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Online Appendix to *Does home production replace consumption spending? Evidence from shocks in housing wealth in the Great Recession*

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A Online Appendix: Additional tables

Table 1: Full estimation results[a]

	(1) Full sample		(2) Full sample		(3) Full sample		(4) Fuller-k		(5) Age 65-81		(6) Non-poor health		(7) Couples		(8) Women	
Second-stage: $\Delta ln(h_{int})$																
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
Elasticity																
$\Delta ln(c^s_{imt})$	-0.50*	(0.29)	-0.62*	(0.36)	-0.65*	(0.37)	-0.56*	(0.30)	-0.57*	(0.31)	-0.60*	(0.34)	-0.76	(0.49)	-0.43	(0.31)
Control variables																
ΔAge					0.46**	(0.21)	0.44*	(0.19)	0.71**	(0.29)	0.43**	(0.20)	0.43	(0.28)	0.47**	(0.22)
$\Delta Age^2(/100)$					-0.27**	(0.14)	-0.27**	(0.12)	-0.46**	(0.19)	-0.24*	(0.13)	-0.31*	(0.19)	-0.29**	(0.14)
$\Delta 1(Age \geq 62)$					0.03	(0.14)	0.02	(0.12)			-0.02	(0.14)	-0.12	(0.16)	0.04	(0.13)
$\Delta 1(Age \geq 65)$					-0.14	(0.12)	-0.13	(0.11)	-0.20	(0.13)	-0.11	(0.12)	-0.03	(0.15)	-0.20	(0.13)
$\Delta 1(Age \geq 70)$					-0.15*	(0.09)	-0.14*	(0.08)	-0.17**	(0.09)	-0.17*	(0.09)	-0.02	(0.10)	-0.11	(0.07)
$\Delta Health(-)$					0.04	(0.07)	0.04	(0.07)	0.04	(0.07)	0.07	(0.07)	0.18	(0.13)	-0.04	(0.07)
$\Delta Health(+)$					0.05	(0.08)	0.04	(0.07)	0.05	(0.07)	-0.03	(0.08)	0.16	(0.13)	-0.03	(0.08)
Δ Partner retired					0.01	(0.06)	0.00	(0.05)	0.01	(0.05)	0.00	(0.05)	0.01	(0.07)	0.04	(0.06)
$\Delta Health(-)$ partner					0.06	(0.08)	0.05	(0.07)	0.08	(0.08)	0.08	(0.07)	0.07	(0.09)	-0.03	(0.08)
$\Delta Health(+)$ partner					0.03	(0.09)	0.02	(0.08)	0.02	(0.08)	0.05	(0.09)	0.03	(0.10)	0.02	(0.09)
$\Delta Single$					0.99*	(0.52)	0.91**	(0.46)	1.04**	(0.49)	0.39	(0.30)	1.08*	(0.61)	1.09*	(0.66)
$\Delta Partner$					-0.15	(0.25)	-0.13	(0.22)	-0.10	(0.21)	-0.13	(0.23)	-0.12	(0.41)	-0.13	(0.23)
$\Delta Wave2007$			-0.13**	(0.06)	-0.29*	(0.17)	-0.27*	(0.14)	-0.27*	(0.15)	-0.32**	(0.16)	-0.25	(0.23)	-0.20	(0.18)
$\Delta Wave2009$			-0.21**	(0.10)	-0.54*	(0.32)	-0.49*	(0.28)	-0.48*	(0.29)	-0.58*	(0.31)	-0.39	(0.41)	-0.39	(0.34)
$\Delta Wave2011$			-0.35***	(0.12)	-0.84*	(0.48)	-0.78*	(0.42)	-0.77*	(0.45)	-0.92**	(0.46)	-0.64	(0.65)	-0.57	(0.50)
First-stage: $\Delta ln(c^s_{imt})$																
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
Instrument																
$D_{GR}\Delta ln(W_{it})$	0.15***	(0.05)	0.14**	(0.06)	0.14**	(0.06)	0.14**	(0.06)	0.17***	(0.06)	0.17***	(0.06)	0.15**	(0.06)	0.16**	(0.07)
$H_0 : \beta_{n2} = -1$	[0.09]		[0.29]		[0.35]		[0.13]		[0.16]		[0.24]		[0.62]		[0.06]	
Observations ($N \times T$)	2,500		2,500		2,500		2,500		2,152		2,309		1,511		1,583	
F-statistic	7.88		6.28		5.90		5.90		8.91		6.55		7.22		5.75	

Notes: Standard errors reported in parentheses are robust to heteroskedasticity and autocorrelation, * denotes significant at the 10% level, ** at the 5% level and *** at the 1% level. P-values reported in square brackets. Consumption spending is expressed in 2011 US dollars using the Consumer Price Index of the Bureau of Labor Statistics.

[a] Time use in home production and consumption spending are transformed using the inverse hyperbolic sine transformation. Changes in home production and consumption spending are trimmed for the top and bottom 1% of the sample in each survey wave following Angrisani et al. (2015); Hicks (2015). The sample for the estimation consists of persons aged 51-80, who own a house, who have not moved since the previous period, and who have retired since the previous period.

Table 2: Estimation results for different retirement definitions

	(1) Full retirees, Out-of-labor-force, Unemployed, Disabled	(2) Full retirees, Out-of-labor-force	(3) Full retirees
Second-stage: $\Delta ln(h_{int})$			
$\Delta ln(c^s_{imt})$	-0.65*	-0.58*	-0.78*
	(0.37)	(0.33)	(0.47)
First-stage: $\Delta ln(c^s_{imt})$			
$D_{GR}\Delta ln(W_{it})$	0.15**	0.15**	0.13**
	(0.06)	(0.06)	(0.06)
$H_0 : \beta_{n2} = -1$	[0.35]	[0.21]	[0.65]
Observations ($N \times T$)	2,500	2,471	2,237
F-statistic	5.90	6.39	4.30

Notes: Standard errors reported in parentheses are robust to heteroskedasticity and auto-correlation, * denotes significant at the 10% level, ** at the 5% level and *** at the 1% level. P-values reported in square brackets. Consumption spending is expressed in 2011 US dollars using the Consumer Price Index of the Bureau of Labor Statistics. All regressions include demographic controls and period dummies.

Table 3: Heterogeneity in the share of substitutable consumption, p_{it}, measured in percent

	(1) Full retirees, Homeowners	(2) Unrestricted	(3) Unrestricted
OLS: p_{it}			
Female	-0.90***	-0.81***	-0.86***
	(0.34)	(0.16)	(0.16)
Age 65+	0.22	0.14	0.14
	(0.45)	(0.15)	(0.17)
Couple	-0.15	0.30*	-0.48***
	(0.34)	(0.16)	(0.17)
Poor health[a]	-0.50	-1.99***	-1.33***
	(0.65)	(0.29)	(0.28)
Homeowner			3.18***
			(0.19)
Retired			-0.13
			(0.17)
Constant	10.67***	10.15***	8.08***
	(0.57)	(0.20)	(0.23)
Observations ($N \times T$)	2,500	11,448	11,407

Notes: Standard errors reported in parentheses are robust to heteroskedasticity, * denotes significant at the 10% level, ** at the 5% level and *** at the 1% level. Consumption spending is expressed in 2011 US dollars using the Consumer Price Index of the Bureau of Labor Statistics.

[a] The dummy of poor health is constructed by using the response 'poor' to the self-reported health question in HRS (*RwSHLT*).

Table 4: Importance of housing wealth in the MPC

	(1) Homeowners	(2) Homeowners	(3) Renters	(4) Renters	(5) Stockowners
Second-stage: $\Delta ln(h_{int})$					
$\Delta ln(c^s_{imt})$	-0.63*	-0.67*	0.02	-0.20	-0.38
	(0.35)	(0.37)	(0.25)	(0.45)	(0.62)
First-stage: $\Delta ln(c^s_{imt})$					
$D_{GR}\Delta ln(W_{it})$	0.13**	0.14**			
	(0.06)	(0.06)			
$D_{GR}\Delta ln(Fin_{it})$	-0.03		0.20		
	(0.05)		(0.18)		
$D_{GR}\Delta ln(Stock_{it})$		0.01		0.23	0.04
		(0.02)		(0.19)	(0.03)
$H_0 : \beta_{n2} = -1$	[0.30]	[0.37]	[0.00]	[0.07]	[0.32]
Observations ($N \times T$)	2,500	2,500	511	511	516
F-statistic	3.16	2.89	1.21	1.51	1.36

Notes: Standard errors reported in parentheses are robust to heteroskedasticity and autocorrelation, * denotes significant at the 10% level, ** at the 5% level and *** at the 1% level. P-values reported in square brackets. Monetary values are expressed in 2011 US dollars using the Consumer Price Index of the Bureau of Labor Statistics. All regressions include demographic controls and period dummies.

Table 5: Conditioning the housing wealth drop on cyclical movements

	(1) Lag housing wealth	(2) 2nd difference shock	(3) Change HPI	(4) Change UR	(5) Change S&P500	(6) Placebo shock
Second-stage: $\Delta ln(h_{int})$						
$\Delta ln(c^s_{imt})$	-0.63*	-0.68*	-0.59*	-0.61*	-0.49*	-0.65*
	(0.37)	(0.37)	(0.34)	(0.34)	(0.30)	(0.37)
First-stage: $\Delta ln(c^s_{imt})$						
$D_{GR}\Delta ln(W_{it})$	0.13**	0.23**	0.14**	0.13**	0.13**	0.13**
	(0.06)	(0.11)	(0.06)	(0.06)	(0.06)	(0.06)
$ln(W_{it-1})(/100)$	0.34					
	(0.36)					
$D_{GR}\Delta^2 ln(W_{it})$		-0.08				
		(0.08)				
$\Delta HPI_t(/100)$			-0.61			
			(0.94)			
ΔUR_t				-0.07		
				(0.09)		
$\Delta S\&P500_t(/1000)$					0.33	
					(0.39)	
$D_{2011}\Delta ln(W_{it})$						-0.03
						(0.06)
$H_0 : \beta_{n2} = -1$	[0.31]	[0.39]	[0.24]	[0.24]	[0.09]	[0.33]
Observations ($N \times T$)	2,500	1,519	2,500	2,500	2,500	2,500
F-statistic	2.81	2.79	2.92	3.22	3.31	2.88

Notes: Standard errors reported in parentheses are robust to heteroskedasticity and autocorrelation, * denotes significant at the 10% level, ** at the 5% level and *** at the 1% level. P-values reported in square brackets. Monetary values are expressed in 2011 US dollars using the Consumer Price Index of the Bureau of Labor Statistics. All regressions include demographic controls and period dummies.

Table 6: The MPC for different consumption definitions

	(1) Total spending	(2) Non-substitutable spending	(3) Substitutable spending	(4) Dining out spending
$D_{GR}\Delta ln(W_{it})$	-0.01	-0.02	0.14**	0.30***
	(0.02)	(0.01)	(0.06)	(0.11)
Observations ($N \times T$)	2,494	2,492	2,500	2,489

Notes: Standard errors reported in parentheses are robust to heteroskedasticity and autocorrelation, * denotes significant at the 10% level, ** at the 5% level and *** at the 1% level. P-values reported in square brackets. Consumption spending is expressed in 2011 US dollars using the Consumer Price Index of the Bureau of Labor Statistics. All regressions include demographic controls and period dummies.

Table 7: Shadow prices and human capital[a]

	Average c^s_{imt}	Average h_{int}	Average Shadow price
Less than high-school	2,258	22.8	2.9
GED	2,897	24.8	3.5
High-school	3,401	22.2	4.5
Some college	4,291	23.9	5.3
College and more	6,662	21.0	9.4
Mean	3,970	22.6	5.2

[a] Substitutable spending is in USD per year. Home production is in hours per week. The shadow price is expressed in 2011 USD.

Table 8: Non-linearities in the MPC

	(1) Full sample	(2) Full sample	(3) Full sample
Second-stage: $\Delta ln(h_{int})$			
$\Delta ln(c^s_{imt})$	-0.64*	-0.54*	-0.56*
	(0.38)	(0.32)	(0.33)
First-stage: $\Delta ln(c^s_{imt})$			
$D_{GR}\Delta ln(W_{it})$	0.13**	0.15**	0.15**
	(0.06)	(0.06)	(0.06)
$D_{GR}\Delta ln(W_{it}) \cdot 1(D_{GR}\Delta ln(W_{it}) > P25)$[a]	0.04		
	(0.26)		
$D_{GR}\Delta ln(W_{it}) \cdot 1(D_{GR}\Delta ln(W_{it}) > P50)$[b]		-0.21	
		(0.27)	
$D_{GR}\Delta ln(W_{it}) \cdot 1(D_{GR}\Delta ln(W_{it}) > P75)$[c]			-0.16
			(0.27)
$H_0 : \beta_{n2} = -1$	[0.34]	[0.15]	[0.19]
Observations ($N \times T$)	2,500	2,500	2,500
F-statistic	2.77	3.11	2.99

Notes: Standard errors reported in parentheses are robust to heteroskedasticity and autocorrelation, * denotes significant at the 10% level, ** at the 5% level and *** at the 1% level. P-values reported in square brackets. Monetary values are expressed in 2011 US dollars using the Consumer Price Index of the Bureau of Labor Statistics. All regressions include demographic controls and period dummies.

[a] P25 = -24.81%.

[b] P50 = -6.58%.

[c] P75 = 4.80%.

B Online Appendix: Selections and definitions in HRS/CAMS 2005-2011

Table 9: Sample selection in HRS/CAMS

	Definition	Total observations
(1)	CAMS waves 3-6[a]	14,972
(2)	(1) + Time use component filled out	14,941
(3)	(2) + Respondents aged 51-80	12,714
(4)	(3) + Non-missing home production[b]	12,566
(5)	(4) + Non-missing substitutable consumption[b]	12,422
(6)	(5) + Taking first differences (CAMS wave 3-6)	7,230
(7)	(6) + Retired[c](t and $t-1$)	3,413
(8)	(7) + Homeowners[d]	2,748
(9)	(8) + Non-movers[d]	2,500

[a] For comparability of time use categories we use four waves of CAMS (2005, 2007, 2009, and 2011) merged with the RAND HRS version M data file. Since the timing of the fielding of the HRS (even years) and CAMS (odd years) surveys are different, the variables in CAMS are merged to the preceding HRS wave, e.g. CAMS 2005 to HRS 2004, etc.

[b] Including top 1% and bottom 1% trimming of wave-to-wave changes.

[c] Based on the variable self-reported labor market status (*RwLBRF*) in the HRS data. People should be fully retired in consecutive waves. We assume that people are also retired when they are unemployed, disabled, or out-of-labor-force in consecutive waves.

[d] Based information on residence-bought or sold in HRS.

Table 10: Home production in HRS/CAMS 2005-2011 (h/week)[a]

	Mean	SD	% Total
Home production activities			
House cleaning	4.7	5.6	3.0
Laundry	2.5	3.0	1.6
Gardening	2.8	5.2	1.8
Shopping	3.8	3.7	2.4
Cooking	6.8	6.3	4.3
Financial management	0.9	1.3	0.6
Home maintenance	0.7	1.8	0.4
Vehicle maintenance	0.4	1.1	0.3
Home production	22.6	16.2	14.3
Non home production activities			
Watching TV	24.2	17.5	15.3
Reading newspapers or magazines	5.8	5.7	3.7
Reading books	3.9	6.4	2.5
Listening to music	5.6	9.8	3.5
Playing games	0.3	1.4	0.2
Attending concerts/movies	0.3	0.9	0.2
Singing/playing instrument	1.6	4.6	1.0
Arts and crafts	0.7	2.7	0.4
Dining out	1.5	2.2	0.9
Personal hygiene	6.5	4.9	4.1
Caring for pets	2.6	9.7	1.6
Managing medical condition	2.2	12.6	1.4
Walking	5.5	9.0	3.5
Sports and exercise	2.2	5.9	1.4
Visiting in-person with friends/family	7.8	12.2	4.9
Communication by telephone/letters/e-mail	5.3	7.6	3.3
Physically showing affection	2.5	5.9	1.6
Helping others	1.5	3.7	0.9
Attending religious services	1.0	1.6	0.6
Attending meetings/clubs	0.4	1.1	0.3
Working for pay	0.4	3.3	0.3
Volunteer work	0.8	2.9	0.5
Using computer	1.8	2.6	1.1
Sleeping and napping	47.9	18.8	30.2
Praying/meditating	3.7	6.5	2.3
Total time use	158.4	61.7	100.0

[a] Statistics are presented for our sample of 2,500 observations.

Table 11: Substitutable consumption spending in HRS/CAMS 2005-2011 (USD/year)[a]

	Mean	SD	% Total
Substitutability - Possible			
Dining out	1,566	2,141	4.3
Dishwasher	20	105	0.1
Housekeeping services	314	930	0.9
Washer/Dryer	67	266	0.2
Gardening/Yard services	373	960	1.0
Home repairs services	1,085	2,557	3.0
Vehicle services	546	715	1.5
Substitutability - Possible, Clear relation to substitutes			
Housekeeping materials	368	593	1.0
Yard materials	297	789	0.8
Home repair materials	767	2,049	2.1
Substitutability - Possible, Not likely			
Clothing	640	1,051	1.8
Substitutable consumption	3,970	4,357	11.0
Substitutable consumption (incl. mat.)	5,402	5,484	14.9
Substitutable consumption (incl. mat., clothing)	6,042	5,879	16.7
Substitutability - Impossible			
Health insurance	2,181	2,634	6.0
Health services	1,132	3,287	3.1
Drugs	1,026	1,838	2.8
Medical supplies	219	658	0.6
Car payments	1,163	2,989	3.2
Auto insurance	1,022	674	2.8
Home/Rent insurance	842	798	2.3
Mortgage	1,848	4,827	5.1
Property tax	1,926	2,319	5.3
Rent	643	3,217	1.8
Household furnishings	522	1,441	1.4
Electricity	1,552	1,266	4.3
Heat	918	1,065	2.5
Water	455	677	1.3
Phone/Cable/Internet	1,386	987	3.8
Tickets	155	531	0.4
Vacations	1,691	2,973	4.7
Refrigerator	76	311	0.2
Computer	73	272	0.2
Television	145	432	0.4
Hobbies	236	604	0.7
Sports equipment	139	646	0.4
Contributions	1,663	3,469	4.6
Gifts	2,006	6,027	5.5
Personal care	532	974	1.5
Food/Drink grocery	4,332	3,990	11.9
Total consumption[b]	36,287	22,884	100.0

[a] Statistics are presented for our sample of 2,500 observations. Consumption spending is expressed in 2011 US dollars using the Consumer Price Index of the Bureau of Labor Statistics.

[b] We define total consumptions as the total of durable and nondurable consumption excluding the categories car purchases and car use.

Table 12: Changes in health[a] and marital status[b]

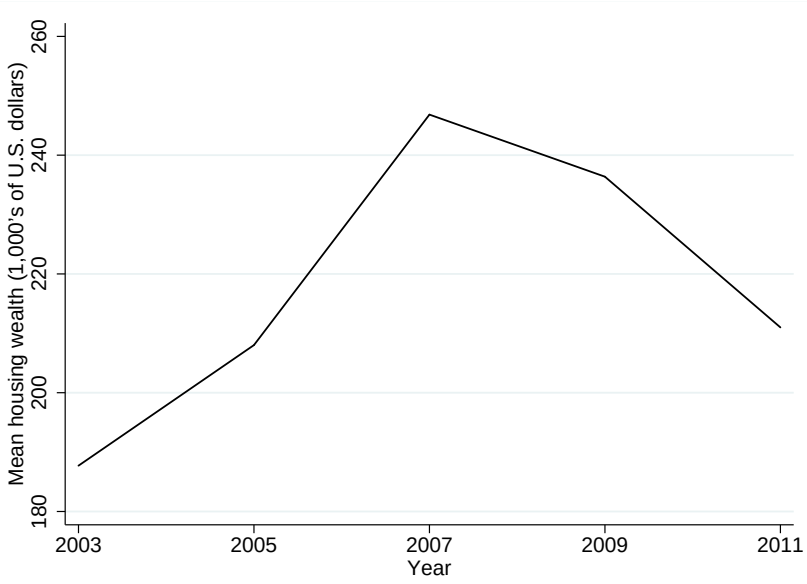
	Mean	SD	Min.	Max.	P50
Demographic characteristics					
Respondent's health worsened	0.24	0.43	0.00	1.00	0.00
Respondent's health improved	0.21	0.41	0.00	1.00	0.00
Spouse's health worsened	0.19	0.39	0.00	1.00	0.00
Spouse's health improved	0.12	0.33	0.00	1.00	0.00
Became couple	0.01	0.09	0.00	1.00	0.00
Became single	0.03	0.17	0.00	1.00	0.00

[a] People's change in health is based on the self-reported health question in HRS (*RwSHLT*).

[b] Summary statistics are presented for our sample of 2,500 observations.

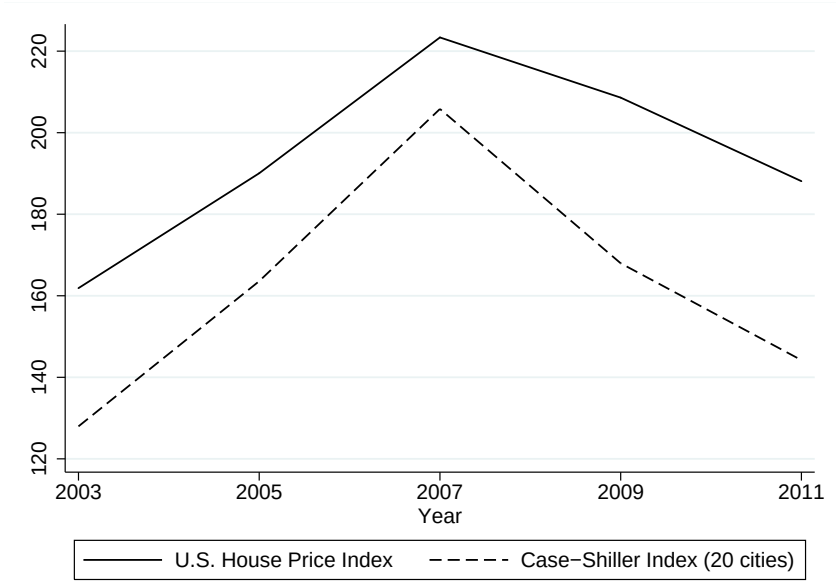
C Online Appendix: Developments in the Great Recession

Figure 1: Development of houseprices in HRS.



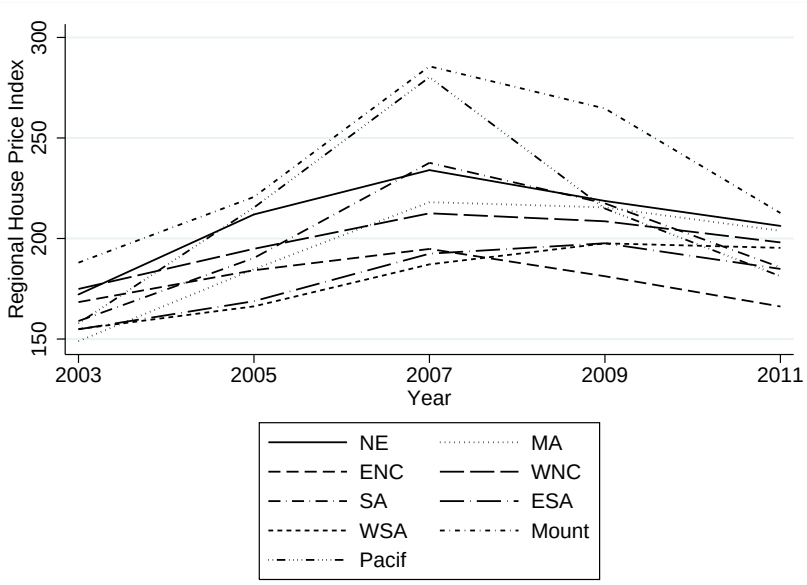
Source: RAND HRS. Based on the *HwAHOUS* variable. Housing wealth is expressed in 2011 US dollars using the Consumer Price Index of the Bureau of Labor Statistics. Due to the temporal misalignment between HRS and CAMS surveys, housing wealth corresponds to the (even) year preceding the odd-numbered year in CAMS.

Figure 2: Development of houseprice indices.



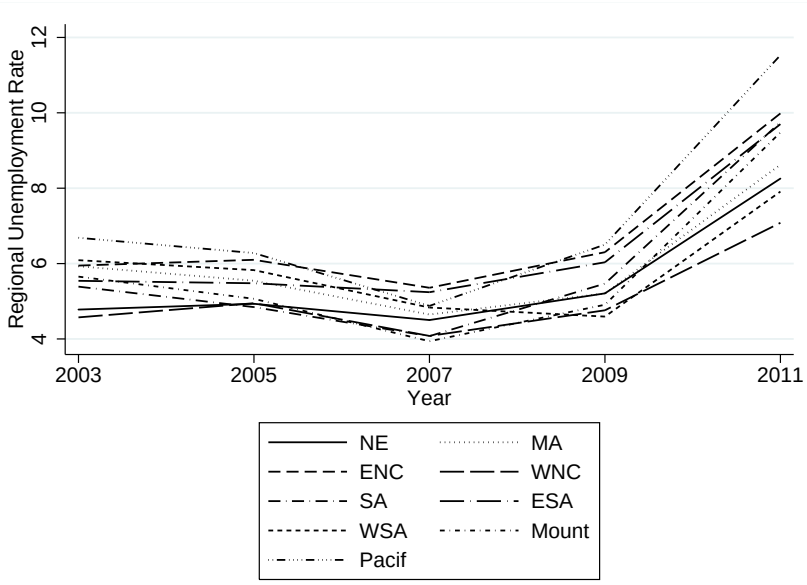
Source: Federal Housing Finance Agency (FHFA) and S&P Case-Shiller Home Price Indices. Due to the temporal misalignment between HRS and CAMS surveys, indices correspond to the (even) year preceding the odd-numbered year in CAMS.

Figure 3: Development of the U.S. House Price Index over nine census divisions.



Source: Federal Housing Finance Agency (FHFA; quarterly statistics).
Note: New England (NE), Middle Atlantic (MA), East North Central (ENC), West North Central (WNC), South Atlantic (SA), East South Atlantic (ESA), West South Atlantic (WSA), Mountain (Mount), and Pacific (Pacif).

Figure 4: Development of the Unemployment Rate over nine census divisions.



Source: Federal Bureau of Labor Statistics (quarterly statistics).
Note: New England (NE), Middle Atlantic (MA), East North Central (ENC), West North Central (WNC), South Atlantic (SA), East South Atlantic (ESA), West South Atlantic (WSA), Mountain (Mount), and Pacific (Pacif).

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