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IZA DP No. 11636

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ABSTRACT

Labor Demand Shocks and Housing Prices across the US: Does One Size Fit All?

This paper examines whether effects of labor demand shocks on housing prices vary across time and space. Using data on 321 US metropolitan statistical areas, we estimate the medium- and long-run effects of increases in metropolitan statistical area-level employment and total labor income on housing prices. Instrumental variable estimates for different time periods, and also for coastal, non-coastal, large, and small metropolitan statistical areas are obtained using the shift-share instrument. Results suggest that labor demand shocks have positive effects on housing prices. However, these effects appear to vary across time periods and across different types of metropolitan statistical areas.

JEL Classification: J23, O18, R12, R23, R31

Keywords: housing prices, labor demand shocks, labor market, housing market

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1. Introduction

The housing market plays an important role in national, state, and local economies (Leamer 2007, 2015). In the United States, housing forms a substantial part of the average household budget. For example, the share of average annual expenditure on housing was about 32.9% in 2015, while shelter alone accounted for 19.2% (Bureau of Labor Statistics 2015). Housing market conditions can also influence household mobility since household reallocation decisions depend in part on the relative cost of housing across metropolitan statistical areas (MSAs). These housing market conditions, in turn, are affected significantly by labor market outcomes. Local economic development policies aimed at increasing local employment and wages may simultaneously affect housing prices. A stronger local labor market makes an area more desirable to potential migrants and increases willingness to pay for housing in the area. As a result, understanding the interdependence between the local housing and labor markets is of considerable interest to policymakers and has become an important topic in academic and policy research. The current paper addresses the effects of MSA employment growth and total labor income[1] growth on MSA housing prices. Our preferred estimates use a shift-share instrumental variables strategy. We also examine differences over time and across types of MSAs.

A large academic literature has examined various interactions between housing and labor markets (Byun 2010; Chakrabarti & Zhang 2015; Coulson & Fisher 2009; Davis & Ortalo-Magné 2011; Dohmen 2005; Glaeser & Gyourko 2005; Glaeser, Gyourko, & Saks 2006; Head & Lloyd-Ellis 2012; Hwang & Quigley 2006; Johnes & Hyclak 1999; Munch, Rosholm, & Svarer 2008; Partridge et al. 2009, 2010; Reed & Ume 2016; Saiz 2008; Winkler 2013; Winters 2009; Zabel 2012). A strand of this literature focuses on the effects of housing market shocks on labor market outcomes. For example, Liu, Miao, and Zha (2016) found that a negative housing

demand shock increases the unemployment rate. Saks (2008) observed that housing supply regulations have persistent effects on restricting local employment growth. Fort et al. (2013) found larger declines in net employment growth for young and small businesses in states where housing prices declined the most. Adelino, Schoar, and Severino (2015) found that employment in small establishments rose in areas with rising house prices during the period prior to the recession of 2008.

On the other hand, relatively few studies have focused specifically on the effects of labor demand shocks on housing prices. The modest previous literature does suggest that stronger labor markets do increase house prices. Gan and Zhang (2013) explored Texas city-level variation in unemployment rates and observe that a decrease in the unemployment rate results in higher house prices and a larger sales volume. Saks (2008) examined the effects of labor demand shocks on MSA housing markets and found a positive relationship between labor demand and housing prices. Johnes and Hyclak (1999) explored the interactions between housing and labor markets in four US cities and found evidence that changes in unemployment and the labor force affect house prices.

Because housing is a large share of average household budgets, the effect of labor demand shocks can be profound. For example, a decline in local labor demand has the direct effect of decreasing local employment and a general equilibrium effect of decreasing local housing prices unless local housing supply is infinitely elastic. Intuitively, a negative labor demand shock that decreases the demand for labor serves as a financial constraint which discourages households from participating in the housing market as buyers. It also lowers consumer confidence and expectations about job security thus reducing the ease with which homeowners can change houses. As a result, the housing market becomes thinner and illiquid

and in equilibrium house prices decline (Adelino, Schoar, & Severino 2015; Mian & Sufi 2011). However, labor demand shocks are rarely geographically uniform. Because geographic areas differ along many dimensions such as skill distribution of workers and industrial composition, the effect of labor demand shocks may vary across space and time (Martin 2012; Martin & Sunley 2015).

To help understand how labor demand shocks affect local housing market conditions, it is important to consider possible heterogeneity over time and across labor markets. In this paper, we complement existing literature by examining how the effect of labor demand shocks on housing prices varies across time periods and by location and size of MSAs using data on 321 MSAs in the US. We quantify the medium- and long-run effects of increases in MSA-level employment and total wages on housing prices for different expansion periods and also for coastal, non-coastal, large, and small MSAs. Existing studies have not systematically examined the differential effect of labor demand shocks on housing prices in this regard. For the most part, previous studies (see, for example, Johnes & Hyclak 1999; Saks 2008) provide an average estimate for all MSAs or cities.

Our analysis spans the period 1995-2015. To shed more light on the timing of these effects, we also estimate effects for the periods 1995-2000, 2002-2007, 2002-2015, and 2010-2015. These periods are chosen from the last three periods of national economic expansions as defined by the National Bureau of Economic Research (NBER) business cycle dating committee. Estimates for these periods also enable us to examine the effects on housing prices during the housing boom that occurred between 2002 and 2007 relative to the other periods. We are also particularly interested in the relationship during the post-2010 housing recovery; 2015 was the most recent year of data available at the time of the analysis. Also, MSAs differ along many

dimensions. Thus, to provide a more nuanced view and to examine potential heterogeneity, we split the sample into coastal and non-coastal state MSAs and also into large and small MSAs and then compare coefficients across subsamples.

A major challenge with estimating the medium- and long-run effects of labor market outcomes on housing prices is to identify variation in the growth of the labor market outcomes that is demand-driven and hence exogenous to other factors that affect local wages and employment. To achieve this identification, labor demand shocks are measured as changes in local annual employment and changes in the total wage bill as predicted from the industrial composition of each MSA in 1995 combined with national growth across industries (Bartik 1991). The instrumental variable estimates using these shocks isolate the effects on housing prices of changes in local annual employment and changes in the total wage bill driven exclusively by changes in relative labor demand. We report the instrumental variable elasticity estimates using these shocks as instruments.

Overall, the empirical evidence presented in this paper shows that labor demand shocks have positive effects on housing prices. For the period 1995-2015, on average, a ten percent increase in the annual average employment level is associated with 9.6% increase in housing prices. Similarly, for the same time period, a ten percent increase in the total wage bill is associated with 7.2% increase in housing prices. However, the size of the effect exhibits considerable heterogeneity across time and space. The employment effect on housing prices is strongest during the 2002-2007 housing boom period. The total wage bill coefficient estimate is largest for 2002-2007, and the 2010-2015 total wage bill coefficient is also larger than other earlier years. While, in this paper, we test for possible heterogeneity across time and space, we

are unable to provide evidence on the specific channels through which the spatial heterogeneity occurs.

We offer suggestive evidence of differing effects across types of MSAs, though the differences are not always statistically significant. Labor demand shocks appear to have larger effects in increasing housing prices in coastal MSAs where land use and other government regulations tend to be more restrictive. The coastal differences are especially pronounced for effects of the total wage bill. The positive effects of MSA labor demand on housing prices also appear larger in large MSAs than in small MSAs.

The rest of this paper is organized as follows: Section 2 describes the data used in the study and documents the correlation between housing prices and employment at the MSA level. Section 3 presents the empirical results from the regression analysis. Section 4 provides robustness checks and section 5 concludes.

2. Empirical approach and data

Our empirical investigations involve estimating the medium- and long-run elasticity of MSA house prices with respect to MSA labor market conditions. We estimate variants of the following model:

$$\Delta H_{it} = \alpha_t + \beta_t \Delta LMKT_{it} + \varepsilon_{it} \quad (1)$$

where ΔH_{it} and $\Delta LMKT_{it}$ are the change over time in the log housing prices and the log labor market outcome in MSA i, respectively, between periods t and $t-\tau$. The labor market variables examined in this paper are changes in local annual employment and total wage bill. OLS estimates of equation (1) rely on all variation in local labor market outcomes that may be driven by either supply or demand or both supply and demand shocks. Even after time differencing to

subtract out MSA fixed effects, changes in the labor market outcomes are potentially correlated with the error term. To isolate exogenous shifts in local labor demand shocks, we follow Bartik (1991) to predict employment (wage) growth rate in each MSA as a weighted average of nationwide employment (wage) growth rates where the MSA-specific weights are determined by the industrial composition of MSA employment in 1995. The exclusion restriction rests on the assumption that the 1995 industrial composition of each MSA is predetermined at the time of the later nationwide labor demand shocks, and that nationwide labor demand shocks are exogenous to each individual MSA.[2] Let $\Delta lnEMPWAG_{jt}$ be the growth rate of labor market variables in industry j nationally between t and $t-\tau$ and $sh_{ji,1995}^{EMPL}$, the share of employment in industry j in MSA i in 1995. The instrument is then given by:

$$\Delta Bartik_{it} = \sum_j \left(sh_{ji,1995}^{Empl} \times \Delta lnEMPWAG_{jt} \right) \quad (2)$$

The instrument is then used to instrument for observed changes in labor market outcomes using two-stage least squares (2SLS).

To conduct our empirical investigations, we use the employment and wages data published by the Quarterly Census of Employment and Wages (QCEW) program. The QCEW data includes annual employment levels and total annual wage and salary income by industry and metropolitan statistical area. If disclosure standards are met, the QCEW program publishes data for every North American Industry Classification System (NAICS) industry, down to the 6-digit NAICS industry level.[3] We define annual employment and total annual wages in each MSA at the 3-digit NAICS industry subsector. For confidentiality reasons, if the data do not meet Bureau of Labor Statistics (BLS) or State agency disclosure standards, it is not reported or marked with a non-disclosure indicator "N". Thus, not all 3-digit NAICS industry subsector data are published. However, when disclosed, aggregates for each supersector and domain include the undisclosed

lower-level data. Although these aggregates cannot be used to reveal the concealed data, they can be used to obtain the "residuals" for each high-level NAICS industry. We therefore use the QCEW industry crosswalk to generate the final series for each labor market variable.[4]

First, we exclude from the sample MSAs for which totals for all industries covered, all private industries, good-producing industries or service-providing industries are not disclosed. We then aggregate the annual employment and total annual wages for each 3-digit NAICS industry subsector. The residuals at the sector level for each 3-digit industry are obtained by subtracting the subsector total from the sector total. To get the residuals at the supersector level, we aggregate each labor market variable for each sector and then subtract the sector total from supersector totals. Similarly, the residuals at the domain level are obtained by subtracting the supersector totals from domain totals. The final series thus consist of the 3-digit NAICS industry subsector and the residuals at the sector, super sector, and domain levels.[5]

We supplement the QCEW data with annual all-transaction house price index (HPI) data at the MSA level from the Federal Housing and Finance Agency (FHFA). The annual all-transaction HPI used in this paper is a weighted, repeat-sales index that measures the average price fluctuations in repeat-sales or refinancing on the same properties. The all-transactions index is calculated using prices from sales transactions of mortgage data and prices from appraisal data obtained from the government-sponsored enterprises. The sample size and sample period partially depend on data availability. The main regression analysis focuses on the last three periods of expansions as defined by the National Bureau of Economic Research (NBER) business cycle dating committee and thus uses data from 1995 to 2015. We use MSAs as our geographical unit of analysis. Before turning to the main results, we provide some descriptive evidence for the dependent and independent variables.

In Figure 1, we show the descriptive empirical relationship between labor market outcomes and housing prices for 321 MSAs. The left panel of Figure 1 shows a positive relationship between the growth in housing prices and the growth in annual employment for the period 1995-2015. The corresponding OLS regression coefficient is 0.415 with a standard error of 0.042. Similarly, the right panel of Figure 1 shows a positive relationship between the growth in housing prices and the growth in total annual wages for the period 1995-2015. The OLS regression coefficient for the period is 0.407 with a standard error of 0.03. The descriptive evidence also shows that there is considerable heterogeneity in the growth rates of the labor market variables and housing prices at the subnational level and over different time periods. Overall, MSAs with large growth in annual employment and total annual wages experienced higher housing price growth. Although the correlations in Figure 1 are suggestive, the relationship is not casual but an equilibrium relationship between labor market outcomes and housing prices.

("Figure 1 about here")

3. Empirical results

In this section, the effect of labor demand shocks on housing prices across time periods and by location and size of MSAs are discussed in turn.

3.1. Heterogeneity across time periods

Tables 1 and 2 report the main IV estimates of the effects of employment growth and total wage bill growth on housing prices, respectively. Because the dependent variable and the explanatory variables of interest are measures in logs, coefficient estimates can be interpreted as elasticities. Overall, the results show a positive relationship between labor demand shocks and

housing prices. The 1995-2015 IV estimates are larger than corresponding OLS estimates, indicating that OLS underestimates the effects of employment and total wage bill growth on housing prices. From Table 1, the IV elasticity for the 1995-2015 period is 0.962 suggesting that, on average, a ten percent increase in the annual average employment level is associated with a 9.62% increase in housing prices.

("Table 1 about here")

Similarly, from Table 2, on average, a ten percent increase in the total wage bill results in a 7.15% increase in housing prices. The result that labor demand shocks have positive effects on housing prices is consistent with the findings by Gan and Zhang (2013), Johnes and Hyclak (1999), and Saks (2008). These authors observe that the labor market has significantly positive effect on housing prices.

("Table 2 about here")

To assess the strength of the instruments, we report the underidentification and weak identification statistics suggested by Kleibergen and Paap (2006). Underidentification is not a concern here since the underidentification p-values are all less than 0.01. The Kleibergen-Paap weak identification statistics for the 2010-2015 period are less than the critical value of 16.38 for 10% maximal IV size, but they exceed the critical value of 8.96 for 15% maximal IV size. Thus, there may be some modest IV test size distortion from weak instruments for the 2010-2015 period, but it is not substantial indicating the instruments do a reasonably good job.

Returning to second stage results, the positive relationship between labor demand shocks and housing prices is significantly positive across the different time periods. Relative to the 1995-2000 and 2010-2015 periods, the positive effect of employment growth on housing prices is stronger in the 2002-2007 housing boom period with an elasticity of 2.683. Notably, the effect

of employment growth during the 2010-2015 period is similar to and not statistically different from most other periods considered (except 2002-2007), indicating a return to normalcy in the relationship between employment growth and housing price growth.

The effects of total wage bill growth on housing price growth follows a somewhat different pattern over time. The elasticity is largest during the 2002-2007 housing boom period at 1.506, which is three times as large as the 0.453 coefficient for 1995-2000, a comparable pattern to employment growth. However, the 2010-2015 coefficient estimate is also quite large at 1.354, which is statistically different from the 1995-2000 coefficient at the five percent level of significance. The 2010-2015 wage bill coefficient is similar in magnitude and not statistically different from the housing boom period coefficient. Thus, total wage bill effects appear to be establishing a new normal instead of returning to the relationship of the bygone days of the late 1990s. Wage effects are playing an increasingly important role in housing prices.

Based on the results above, employment and wage bill effects on housing prices appear strongest during the 2002-2007 housing boom period, relative to the other periods we consider. While we do not empirically examine the specific channels through which the heterogeneity across time occurs, we do offer possible explanation for the differential effects over time. A positive labor demand shock is expected to increase housing demand because a stronger labor market increases the desirability of living and working in a local market. However, the exact transmission from labor demand shocks to housing demand in part depends on expectations for the future and mortgage financing constraints.

Housing prices are forward looking meaning that the price that buyers are willing to pay for a home in a given area depends on the current benefits of living in the area and also the expected future benefits. A positive labor demand shock combined with an increase in optimism

about the future demand for housing will lead to amplified effects on housing demand and housing prices. The 2002-2007 housing boom period has been characterized as one with considerable optimism and even irrational exuberance (Shiller 2015). This increased housing prices across the nation, but our results show that house price increases during this period were especially strongly related to strong local labor markets. Thus, the 2002-2007 housing boom period coefficients are likely capturing both the direct effects of labor demand shocks and interaction effects between labor demand shocks and a national wave of increased optimism about housing.

The post-2000 housing boom was also characterized by relatively low interest rates and increased availability of mortgages for marginal borrowers due to relaxed lending practices. This increased household demand for homeownership and led to higher homeownership rates (Chakrabarty et al. 2017). It likely also affected housing prices. While we cannot offer supporting empirical evidence, there is some belief that increased mortgage availability may have been especially important in growing metropolitan areas with a steady stream of newcomers, thus amplifying the effects of employment shocks on housing prices. Thus, we believe that both increased optimism and relaxed lending practices amplified the effects of local labor demand shocks on housing prices during the 2002-2007 period.

3.2. Heterogeneity by location and size of MSAs

We next examine heterogeneous effects across types of MSAs. For example, land use regulations and other restrictions can impact the housing and labor market dynamics considerably. MSAs with severe land use regulation and other restrictions may experience higher housing prices growth in response to positive labor demand shocks (see, for example, Glaeser,

Gyourko, & Saks 2006; Quigley & Raphael 2005; Saks 2008). To investigate this, we estimate split-sample regressions by dividing the sample into coastal state MSAs and non-coastal state MSAs and then compare coefficients across subsamples.[6] Coastal states tend to have more stringent housing regulations, and coastal MSAs are restricted in spatial growth by the coast. One might desire to split the sample in alternative ways. One major constraint in splitting the sample involves instrument explanatory power. For the instrument to be valid, the first-stage needs to have sufficient explanatory power, which warrants reasonably large samples and variation in the instrument and endogenous explanatory variable.

Table 3 shows the effect of annual employment and total wage bill growth on housing prices for coastal state MSAs and non-coastal state MSAs for the 1995-2015 period. The IV coefficient estimates for both annual employment and total wage bill are larger in coastal state MSAs than non-coastal state MSAs, consistent with expectations that MSAs with significant land restrictions have faster housing price appreciation in response to labor demand shocks. However, the employment growth effect difference is not very large and not statistically significant. On the other hand, the difference in wage bill coefficients is much more pronounced and statistically significant at the ten percent level.

("Table 3 about here")

Given differences in industrial composition, productivity, and land use, it is also possible that labor demand shock effects on housing prices may differ between larger and smaller MSAs. To examine this, we split the sample into smaller MSAs (bottom half) and larger MSAs (top half) subsamples according to their 1995 annual level of employment and then estimate split-sample regressions to test for potential coefficient differences across the two subsamples. In Table 4, we show the effect of annual employment and total wage bill growth on housing prices

across these two subsamples for the 1995-2015 periods. The IV coefficients appear larger in large MSAs than in small MSAs, but the differences are not statistically significant at conventional levels. Thus, the evidence weakly suggests stronger effects of labor demand shocks on house prices in larger MSAs, but we cannot draw very strong conclusions about this.

("Table 4 about here")

In results not shown, we also examined differences for coastal, non-coastal, large and small MSAs for the shorter time periods in Tables 1-2. The qualitative pattern of results is similar to the results in the paper, but results are generally less precisely estimated and the instruments are often weaker in the first stage, preventing us from drawing strong conclusions. We also estimated other additional robustness checks in results not shown. For example, our main results are robust to including mean January temperature as an amenity control variable. We also experimented with excluding the construction industry from the shift-share instrument, since it is possible that the construction industry initial employment share in an MSA might be correlated with the elasticity of housing supply and other housing market conditions. Results are qualitatively robust to excluding the construction industry from the instrument.

4. Conclusion

The interactions between housing and labor markets have important implications for local economic development. How local demand shocks affect housing market conditions should be of considerable interest to policymakers because housing forms a large share of household budgets and household migration decisions depend in part on the relative cost of housing across MSAs. In this paper, we examine how the effect of labor demand shocks on housing prices varies across time and space. Using data on 321 US MSAs, we estimate the medium- and long-run effects of

increases in MSA-level employment and total wage bill on housing prices for three different expansion periods and also for coastal, non-coastal, large, and small MSAs. Instrumental variable estimates are obtained using the shift-share instrument.

The results indicate that labor demand shocks have positive effects on housing prices. However, the effect does appear to vary over time and across types of MSAs. Employment growth and total wage bill growth also have somewhat unique effects. Labor demand shocks had especially large effects on housing prices during the 2002-2007 housing boom and economic expansion period. For the most recent period examined, 2010-2015, the effect of employment growth on housing prices is similar to the 1995-2000 pre-housing boom relationship, suggesting a return to normalcy. On the other hand, the total wage bill effect on housing prices during 2010-2015 is roughly as large as the total wage bill effect on housing prices during the boom; the 2010-2015 effect is much larger than that experienced during the pre-boom period, indicating a new normal is occurring. MSA wage growth is playing an increasingly strong role in MSA house price growth.

We also find evidence of spatial heterogeneity in the relationships between labor demand shocks and housing price appreciation. Specifically, total wage bill effects are larger in coastal states than in non-coastal states, possibly due to restrictions on development and land availability that especially drive up housing prices in coastal areas with strong labor demand growth. There is also some suggestive evidence of larger elasticities in more populous MSAs. This may be due to the greater availability of undeveloped land in less populous MSAs.

Thus, in designing local economic development policies aimed at improving local labor market conditions, policymakers should take into account the general equilibrium effects on housing prices. To the extent that stronger local labor markets increase housing prices, the

benefits of local economic development accrue to prior land and housing owners. A more elastic supply of housing may increase the extent to which workers benefit from economic development. Inelastic housing supply and rising housing prices may also crowd some households out of areas with positive labor demand shocks. In recent years, growth in high wage jobs appears to especially increase housing prices, which is good for prior owners but not for households with more modest paying jobs who did not previously own land or housing in growing MSAs.

In addition, high housing prices may crowd poorer households out of prosperous areas while richer households can afford to remain or move in from other MSAs. As a result, policies that increase employment and wages and hence housing prices may also affect the composition of the population within an MSA and exacerbate national income inequality by reducing access to highly productive areas for previously disadvantaged workers. Severe land use regulation and other housing supply restrictions may amplify these problems as MSAs with a large degree of regulation appear to experience higher housing price growth in response to positive labor demand shocks. Improving the well-being of disadvantaged workers requires more than strong job growth in an MSA. There is also a need for affordable housing, which appears to require relaxed housing supply restrictions in many areas with strong local economies, so that the housing supply can expand for a growing workforce.

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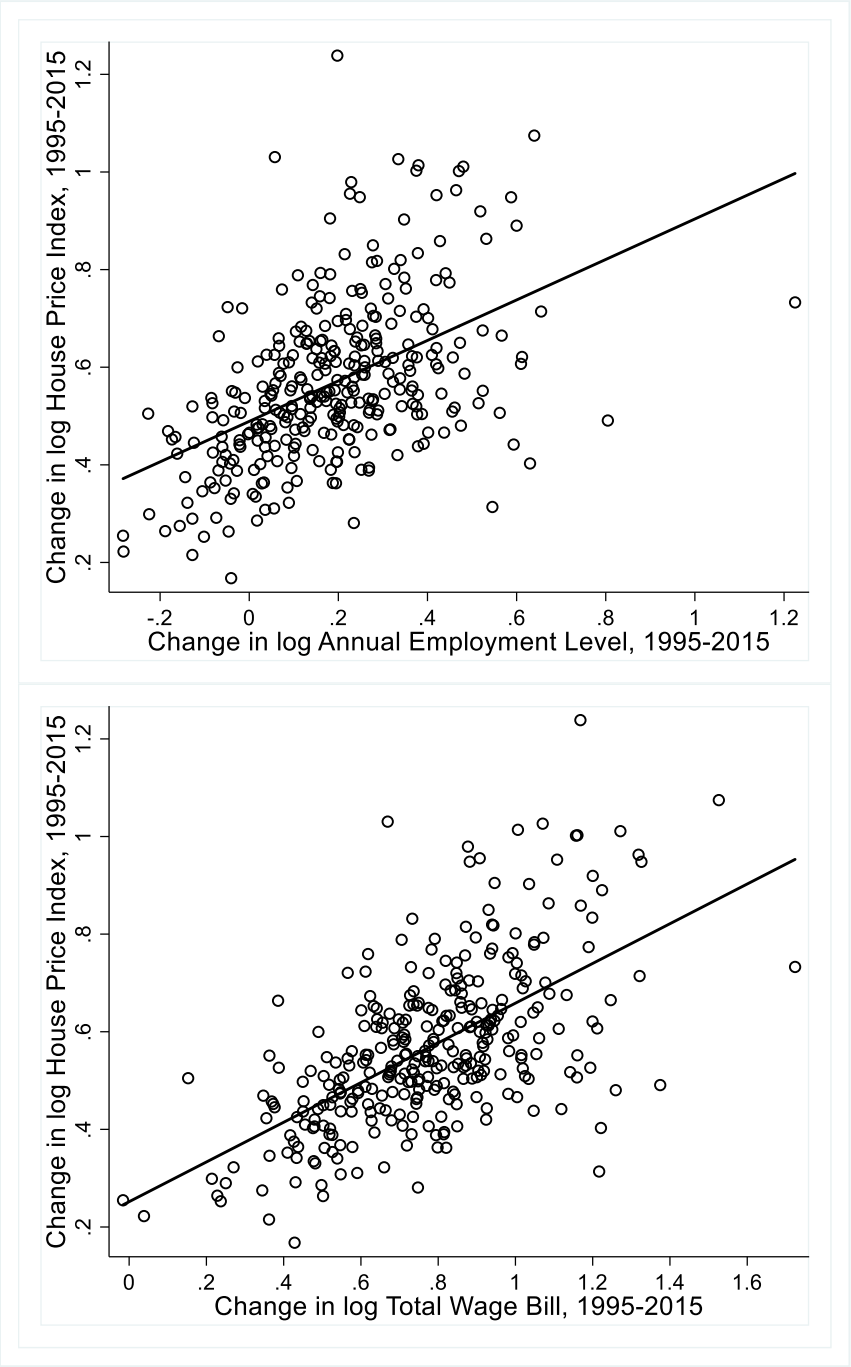

Figure 1. Growth in Housing Prices and Growth in Annual Employment and Total Wage Bill at the MSA-Level, 1995-2015.

Table 1. Estimates of the effects of employment growth on housing prices: Full sample

Dependent Variable	Change in Log House Price				
	1995-15	1995-00	2002-07	2002-15	2010-15
Change in Log Annual Employment	0.962***	0.823***	2.683***	1.064***	0.884***
	(0.142)	(0.220)	(0.572)	(0.217)	(0.334)
K-P Weak Identification Statistic	58.988	46.665	21.153	29.173	13.668
K-P Underidentification Statistic	27.062	32.096	15.194	14.979	11.677
[P-Value]	[0.000]	[0.000]	[0.000]	[0.000]	[0.001]
# MSAs	321	321	321	321	321

Notes: Each column shows the coefficient from a separate regression. The initial year for the instrument is 1995. Standard errors are reported in parenthesis. *** indicates statistical significance at the 1% level.

Table 2. Estimates of the effects of total wage bill growth on housing prices: Full sample

Dependent Variable	Change in Log House Price				
	1995-15	1995-00	2002-07	2002-15	2010-15
Change in Log Total Wage Bill	0.715***	0.453***	1.506***	0.709***	1.354***
	(0.092)	(0.093)	(0.298)	(0.123)	(0.393)
K-P Weak Identification Statistic	56.865	62.856	21.793	29.123	10.300
K-P Underidentification Statistic	31.124	27.003	15.737	17.405	9.688
[P-Value]	[0.000]	[0.000]	[0.000]	[0.000]	[0.002]
# MSAs	321	321	321	321	321

Notes: Each column shows the coefficient from a separate regression. The initial year for the instrument is 1995. Standard errors are reported in parenthesis. *** indicates statistical significance at the 1% level.

Table 3. Labor market shocks and housing prices: Coastal vs non-coastal MSAs

	Change in Log House Price			
	1995-15	1995-15	1995-15	1995-15
	Coastal	Coastal	Non-coastal	Non-coastal
Change in Log Annual Employment	0.990***		0.908***	
	(0.204)		(0.192)	
Change in Log Total Wage Bill		0.892***		0.528***
		(0.164)		(0.101)
K-P Weak Identification Statistic	43.678	28.160	21.647	27.608
K-P Underidentification Statistic	11.460	14.058	13.841	15.402
[P-Value]	[0.001]	[0.000]	[0.000]	[0.000]
# MSAs	125	125	196	196

Notes: Each column shows the coefficient from a separate regression for Coastal and non-coastal MSAs. The initial year for the instrument is 1995. Standard errors are reported in parenthesis. *** indicates statistical significance at the 1% level.

Table 4. Labor market shocks and housing prices: Large vs small MSAs

	Change in Log House Price			
	1995-15	1995-15	1995-15	1995-15
	Large MSA	Large MSA	Small MSA	Small MSA
Change in Log Annual Employment	1.191***		0.881***	
	(0.426)		(0.132)	
Change in Log Total Wage Bill		0.998***		0.591***
		(0.225)		(0.091)
K-P Weak Identification Statistic	12.744	21.984	46.302	38.401
K-P Underidentification Statistic	6.360	13.169	21.422	18.911
[P-Value]	[0.012]	[0.000]	[0.000]	[0.000]
# MSAs	160	160	161	161

Notes: Each column shows the coefficient from a separate regression for large and small MSAs. The initial year for the instrument is 1995. Standard errors are reported in parenthesis. *** indicates statistical significance at the 1% level.

Endnotes

[1] We use the terms total labor income, total wage bill, and total wages, interchangeably in this paper.

[2] While we believe that our shift-share identification strategy is the best approach available for our research question, one cannot guarantee that the industrial composition of each MSA in 1995 is completely exogenous to post-1995 housing market conditions; hence, the results should be interpreted with some caution.

[3] NAICS industries comprises 2 domains, 11 supersectors, 20 sectors, up to 99 3-digit subsectors, up to 317 4-digit industry groups, up to 724 5-digit NAICS industries, and up to 1,179 6-digit industries (https://www.bls.gov/help/def/en.htm#totalwages).

[4] The QCEW industry crosswalk displays how each high-level industry is derived from its corresponding lower-level industries (https://data.bls.gov/cew/doc/titles/industry/high_level_industries.htm).

[5] The total number of 3-digit NAICS varies over time and by MSAs between 47 and 99

[6] For these purposes, we define coastal states as those on the Pacific and Atlantic Oceans, thus excluding TX, LA, MS, and AL on the Gulf of Mexico.