Did the Housing Price Bubble Clobber Local Labor Market Job and Worker Flows When It Burst?

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We integrate local labor market data on worker flows, job flows, employment levels, and earnings with Metropolitan Statistical Area (MSA)-level data on housing prices and local area unemployment, to study the local labor market dynamics associated with the U.S. housing price bubble of the late 2000s. We proceed to study the magnitude and timing of the relation between the changes in local housing prices and local worker and job flows, and local labor market earnings. In addition to the unique contribution of using both local labor and housing market data, the paper also considers the contributions of the aggregate movements in the worker and job flows to the heterogeneous local labor market outcomes.

I. Data sources

The U.S. Census Bureau's local labor market indicators, known as the Quarterly Workforce Indicators (QWI) cover about 92 percent of the private non-agricultural workforce. The complete set of detailed flows – job creations, job destructions, accessions, separations, churning, earnings, and earnings changes – are available for 566 micropolitan areas and 357 MSAs). For most of these areas, the data are available from the mid-1990s onwards (Abowd and Vilhuber, 2011). For this article, we focus our attention on full-quarter jobs and the associated earnings. Full-quarter jobs are those for which the individual has positive earnings from a given employer in at least three consecutive quarters, thus excluding very short jobs.[1] The average monthly full-quarter earnings zw_3 associated with full-quarter jobs f are a good approximation of a wage rate. We also use average monthly full-quarter earnings $zwfs$ associated with separations from full-quarter jobs fs, and equivalently, average monthly full-quarter earnings $zwfa$ associated with accessions to full-quarter jobs fa. Finally, the associated job creation and destruction rates $fjcr$ and $fjdr$ are also part of the QWI.

The Federal Housing Finance Agency (FHFA) publishes house price indices (HPI) for single-family, detached properties using data on repeat sales and refinancings obtained from the Federal Home Loan Mortgage Corporation (Freddie Mac) and the Federal National Mortgage Association (Fannie Mae) based on a modified version of the Case and Shiller (1987) weighted-repeat sales (WRS) methodology (Calhoun, 1996). Coverage excludes mortgage transactions on attached and multi-unit properties, properties financed by government insured loans, and properties financed by mortgages exceeding the conforming loan limits determining eligibility for purchase by Freddie Mac or Fannie Mae. We use available House Price Indexes (HPI) for 366 MSAs. All housing price indices are normalized to 100 in 1995:1 and divided by the Consumer Price Index (All Urban Consumers) (CPI-U).

We also use additional information on national and local labor market unemployment rates as estimated by the Bureau of

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[1] Abowd et al. (2009) contains the precise definitions of the QWI-related concepts used in this article, which are based on integrated flow concepts from Abowd, Corbel and Kramarz (1999) and job flow concepts from Davis, Haltiwanger and Schuh (1996).

Labor Statistics (BLS).

The merged data have information on 354 MSAs, which are home to about 81 percent of the 2009 U.S. population, and in which 84 percent of all individuals worked in 2006. These data are ideal for studying the local labor market dynamics associated with the U.S. housing price bubble that burst nationally between April and December 2006 (authors' private calculations from Case-Shiller and national HPI data).

II. Model

The basic national equation relating housing price to labor market flows can be expressed as $y_{\circ t} = x_{\circ t}\bar{\beta} + \epsilon_{\circ t}$ for any variable $y_{\circ t}$ under study and any vector $x_{\circ t}$ of housing price and aggregate labor market conditions (including an intercept and lags, in our case for 5 quarters without restriction). The local labor market variable can be modeled as a composite of national and local effects which we represent as $y_{jt} = x_{\circ t}\bar{\beta} + (x_{jt} - x_{\circ t})\,\beta_j + \epsilon_{\circ t} + \epsilon_{jt}$. The purely local equation can be written as

$$(1) \qquad y_{jt} - y_{\circ t} = (x_{jt} - x_{\circ t})\,\beta_j + \epsilon_{jt}$$

where the MSA-specific effect β_j is modeled as a mixed effect. Relaxing the specification to eliminate the implicit assumption that the relevant MSA-level equation is a strict deviation from the national equation gives

$$(2) \quad y_{jt} = \beta_{1j} y_{\circ t} + \beta_{2j} x_{\circ t} + \beta_{3j} x_{jt} + \epsilon_{jt},$$

where $\beta_{1j} = 1$ with no MSA-level variation, and $-\beta_{2j} = \beta_{3j}$ if the correct model is equation 1. We then restate the equation 2 as a mixed-effects linear model:

$$(3) \quad \begin{aligned} y_{jt} \;=\; & \bar{\beta}_1 y_{\circ t} + \bar{\beta}_2 x_{\circ t} + \bar{\beta}_3 x_{jt} \\ & + \tilde{\upsilon}_{1j} y_{\circ t} + \tilde{\upsilon}_{2j} x_{\circ t} + \tilde{\upsilon}_{3j} x_{jt} \\ & + \epsilon_{jt}, \end{aligned}$$

where $\bar{\beta}_1$, $\bar{\beta}_2$ and $\bar{\beta}_3$ are the fixed national average coefficients, and $\tilde{\upsilon}_{1j}$, $\tilde{\upsilon}_{2j}$ and $\tilde{\upsilon}_{3j}$ are the random deviations of MSA-specific coefficients from the national average. The fitted marginal predictor captures the effects of the overall market conditions and MSA variation in the housing market and local labor market conditions:

$$(4) \qquad \widehat{\bar{y}}_{jt} = \widehat{\bar{\beta}}_1 y_{\circ t} + \widehat{\bar{\beta}}_2 x_{\circ t} + \widehat{\bar{\beta}}_3 x_{jt}.$$

The linear predictor inclusive of the estimated random effects captures the incremental contribution of the MSA-specific variation in the coefficients:

$$(5) \quad \widehat{\widehat{\bar{y}}}_{jt} = \widehat{\bar{y}}_{jt} + \widehat{\tilde{\upsilon}}_{1j} y_{\circ t} + \widehat{\tilde{\upsilon}}_{2j} x_{\circ t} + \widehat{\tilde{\upsilon}}_{3j} x_{jt}.$$

The model is fit for full-quarter employment, worker flows, job flows, log full-quarter monthly earnings, log full-quarter monthly earnings of accessions (hires plus recalls) and log full-quarter earnings of separations (voluntary plus involuntary) by restricted maximum likelihood assuming that the residuals and the random effects have independent normal distributions with zero means and constant variances.

III. Results

The housing price bubble reached a peak in 2006:4. In that quarter, we identify the top decile of MSAs, which we call "top group" in our analysis. The 35 MSAs in the top group are the most important ones for understanding local variability in the response to the housing price bubble. Collectively, these 35 MSAs spent at least four years above the national average, but also experienced the most rapid housing price deflation. We compare them to the middle eight deciles, called "middle group." Well before the official onset of the recession, 2007:4, the top group MSAs experienced price decreases substantially greater (in absolute value) than the national average. In the depths of the recession, these MSAs displayed the largest price reductions of all, accounting for the lower tail of distribution even after housing prices started to recover.[2]

The differential incidence of the housing price bubble is working its way through the labor market. Consider Figure 1 (Panel A), which shows the level of full-quarter employment nationally from 1993:1 to 2010:2

[2]These data are illustrated in the figures in the Online Appendix.

with the two official recessions shaded gray. Full-quarter employment fell during both recessions. In the most recent recession, it did not level off until after the recession had been over for several quarters, and it has still not begun to grow again. Overall, the economy lost 4.8 million private full-quarter jobs from 2007:4 to 2009:4. The loss of stable jobs represents 76 percent of the 6.3 million such jobs that were gained from 2002:4 to 2007:4 (trough to peak) following the 2001 recession. Exploiting the flow identities, we note that the loss of full-quarter jobs during the most recent recession was accomplished by a precipitous decline in accessions to full-quarter employment accompanied by a very mild decline in full-quarter separations, which generated substantial net full-quarter employment declines. Using the job creation/destruction identity, we note that the same period saw a mild decline in gross full-quarter job creations and a substantial increase in full-quarter gross job destructions. Nationally, then, the 4.8 million net full-quarter jobs loss was accomplished by slashing the accession rate and allowing jobs to be destroyed through separations.

Figure 1 (Panel B) shows the level of full-quarter employment and the associated worker and job flow rates for the top group MSAs. These 35 MSAs, which accounted for 17 percent (16.6 million) of the 97.8 million full-quarter jobs at the peak of the housing price boom (2006:4), lost 1.1 million full-quarter jobs from 2007:4 to 2009:4.[3] The massive loss of full-quarter jobs in the top group MSAs was accomplished through worker flows in which full-quarter accessions fell off the cliff, only beginning to recover in 2010:2, while full-quarter separations fell only very gently over the same period. From the gross job flow side of the identities, full-quarter job creations fell strongly, while full-quarter job destructions increased mildly. The top group local labor markets experienced a more extreme form of the adjustment process that occurred nationally–destroying stable jobs by massively reducing hiring while separations only fell slightly.

To attempt to capture the differentially strong effect of the housing price bubble on the top group MSAs, we report the results of the MSA-level estimates of the responsiveness of gross worker and job flows to the local housing price index. By controlling for the national level of the labor market flow variable, national housing price movements, local and national labor market conditions, we can isolate the marginal contribution of the local HPI on the predicted flows. By allowing the effect to be heterogeneous across MSAs, we allow for the possibility that high-HPI MSAs had differential responses to all of the control variables. The results are partially summarized in Table 1. For all four MSA-specific gross flow rates, the coefficient on the equivalent national gross flow is essentially unity on average, but with a substantial standard deviation for the MSA-specific random component. In the case of gross worker flows, the random component has a standard deviation of about 14 percentage points while for gross job flows the standard deviation of the random component is about 25 percentage points. Both of these estimates imply very substantial MSA-specific deviation in the gross flows. Online Appendix figures C2 and C3 show that for all four gross flows, the estimated variation in the MSA-specific deviation from the national average is greatest for the top HPI group. That is, the most volatile local labor markets were those in which the housing price bubble was greatest.

[Table 1 about here]

Table 1 also shows the responsiveness of the flows to the local HPI, holding constant the national HPI, local and national labor market conditions. These effects are all positive on average (the estimated long-run effect is zero in all cases, not shown). Except for the full-quarter job creation rate, the standard deviation of the effect is about half

[3] There is a break in the comparability of the MSA data between 2005:1 and 2005:2 which accounts for the apparent large increase in the stock of full-quarter workers in the top HPI decile in the mid-2000s. From 2005:2 through 2010:2, there are no composition changes in the MSA data.

the effect magnitude, indicating that heterogeneity in the response to the housing price changes also contributed to differential local labor market outcomes.

A full explanation for why the local labor markets in the top group MSAs were more volatile and experienced a more severe recession than the national average awaits further modeling. There are some clues, however, in the wage rate movements. Spatial equilibrium models predict that local housing prices and local wage rates move in the same direction Moretti (2011). Figure 2 (Panel A) shows what happened to log real full-quarter monthly earnings over the course of the recession. For the middle group of MSAs, the real earnings fell very gently. For the top group, those earnings fell more strongly; however, the predicted fall in the log real monthly earnings of full-quarter workers, according to equation 4, shown as the "average marginal prediction (top group)" in the figure, is much greater. If wages had responded in the 35 top group MSAs in a manner consistent with the national average response, those wages would have fallen much more strongly. Hence, the movement towards a new spatial equilibrium in these local markets has been much slower than predicted. Online Appendix figures C4 and C4 show that the same phenomenon occurred for the log real monthly earnings of full-quarter accessions, which exacerbated the adjustments, and full-quarter separations, which mitigated the effects of the full-quarter accession wage rate stability.

Figure 2 (Panel B) shows the equivalent comparison between the "average marginal prediction (top group)" and the actual full-quarter employment for the top group and the middle group. The national model predicts an even more severe decline in employment in these MSAs than actually occurred.

IV. Discussion

The housing price bubble was most extreme in 35 Metropolitan Statistical Areas identified as occupying the top decile of the housing price index in the quarter of its peak in real terms (2006:4). These 35 MSAs experienced a precipitous drop in full-quarter (stable) employment that was much steeper than the drop in the overall economy. The decline in the levels resulted from gross worker flows in which the full-quarter accession rate fell off a cliff while the full-quarter separation rate declined very slowly. In terms of gross job flows, the full-quarter job creation rate fell sharply while the full-quarter job destruction rate rose only modestly. In the economy as a whole, MSA-specific log real full-quarter monthly earnings fell over the course of the recession, which helped to restore the spatial equilibrium. However, in the 35 MSAs in the top decile of the housing price bubble, this did not happen, which probably exacerbated the local labor market adjustments as evidenced by sustained above-prediction earnings for full-quarter employment and accessions. The log real earnings of full-quarter separations in these labor markets also fell more slowly than predicted, which may have offset the exacerbating effect of the accession earnings.

REFERENCES

Abowd, John M., and Lars Vilhuber. 2011. "National Estimates of Gross Employment and Job Flows from the Quarterly Workforce Indicators with Demographic and Industry Detail." *Journal of Econometrics*, 161: 82–99.

Abowd, John M., Bryce E. Stephens, Lars Vilhuber, Fredrik Andersson, Kevin L. McKinney, Marc Roemer, and Simon Woodcock. 2009. "The LEHD Infrastructure Files and the Creation of the Quarterly Workforce Indicators." *Producer Dynamics: New Evidence from Micro Data*, , ed. Timothy Dunne, J. Bradford Jensen and Mark J. Roberts Vol. 68 of *Studies in Income and Wealth*, 149–230. University of Chicago Press for the NBER.

Abowd, John M., Patrick Corbel, and Francis Kramarz. 1999. "The Entry and Exit of Workers and the Growth of Employment: An Analysis of French Es-

tablishments." *Review of Economics and Statistics*, 81(2): 170–187.

Brown, Sharon P. 2005. "Improving estimation and benchmarking of State labor force statistics." *Monthly Labor Review*, 128(5): 23–31. .

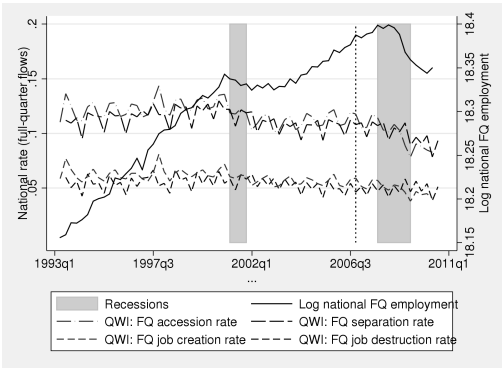
Bureau of Labor Statistics. 1997. *BLS Handbook of Methods.* Washington DC:U.S. Bureau of Labor Statistics, Division of Information Services. http://www.bls.gov/opub/hom/.

Calhoun, Charles A. 1996. "OFHEO House Price Indexes: HPI Technical Description." Federal Housing Finance Agency. accessed April 6, 2011.

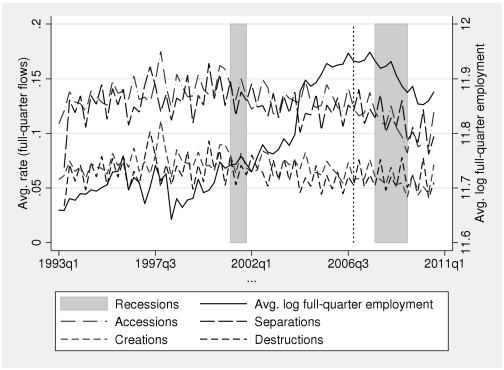
Case, K.E., and R.J. Shiller. 1987. "Prices of Single Family Real Estate Prices." *New England Economic Review*, 45–56.

Davis, Steven J., John C. Haltiwanger, and Scott Schuh. 1996. *Job creation and destruction.* Cambridge, MA:MIT Press.

Moretti, Enrico. 2011. "Local Labor Markets." In *Handbook of Labor Economics*. Vol. 4, Part B, , ed. Orley Ashenfelter and David Card, Chapter 14, 1237 – 1313. Elsevier.

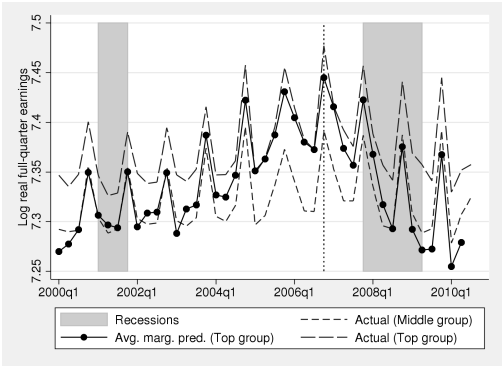


Panel A: National

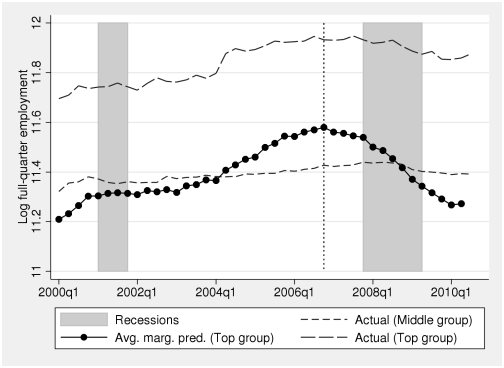


Panel B: Top Decile MSAs by HPI

Figure 1. Full-quarter Employment and Flows, 1993-2010



Panel A: Log Full-quarter Monthly Earnings



Panel B: Log Full-quarter Employment

Figure 2. Actual and Predicted Values, Top and Middle Groups by HPI, 2000-2010

Table 1—Selected Results

Dependent Variable	National Variable Coeff.	RE Standard Deviation	Log Local HPI Coeff.	HPI RE Standard Deviation
FQ AR	0.9649	0.1364	0.0267	0.011
	(0.0307)		(0.0072)	
FQ SR	1.0318	0.1519	0.0222	0.0146
	(0.0407)		(0.0084)	
FQ JCR	0.9748	0.2485	0.0133	-
	(0.0399)		(0.0069)	
FQ JDR	1.0236	0.2693	0.0101	0.0128
	(0.0491)		(0.0079)	

Standard errors are in parentheses. RE=Random effect. AR=Accession rate. SR=Separation rate. JCR = Job creation rate. JDR = Job destruction rate.