Shiller (2003). In their paper, a housing bubble refers to "a situation in which excessive public expectations of future price increases cause prices to be temporarily elevated".

2.4 Hypotheses development

Since local individualism culture traits affect investors' behavior and investors' sentiment influences housing prices, there should be a relationship between individualistic culture and housing bubbles. Thus, when the local culture is more collectivist, people are less likely to have overconfidence bias and there are less housing bubbles and busts. In this paper, I construct a collectivism score index following Vandello and Cohen (1999) to measure local individualism-collectivism culture. The higher the score, the more collectivist the local culture. I use the proportion of the unexplained part of local housing prices as a housing bubble/bust proxy. Thereby, a hypothesis can be formulated as below.

Hypothesis 1: Collectivism scores and the housing bubble/bust proxy are significantly negatively correlated.

Meanwhile, according to the urban literature, a housing bubble/bust is a local phenomenon. The effect of individualism driven overconfidence on housing bubbles/busts should also be mostly local. This leads to the second hypothesis below.

Hypothesis 2: The relation between collectivism scores and the housing bubble/bust proxy is mainly cross-sectional.

3. Data

In this paper, I construct panel data from 1990 to 2015 for 355 Metropolitan statistical areas (MSA) in the U.S. to conduct my analysis. A MSA is a highly populated and urbanized geographical concept introduced and commonly used by U.S. Census Bureau. Table 1 summarizes definitions of all the variables.

[Insert Table 1 here]

3.1 Housing prices measure

The measure for housing prices (*hp*) is the all-transactions FHFA Housing Price Index (HPI) for MSA's in the U.S. I convert the quarterly data into annual data by taking means of the four quarters in the same year. The data is available from the website of the American Federal Housing Finance Agency. This index is estimated using both sales prices and appraisal data. The sample includes data from 1990 to 2015.

3.2 Fundamentals

I follow the selection of fundamental variables of Case and Shiller (2003) but I use housing permits instead of housing starts because MSA housing starts data during 1990-2015 is not complete. My fundamental variables are summarized as follow:

- *income* is measured by personal income per capita (thousands) and the yearly data by MSA from 1990 to 2015 is from Bureau of Economic Analysis;
- *population* data (thousands) is from U.S. Census Bureau Population and Housing Unit Estimates. From 1990 to 2000, population estimates data is not available at the MSA level. Instead, I merge Population County Intercensal datasets with County and MSA County Crosswalk data by FIPS (County code) and CBSA code (MSA code) to construct annual MSA population for 1990-2000 period and combine it with the data from 2001 to 2015;
- *employment* data by MSA from 1990 to 2015 is measured by Total Full-Time and Part-Time Employment (thousands) and is also available at Bureau of Economic Analysis website.
- *unemployment rate* (%) by MSA/year from 1990 to 2015 is from Civilian labor force and unemployment by metropolitan area (Seasonally Adjusted) dataset from the Local Area Unemployment Statistics on the Bureau of Labor Statistics website.
- *mortgage rate* (%) is annual average mortgage interest rates on thirty-year fixed rate mortgages. Mortgage interest rate is the same for all the states in U.S. in the same year. The data is from Freddie Mac.
- *permits* is the number of units (thousands) of new privately-owned residential construction in each year. The data is from U.S. Census Building Permits Survey. Because data at the MSA level is not available before 1995, I use the county level data from 1990 to 2015 and County to MSA crosswalk dataset to construct MSA level housing permits data.

3.3 Collectivism index

I follow Vandello and Cohen (1999) and extend their collectivism index to measure local individualism-collectivism culture. There are eight items to construct the index. Most data for the items is from U.S. Census surveys. Annual data for each MSA from 2005 to 2015 for *percentage of people living alone (reversed scores), percentage of elderly people living alone (reversed scores), percentage of households with grandchildren in them, divorce to marriage ratio (reversed scores), ratio of people carpooling to work to people driving alone, percentage of self-employed workers (reversed scores)* is available from the U.S. Census American Community Survey (ACS). Data in 1990 and 2000 can also be found in U.S. census decennial surveys. Since U.S. census decennial survey data in 1990 is only available in PDF format, I manually collect the six index variables data for each MSA from census comprehensive summary tables. Because census reports in 1990, 2000 and later years do not use the same code system for MSAs and names of MSAs are not exactly the same, I can only determine and merge the data by MSA names and states by hand.

For the other two items: *percentage of people with no religious affiliation (reversed scores)* is only available in the years 1990 (by county), 2000 (by county) and 2010 (by MSA) from the Association of Statisticians of American Religious Bodies (ASARB) Religious Congregations and Membership Study. As above, I construct MSA data for 1990 and 2000 by combing the county data with the crosswalk dataset. I hand collect the county level data for *average percentage voting Libertarian over the last four presidential elections (reversed scores)*, from the website of Dave Leip's Atlas of U.S. Presidential Elections. I collect 1976 to 2012 presidential elections data and merge into MSA level and then calculate the average over the last four elections for each MSA/year during 1990 - 2015. The website sometimes reports neither the votes nor the percentage of the votes for Libertarian candidates in each county because they have too few votes. In that case, I use the percentage of votes out of Democratic and Republican candidates as a proxy.

Because the data for years between 1990 and 2000 and between 2000 and 2005 is missing for the former six variables, I interpolate the missing values by assuming the annual growth rate stays the same in the same period of time. Likewise, I also interpolate the data using the three years decennial data to get annual no religious affiliated percent data.

To generate the individualism-collectivism measure *score*, I standardize each of the eight items and take the sum of them for each MSA/year. To make the index readable and to avoid negative scores, I further multiply the sum with 5 and then plus 120.

3.4 Instrumental variable

My instrumental variable for collectivism scores in the 2SLS analysis in this paper is *congregation*, which is the number of congregations by MSA/year. The total number of congregations are not determined by the local housing price while it is correlated with culture traits like individualism. *congregation* data is also from ASARB Religious Congregations and Membership Study datasets. As with the no religious affiliation data, I merge county data into MSA data and interpolate missing years' data during 1990 to 2015.

Because of different data sources for all the variables, my final dataset is unbalanced and it includes 6,730 observations from 355 different MSAs from 1990 to 2015.

4. Methodology

To investigate the relationship between local collectivism scores and housing bubbles, I conduct a two-step analysis: 1) regress the local housing price on fundamentals to obtain the proportion of the unexplained part of the housing price; 2) regress it on collectivism scores and control variables. The proportion of the unexplained part of the housing price measures the magnitude of the local housing bubble/bust.

$$hp_{it} = \alpha_0 + \beta_k \, Fundamental_{it}^{k} + \epsilon_{it} \;\; (k = 1, 2, 3 \ldots 6) \qquad (1)$$

Equation (1) describes the first step analysis. hp is the housing price index, fundamentals are the six variables explained in the data section. ϵ is the error term in this model.

I then take residuals of this fundamental regression and divide them by housing prices. I also multiply the absolute value of the proportion by 100 to make it more readable. This figure represents the percent of housing prices that cannot be explained by the fundamentals in each MSA/year. Thus, I define it as *HBP* (housing bubble/bust proxy):

$$HBP_{it} = abs\left(\frac{residual_{it}}{hp_{it}}\right) * 100 \quad (2)$$

To see the relationship between collectivism-individualism dimension and *HBP*, I regress *HBP* from equation (2) on *score* which is the collectivism-individualism measure. I also use the variables $Fundamental^{k}$ in equation (1) as controls in this step. I also include fixed effects in my analysis. φ_i is either MSA fixed effects or Region fixed effects depending on specifications and ω_t is year fixed effects. τ_{it} is the error term of this model.

$$HBP_{it} = \alpha_1 + \gamma_1 score_{it} + \mu_k\ Fundamental_{it}^k + \varphi_i + \omega_t + \tau_{it}\ \ (k = 1, 2, 3 \ldots 6) \quad (3)$$

However, there is an omitted variable concern at this step. Some variables that are not included in equation (3) could be related to *HBP*. Therefore the inferences could be misleading in understanding the relationship between $score$ and *HBP*. To solve this potential problem, I use *congregation* as an instrumental variable for *score*. The distribution of congregations in U.S. reflects the local culture traits including individualism dimension but it should have no direct relation with local housing prices. I design a two-stage analysis in equation (4) and (5) by 1) instrumenting *score* with *congregation* for each MSA and 2) replacing predicted *score* with actual *score* in equation (3).

So the first stage is:

$$\widehat{score}_{it} = \alpha_2 + \delta congregation_{it} + \theta_k\ Fundamental_{it}^k + \varepsilon_{it}\ \ (k = 1, 2, 3 \ldots 6) \quad (4)$$

And the second stage is:

$$HBP_{it} = \alpha_1 + \gamma_1 \widehat{score}_{it} + \mu_k\ Fundamental_{it}^k + \varphi_i + \omega_t + \tau_{it}\ \ (k = 1, 2, 3 \ldots 6) \quad (5)$$

In equation (4), ε_{it} is the error term and α_2 is the constant.

5. Results

5.1 Summary statistics

[Insert Table 2 here]

Table 2 provides descriptive statistics of my final dataset, panel A gives a general picture of the panel. I identify 185 MSAs in 1990 and over 90% of them (173) have data in all the years during the 26 years period. Moreover, 224 out of 355 MSAs have balanced data during the 2000-2015 period.

Table 2 Panel C and Figure 1 shows that the U.S. housing market experienced a boom from 2004 to 2006 and then a bust from 2007 to 2010 because of the global financial crisis (GFC) in 2008. Since 2011, the market started to recover from the 2008 crisis and the housing price increased significantly. Therefore, I identify four periods during this recent business cycle: 2000-2003 is an expansion period; 2004-2006 is a boom period; 2007-2010 is a bust period; and 2011-2015 is a recovery period. This is generally consistent with the

National Bureau of Economic Research's publication of U. S. business cycle Expansions and Contractions[1].

[Insert Figure 1 & Figure 2 here]

Also, as Panel B of Table 2 shows, fundamentals, especially *permits*, *population* and *employment*, are highly correlated with each other and they are moving together with *hp* during this business cycle. Meanwhile, the number of congregations increases steadily, especially after 2000 (Table 2 Panel C).

To show the geographic pattern of individualism-collectivism clearly, I create a map of collectivism scores by taking means of all years data for each state in Figure 3 Panel A. For those MSAs located at the boundaries of more than one state, I include them in each state they belong to. Data of six states (VT, NH, ME, MA, RI and CT) in the North East Region is missing. To compare with previous studies of American individualism pattern, I also include the collectivism score map created by Vandello and Cohen (1999) in Figure 3 Panel B.

[Insert Figure 3 here]

The geographic patterns of individualism-collectivism generally remain similar with that shown by Vandello and Cohen (1999). As Panel A shows, the most collectivist areas are deep south states, namely South Carolina, Alabama, Georgia, Louisiana, Texas, Tennessee, Arkansas, and North Carolina. Utah and California are also very collectivist. Meanwhile, the most individualistic states concentrate on Mountain West and Great Plains (Montana, Wyoming, Nevada, Washington, Oregon, Nebraska, Colorado, and Kansas). In the northeast area, despite other missing states, New York also exhibits strong individualism. The most significant difference between this map and Vandello and Cohen (1999)'s map is Florida. It was relatively collectivist but becomes one of the most individualistic states in Figure 3.

Previous studies find that Northeast and West areas (Abraham and Hendershott, 1996) and coastal cities (Glaeser and Gyourko, 2006) have larger housing price fluctuations than other areas in U.S. Figure 3 shows that these areas are also more individualistic than the others. Furthermore, according to the literature, the high volatility of these local housing prices can

[1] The NBER (National Bureau of Economic Research) identified December 2007 as the most recent peak and June 2009 as the most recent trough turning point dates. See http://www.nber.org/cycles.html for more detailed information.

hardly be explained by fundamental models. As Figure 1 shows, the top 20 individualistic cities' average housing price is more volatile than the average housing price of all MSAs, mainly during the recent boom-bust period. After 2011, the former increases noticeably more quickly than the latter.

Because of this clear evidence, I suspect that individualistic culture affects the unexplained part of housing prices. In addition, I expect that the effect of individualism on the housing market is more cross-sectional, rather than time-varying, relative to the housing price fluctuation. Apparently, the consistency between Figure 3 Panel A and Panel B indicates that the individualism-collectivism culture trait across U.S. is roughly unchanged across time. Also, much smaller within (9.46) than between (19.37) standard deviation of collectivism scores in Table 2 Panel D suggests a very stable culture pattern over time. Therefore, the major variation of *score* is among cities rather than across years. Meanwhile the variation of housing prices comes from both dimensions: cross-sectional and time-varying standard deviations are not notably different (29.04 versus 34.66).

5.2 Fundamental regressions

To further investigate the relationship between collectivism-individualism culture and housing prices, I first regress the housing price on fundamental variables to obtain the unexplained part of the housing price. I present results for four different samples in Table 3: (1) the whole sample, (2) a sample with big MSAs (population above the median); (3) a sample during the period that the average individualistic areas' housing price deviates the most from the average for all MSAs and (4) a sample with the data in the recent business cycle. The results are shown in Table 3.

[Insert Table 3 here]

Based on statistical significance, all of the six fundamental variables have strong explanatory power for *hp* in all four regressions. *income* and *population* represent the demand side while *permits* proxies for the supply side in the housing market. All of the three fundamentals have positive coefficients. This suggests that more populated and more developed areas have higher housing prices. *mortgage rate* provides credit supply for housing buyers. The negative sign of the coefficient indicates that the looser credit policy leads to easier financing for housing market investors. *unemployment rate* has a negative sign because the higher the unemployment ratio, the more people lose stable income sources and cannot afford to buy properties. *employment* negatively correlates with housing prices. This finding is consistent with Case and Shiller (2003). Their explanation is that the coefficients of *employment* may be affected by simultaneity in reduced form equations. *employment* influences the local housing price; meanwhile, increasing housing prices means higher costs of the housing arrangement for employees so that they give up local job markets and move to other cities (Case, 1986). It may also be that *employment* measures the local labor force but ignores immigrants. Many new immigrants are not part of local labor force but they significantly contribute to local housing price rises. Therefore, cities with a larger proportion of immigrants but less labor force have higher housing prices.

The fundamentals in total explain about 60% of housing prices in my whole sample results and in big MSA sample results. The explanatory power becomes much weaker during 2000-2015, covering only around 30% of housing prices. This is consistent with the data summary above that during the recent business cycle, the housing price is more volatile and fundamentals are not as useful as in understanding the housing market.

Then I plot *HBP* calculated from Table 3 Model 1. Figure 4 shows that in general, both the collectivist and the individualistic areas experienced similar housing bubble/bust fluctuations; however, individualistic areas always dominate collectivist areas in terms of the unexplained proportion of local housing prices. This is an evidence that the investors' investment decisions are affected by the local culture traits and the influence is long lasting and stable.

[Insert Figure 4 here]

When the housing market boomed and busted from 2004 to 2010, housing prices exhibited the most deviation from fundamentals. During the expansion period (2000-2003), fundamentals can explain on average 80%- 85% of local housing prices in individualistic areas each year and on average 85%-90% in collectivist areas each year. Since 2004, housing bubbles increase significantly up to more than 35% of local housing prices in individualistic areas and 25%- 30% in collectivist areas in 2006. After that, when the housing market started to go down in 2007, the average unexplained part of housing prices in both areas began to drop from 28% of local housing prices dramatically to below 15% and 10% in 2010 respectively. Nevertheless, individualistic cities exhibited noticeably more bubbles/busts (on average 5 to 10 percent of local housing prices) than collectivist cities since 2011.

Another finding from Figure 4 is that individualistic areas and collectivist areas have the least difference during the recent business cycle from 2000 to 2010. This indicates that behavior of housing market investors was less affected by individualism but more determined by the 2008 crisis.

5.3 Score regressions

In the second step, I regress *HBP* on *score* and add fundamental variables as controls using both OLS and 2SLS methods with *congregation* as an instrumental variable. I use both methods for the same four samples as Table 3 separately: the whole sample, the big MSAs sample, the 2000-2010 sample and the recent business cycle sample (using dummies for each of the four periods). In addition, to control time and local variables, for both regressions, I include three types of fixed effects: year fixed effects, MSA fixed effects and Region fixed effects. Region is determined by which region in the U.S. the MSA belongs to (Northeast, Midwest, South or West). If the MSA is on the boundaries of two or more regions, it depends on which region has more population in that MSA.

congregation is a valid instrumental variable for *score* in all samples in the first stages of 2SLS regressions because it passes the weak IV tests (F test of excluded instrument and Sanderson-Windmeijer F test) for all samples. The IV method requires an exclusion restriction which cannot be directly tested. The exclusion restriction asserts that *congregation* matters for housing bubbles only insofar as it changes collectivism scores. I argue that *congregation* affects the local individualism-collectivism culture which ultimately affects housing market behavior.

5.3.1 Baseline regressions

My baseline regression results in Table 4 suggest that collectivism scores are significantly negatively associated with the housing bubble/bust proxy, even after controlling fundamentals and instrumenting with the number of local congregations.

[Insert Table 4 here]

In Table 4 Panel A, *score* is significant at the 0.01 level in all regressions except Model 4 with both MSA and year fixed effects (significant at 0.1 level). Moreover, *score* coefficients in Region fixed effects models (Model 5 and Model 6) have smaller absolute values than in year fixed effects models (Model 2 and Model 4). This is consistent with my data summaries that most of the variation of *score* is from between MSAs but not from within MSAs.

While instrumented *score* exhibits more significant effects. In all models in Table 4 Panel B, *score* coefficients are significant at 0.01 level. 2SLS results suggest that 1 unit of *score* decrease is associated with at least 0.6 and at most 1.06 units of *HBP* increase. Moreover, *score* coefficient in Panel B Model 1 is more than 15 times of that in Panel A Model 1. More negative *score* coefficients in 2SLS models than in OLS models suggest that omitted variables cause a positive bias in estimated coefficients. Besides, when adding fixed effects, the size of *score* coefficient increases in most cases.

5.3.2 Regressions of big MSAs sample

[Insert Table 5 here]

Table 5 shows the results for the Big MSAs sample. Big MSAs are defined as MSAs with *population* above the median *population* (243,124.5) in the whole dataset. In general, the big MSAs sample results have a similar pattern as the whole sample. The effect of *score* on *HBP* is negative and significant. 1 unit of *score* decrease is associated with at most 0.65 (2SLS) unit of *HBP* increase. When adding MSA/Region fixed effects, not only size but also significance level decreases. The OLS table even has positive sign *score* coefficients in MSA fixed effects regressions, but these are barely significant. This also proves that the effect of the local individualism trait is more cross-sectional and less time-varying.

However, individualism has a weaker effect on housing bubbles/busts in big cities. The size and significance level of *score* coefficients in all regressions are distinctly smaller than those in Table 4.

5.3.3 Regressions of 2000-2010 sample

Figure 1 shows that during 2000-2010, the average housing price of individualistic areas deviates the most from that of all cities. To investigate the effect of *score* during this period, I replicate my analysis with a sample including only data from 2000 to 2010. Table 6 presents the results for this sample.

[Insert Table 6 here]

Different from results of Table 4 and Table 5, *score* coefficients in Table 6 have mainly reversed results in OLS regressions. In Panel A, OLS MSA fixed effects regressions (Model 3 and Model 4) have the only significant but positive *score* coefficients. In other models in OLS results, *score* coefficients are negative but not significant at all. While when I use instrumented *score* in Table 6 Panel B, the results become consistent with my previous findings that *score* negatively and significantly affects *HBP*. The explanatory power of *score* is still missing when adding MSA fixed effects. This large difference between OLS and 2SLS results suggests that during 2000 - 2010, the 2008 crisis and corresponding business cycle significantly affect U.S. housing market performance. As descriptive statistics show, there was an obvious housing market boom and a bust from 2000 to 2010. 2SLS method successfully controls omitted variables affected by the recent business cycle. Therefore the 2SLS results are similar with previous regression findings. In addition, the individualism effect is not weak: 1 unit of *score* decrease is related to up to 0.82 unit of *HBP* increase.

5.3.4 Regressions of business cycle sample

In light of patterns showing in the 2000 to 2010 sample, I wonder whether and how the recent business cycle after 2000 influences the relationship between the housing market and local culture. Based on my discussion of average housing price statistics and according to the NBER (National Bureau of Economic Research), there are 4 periods during the business cycle: 2000-2003 is an expansion period; 2004-2006 is a boom period; 2007-2010 is a bust period; and 2011-2015 as a recovery period. I therefore construct 4 dummy variables: *d1*, *d2*, *d3* and *d4* to represent each period. I include 4 score variables by multiply *score* and the four dummies respectively to replace the variable *score* in my previous regressions. I use *HBP* calculated from Table 3 Model 4 as the dependent variable in Table 7.

[Insert Table 7 here]

Table 7 Panel A shows that the effect of *score* is not robust, especially in 2004-2006 housing boom period. Fixed effects reduce the significance and sway signs of *score* in all periods. Four of six regressions have positive *score**d2* coefficients and three are significant at the same time. Only when the market started to revive in the recovery period (2011-2015), do the results become consistent with previous findings. For all periods, the most different results come from MSA fixed effects: all the coefficients of score interaction terms are positive in Model 3 and Model 4.

In Table 7 Panel B, instrumented *score* exhibits better results but similar patterns: most of the score dummy coefficients are negative, but the statistical significance is reduced by adding fixed effects, particularly MSA fixed effects. All the significant interaction term coefficients are negative and all score dummy coefficients in Model 3 and Model 4 are not significant. The 2000-2003 expansion period has the least robust score coefficients among all four periods.

In score regression tables above, coefficients of control variables are very significant and are robust in terms of both signs and sizes in most cases, which means that fundamentals have strong explanatory power for *HBP*. *income*, *population* and *permits* have positive coefficients, which means that more developed and urbanised areas have more volatile housing cycles. In these areas, the population density is higher and housing markets are mature so that markets can reflect housing investors and owners' sentiment quickly. *mortgage rate* has positive effects on *HBP* in most tables. One reason is that more credit supply advocates a housing boom. After controlling for MSA characteristics, higher *unemployment rate* contributes to less housing bubbles. *employment* is always negatively related with *HBP*. This may be due to the simultaneity relation between *employment* and *HBP* in reduced form equations (Case and Shiller, 2003). More *employment* may indicate high demand of housing. While local housing bubbles scare employees away (Case, 1986). Another explanation for negative *employment* coefficients is that the effect of non-labor immigrants is ignored in *employment*.

6. Robustness tests

6.1 Alternative big MSAs sample

To test the robustness of big MSA regressions, I use another method to reset my big MSAs sample and rerun the regressions. Specifically, I determine the big MSAs for each year by taking medians of *population* by year. For each particular year, I include MSAs with population over the median of that year as big MSAs. The results are shown in Table 8. The general pattern of the effects of *score* are robust in the alternative big MSA sample regressions. *scor*e is negatively related to *HBP*. Compared with baseline regression results, both the size and the significance of *score* coefficients are somewhat smaller. 2SLS shows better results than OLS results in general: for every model, the size of the *score* effect in 2SLS is about 20 times that in OLS; All the *score* coefficients are negative in the 2SLS table while 2 out of 3 are positive and only significant at 10 percent level in the OLS table. At the same time, all the control variables in Table 8 have similar sizes, signs and significance with Table 5 as well.

[Insert Table 8 here]

6.2 Alternative methods for business cycle

To test the effect in the recent business cycle since 2000, I use another two ways to conduct my analysis. Results of both confirm my previous findings.

First, I run the two-step analysis (both fundamental regression and score regressions) for each of the four periods separately. The results of my separate samples for the business cycle are summarized in Table 9. The effect of individualism is less pronounced during the recent business cycle. *score* loses much significance in explaining the housing bubble/bust proxy especially during 2004-2006 in both OLS and 2SLS regressions. Most of the significant *score* coefficients have negative signs, especially in 2SLS regressions.

[Insert Table 9 here]

2SLS regressions show better results than OLS regressions because potential omitted variables affecting housing markets are controlled by the instrumental variable. In Table 9, *congregation* is still a powerful instrumental variable for *score*. It passes the weak IV tests (F test of excluded instrument and Sanderson-Windmeijer F test) in the last three periods and is only close to being powerful in the first period (2000-2003)[2].

The second method is to use a dummy regression for each respective period of the business cycle sample during 2000-2015. For example, for expansion period 2000-2003, I use *d1, score*, the interaction term *score*d1* and the same controls as my independent variables. The dependent variable is *HBP* from Table 3 Model 4. The results are still similar with my previous findings in Table 7 and Table 9. The detailed results are included in Appendix in Table A1.

[2] The F value of excluded instrument and Sanderson-Windmeijer F value is both 8.12 and the usually used threshold is 10.

6.3 Clustered standard deviation results

For all score regressions I discussed above, I check clustered standard deviation by year and by MSA respectively. The significance level of *score* coefficients is robust in either clustered results. As an example, in Appendix Table A2 and Table A3, I show baseline regression results based on clustered standard deviation by year and by MSA respectively.

7. Conclusion

In this paper, I examine the correlation between individualism and housing bubbles/busts. Housing bubble/bust proxy is defined as the proportion of housing prices unexplained by fundamental variables. I measure individualism by extending a collectivism index proposed by Vandello and Cohen (1999).

My findings support both hypotheses: 1) Individualism driven overconfidence cultivates housing bubbles/busts and 2) the effect is mainly cross-sectional. Collectivism scores negatively influence the unexplained parts of housing prices. Both OLS and 2SLS show significant and negative coefficients of *score*. 2SLS results exhibit more significance than OLS results. The findings are robust in the whole sample and in the big MSAs sample.

Another finding is that the business cycle influences the effect of individualism culture. The score effect is only identified in 2SLS regressions during 2000-2010. During expansion and boom periods from 2000 to 2006, the score effect becomes weaker and is not robust in different test samples. Meanwhile, when markets revive from the crisis after 2010, the effect comes back to normal.

Robustness tests have mainly consistent results with my main analysis. Reconstructing samples and using interaction terms do not affect my findings. Clustering standard deviation results confirm significance levels of independent variables in all score regressions.

There are still some limitations of this study. First, my panel is unbalanced and some MSAs in the North East Region are missing because data are from various sources and MSAs are changing over time. Second, part of data for the components of *score* and for the instrumental variable are interpolated due to data unavailability, especially from 1990 to 2005. It therefore may not reflect the real change of individualism traits and congregation distribution over time.

Reference

Abraham, J. M., & Hendershott, P. H. (1996). Bubbles in Metropolitan Housing Markets. *Journal of Housing Research*, 191-207.

Ambrose, B. W., Eichholtz, P., & Lindenthal, T. (2013). House prices and fundamentals: 355 years of evidence. *Journal of Money, Credit and Banking*, *45*(2-3), 477-491.

Anenberg, E. (2016). Information frictions and housing market dynamics. *International Economic Review*, *57*(4), 1449-1479.

Bellah, R. (1985). *Habits of the heart: individualism and commitmentin American life*. Harper & Row.

Bond, M. H., Leung, K., & Wan, K. C. (1982). How does cultural collectivism operate? The impact of task and maintenance contributions on reward distribution. *Journal of Cross-Cultural Psychology*, *13*(2), 186-200.

Case, K. E. (1986). The market for single-family homes in the Boston area. *New England Economic Review*, *5*(6), 38-48

Case, K. E., & Shiller, R. J. (1988). The efficiency of the market for single-family homes.

Case, K. E., & Shiller, R. J. (1990). Forecasting prices and excess returns in the housing market. *Real Estate Economics*, *18*(3), 253-273.

Case, K. E., & Shiller, R. J. (2003). Is there a bubble in the housing market? *Brookings papers on economic activity*, *2003*(2), 299-342.

Chui, A. C., Titman, S., & Wei, K. J. (2010). Individualism and momentum around the world. *The Journal of Finance*, *65*(1), 361-392.

Daniel, K., Hirshleifer, D., & Subrahmanyam, A. (1998). Investor psychology and security market under-and overreactions. *The Journal of Finance*, *53*(6), 1839-1885.

Gelain, P., Lansing, K. J., & Mendicino, C. (2013). House prices, credit growth, and excess volatility: Implications for monetary and macroprudential policy.

Glaeser, E. L., & Gyourko, J. (2006). *Housing dynamics* (No. w12787). National Bureau of Economic Research.

Glaeser, E. L., & Nathanson, C. G. (2015). An Extrapolative Model of House Price Dynamics.

Glaeser, E. L., Gyourko, J., & Saiz, A. (2008). Housing supply and housing bubbles. *Journal of urban Economics*, *64*(2), 198-217.

Goswami, G., Tan, S., & Waisman, M. (2014). Understanding the cross-section of the US housing bubble: The roles of lending, transaction costs, and rent growth. *Journal of Financial Stability*, *15*, 76-90.

Greenfield, P. M., & Suzuki, L. K. (1998). Culture and Human Development: Implications for Parenting, Education, Pediatrics and Mental Health.

Gyourko, J., & Saiz, A. (2004). Reinvestment in the housing stock: the role of construction costs and the supply side. *Journal of Urban Economics*, *55*(2), 238-256.

Heine, S. J., Lehman, D. R., Markus, H. R., & Kitayama, S. (1999). Is there a universal need for positive self-regard?. *Psychological review*, *106*(4), 766.

Hillert, A., Jacobs, H., & Müller, S. (2014). Media makes momentum. *The Review of Financial Studies*, *27*(12), 3467-3501.

Himmelberg, C., Mayer, C., & Sinai, T. (2005). Assessing high house prices: Bubbles, fundamentals and misperceptions. *The Journal of Economic Perspectives*, *19*(4), 67-92.

Hofstede, G. (1980). Motivation, leadership, and organization: do American theories apply abroad?. *Organizational dynamics*, *9*(1), 42-63.

Hofstede, G. (2001). Culture’s consequences: Comparing values, behaviors, institutions, and organizations across cultures.

Kitayama, S., Markus, H. R., Matsumoto, H., & Norasakkunkit, V. (1997). Individual and collective processes in the construction of the self: self-enhancement in the United States and self-criticism in Japan. *Journal of personality and social psychology*, *72*(6), 1245.

Lai, R. N., & Van Order, R. A. (2010). Momentum and house price growth in the United States: anatomy of a bubble. *Real Estate Economics*, *38*(4), 753-773.

Ling, D. C., Ooi, J. T., & Le, T. T. (2015). Explaining house price dynamics: Isolating the role of nonfundamentals. *Journal of Money, Credit and Banking*, *47*(S1), 87-125.

Markus, H. R., & Kitayama, S. (1991). Cultural variation in the self-concept. *Multidisciplinary perspectives on the self*, 18-48.

Markus, H. R., & Kitayama, S. (1991). Culture and the self: Implications for cognition, emotion, and motivation. *Psychological review*, *98*(2), 224.

Mayer, C. J., & Somerville, C. T. (2000). Land use regulation and new construction. *Regional Science and Urban Economics*, *30*(6), 639-662.

Mezei, L. (1974). Factorial validity of the Kluckhohn and Strodtbeck value orientation scale. *The Journal of Social Psychology*, *92*(1), 145-146.

Mikhed, V., & Zemčík, P. (2009). Do house prices reflect fundamentals? Aggregate and panel data evidence. *Journal of Housing Economics*, *18*(2), 140-149.

Odean, T. (1998). Volume, volatility, price, and profit when all traders are above average. *The Journal of Finance*, *53*(6), 1887-1934.

Soo, C. K. (2015). Quantifying animal spirits: news media and sentiment in the housing market.
Stiglitz, J. E. (1990). Symposium on bubbles. *The Journal of Economic Perspectives*, *4*(2), 13-18.

Triandis, H. C. (1995). *Individualism & collectivism*. Westview press.

Triandis, H. C. (2001). Individualism-collectivism and personality. *Journal of personality*, *69*(6), 907-924.

Triandis, H. C., Bontempo, R., Villareal, M. J., Asai, M., & Lucca, N. (1988). Individualism and collectivism: Cross-cultural perspectives on self-ingroup relationships. *Journal of personality and social psychology*, *54*(2), 323.

Vandello, J. A., & Cohen, D. (1999). Patterns of individualism and collectivism across the United States. *Journal of personality and social psychology*, *77*(2), 279.

Figures

Figure 1. All cities and top 20 individualistic cities annual average housing prices

This figure shows annual average housing prices for all MSAs and for the top 20 individualistic MSAs respectively during 1990-2015. X axis is Year and Y axis is the average housing price index. Top 20 individualistic cities are 20 MSAs with smallest average *score* during this period.

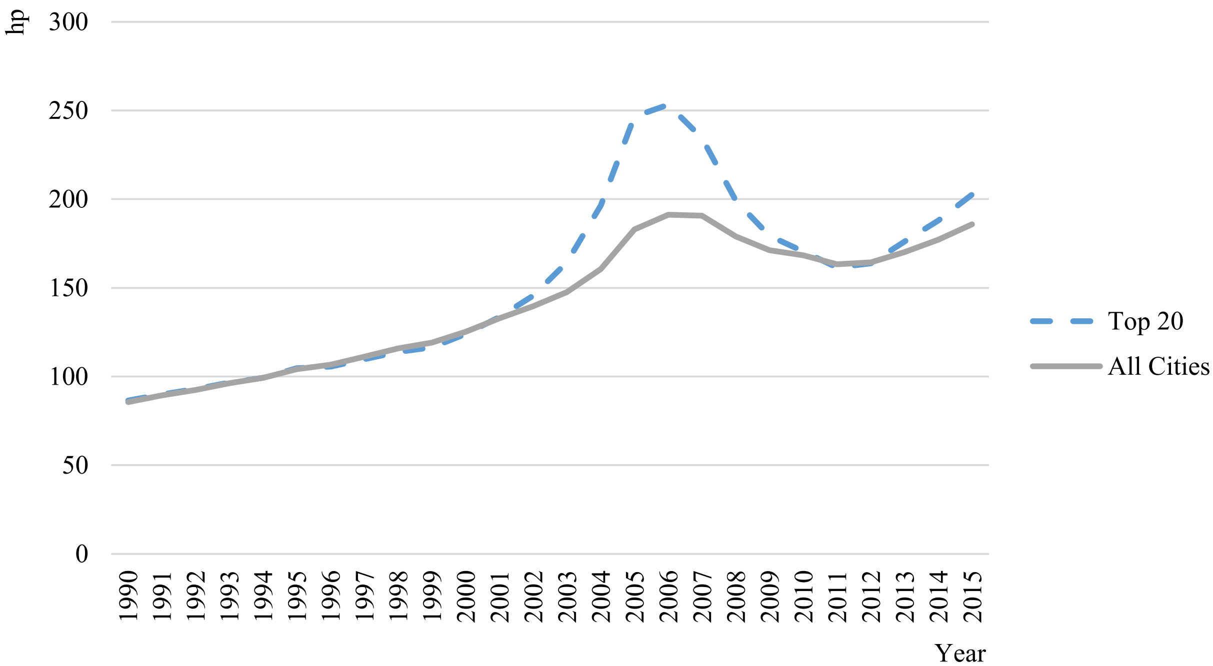


Figure 2. Annual average collectivism score

This figure shows annual average collectivism scores from 1990 to 2015. X axis is Year and Y axis is annual average *score*.

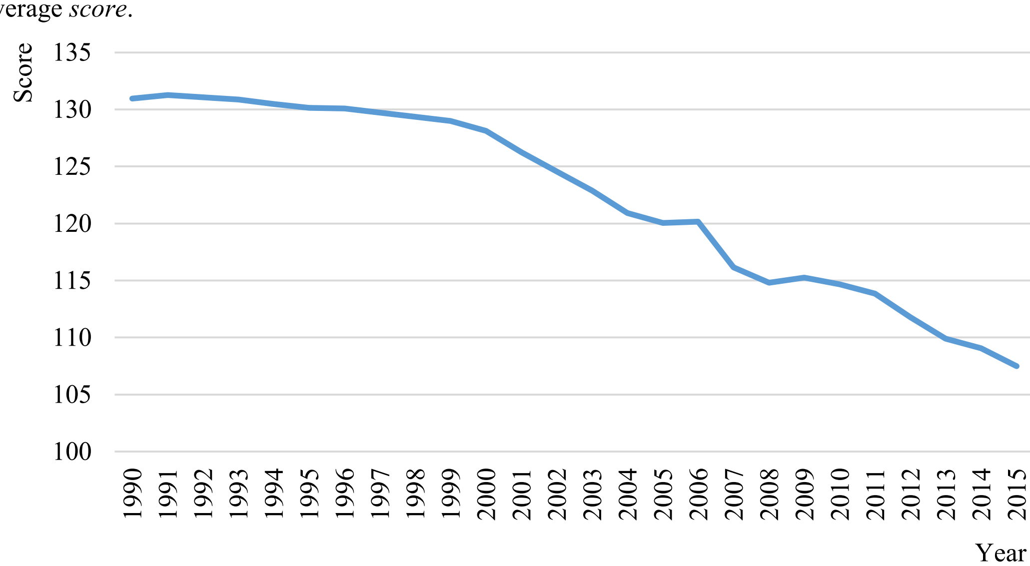
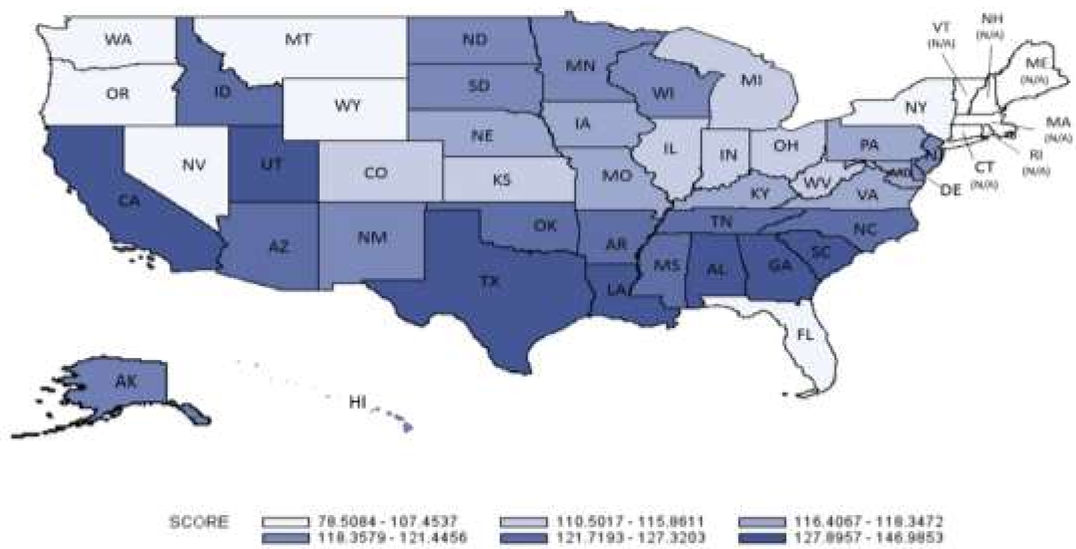


Figure 3. Collectivism score maps of U.S. States

Panel A is a U.S. state collectivism score map based on my collectivism index. To create the map, I classify MSAs by the states they belong to. For MSAs cross states, I include them in each state they belong to. Then I take the mean of collectivism scores of all the MSAs for all years in each state and draw the map based on the average score for each state. There are six levels of scores. The lighter colour means lower collectivism score and the more individualistic the state is. However, the scores of six states: VT, NH, ME, MA, RI and CT are missing.

Panel B is the collectivism score map shown on page 284 in "Vandello, J. A., & Cohen, D. (1999). Patterns of individualism and collectivism across the United States. *Journal of personality and social psychology*, *77*(2), 279. "

Panel A: Collectivism score map based on my collectivism index



Panel B: Collectivism score map by Vandello and Cohen (1999), page 284

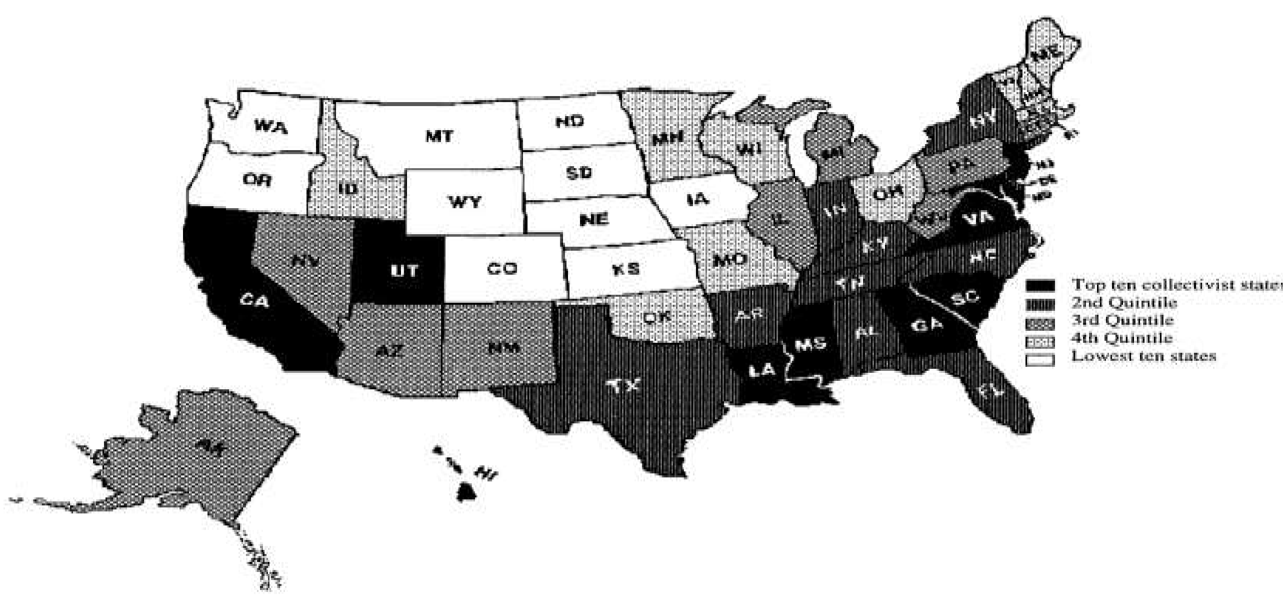
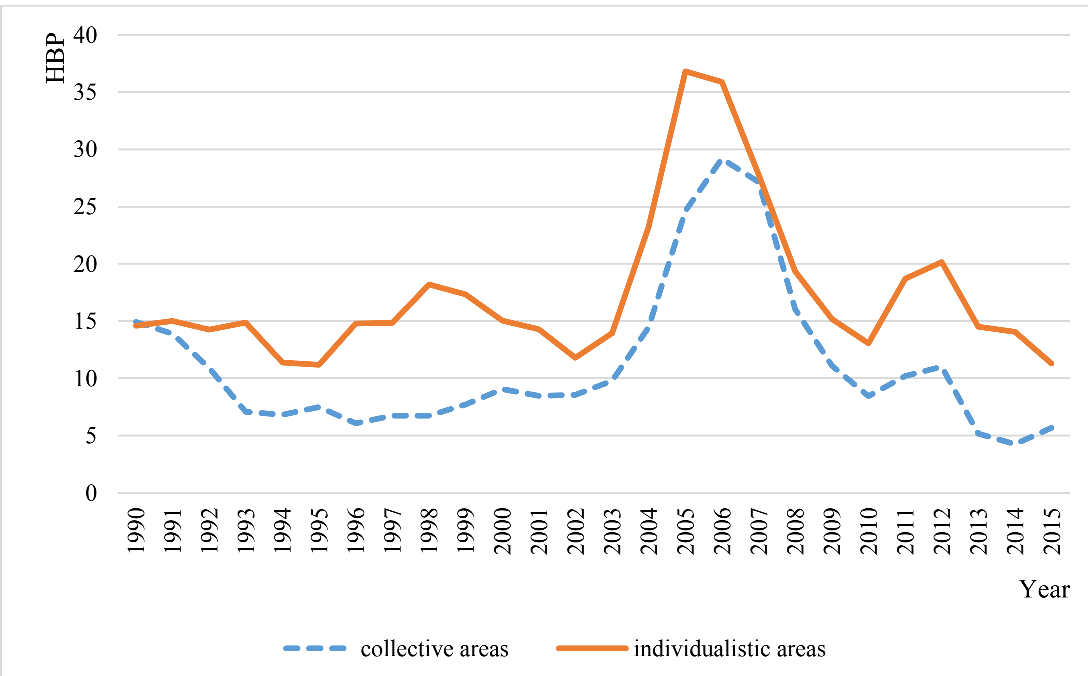


Figure 4. Average housing bubble/bust proxy of collectivist areas and of individualistic areas

This figure provides annual average housing bubble/bust proxy for collectivist areas and for individualistic areas. Housing bubble/bust proxy is defined as the absolute value of the fundamental regression residual divided by the local housing price and then multiplied by 100. X axis is Year and Y axis is the housing bubble/bust proxy (HBP) calculated from Model 1 in Table 3. Collectivist areas include the top 20 MSAs with highest average collectivism scores from 1990 to 2015. Accordingly, individualistic areas include the top 20 MSAs with lowest average collectivism scores from 1990 to 2015.



Tables

Table 1. Variable Definitions

Variables	Description	Source
Housing price measure		
hp	all-transactions FHFA Housing Price Index (HPI)	American Federal Housing Finance Agency; converted from quarterly data by taking means
Fundamentals		
income	personal income per capita (thousands)	Bureau of Economic Analysis
population	population (thousands)	U.S. Census Bureau Population and Housing Unit Estimates; 1990-2000 period data is converted from county level
employment	Total Full-Time and Part-Time Employment (thousands)	Bureau of Economic Analysis
unemployment rate	unemployment rate (%)	Local Area Unemployment Statistics in Bureau of Labor Statistics
mortgage rate	average mortgage interest rates on thirty-year fixed rate mortgages (%)	Freddie Mac
permits	the number of units of new privately-owned residential construction (thousands)	U.S. Census Building Permits Survey; converted from county level
Collectivism index components		
percentage of people living alone (reversed scores)		data from 2005 to 2015 is from U.S. Census American Community Survey (ACS); data in 1990 and 2000 is from U.S. census decennial surveys; data from 1991 to 1999 is constructed by interpolation
percentage of households with grandchildren in them		
percentage of elderly people living alone (reversed scores)		
divorce to marriage ratio (reversed scores)		
ratio of people carpooling to work to people driving alone		
percentage of self-employed workers (reversed scores)		
percentage of people with no religious affiliation (reversed scores)		data in 1990, 2000 and 2010 is from Association of Statisticians of American Religious Bodies (ASARB); data in missing years is from interpolation
average percentage voting Libertarian over the last four presidential elections (reversed scores)		Dave Leip's Atlas of U.S. Presidential Elections
Individualism- collectivism measure		
score	collectivism index score	the sum of standardized eight components multiplies 5 then plus 120
Instrumental variable		
congregation	the total number of local congregations	data in 1990, 2000 and 2010 is from Association of Statisticians of American Religious Bodies (ASARB); data in missing years is from interpolation

Dependent variable for score regressions		
HBP	the proportion the housing price unexplained by fundamentals	the absolute value of the residual of fundamental regression divided by housing price then multiplied by 100

Table 2. Descriptive statistics

Table 2 provides descriptive statistics. Panel A shows the number of MSAs in each year from 1990 to 2015. Panel B provides the correlation matrix of *hp*, fundamentals variables, *score* and the instrumental variable (*congregation*). Panel C reports average values of each variable for each year. Panel D shows the overall, between and within statistics for *hp* and *score*, including mean, standard deviation, the total number of observations, minimum and maximum.

Panel A: The number of MSAs for each year

Year	No. of MSAs
1990	185
1991	183
1992	193
1993	197
1994	198
1995	199
1996	199
1997	199
1998	199
1999	199
2000	236
2001	228
2002	228
2003	228
2004	228
2005	306
2006	313
2007	318
2008	318
2009	327

2010	328
2011	328
2012	328
2013	355
2014	355
2015	355

Panel B: Correlation Matrix of variables

	hp	income	employment	permits	population	mortgage rate	unemployment rate	congregation	score	HBP
hp	1.00									
income	0.73	1.00								
employment	0.12	0.23	1.00							
permits	0.08	0.07	0.78	1.00						
population	0.12	0.21	0.99	0.77	1.00					
mortgage rate	-0.65	-0.77	-0.04	0.07	-0.04	1.00				
unemployment rate	0.01	-0.01	-0.08	-0.15	-0.03	-0.25	1.00			
congregation	0.10	0.23	0.92	0.67	0.92	-0.10	-0.06	1.00		
score	-0.31	-0.43	0.04	0.12	0.05	0.38	0.02	0.06	1.00	
HBP	0.20	0.18	0.12	0.15	0.12	-0.04	-0.01	0.04	-0.11	1.00

Panel C: Average values for variables for each year

Year	hp	employment (thousands of labor force)	income (thousands of dollars)	permits (thousands of units)	population (thousands of persons)	unemployment rate	mortgage rate	score	congregation
1990	85.47	248.31	17.35	2.26	432.69	5.82	10.13	130.96	429.06
1991	89.27	240.62	17.79	2.02	428.67	6.72	9.25	131.25	415.24
1992	92.39	234.26	18.71	2.33	420.47	7.15	8.39	131.07	406.86
1993	96.17	236.64	19.28	2.58	421.4	6.72	7.31	130.87	405.38

1994	99.21	242.79	20.09	2.82	426.42	6.07	8.38	130.48	407.16
1995	104.08	249.38	20.94	2.79	428.55	5.7	7.93	130.14	409.2
1996	106.7	255.56	21.86	3.01	434.36	5.48	7.81	130.08	411.95
1997	111.18	261.96	22.82	2.97	440.52	5.11	7.6	129.72	414.7
1998	115.85	269.26	24.09	3.3	446.53	4.81	6.94	129.36	417.45
1999	119.03	274.96	24.89	3.55	452.49	4.52	7.44	129	420.2
2000	125.21	269.47	26.2	3.22	442.35	4.2	8.05	128.13	407.63
2001	132.76	277.07	27.25	3.49	466.09	4.86	6.97	126.25	430.91
2002	139.58	277.42	27.75	3.75	471.8	5.67	6.54	124.56	445.39
2003	147.57	279.8	28.61	4.08	477.41	5.86	5.83	122.87	459.88
2004	160.62	285.82	29.93	4.47	484.07	5.52	5.84	120.92	474.37
2005	182.83	300.62	31.58	4.64	506.13	5.24	5.87	120.06	482.08
2006	191.3	302.52	33.23	3.85	504.8	4.79	6.41	120.17	489.55
2007	190.64	305.65	34.73	2.85	505.87	4.71	6.34	116.14	497.38
2008	179.04	305.26	36.24	1.78	512.18	5.84	6.03	114.81	511.3
2009	171.26	289.27	34.93	1.19	506.18	9.2	5.04	115.27	515.39
2010	168.23	287.54	35.76	1.21	511.12	9.6	4.69	114.66	529.44
2011	163.27	292.84	37.61	1.22	516.76	8.95	4.45	113.84	543.66
2012	164.4	297.52	38.96	1.67	521.75	8.07	3.66	111.78	558.32
2013	170.12	287.26	39.09	1.91	499.71	7.42	3.98	109.89	546.56
2014	177.19	293.47	40.66	2.02	504.82	6.27	4.17	109.05	561.34
2015	185.78	300.23	41.99	2.17	510.13	5.49	3.85	107.48	576.57

Panel D:overall, between and within statistics of score and hp

Variable		Mean	Std Dev.	Min	Max	Obs
score	overall	120.38	19.63	1.93	205.32	N=6730
	between		19.37	29.86	188.80	n=355
	within		9.46	9.81	156.58	T-bar=18.96
hp	overall	148.97	42.19	62.80	364.15	N=6730
	between		29.04	118.31	284.84	n=355
	within		34.66	28.29	335.12	T-bar=18.96

Table 3: Fundamental regressions (Step 1)

This table provides results of fundamental regressions. The dependent variable is housing price index (*hp*) and the independent variables are six fundamentals discussed in the data section. *income* is income per capita in thousands of dollars; *population* is thousands of persons; *permits* is thousands of housing permits; *unemployment rate* and *mortgage rate* are in %; *employment* is thousands of jobs and constant is the intercept term. Model 1 is the whole sample results; Model 2 includes only the big MSAs which is defined as MSAs with population over the median of the whole sample; Model 3 uses the data from 2000 to 2010; Model 4 uses the data during the recent business cycle from 2000 to 2015. Standard errors in parentheses. Stars indicate p-value as * p < 0.05, ** p < 0.01 and *** p < 0.001.

Dependent variable: hp	(1) All data	(2) Big MSAs	(3) 2000-2010	(4) Business cycle
income	2.869***	3.460***	3.023***	2.502***
	(0.064)	(0.100)	(0.113)	(0.076)
population	0.050***	0.058***	0.074***	0.050***
	(0.004)	(0.005)	(0.007)	(0.005)
permits	1.514***	1.381***	1.380***	1.427***
	(0.100)	(0.110)	(0.142)	(0.121)
mortgage_rate	-4.870***	-2.036***	-6.617***	1.160**
	(0.348)	(0.544)	(0.912)	(0.493)
unemployment_rate	-0.703***	-0.784***	-1.623***	-0.808***
	(0.131)	(0.221)	(0.279)	(0.187)
employment	-0.102***	-0.114***	-0.140***	-0.099***
	(0.007)	(0.008)	(0.012)	(0.009)
Constant	95.713***	57.371***	119.096***	80.153***
	(4.191)	(6.720)	(8.853)	(5.287)
Observations	6,730	3,365	3,058	4,779
R-squared	0.581	0.574	0.302	0.269

Table 4. Baseline Regressions

This table provides the details of baseline regressions. Panel A shows the results of OLS regressions and Panel B provides the results of 2SLS regressions using *congregation* as an instrumental variable for *score*. The dependent variable is *HBP* from Table 3 Model 1 and the test variable is *score* (or instrumented *score* in Panel B). Model 1 has no fixed effects; Model 2 includes year fixed effects; Model 3 includes MSA fixed effects; Model 4 has both year and MSA fixed effects. Model 5 includes Region fixed effects. Model 6 has both Region and year fixed effects. Standard errors in parentheses. Stars indicate p-value as * p < 0.05, ** p < 0.01 and *** p < 0.001.

Panel A						
Dependent variable: HBP	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) OLS	(6) OLS
score	-0.041***	-0.040***	-0.058***	-0.029*	-0.027***	-0.025***
	(0.007)	(0.006)	(0.015)	(0.016)	(0.007)	(0.007)
income	0.415***	0.471***	-0.059	-0.132**	0.378***	0.427***
	(0.023)	(0.025)	(0.036)	(0.053)	(0.023)	(0.025)
population	0.010***	0.010***	0.009**	0.003	0.010***	0.010***
	(0.001)	(0.001)	(0.004)	(0.004)	(0.001)	(0.001)
permits	0.431***	0.429***	0.149***	0.178***	0.444***	0.448***
	(0.035)	(0.034)	(0.047)	(0.046)	(0.035)	(0.035)
mortgage_rate	1.676***	1.766***	-0.492***	-0.611**	1.440***	1.559***
	(0.121)	(0.161)	(0.163)	(0.246)	(0.121)	(0.160)
unemployment_rate	0.223***	0.240***	-0.681***	-1.150***	0.119**	0.112**
	(0.045)	(0.049)	(0.064)	(0.089)	(0.046)	(0.051)
employment	-0.020***	-0.020***	-0.030***	-0.018***	-0.020***	-0.020***
	(0.002)	(0.002)	(0.006)	(0.006)	(0.002)	(0.002)
Constant	-7.932***	-11.222***	21.203***	22.025***	-6.645***	-9.754***
	(1.693)	(1.873)	(3.308)	(3.653)	(1.738)	(1.910)
Observations	6,730	6,730	6,730	6,730	6,730	6,730
R-squared	0.088	0.149	0.344	0.402	0.110	0.170
Year FE		Yes		Yes		Yes
Region FE					Yes	Yes
MSA FE			Yes	Yes		

Table 4 continued

Panel B						
Dependent variable: HBP	(1) 2SLS	(2) 2SLS	(3) 2SLS	(4) 2SLS	(5) 2SLS	(6) 2SLS
score	-0.665***	-0.600***	-0.759***	-1.063***	-0.812***	-0.695***
	(0.095)	(0.079)	(0.139)	(0.368)	(0.212)	(0.155)
income	-0.063	0.079	-0.469***	0.144	-0.157	0.039
	(0.080)	(0.065)	(0.090)	(0.119)	(0.150)	(0.098)
population	0.013***	0.013***	0.014***	0.021***	0.011***	0.012***
	(0.002)	(0.002)	(0.004)	(0.008)	(0.003)	(0.002)
permits	0.657***	0.598***	0.393***	0.424***	0.594***	0.529***
	(0.063)	(0.055)	(0.071)	(0.105)	(0.073)	(0.058)
mortgage_rate	2.495***	2.310***	0.597**	4.263**	2.781***	2.533***
	(0.221)	(0.247)	(0.281)	(1.760)	(0.418)	(0.341)
unemployment_rate	0.446***	0.546***	-1.003***	-2.044***	0.411***	0.508***
	(0.077)	(0.083)	(0.096)	(0.337)	(0.113)	(0.123)
employment	-0.023***	-0.024***	-0.038***	-0.046***	-0.018***	-0.020***
	(0.004)	(0.004)	(0.007)	(0.012)	(0.004)	(0.004)
Constant	74.258***	60.681***	114.635***	110.803***	89.173***	68.168***
	(12.699)	(10.431)	(18.714)	(31.898)	(25.992)	(18.271)
Observations	6,730	6,730	6,730	6,730	6,730	6,730
Year FE		Yes		Yes		Yes
Region FE					Yes	Yes
MSA FE			Yes	Yes		
R-squared			0.126			

Table 5. Regressions results based on big MSAs

This table provides results based on a sample of big MSAs. Panel A shows the results of OLS regressions and Panel B provides the results of 2SLS regressions using *congregation* as an instrumental variable for *score*. The dependent variable is *HBP* from Table 3 Model 2 and the test variable is *score* (or instrumented *score* in Panel B). Model 1 has no fixed effects; Model 2 includes year fixed effects; Model 3 includes MSA fixed effects; Model 4 has both year and MSA fixed effects. Model 5 includes Region fixed effects. Model 6 has both Region and year fixed effects. Standard errors in parentheses. Stars indicate p-value as * p < 0.05, ** p < 0.01 and *** p < 0.001.

Panel A						
Dependent variable: HBP	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) OLS	(6) OLS
score	-0.030***	-0.029***	0.030	0.039*	-0.022**	-0.020**
	(0.010)	(0.010)	(0.021)	(0.022)	(0.010)	(0.010)
income	0.411***	0.431***	0.308***	0.287***	0.353***	0.355***
	(0.035)	(0.039)	(0.056)	(0.095)	(0.036)	(0.040)
population	0.010***	0.010***	0.010**	0.006	0.010***	0.010***
	(0.002)	(0.002)	(0.004)	(0.004)	(0.002)	(0.002)
permits	0.387***	0.391***	0.138***	0.154***	0.417***	0.432***
	(0.037)	(0.038)	(0.049)	(0.051)	(0.038)	(0.039)
mortgage_rate	1.545***	1.694***	0.392	0.617	1.222***	1.366***
	(0.183)	(0.245)	(0.246)	(0.425)	(0.185)	(0.245)
unemployment_rate	0.239***	0.237***	-0.425***	-0.805***	0.132*	0.081
	(0.075)	(0.086)	(0.095)	(0.136)	(0.076)	(0.088)
employment	-0.020***	-0.021***	-0.034***	-0.026***	-0.020***	-0.020***
	(0.003)	(0.003)	(0.007)	(0.007)	(0.003)	(0.003)
Constant	-8.674***	-10.727***	16.935***	15.519**	-4.745*	-5.844*
	(2.654)	(3.030)	(5.010)	(6.340)	(2.757)	(3.134)
Observations	3,365	3,365	3,365	3,365	3,365	3,365
R-squared	0.084	0.120	0.338	0.374	0.108	0.144
Year FE		Yes		Yes		Yes
Region FE					Yes	Yes
MSA FE			Yes	Yes		

Table 5 continued

Panel B						
Dependent variable: HBP	(1) 2SLS	(2) 2SLS	(3) 2SLS	(4) 2SLS	(5) 2SLS	(6) 2SLS
score	-0.655***	-0.607***	-0.526**	-0.601	-0.479***	-0.469***
	(0.118)	(0.099)	(0.218)	(0.600)	(0.109)	(0.096)
income	-0.205	-0.140	-0.036	0.663*	-0.101	-0.073
	(0.126)	(0.112)	(0.147)	(0.367)	(0.117)	(0.104)
population	0.009***	0.008***	0.015***	0.020	0.006***	0.006***
	(0.002)	(0.002)	(0.005)	(0.014)	(0.002)	(0.002)
permits	0.601***	0.547***	0.319***	0.292**	0.485***	0.466***
	(0.068)	(0.060)	(0.088)	(0.141)	(0.051)	(0.050)
mortgage_rate	1.955***	1.548***	1.296***	4.492	1.547***	1.371***
	(0.283)	(0.351)	(0.441)	(3.659)	(0.249)	(0.312)
unemployment_rate	0.737***	0.968***	-0.718***	-1.409**	0.408***	0.561***
	(0.145)	(0.175)	(0.153)	(0.585)	(0.117)	(0.151)
employment	-0.017***	-0.015***	-0.041***	-0.048**	-0.012***	-0.011***
	(0.004)	(0.004)	(0.008)	(0.021)	(0.004)	(0.004)
Constant	80.032***	72.629***	84.315***	48.932	58.854***	56.227***
	(17.062)	(14.829)	(26.851)	(32.044)	(15.453)	(13.692)
Observations	3,365	3,365	3,365	3,365	3,365	3,365
Year FE		Yes		Yes		Yes
Region FE					Yes	Yes
MSA FE			Yes	Yes		
R-squared			0.195	0.211		

Table 6. Regressions results based on 2000-2010 period

This table provides the results based on a sample of 2000-2010 period data. Panel A shows the results of OLS regressions and Panel B provides the results of 2SLS regressions using *congregation* as an instrumental variable for *score*. The dependent variable is *HBP* from Table 3 Model 3 and the test variable is *score* (or instrumented *score* in Panel B). Model 1 has no fixed effects; Model 2 includes year fixed effects; Model 3 includes MSA fixed effects; Model 4 has both year and MSA fixed effects. Model 5 includes Region fixed effects. Model 6 has both Region and year fixed effects. Standard errors in parentheses. Stars indicate p-value as * p < 0.05, ** p < 0.01 and *** p < 0.001.

Panel A						
Dependent variable: HBP	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) OLS	(6) OLS
score	-0.006	-0.007	0.105***	0.098***	0.007	0.004
	(0.010)	(0.010)	(0.024)	(0.026)	(0.010)	(0.010)
income	0.528***	0.660***	0.143**	0.116	0.479***	0.602***
	(0.035)	(0.039)	(0.060)	(0.117)	(0.035)	(0.039)
population	0.013***	0.014***	0.011*	0.010	0.011***	0.012***
	(0.002)	(0.002)	(0.006)	(0.006)	(0.002)	(0.002)
permits	0.346***	0.279***	0.056	0.049	0.360***	0.299***
	(0.043)	(0.043)	(0.065)	(0.066)	(0.043)	(0.043)
mortgage_rate	2.789***	3.182***	-0.462	-0.900*	2.396***	2.738***
	(0.273)	(0.309)	(0.314)	(0.524)	(0.273)	(0.311)
unemployment_rate	0.555***	0.822***	-0.606***	-0.655***	0.431***	0.669***
	(0.083)	(0.092)	(0.117)	(0.170)	(0.085)	(0.094)
employment	-0.024***	-0.025***	-0.042***	-0.040***	-0.021***	-0.022***
	(0.004)	(0.004)	(0.011)	(0.011)	(0.004)	(0.004)
Constant	-24.486***	-33.614***	-1.317	3.757	-18.535***	-26.659***
	(2.988)	(3.373)	(5.517)	(7.760)	(3.029)	(3.439)
Observations	3,058	3,058	3,058	3,058	3,058	3,058
R-squared	0.113	0.138	0.489	0.492	0.138	0.158
Year FE		Yes		Yes		Yes
Region FE					Yes	Yes
MSA FE			Yes	Yes		

Table 6 continued

Panel B						
Dependent variable: HBP	(1) 2SLS	(2) 2SLS	(3) 2SLS	(4) 2SLS	(5) 2SLS	(6) 2SLS
score	-0.719***	-0.650***	0.013	0.116	-0.818***	-0.744***
	(0.150)	(0.139)	(0.658)	(1.319)	(0.247)	(0.225)
income	-0.169	0.035	0.065	0.114	-0.266	-0.039
	(0.156)	(0.147)	(0.562)	(0.158)	(0.231)	(0.203)
population	0.019***	0.020***	0.011*	0.010	0.015***	0.016***
	(0.004)	(0.003)	(0.006)	(0.011)	(0.004)	(0.004)
permits	0.526***	0.439***	0.070	0.047	0.440***	0.355***
	(0.078)	(0.074)	(0.118)	(0.181)	(0.079)	(0.074)
mortgage_rate	4.005***	4.170***	-0.371	-0.951	4.035***	4.254***
	(0.509)	(0.519)	(0.714)	(3.801)	(0.688)	(0.689)
unemployment_rate	0.709***	0.947***	-0.640**	-0.640	0.628***	0.875***
	(0.139)	(0.143)	(0.263)	(1.141)	(0.161)	(0.169)
employment	-0.032***	-0.032***	-0.044***	-0.040	-0.022***	-0.024***
	(0.006)	(0.006)	(0.016)	(0.029)	(0.006)	(0.006)
Constant	73.448***	55.462***	12.252	1.762	86.366***	67.022**
	(20.961)	(19.801)	(97.232)	(148.236)	(31.827)	(28.689)
Observations	3,058	3,058	3,058	3,058	3,058	3,058
Year FE		Yes		Yes		Yes
Region FE					Yes	Yes
MSA FE			Yes	Yes		
R-squared			0.486	0.492		

Table 7. Regressions results based on the recent business cycle

This table provides the results based on a sample of data from 2000 to 2015 (the recent business cycle). Panel A shows the results of OLS regressions and Panel B provides the results of 2SLS regressions using *congregation* as an instrumental variable for *score*. The dependent variable is *HBP* from Table 3 Model 4 and the test variables are *score_d1, score_d2, score_d3* and *score_d4*. *score_d1* is an interaction term formed between *score* and a dummy variable *d1* which equals to 1 if the year is during 2000 to 2003 and equals to 0 if not. Similarly, *score_d2, score_d3* and *score_d4* are interaction terms for 2004-2006, 2007-2010 and 2011-2015 respectively. Model 1 has no fixed effects; Model 2 includes year fixed effects; Model 3 includes MSA fixed effects; Model 4 has both Year and MSA fixed effects. Model 5 includes Region fixed effects. Model 6 has both Region and year fixed effects. Standard errors in parentheses. Stars indicate p-value as * p < 0.05, ** p < 0.01 and *** p < 0.001.

Panel A						
Dependent variable: HBP	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) OLS	(6) OLS
score_d1	-0.027***	-0.059***	0.055***	0.047*	-0.020**	-0.036*
	(0.008)	(0.020)	(0.019)	(0.028)	(0.008)	(0.020)
score_d2	-0.041***	0.029	0.041**	0.108***	-0.034***	0.043**
	(0.008)	(0.018)	(0.019)	(0.025)	(0.008)	(0.018)
score_d3	-0.058***	-0.020	0.041**	0.033	-0.049***	-0.013
	(0.008)	(0.014)	(0.020)	(0.023)	(0.008)	(0.014)
score_d4	-0.021***	-0.060***	0.067***	0.006	-0.014*	-0.057***
	(0.008)	(0.011)	(0.020)	(0.021)	(0.008)	(0.011)
income	0.434***	0.438***	0.165***	0.122*	0.405***	0.406***
	(0.025)	(0.025)	(0.059)	(0.066)	(0.026)	(0.026)
population	0.008***	0.008***	-0.005	-0.002	0.008***	0.008***
	(0.002)	(0.002)	(0.005)	(0.005)	(0.002)	(0.002)
permits	0.285***	0.283***	0.003	0.056	0.315***	0.316***
	(0.038)	(0.038)	(0.058)	(0.057)	(0.039)	(0.038)
mortgage_rate	4.135***	4.525***	2.085***	1.257*	3.924***	3.787***
	(0.258)	(0.693)	(0.268)	(0.699)	(0.259)	(0.693)
unemployment_rate	0.584***	0.642***	-0.477***	-1.103***	0.508***	0.549***
	(0.061)	(0.067)	(0.093)	(0.132)	(0.062)	(0.069)
employment	-0.016***	-0.015***	-0.022**	-0.022**	-0.016***	-0.015***
	(0.003)	(0.003)	(0.009)	(0.009)	(0.003)	(0.003)
Constant	-24.666***	-21.558***	-11.160***	2.061	-22.117***	-16.350***
	(2.108)	(3.719)	(4.233)	(5.241)	(2.181)	(3.782)
Observations	4,779	4,779	4,779	4,779	4,779	4,779
R-squared	0.143	0.165	0.438	0.465	0.155	0.178
Year FE		Yes		Yes		Yes
Region FE					Yes	Yes
MSA FE			Yes	Yes		

Table 7 continued

Panel B						
Dependent variable: HBP	(1) 2SLS	(2) 2SLS	(3) 2SLS	(4) 2SLS	(5) 2SLS	(6) 2SLS
score_d1	-0.522***	-0.119	-0.208	-0.061	-0.476***	0.014
	(0.092)	(0.258)	(0.221)	(0.373)	(0.110)	(0.255)
score_d2	-0.553***	-0.835***	-0.224	-0.177	-0.509***	-0.673***
	(0.092)	(0.252)	(0.224)	(0.613)	(0.110)	(0.246)
score_d3	-0.572***	-0.611***	-0.221	-0.299	-0.532***	-0.555***
	(0.091)	(0.186)	(0.225)	(0.545)	(0.112)	(0.190)
score_d4	-0.528***	-0.480***	-0.166	0.201	-0.494***	-0.429***
	(0.090)	(0.133)	(0.220)	(0.713)	(0.111)	(0.131)
income	0.133*	0.137**	-0.011	-0.005	0.155**	0.165**
	(0.072)	(0.069)	(0.141)	(0.221)	(0.075)	(0.074)
population	0.012***	0.013***	-0.003	-0.002	0.010***	0.010***
	(0.002)	(0.002)	(0.006)	(0.012)	(0.002)	(0.002)
permits	0.432***	0.427***	0.131	0.016	0.358***	0.354***
	(0.064)	(0.072)	(0.105)	(0.200)	(0.057)	(0.060)
mortgage_rate	5.232***	-5.507	3.780***	8.836	4.669***	-8.158
	(0.868)	(8.450)	(0.841)	(8.344)	(0.831)	(7.461)
unemployment_rate	0.772***	0.716***	-0.301**	-1.512***	0.659***	0.538***
	(0.099)	(0.117)	(0.125)	(0.428)	(0.099)	(0.117)
employment	-0.020***	-0.022***	-0.026***	-0.037***	-0.016***	-0.018***
	(0.004)	(0.004)	(0.010)	(0.012)	(0.004)	(0.004)
Constant	36.875***	73.654*	15.389	-39.011	33.585**	77.159**
	(11.511)	(40.365)	(26.018)	(99.529)	(13.375)	(34.380)
Observations	4,779	4,779	4,779	4,779	4,779	4,779
Year FE		Yes		Yes		Yes
Region FE					Yes	Yes
MSA FE			Yes	Yes		
R-squared			0.409	0.283		

Table 8. Regression results based on an alternative big MSAs sample

This table provides the results based on an alternative sample of big MSAs. Big MSAs are identified for each year if the MSA has *population* over the median *population* in that year. Panel A shows the results of OLS regressions and Panel B provides the results of 2SLS regressions using *congregation* as an instrumental variable for *score*. The dependent variable is *HBP* from the fundamental regression of this sample. The test variable is *score* (or instrumented *score* in Panel B). Model 1 has no fixed effects; Model 2 includes year fixed effects; Model 3 includes MSA fixed effects; Model 4 has both year and MSA fixed effects. Model 5 includes Region fixed effects. Model 6 has both Region and year fixed effects. Standard errors in parentheses. Stars indicate p-value as * $p < 0.05$, ** $p < 0.01$ and *** $p < 0.001$.

Panel A						
Dependent variable: HBP	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) OLS	(6) OLS
score	-0.029***	-0.028***	0.035*	0.043*	-0.022**	-0.019**
	(0.010)	(0.010)	(0.021)	(0.022)	(0.010)	(0.010)
income	0.392***	0.406***	0.319***	0.324***	0.332***	0.328***
	(0.035)	(0.039)	(0.057)	(0.096)	(0.036)	(0.040)
population	0.010***	0.010***	0.011***	0.008*	0.010***	0.010***
	(0.002)	(0.002)	(0.004)	(0.004)	(0.002)	(0.002)
permits	0.384***	0.391***	0.139***	0.154***	0.414***	0.433***
	(0.037)	(0.038)	(0.049)	(0.051)	(0.038)	(0.039)
mortgage_rate	1.476***	1.556***	0.415*	0.716*	1.142***	1.221***
	(0.185)	(0.248)	(0.249)	(0.430)	(0.187)	(0.249)
unemployment_rate	0.232***	0.230***	-0.454***	-0.851***	0.122	0.073
	(0.075)	(0.086)	(0.095)	(0.136)	(0.076)	(0.089)
employment	-0.020***	-0.020***	-0.036***	-0.029***	-0.020***	-0.020***
	(0.003)	(0.003)	(0.007)	(0.007)	(0.003)	(0.003)
Constant	-7.704***	-9.247***	16.127***	13.419**	-3.505	-4.151
	(2.668)	(3.024)	(5.059)	(6.406)	(2.777)	(3.134)
Observations	3,358	3,358	3,358	3,358	3,358	3,358
R-squared	0.080	0.118	0.339	0.377	0.105	0.143
Year FE		Yes		Yes		Yes
Region FE					Yes	Yes
MSA FE			Yes	Yes		

Table 8 continued

Panel B						
Dependent variable: HBP	(1) 2SLS	(2) 2SLS	(3) 2SLS	(4) 2SLS	(5) 2SLS	(6) 2SLS
score	-0.674***	-0.620***	-0.503**	-0.532	-0.491***	-0.477***
	(0.122)	(0.101)	(0.218)	(0.575)	(0.111)	(0.096)
income	-0.244*	-0.175	-0.023	0.652*	-0.135	-0.107
	(0.131)	(0.114)	(0.150)	(0.343)	(0.119)	(0.104)
population	0.009***	0.008***	0.016***	0.020	0.006***	0.006**
	(0.002)	(0.002)	(0.005)	(0.013)	(0.002)	(0.002)
permits	0.602***	0.546***	0.315***	0.275**	0.484***	0.465***
	(0.069)	(0.061)	(0.088)	(0.133)	(0.051)	(0.050)
mortgage_rate	1.908***	1.411***	1.252***	4.112	1.473***	1.223***
	(0.291)	(0.361)	(0.428)	(3.417)	(0.254)	(0.319)
unemployment_rate	0.715***	0.941***	-0.741***	-1.398**	0.378***	0.526***
	(0.145)	(0.173)	(0.154)	(0.565)	(0.116)	(0.148)
employment	-0.016***	-0.015***	-0.043***	-0.048**	-0.012***	-0.011***
	(0.004)	(0.004)	(0.008)	(0.021)	(0.004)	(0.004)
Constant	83.971***	75.966***	81.908***	44.313	62.066***	59.229***
	(17.679)	(15.082)	(27.004)	(31.554)	(15.801)	(13.795)
Observations	3,358	3,358	3,358	3,358	3,358	3,358
Year FE		Yes		Yes		Yes
Region FE					Yes	Yes
MSA FE			Yes	Yes		
R-squared			0.207	0.247		

Table 9. Summary of score coefficients for four periods separately

This table summarizes the *score* coefficients for four samples. Each sample includes data for the respective period during the recent business cycle. For all samples, the dependent variable is *HBP* obtained from the fundamental regression for the respective period and the test variable is *score* (or instrumented *score* in 2SLS regressions). Fundamentals' coefficients are omitted in this table. Model 1 has no fixed effects; Model 2 includes year fixed effects; Model 3 includes MSA fixed effects; Model 4 has both year and MSA fixed effects. Model 5 includes Region fixed effects. Model 6 has both Region and year fixed effects. Standard errors in parentheses. Stars indicate p-value as * $p < 0.05$, ** $p < 0.01$ and *** $p < 0.001$.

score coefficient	Obs	(1)	(2)	(3)	(4)	(5)	(6)
2000-2003 OLS	920	-0.041***	-0.042***	0.109**	0.113**	-0.015	-0.015
		(0.013)	(0.013)	(0.044)	(0.044)	(0.013	(0.013)
2000-2003 2SLS	920	-0.975***	-0.963***	-0.262	-0.295	-1.876	-1.842
		(0.354)	(0.347)	(0.628)	(0.868)	(1.432)	(1.381)
2004-2006 OLS	847	0.049**	0.049**	0.024	0.018	0.052**	0.052**
		(0.021)	(0.021)	(0.039)	(0.039)	(0.021)	(0.021)
2004-2006 2SLS	847	-0.103	-0.103	-0.481	-1.013	-0.182	-0.183
		(0.169)	(0.169)	(0.569)	(1.244)	(0.308)	(0.309)
2007-2010 OLS	1,291	-0.046***	-0.045***	0.152***	0.146***	-0.033***	-0.033***
		(0.012)	(0.012)	(0.039)	(0.039)	(0.012)	(0.012)
2007-2010 2SLS	1,291	-0.438***	-0.435***	0.949***	1.034***	-0.373**	-0.373**
		(0.149)	(0.148)	(0.290)	(0.330)	(0.156)	(0.156)
2011-2015 OLS	1,721	-0.043***	-0.041***	0.100***	0.122***	-0.032***	-0.029***
		(0.009)	(0.009)	(0.037)	(0.039)	(0.009)	(0.009)
2011-2015 2SLS	1,721	-0.404***	-0.407***	-0.053	0.259	-0.241***	-0.252***
		(0.109)	(0.108)	(0.252)	(0.970)	(0.089)	(0.088)
Year FE			Yes		Yes		Yes
Region FE						Yes	Yes
MSA FE				Yes	Yes		

Appendix

A1. Summary of score coefficients of dummy regressions for four periods separately

This table summarizes dummy regression results for four samples. Each sample includes data from the respective period during the recent business cycle. The dependent variable is *HBP* obtained from Table 3 Model 4 and the test variables are *score* and interaction terms. *score_d1* is an interaction term formed between *score* and a dummy variable *d1* which equals to 1 if the year is during 2000 to 2003 and equals to 0 if not. Similarly, *score_d2, score_d3* and *score_d4* are interaction terms for 2004-2006, 2007-2010 and 2011-2015 respectively. Fundamentals' coefficients are omitted in this table. Model 1 has no fixed effects; Model 2 includes year fixed effects; Model 3 includes MSA fixed effects; Model 4 has both year and MSA fixed effects. Model 5 includes Region fixed effects. Model 6 has both Region and year fixed effects. Standard errors in parentheses. Stars indicate p-value as * p < 0.05, ** p < 0.01 and *** p < 0.001.

		(1)	(2)	(3)	(4)	(5)	(6)
2000-2003 OLS	d1	3.207	25.132***	-1.220	3.210	0.991	22.160**
		(2.696)	(9.100)	(2.477)	(7.792)	(2.689)	(9.049)
	score	-0.034***	-0.032***	0.050***	0.030	-0.028***	-0.026***
		(0.008)	(0.008)	(0.019)	(0.020)	(0.008)	(0.008)
	score_d1	0.003	-0.027	0.032	0.006	0.020	-0.011
		(0.021)	(0.021)	(0.019)	(0.019)	(0.021)	(0.021)
2000-2003 2SLS	d1	-43.265	-40.276	-3.682	-50.818	-50.316*	-47.489
		(33.212)	(35.676)	(26.614)	(50.025)	(29.083)	(31.363)
	score	-0.591***	-0.585***	-0.565**	-1.517*	-0.501***	-0.491***
		(0.096)	(0.092)	(0.237)	(0.915)	(0.110)	(0.105)
	score_d1	0.385	0.491*	0.074	0.327	0.441*	0.532**
		(0.267)	(0.258)	(0.216)	(0.330)	(0.233)	(0.224)
2004-2006 OLS	d2	-9.277***	-13.473***	-11.219***	-14.251***	-10.305***	-14.312***
		(2.434)	(2.442)	(2.079)	(2.082)	(2.417)	(2.427)
	score	-0.042***	-0.047***	0.063***	0.015	-0.035***	-0.040***
		(0.008)	(0.008)	(0.019)	(0.020)	(0.008)	(0.008)
	score_d2	0.070***	0.076***	0.077***	0.085***	0.077***	0.082***
		(0.020)	(0.020)	(0.017)	(0.017)	(0.020)	(0.019)
2004-2006 2SLS	d2	57.870*	48.638	37.754	29.271	45.652	37.429
		(32.903)	(31.666)	(25.759)	(24.892)	(31.564)	(30.416)
	score	-0.490***	-0.465***	-0.310	-0.485	-0.489***	-0.466***
		(0.105)	(0.097)	(0.234)	(0.476)	(0.129)	(0.117)
	score_d2	-0.488*	-0.440*	-0.331	-0.283	-0.387	-0.347
		(0.274)	(0.264)	(0.215)	(0.210)	(0.263)	(0.253)
2007-2010 OLS	d3	-6.196***	-7.482***	-2.593	0.985	-5.784***	-6.959***
		(1.887)	(1.945)	(1.642)	(1.771)	(1.876)	(1.934)
	score	-0.041***	-0.041***	0.054***	0.031	-0.033***	-0.033***
		(0.009)	(0.008)	(0.020)	(0.020)	(0.009)	(0.009)
	score_d3	0.023	0.021	0.004	-0.003	0.021	0.019
		(0.016)	(0.016)	(0.014)	(0.014)	(0.016)	(0.016)
2007-2010 2SLS	d3	13.678	9.606	46.755***	40.477**	18.201	14.209
		(26.418)	(25.014)	(17.635)	(17.569)	(25.600)	(24.091)
	score	-0.505***	-0.510***	-0.385	-0.674	-0.470***	-0.468***
		(0.112)	(0.107)	(0.275)	(0.573)	(0.134)	(0.124)
	score_d3	-0.156	-0.128	-0.430***	-0.297**	-0.194	-0.164
		(0.227)	(0.219)	(0.151)	(0.143)	(0.220)	(0.210)
2011-2015 OLS	d4	11.818***	-15.871*	10.689***	2.159	12.711***	-13.741
		(1.663)	(8.858)	(1.511)	(7.509)	(1.653)	(8.798)
	score	-0.007	-0.015	0.102***	0.060***	0.005	-0.003
		(0.010)	(0.010)	(0.020)	(0.021)	(0.010)	(0.010)
	score_d4	-0.056***	-0.045***	-0.056***	-0.050***	-0.065***	-0.054***
		(0.014)	(0.014)	(0.013)	(0.013)	(0.014)	(0.014)
2011-2015 2SLS	d4	-13.664	-34.986	-61.933**	-71.749**	-7.648	-27.011
		(23.666)	(27.211)	(30.182)	(36.049)	(23.194)	(26.249)
	score	-0.678***	-0.586***	0.099	0.419	-0.644***	-0.537***

	(0.148)	(0.128)	(0.186)	(0.422)	(0.186)	(0.156)
score_d4	0.178	0.090	0.591**	0.505*	0.122	0.039
	(0.213)	(0.188)	(0.269)	(0.265)	(0.209)	(0.180)
obs	4,779	4,779	4,779	4,779	4,779	4,779
Year FE		Yes		Yes		Yes
Region FE					Yes	Yes
MSA FE			Yes	Yes		

A2. Baseline regressions results based on clustered standard deviation by year

This table provides clustered standard deviation (by year) results of baseline regressions (Table 4). Panel A shows the results of OLS regressions and Panel B provides the results of 2SLS regressions using *congregation* as an instrumental variable for *score*. The dependent variable is *HBP* from Table 3 Model 1 and the test variables is *score* (or instrumented *score* in Panel B). Model 1 has no fixed effects; Model 2 includes year fixed effects; Model 3 includes MSA fixed effects; Model 4 has both year and MSA fixed effects. Model 5 includes Region fixed effects. Model 6 has both Region and year fixed effects. Standard errors in parentheses. Stars indicate p-value as * $p < 0.05$, ** $p < 0.01$ and *** $p < 0.001$.

Panel A						
Dependent variable: HBP	(1) Cluster by Year OLS	(2) Cluster by Year OLS	(3) Cluster by Year OLS	(4) Cluster by Year OLS	(5) Cluster by Year OLS	(6) Cluster by Year OLS
score	-0.041***	-0.040***	-0.058**	-0.029	-0.027***	-0.025***
	(0.009)	(0.008)	(0.026)	(0.025)	(0.007)	(0.008)
income	0.415***	0.471***	-0.059	-0.132	0.378***	0.427***
	(0.072)	(0.067)	(0.158)	(0.092)	(0.073)	(0.072)
population	0.010***	0.010***	0.009	0.003	0.010***	0.010***
	(0.003)	(0.003)	(0.006)	(0.006)	(0.003)	(0.003)
permits	0.431***	0.429***	0.149	0.178**	0.444***	0.448***
	(0.073)	(0.073)	(0.093)	(0.066)	(0.071)	(0.072)
mortgage_rate	1.676***	1.766***	-0.492	-0.611*	1.440***	1.559***
	(0.300)	(0.268)	(0.676)	(0.332)	(0.304)	(0.270)
unemployment_rate	0.223**	0.240	-0.681**	-1.150**	0.119	0.112
	(0.106)	(0.144)	(0.295)	(0.430)	(0.143)	(0.178)
employment	-0.020***	-0.020***	-0.030**	-0.018	-0.020***	-0.020***
	(0.005)	(0.005)	(0.011)	(0.011)	(0.005)	(0.005)
Constant	-7.932*	-11.222***	21.203**	22.025***	-6.645	-9.754**
	(4.354)	(3.613)	(8.541)	(5.053)	(4.343)	(3.995)
Observations	6,730	6,730	6,730	6,730	6,730	6,730
R-squared	0.088	0.149	0.344	0.402	0.110	0.170
Year FE		Yes		Yes		Yes
Region FE					Yes	Yes
MSA FE			Yes	Yes		

A2 continued

Panel B						
Dependent variable: HBP	(1) Cluster by Year 2SLS	(2) Cluster by Year 2SLS	(3) Cluster by Year 2SLS	(4) Cluster by Year 2SLS	(5) Cluster by Year 2SLS	(6) Cluster by Year 2SLS
score	-0.665***	-0.600***	-0.759***	-1.063***	-0.812***	-0.695***
	(0.127)	(0.121)	(0.175)	(0.335)	(0.282)	(0.235)
income	-0.063	0.079	-0.469**	0.144	-0.157	0.039
	(0.165)	(0.160)	(0.210)	(0.187)	(0.276)	(0.221)
population	0.013***	0.013***	0.014**	0.021**	0.011***	0.012***
	(0.004)	(0.003)	(0.006)	(0.010)	(0.003)	(0.003)
permits	0.657***	0.598***	0.393***	0.424***	0.594***	0.529***
	(0.106)	(0.092)	(0.105)	(0.135)	(0.109)	(0.092)
mortgage_rate	2.495***	2.310***	0.597	4.263**	2.781***	2.533***
	(0.427)	(0.254)	(0.780)	(1.842)	(0.458)	(0.241)
unemployment_rate	0.446***	0.546***	-1.003***	-2.044***	0.411***	0.508***
	(0.117)	(0.152)	(0.311)	(0.470)	(0.134)	(0.149)
employment	-0.023***	-0.024***	-0.038***	-0.046***	-0.018***	-0.020***
	(0.006)	(0.005)	(0.012)	(0.017)	(0.005)	(0.005)
Constant	74.258***	60.681***	114.635***	110.803***	89.173**	68.168**
	(20.370)	(19.445)	(26.653)	(25.687)	(39.539)	(32.058)
Observations	6,730	6,730	6,730	6,730	6,730	6,730
Year FE		Yes		Yes		Yes
Region FE					Yes	Yes
MSA FE			Yes	Yes		
R-squared			0.126			

A3. Baseline regressions results based on clustered standard deviation by MSA

This table provides clustered standard deviation (by MSA) results of baseline regressions (Table 4). Panel A shows the results of OLS regressions and Panel B provides the results of 2SLS regressions using *congregation* as an instrumental variable for *score*. The dependent variable is *HBP* from Table 3 Model 1 and the test variable is *score* (or instrumented *score* in Panel B). Model 1 has no fixed effects; Model 2 includes year fixed effects; Model 3 includes MSA fixed effects; Model 4 has both year and MSA fixed effects. Model 5 includes Region fixed effects. Model 6 has both Region and year fixed effects. Standard errors in parentheses. Stars indicate p-value as * p < 0.05, ** p < 0.01 and *** p < 0.001.

Panel A						
Dependent variable: HBP	(1) cluster by MSA OLS	(2) cluster by MSA OLS	(3) cluster by MSA OLS	(4) cluster by MSA OLS	(5) cluster by MSA OLS	(6) cluster by MSA OLS
score	-0.041***	-0.040***	-0.058*	-0.029	-0.027**	-0.025**
	(0.014)	(0.014)	(0.034)	(0.034)	(0.012)	(0.013)
income	0.415***	0.471***	-0.059	-0.132	0.378***	0.427***
	(0.050)	(0.059)	(0.087)	(0.172)	(0.063)	(0.073)
population	0.010***	0.010***	0.009	0.003	0.010**	0.010**
	(0.003)	(0.003)	(0.012)	(0.013)	(0.004)	(0.004)
permits	0.431***	0.429***	0.149	0.178	0.444***	0.448***
	(0.073)	(0.079)	(0.105)	(0.112)	(0.068)	(0.072)
mortgage_rate	1.676***	1.766***	-0.492	-0.611	1.440***	1.559***
	(0.243)	(0.261)	(0.337)	(0.671)	(0.296)	(0.310)
unemployment_rate	0.223**	0.240**	-0.681***	-1.150***	0.119	0.112
	(0.087)	(0.101)	(0.138)	(0.258)	(0.097)	(0.110)
employment	-0.020***	-0.020***	-0.030	-0.018	-0.020***	-0.020***
	(0.006)	(0.006)	(0.022)	(0.022)	(0.007)	(0.007)
Constant	-7.932**	-11.222***	21.203***	22.025**	-6.645	-9.754**
	(3.462)	(3.789)	(7.033)	(10.308)	(4.224)	(4.614)
Observations	6,730	6,730	6,730	6,730	6,730	6,730
R-squared	0.088	0.149	0.344	0.402	0.110	0.170
Year FE		Yes		Yes		Yes
Region FE					Yes	Yes
MSA FE			Yes	Yes		

A3 continued

Panel B						
Dependent variable: HBP	(1) cluster by MSA 2SLS	(2) cluster by MSA 2SLS	(3) cluster by MSA 2SLS	(4) cluster by MSA 2SLS	(5) cluster by MSA 2SLS	(6) cluster by MSA 2SLS
score	-0.665*	-0.600*	-0.759**	-1.063	-0.812	-0.695
	(0.383)	(0.316)	(0.323)	(0.956)	(1.037)	(0.745)
income	-0.063	0.079	-0.469**	0.144	-0.157	0.039
	(0.321)	(0.269)	(0.232)	(0.330)	(0.683)	(0.431)
population	0.013**	0.013**	0.014	0.021	0.011	0.012*
	(0.006)	(0.006)	(0.014)	(0.024)	(0.008)	(0.007)
permits	0.657***	0.598***	0.393***	0.424	0.594**	0.529***
	(0.168)	(0.127)	(0.150)	(0.259)	(0.237)	(0.135)
mortgage_rate	2.495***	2.310***	0.597	4.263	2.781	2.533*
	(0.920)	(0.750)	(0.626)	(4.483)	(2.178)	(1.440)
unemployment_rate	0.446	0.546	-1.003***	-2.044**	0.411	0.508
	(0.319)	(0.364)	(0.249)	(0.945)	(0.598)	(0.669)
employment	-0.023**	-0.024**	-0.038	-0.046	-0.018	-0.020*
	(0.010)	(0.010)	(0.026)	(0.040)	(0.013)	(0.012)
Constant	74.258	60.681	114.635***	110.803	89.173	68.168
	(49.812)	(40.573)	(44.326)	(84.851)	(123.086)	(84.115)
Observations	6,730	6,730	6,730	6,730	6,730	6,730
Year FE		Yes		Yes		Yes
Region FE					Yes	Yes
MSA FE			Yes	Yes		
R-squared			0.126			