

The “Great Recession,” Housing Markets, and US Internal Migration

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Reports on declining mobility in the United States in recent years

- popular press
- Bureau of the Census

Many make note of recession and collapse of housing market as cause

- strongest economic downturn since 1930s
- unprecedented downturn in housing market

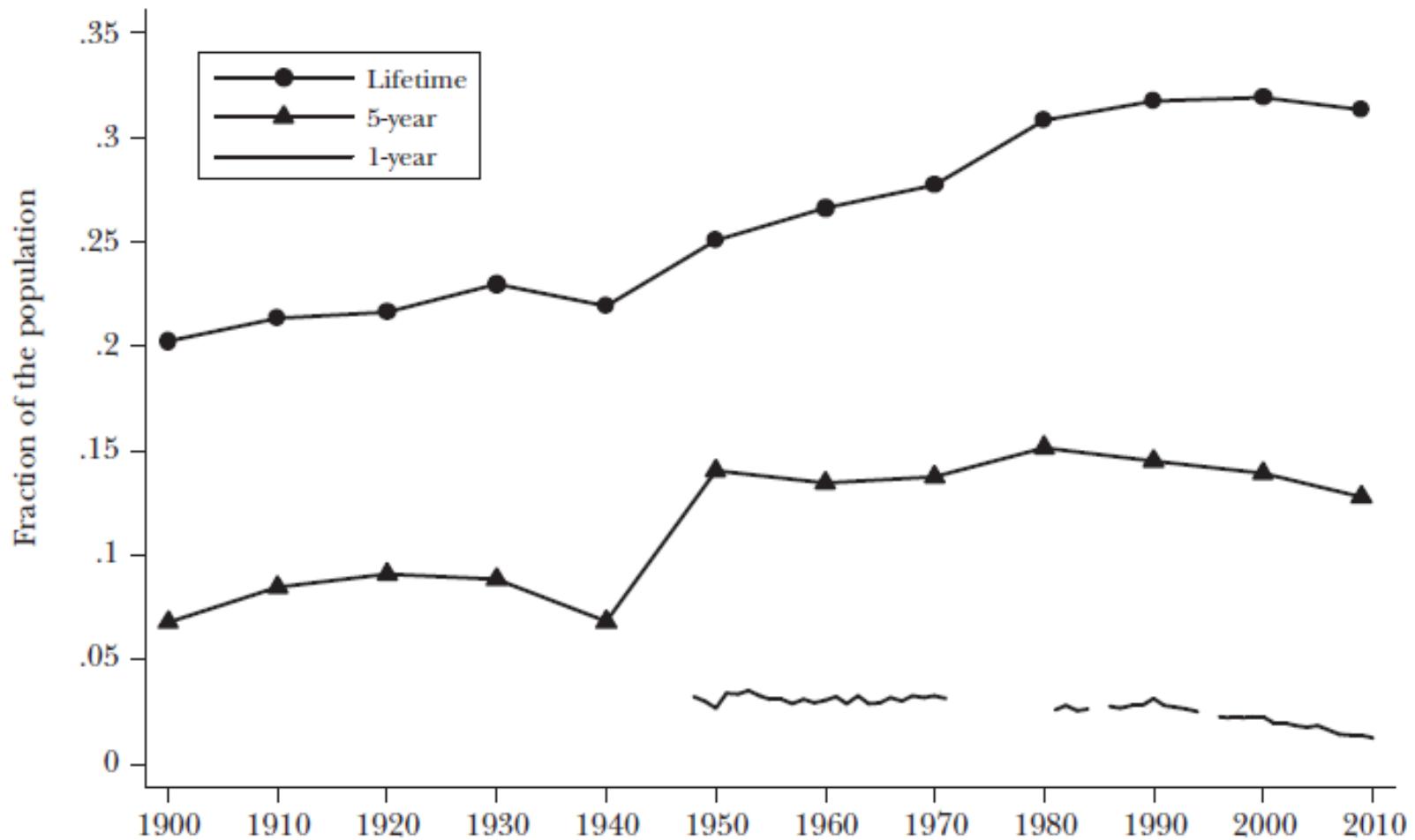
Want to look more closely at recent migration experience and its connection to general economic conditions and housing markets

Analysis complicated by a couple of factors:

- overlying long-term pattern of declining internal migration (Figure 1)
- explanations for long-term trend
- lack of ideal time series of migration data that is:
 - a) recent enough to cover “Great Recession” and housing market collapse
 - b) long enough to distinguish this period from prior periods
 - c) consistent enough to be confident that conclusions are not based on statistical quirks
 - d) based on a sufficiently large and representative sample

Figure 1

Interstate Migration Rates since 1900



Three related relevant issues addressed in recent research:

- 1) Sudden and dramatic drop in US internal migration rates after about 2006 (Figure 2)
 - imputation issue (statistical quirk)?
- 2) The effect of the “Great Recession” on US internal migration
 - evidence suggests that migration typically is pro-cyclical (Figure 3)
 - Saks and Wozniak (2011)
 - age cohorts
 - timing of their research
 - Molloy, Smith, and Wozniak (2011)
 - current recession vs long-term trend
- 3) The impact of the housing market collapse on US internal migration
 - house prices (Table 1), negative equity, and foreclosures

Figure 2

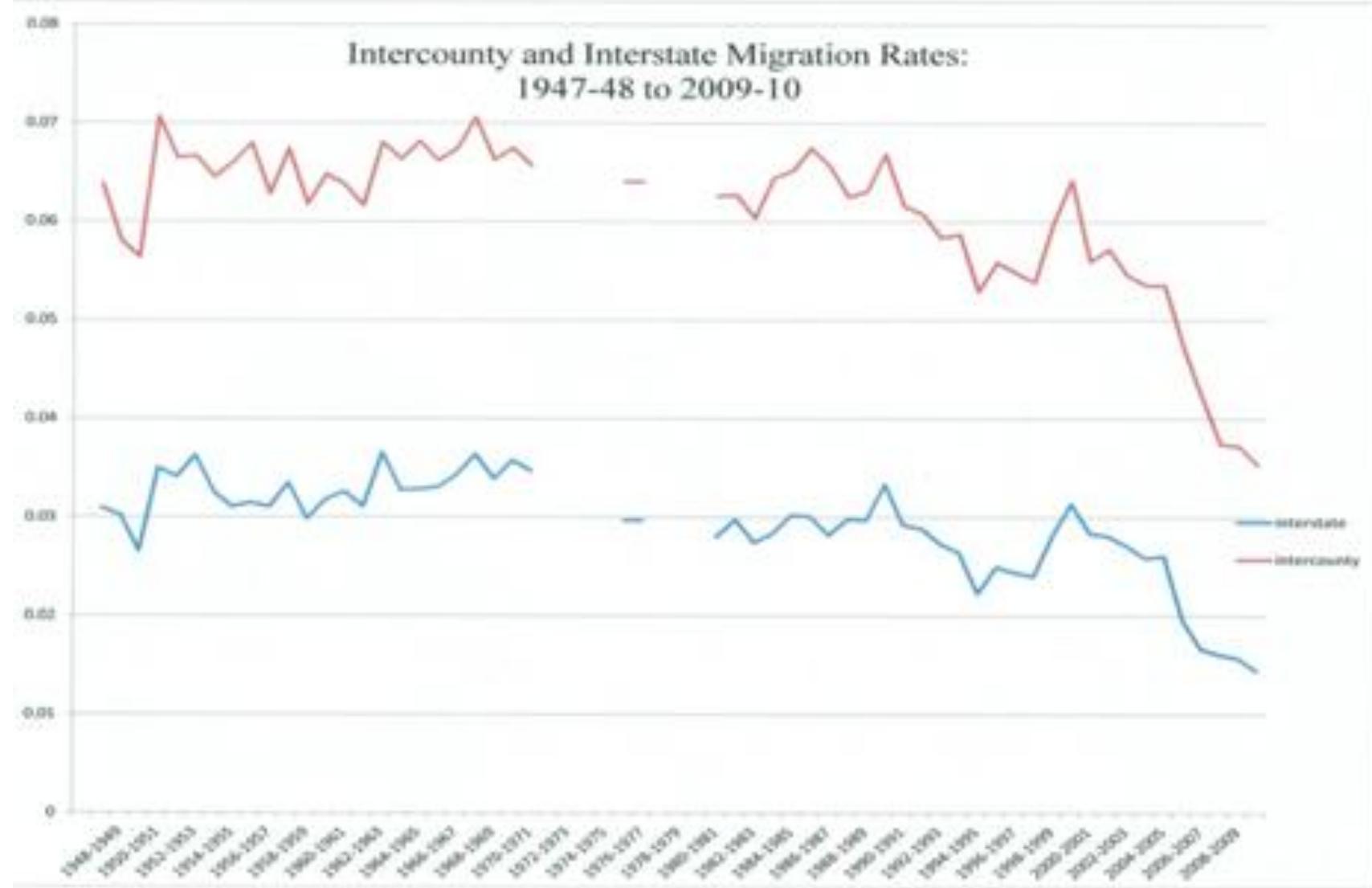


Figure 3

Figure 1
Internal Migration Rates Over the Business Cycle

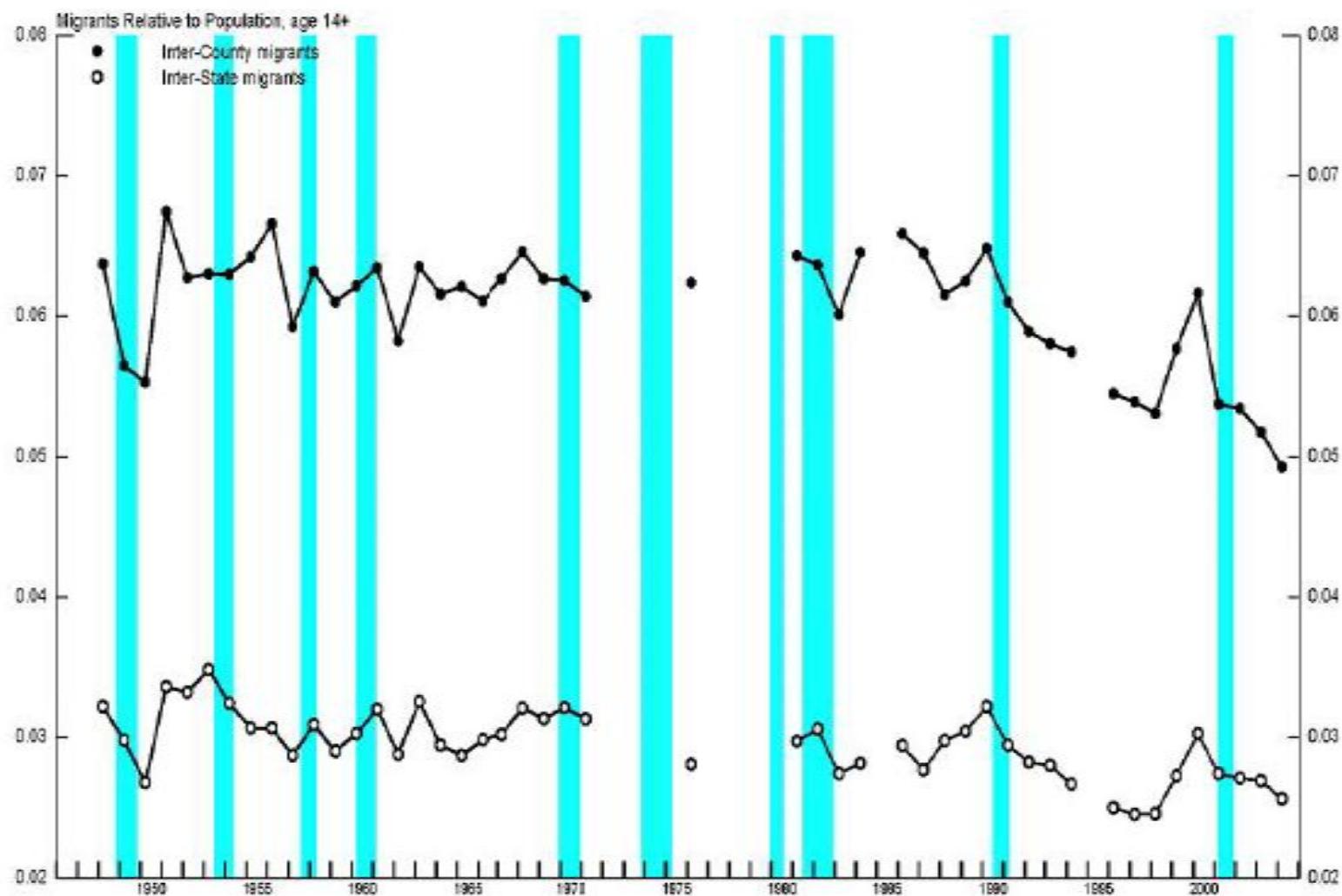


Table 1

Single-Family Housing Price Indexes by State: 4th Quarter						
State						% Change 2006-10
	2006	2007	2008	2009	2010	
United States	222.8	217.6	197.6	193.9	185.7	-16.7
Alabama	196.3	200.2	193.0	197.4	176.9	-9.9
Alaska	218.3	222.3	226.1	217.0	222.9	2.1
Arizona	319.4	289.2	227.1	198.6	172.6	-46.0
Arkansas	192.8	194.4	186.6	190.7	175.2	-9.1
California	269.5	230.7	170.6	168.1	159.2	-40.9
Colorado	278.4	276.7	263.9	270.3	266.3	-4.3
Connecticut	195.2	194.4	184.1	176.9	170.2	-12.8
Delaware	221.0	215.8	201.8	194.8	194.0	-12.2
District of Columbia	342.9	344.8	330.8	327.2	333.7	-2.7
Florida	306.5	275.6	205.5	188.5	175.7	-42.7
Georgia	198.5	197.1	178.3	174.4	154.8	-22.0
Hawaii	211.6	207.9	205.3	180.8	174.7	-17.4
Idaho	258.1	263.9	240.8	225.8	189.6	-26.5
Illinois	210.7	209.2	196.0	186.6	181.5	-13.9
Indiana	167.3	165.6	158.9	160.6	159.2	-4.9
Iowa	196.8	199.1	197.3	198.0	195.1	-0.8
Kansas	195.0	198.3	195.7	196.7	191.8	-1.6
Kentucky	188.9	191.4	188.3	190.2	189.1	0.1
Louisiana	229.2	234.5	230.0	231.4	227.4	-0.8
Maine	221.6	223.6	211.3	211.9	209.8	-5.3
Maryland	266.6	262.8	227.1	215.4	211.2	-20.8
Massachusetts	242.9	235.4	222.9	221.7	221.1	-9.0
Michigan	193.3	175.4	155.6	150.4	145.3	-24.9
Minnesota	252.6	242.2	221.9	219.2	209.7	-17.0
Mississippi	190.8	193.0	185.9	179.8	173.7	-8.9
Missouri	203.4	202.6	194.0	193.8	181.8	-10.6
Montana	306.9	322.6	309.5	305.7	288.5	-6.0
Nebraska	197.5	196.9	192.4	197.7	189.6	-4.0
Nevada	266.6	235.0	160.9	135.0	126.1	-52.7
New Hampshire	232.1	224.3	208.2	207.0	200.4	-13.6
New Jersey	257.3	252.9	234.4	226.2	222.7	-13.5
New Mexico	237.4	240.0	235.3	224.7	213.1	-10.2
New York	218.5	220.0	213.0	211.2	208.8	-4.5
North Carolina	196.2	201.0	192.7	192.2	185.8	-5.3
North Dakota	201.2	208.5	214.8	217.0	226.5	12.6
Ohio	174.1	169.9	159.7	160.6	154.1	-11.5
Oklahoma	185.9	194.6	189.1	195.5	193.2	4.0
Oregon	327.2	333.0	307.3	284.3	256.1	-21.7
Pennsylvania	199.0	201.9	194.5	194.0	189.2	-5.0
Rhode Island	235.1	221.3	197.6	195.4	190.4	-19.0
South Carolina	195.3	198.2	190.2	191.0	179.8	-7.9
South Dakota	216.8	224.1	223.7	226.2	220.9	1.9
Tennessee	197.7	202.3	194.0	190.8	183.9	-7.0
Texas	183.7	190.9	189.5	191.4	188.0	2.3
Utah	300.3	316.3	288.3	266.5	249.1	-17.1
Vermont	217.1	216.0	212.5	208.4	205.5	-5.3
Virginia	247.1	240.6	215.8	221.5	209.6	-15.2
Washington	270.1	278.3	255.1	241.9	224.7	-16.8
West Virginia	185.2	192.3	191.3	188.0	188.0	1.5
Wisconsin	227.2	225.3	218.4	214.5	209.4	-7.8
Wyoming	292.2	302.3	305.6	288.9	280.1	-4.2

Source: Federal Housing Finance Agency, Housing Price Index,

Housing Markets

Negative Equity (data from CoreLogic)

- 1) 11.1 million, or 23.1 percent, of all residential properties with a mortgage were in negative equity at the end of the fourth quarter of 2010
- 2) An additional 2.4 million borrowers had less than five percent equity, referred to as near-negative equity, in the fourth quarter.
- 3) Nevada had the highest negative equity percentage with 65 percent of all of its mortgaged properties underwater, followed by Arizona (51 percent), Florida (47 percent), Michigan (36 percent) and California (32 percent).

Foreclosures (data from RealtyTrac)

- 1) Foreclosure filings increased by more than 200 percent between the end of 2005 and the end of 2009 and continued to increase slowly in the year after that.
- 2) In 2010, 1 out of every 11 mortgaged housing units in Nevada received at least one foreclosure notice.

Table 2: Interstate Immigration Patterns, 2007-2010

State	2007	2008	2009	2010
Alabama	3.02	2.63*	2.67	2.30*
Alaska	5.40	5.96	5.89*	5.17*
Arizona	4.21	3.77*	3.48*	3.52
Arkansas	3.19	3.14*	3.00*	2.74*
California	1.36	1.29*	1.26*	1.21*
Colorado	4.13	4.04*	3.69*	3.74
Connecticut	2.27	2.28	2.19*	2.18*
Delaware	4.72	4.83	3.99*	3.46*
District of Columbia	8.22	7.62*	6.55*	8.59
Florida	2.74	2.70*	2.52*	2.59
Georgia	3.57	3.03*	2.87*	2.60*
Hawaii	4.11	4.36	4.17*	3.98*
Idaho	4.49	4.32*	3.80*	3.59*
Illinois	1.83	1.75*	1.61*	1.61*
Indiana	2.40	2.56	2.09*	1.99*
Iowa	2.80	2.68*	2.50*	2.41*
Kansas	3.16	3.63	3.70	3.37*
Kentucky	2.95	2.55*	2.85	2.76*
Louisiana	3.01	2.55*	2.05*	2.18
Maine	2.64	2.58*	1.89*	2.11
Maryland	2.72	2.86	3.10	2.88*
Massachusetts	2.10	2.29	2.23*	2.16*
Michigan	1.32	1.27*	1.19*	1.19
Minnesota	2.01	1.89*	1.75*	1.71*
Mississippi	2.85	2.52*	2.31*	2.47
Missouri	2.86	2.67*	2.54*	2.45*
Montana	3.79	4.64	3.22*	3.64
Nebraska	2.97	2.85*	3.00	2.85*
Nevada	5.09	4.68*	4.16*	3.85*
New Hampshire	3.93	3.55*	2.89*	3.02
New Jersey	1.70	1.69*	1.52*	1.46*
New Mexico	3.57	3.51*	3.26*	3.61
New York	1.42	1.36*	1.41	1.41
North Carolina	3.82	3.55*	3.04*	2.79*
North Dakota	3.55	4.22	4.71	4.52*
Ohio	1.66	1.60*	1.49*	1.51
Oklahoma	3.40	3.40	3.24*	2.87*
Oregon	3.39	3.20*	3.37	3.08*
Pennsylvania	2.12	1.93*	1.84*	1.87
Rhode Island	3.26	2.71*	3.18	3.08*
South Carolina	3.99	3.41*	3.23*	3.33
South Dakota	3.49	3.03*	3.70	3.20*
Tennessee	3.07	2.93*	2.71*	2.54*
Texas	2.35	2.24*	2.08*	1.95*
Utah	4.00	3.79*	3.31*	2.86*
Vermont	3.76	3.57*	3.15*	3.64
Virginia	3.61	3.46*	3.46	3.27*
Washington	3.18	3.17*	2.92*	2.88*
West Virginia	2.91	3.01	2.77*	2.16*
Wisconsin	1.85	1.89	1.70*	1.66*
Wyoming	5.62	5.19*	5.75	5.04*
# of States with Decline		38	39	37

Table 3: Interstate Outmigration Patterns, 2007-2010

State	2007	2008	2009	2010
Alabama	2.50	2.21*	2.31	2.11*
Alaska	9.12	11.95	10.06*	12.53
Arizona	3.10	2.98*	3.06	2.83*
Arkansas	3.01	2.79*	2.33*	2.24*
California	1.86	1.62*	1.50*	1.56
Colorado	3.71	3.45*	3.16*	2.87*
Connecticut	2.86	2.80*	2.67*	2.53*
Delaware	3.60	3.72	3.38*	3.40
District of Columbia	10.31	9.97*	8.88*	9.43
Florida	2.97	2.81*	2.42*	2.32*
Georgia	2.80	2.72*	2.62*	2.57*
Hawaii	5.26	4.50*	5.06	3.72*
Idaho	3.37	3.99	3.89*	3.44*
Illinois	2.35	2.36	2.18*	2.19
Indiana	2.42	2.12*	2.28	2.04*
Iowa	2.41	2.49	2.37*	2.23*
Kansas	3.39	3.27*	3.23*	3.23
Kentucky	2.50	2.20*	2.24	2.19*
Louisiana	2.78	2.51*	2.04*	1.98*
Maine	2.70	2.44*	2.46	2.45*
Maryland	3.48	3.18*	2.85*	2.82*
Massachusetts	2.76	2.40*	2.15*	2.24
Michigan	2.10	2.05*	2.09	1.82*
Minnesota	2.26	2.25	2.17*	2.00*
Mississippi	3.01	2.44*	2.54	2.34*
Missouri	2.69	2.61*	2.36*	2.51
Montana	3.19	3.84	3.16*	3.68
Nebraska	3.08	2.95*	2.49*	2.44*
Nevada	4.47	4.10*	4.30	4.12*
New Hampshire	3.60	3.19*	3.67	2.96*
New Jersey	2.49	2.43*	2.18*	2.22
New Mexico	3.75	3.50*	3.35*	2.51*
New York	2.31	2.14*	1.96*	1.90*
North Carolina	2.52	2.62	2.50*	2.22*
North Dakota	3.37	3.88	3.41*	3.72
Ohio	1.89	1.93	1.81*	1.65*
Oklahoma	2.57	2.72	2.51*	2.46*
Oregon	2.92	2.99	2.71*	2.67*
Pennsylvania	1.98	1.86*	1.65*	1.68
Rhode Island	3.50	3.30*	3.04*	2.43*
South Carolina	2.38	2.66	2.61*	2.60*
South Dakota	3.01	3.25	3.26	3.46
Tennessee	2.70	2.49*	2.58	2.29*
Texas	1.81	1.72*	1.57*	1.67
Utah	2.86	2.81*	3.04	2.79*
Vermont	4.08	3.93*	3.88*	3.00*
Virginia	3.30	3.20*	3.22	2.95*
Washington	2.66	2.68	2.75	2.53*
West Virginia	2.50	2.81	2.62*	2.68
Wisconsin	2.16	2.00*	1.79*	1.98
Wyoming	5.23	5.84	5.67*	5.08*
# of States with Decline		35	36	36

Table 3: Interstate Netmigration Patterns, 2007-2010

State	2007	2008	2009	2010
Alabama	0.52	0.42	0.36	0.19
Alaska	-3.71	-5.99	-4.16	-7.36
Arizona	1.11	0.79	0.42	0.69
Arkansas	0.18	0.36	0.67	0.50
California	-0.49	-0.33	-0.25	-0.36
Colorado	0.42	0.58	0.53	0.87
Connecticut	-0.59	-0.53	-0.48	-0.35
Delaware	1.12	1.11	0.62	0.06
District of Columbia	-2.09	-2.35	-2.33	-0.84
Florida	-0.23	-0.11	0.10	0.27
Georgia	0.77	0.32	0.25	0.03
Hawaii	-1.15	-0.13	-0.89	0.26
Idaho	1.12	0.34	-0.09	0.14
Illinois	-0.52	-0.61	-0.56	-0.58
Indiana	-0.03	0.43	-0.18	-0.05
Iowa	0.39	0.19	0.14	0.17
Kansas	-0.23	0.36	0.46	0.14
Kentucky	0.45	0.35	0.61	0.57
Louisiana	0.23	0.03	0.00	0.21
Maine	-0.06	0.13	-0.57	-0.34
Maryland	-0.76	-0.32	0.25	0.06
Massachusetts	-0.67	-0.10	0.08	-0.08
Michigan	-0.78	-0.78	-0.89	-0.63
Minnesota	-0.24	-0.36	-0.42	-0.29
Mississippi	-0.17	0.08	-0.23	0.13
Missouri	0.17	0.06	0.18	-0.06
Montana	0.60	0.81	0.06	-0.04
Nebraska	-0.11	-0.10	0.51	0.41
Nevada	0.62	0.58	-0.14	-0.27
New Hampshire	0.33	0.36	-0.78	0.06
New Jersey	-0.79	-0.74	-0.66	-0.76
New Mexico	-0.18	0.01	-0.09	1.10
New York	-0.90	-0.78	-0.56	-0.49
North Carolina	1.29	0.93	0.55	0.57
North Dakota	0.18	0.34	1.30	0.80
Ohio	-0.23	-0.33	-0.32	-0.14
Oklahoma	0.83	0.68	0.74	0.41
Oregon	0.47	0.21	0.65	0.41
Pennsylvania	0.14	0.07	0.19	0.19
Rhode Island	-0.24	-0.60	0.14	0.64
South Carolina	1.61	0.75	0.63	0.73
South Dakota	0.48	-0.22	0.43	-0.26
Tennessee	0.38	0.44	0.13	0.25
Texas	0.54	0.52	0.51	0.28
Utah	1.14	0.98	0.26	0.06
Vermont	-0.32	-0.36	-0.73	0.64
Virginia	0.30	0.26	0.24	0.32
Washington	0.52	0.50	0.17	0.35
West Virginia	0.40	0.20	0.15	-0.52
Wisconsin	-0.31	-0.11	-0.09	-0.32
Wyoming	0.39	-0.65	0.09	-0.04
# of States with Net Outmigration	23	20	20	20

Interstate Migration Data

ACS vs IRS vs CPS

- 1) stratify by different population characteristics
- 2) sufficient sample size
- 3) available for appropriate years

Will we have ACS data in the future?

Aggregate in/Out Migration vs State-to-State vs PUMS

1 year vs 3 year vs 5 year

Time Period

- 1) 2007, 2008, 2009, 2010
- 2) 2005 (group quarters); 2006 (incomplete)

Model and Methods

- 1) 4 year panel with 48 continental states (exclude AK, DC, HI)
- 2) Fixed effects for states (helps us focus on variables of interest)
- 3) No time fixed effects (have US unemployment rate)
- 4) Stratify by age group (later by other characteristics)

Regression Equation

$\text{LN(OutRate)} = f(\text{Employment Growth, Unemployment Rate, Foreclosures, US Unemployment Rate, LN(House Value)})$

where:

LNOutRate = natural log of the outmigration rate, defined as (number of people who lived in a state during the previous survey year, but lived in a different state at the time of the current survey) divided by (the number of people who lived in the origin state a year ago) [US Bureau of the Census, American Community Survey];

Employment Growth = the percentage growth rate of total employment during the 3 years prior to the survey year [US Bureau of Economic Analysis, REIS];

Unemployment Rate = Average annual percentage of the civilian labor force that was unemployed in the previous year [Bureau of Labor Statistics];

Foreclosures = percentage of housing units that received a foreclosure notice during the previous year;

US Unemployment Rate = unemployment rate for the nation during the previous year [US Bureau of Labor Statistics];

Ln(House Value) = natural log of the median house value in the state during the 4th quarter of the previous year.

Dependent Variable: LNOUTRAT				
Method: Panel Least Squares				
Sample: 1 192				
Periods included: 48				
Cross-sections included: 4				
Total panel (balanced) observations: 192				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-8.341940	2.040450	-4.08828***	0.0001
State Unemployment Rate	-0.016670	0.007091	-2.35108**	0.0201
Employment Growth	-0.014750	0.012547	-1.17553	0.2418
Foreclosures	0.070298	0.018302	3.840923***	0.0002
US Unemployment Rate	-0.017090	0.002958	-5.77566***	0.0000
Ln House Value	0.768976	0.163391	4.706355***	0.0000
	Effects Specification			
Period fixed (dummy variables)				
R-squared	0.956069	Mean dependent var		0.981594
Adjusted R-squared	0.939634	S.D. dependent var		0.248993
S.E. of regression	0.061176	Akaike info criterion		-2.52105
Sum squared resid	0.520215	Schwarz criterion		-1.62184
Log likelihood	295.0207	Hannan-Quinn criter.		-2.15687
F-statistic	58.17347	Durbin-Watson stat		2.146665
Prob(F-statistic)	0			

Dependent Variable: LNOUTRAT 25-34 Years Old				
Method: Panel Least Squares				
Sample: 1 192				
Periods included: 48				
Cross-sections included: 4				
Total panel (balanced) observations: 192				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-7.200022	3.634716	-1.980903**	0.0496
State Unemployment Rate	-0.020702	0.012631	-1.638896	0.1035
Employment Growth	-0.014043	0.02235	-0.628305	0.5308
Foreclosures	0.07214	0.032603	2.21269	0.0286
US Unemployment Rate	-0.013949	0.00527	-2.64709	0.0091
Ln House Value	0.719183	0.291053	2.470966	0.0147
Effects Specification				
Period fixed (dummy variables)				
R-squared	0.867259	Mean dependent var		1.512742
Adjusted R-squared	0.817601	S.D. dependent var		0.255162
S.E. of regression	0.108975	Akaike info criterion		-1.36633
Sum squared resid	1.650713	Schwarz criterion		-0.46712
Log likelihood	184.1675	Hannan-Quinn criter.		-1.00214
F-statistic	17.46447	Durbin-Watson stat		2.254128
Prob(F-statistic)	0			

Dependent Variable: LNOUTRAT 35-49 Years Old				
Method: Panel Least Squares				
Sample: 1 192				
Periods included: 48				
Cross-sections included: 4				
Total panel (balanced) observations: 192				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-13.72752	3.770959	-3.640325	0.0004
State Unemployment Rate	-0.014743	0.013105	-1.125001	0.2625
Employment Growth	-0.029088	0.023188	-1.25443	0.2118
Foreclosures	0.098377	0.033825	2.908437	0.0042
US Unemployment Rate	-0.023098	0.005467	-4.224822	0
Ln House Value	1.188823	0.301963	3.936981	0.0001
	Effects Specification			
Period fixed (dummy variables)				
R-squared	0.878416	Mean dependent var		0.75264
Adjusted R-squared	0.832931	S.D. dependent var		0.276606
S.E. of regression	0.11306	Akaike info criterion		-1.29273
Sum squared resid	1.776782	Schwarz criterion		-0.39353
Log likelihood	177.1022	Hannan-Quinn criter.		-0.92855
F-statistic	19.3123	Durbin-Watson stat		2.076832
Prob(F-statistic)	0			

Dependent Variable: LNOUTRAT 50-64 Years Old							
Method: Panel Least Squares							
Sample: 1 192							
Periods included: 48							
Cross-sections included: 4							
Total panel (balanced) observations: 192							
Variable	Coefficient	Std. Error	t-Statistic	Prob.			
C	-10.7905	4.395773	-2.45475	0.0153			
State Unemployment Rate	-0.01269	0.015276	-0.83062	0.4076			
Employment Growth	-0.06112	0.02703	-2.2613	0.0253			
Foreclosures	0.040459	0.039429	1.026117	0.3066			
US Unemployment Rate	-0.0219	0.006373	-3.43633	0.0008			
Ln House Value	0.92533	0.351996	2.628809	0.0095			
	Effects Specification						
Period fixed (dummy variables)							
R-squared	0.849061	Mean dependent var		0.351591			
Adjusted R-squared	0.792595	S.D. dependent var		0.28939			
S.E. of regression	0.131793	Akaike info criterion		-0.9861			
Sum squared resid	2.414354	Schwarz criterion		-0.0869			
Log likelihood	147.6659	Hannan-Quinn criter.		-0.62192			
F-statistic	15.03658	Durbin-Watson stat		2.060371			
Prob(F-statistic)	0						

Dependent Variable: LNOUTRAT 65+				
Method: Panel Least Squares				
Sample: 1 192				
Periods included: 48				
Cross-sections included: 4				
Total panel (balanced) observations: 192				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-11.9476	5.657877	-2.111676	0.0365
State Unemployment Rate	-0.016125	0.019662	-0.820114	0.4136
Employment Growth	-0.072583	0.034791	-2.086252	0.0388
Foreclosures	0.028395	0.05075	0.559502	0.5767
US Unemployment Rate	-0.026202	0.008203	-3.19431	0.0017
Ln House Value	1.005482	0.45306	2.219314	0.0281
Effects Specification				
Period fixed (dummy variables)				
R-squared	0.956069	Mean dependent var		0.981594
Adjusted R-squared	0.939634	S.D. dependent var		0.248993
S.E. of regression	0.061176	Akaike info criterion		-2.52105
Sum squared resid	0.520215	Schwarz criterion		-1.62184
Log likelihood	295.0207	Hannan-Quinn criter.		-2.15687
F-statistic	58.17347	Durbin-Watson stat		2.146665
Prob(F-statistic)	0			

Conclusions and Upcoming Work