Home production as a substitute to market consumption? Estimating the elasticity using houseprice shocks from the Great Recession

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December 5-6, 2016, *Future Well-Being of the Elderly*, Montréal

Motivation

Analyses of *well-being* have relied on measures of income and spending.

- ▶ Becker's 1965 theory of the allocation of time.

- ▶ 'Time' can be used to increase consumption beyond market spending (Aguiar & Hurst 2005).

- ▶ 'Time' can be a considerable endowment in low-income households.

A theory of the allocation of time (Becker 1965)

- ► Consumption 'produced' by two inputs
  - ► Market expenditures.
  - ► Time.

- ► *Money-intensive* versus *Time-intensive goods*.

- ► Composition of consumption bundle depends on *relative price of time*.

- ► Shift in composition when the price of time changes.

Shocks and Home Production

Home production can smooth consumption in response to shocks in income (Hicks 2015):

- Home production and **retirement** (e.g. Aguiar & Hurst 2005).
- Home production and **unemployment** (e.g. Guler & Taskin 2013).
- Home production and **health** (e.g. Halliday & Podor 2012).
- Home production and **wealth** (e.g. Kuehn 2015).

Transitory shocks in income.

- *Monetary-* and *Time-budget*: substitution or time-endowment?

Identification strategies

Macroeconomic approach ($\varepsilon = [0, 5]$):

► Simulation (Campbell & Ludvigson 2001).

Microeconomic approaches ($\varepsilon \approx 2$):

► Disputable instruments: lagged consumption (Rupert et al. 1995).

► Specific subsample: EITC and single women (Gelber & Mitchell 2009).

► Permanent shocks in income: permanent income (Hicks 2015).

    ► Identification from cross-sectional differences between poorer and richer persons.

Main contribution

Intratemporal (micro) elasticity from within-person variation.

► To what extent can people substitute away from market consumption to home production?

► Causal identification:
  ► Wealth-shocks only influence market consumption possibilities.
  ► Large exogenous shock: *houseprices* in the Great Recession.
    ► Consumption (Angrisani et al. 2015).
    ► Home production (Kuehn 2015).

Minor contribution

Panel data with detailed consumption spending and time-use information of persons in US households (HRS/CAMS).

- ▶ Consumption: *Retirement-Consumption "Puzzle"* literature.
- ▶ Time-use: Burda & Hamermesh (2010); Aguiar et al. (2013).
- ▶ Both, but imperfect: Ahn et al. (2008) (cross-section); Velarde & Herrmann (2014) (food).
- ▶ Both: Colella & Van Soest (2013) (NL); Hicks (2015) (MEX).

HRS/CAMS

Health and Retirement Survey

- ▶ Representative 50+ population of the US.

- ▶ Longitudinal: 12 waves.

- ▶ 20,000 persons every two years (one wave).

- ▶ Detailed information on demographics, economic status, etc.

Consumption and Activities Mail Survey

- ▶ Supplementary study to HRS.

- ▶ Survey to subset of HRS respondents.

- ▶ Longitudinal: 4 waves (2005, 2007, 2009, 2011).

- ▶ 37 time-use categories, 39 spending categories.

Definition of home production

Following Aguiar et al. (2013):

- ▶ House cleaning

- ▶ Washing, ironing or mending clothes (*Laundry*)

- ▶ Yard work or gardening (*Gardening*)

- ▶ Shopping or running errands (*Shopping*)

- ▶ Preparing meals and cleaning up afterwards (*Cooking*)

- ▶ Taking care of finances or investments, such as banking, paying bills, balancing the checkbook, doing taxes, etc. (*Financial Management*)

- ▶ Doing home improvements, including painting, redecorating, or making home repairs (*Home maintenance*)

- ▶ Working on, maintaining, or cleaning car(s) and vehicle(s) (*Vehicle maintenance*)

What can home production substitute?

"Home Production Substitutable Consumption":

- House cleaning $\iff$ Housekeeping services
- Laundry $\iff$ Housekeeping services, Washing/Drying machine
- Gardening $\iff$ Gardening services
- Shopping $\iff$ n.a.
- Cooking $\iff$ Dining out, Dishwasher
- Financial Management $\iff$ n.a.
- Home maintenance $\iff$ Homerepair services
- Vehicle maintenance $\iff$ Vehicle maintenance services

Consumption spending across Time ($/y)

	Wave 2005	Wave 2007	Wave 2009	Wave 2011
	Mean	Mean	Mean	Mean
Dining out	1,795	1,761	1,472	1,683
Housekeeping services	432	390	291	296
Gardening services	486	429	348	363
Homerepair services	1,403	1,412	1,176	1,059
Vehicle maintenance	632	558	556	545
Dishwasher	21	82	18	18
Washing/Drying machine	71	82	69	45
Substitutable consumption (98%)	4,841	4,656	3,930	4,009
Substitutable consumption excl. durables	4,749	4,549	3,843	3,946
Substitutable consumption incl. suppl. mat.	6,540	6,266	5,320	5,402
Total consumption	40,120	38,856	36,122	35,348

Home Production across Time (h/w)

	Wave 2005	Wave 2007	Wave 2009	Wave 2011
	Mean	Mean	Mean	Mean
House cleaning	4.5	5.2	5.0	4.8
Laundry	2.7	2.6	2.8	2.6
Gardening	2.7	3.0	2.9	3.0
Shopping	4.1	3.9	4.0	4.0
Cooking	7.0	7.0	6.8	7.1
Financial management	0.9	1.0	0.8	0.9
Home maintenance	1.0	0.9	0.7	0.7
Vehicle maintenance	0.3	0.4	0.4	0.4
Home production (99%)	23.1	23.9	23.4	23.3

Life-Cycle Model with Home Production and Wealth Shocks

$$U_\tau = max_{c_{mt}, h_{mt}, h_{nt}} \, \mathbb{E}_\tau \left[\sum_{t=\tau}^{T} (1+\delta)^{\tau-t} u(c_{mt}, c_{nt}(h_{nt}), l_t) \psi(v_t) \right] \qquad (1)$$

with

$$c_{nt}(h_{nt}) = g_t(h_{nt}) \qquad (2)$$

$$c_{mt} = \{c_{mt}^s, c_{mt}^{ns}\} \qquad (3)$$

Empirical model only focuses on retirees:

$$h_{mt} = 0 \qquad (4)$$

Life-Cycle Model with Home Production and Wealth Shocks

Maximize (1) subject to

$$h_{nt} = H - l_t \qquad (5)$$

$$A_{t+1} = (1 + r)(\mathbb{E}_t[A_t] + b_t - c_{mt}) \qquad (6)$$

$$\mathbb{E}_t[A_t] = A_t + \xi_t \qquad (7)$$

$$A_t = \{A_t^f, A_t^h\} \qquad (8)$$

ξ_t may consist of permanent ($AR(1)$) and transitory component ($\sim N$).
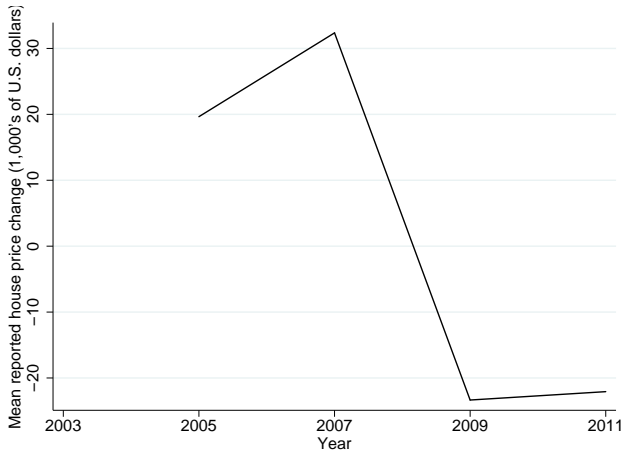
Empirical model

Second-stage:

$$\Delta ln(h_{int+1}) = \Delta X_{it+1}\beta_{n1} + \Delta ln(c^s_{imt+1})\beta_{n2} + \varepsilon_{int+1} \qquad (9)$$

where $\beta_{n2} = \frac{\Delta h_{nt+1}}{\Delta c^s_{mt+1}}$, using

First-stage:

$$\Delta ln(c^s_{imt+1}) = \Delta X_{it+1}\beta_{c1} + D_{GR}\Delta ln(W_{it})\beta_{c2} + \varepsilon_{ict+1} \qquad (10)$$

Identification: Houseprice changes

Instrument Validity

Wealth-shock **directly** affects market consumption possibilities:

$$A_{t+1} = (1 + r)(\mathbb{E}_t[A_t] + b_t - c_{mt}) \qquad (11)$$

Wealth-shock has **no direct** effect on home production:

$$h_{nt} = H - l_t \qquad (12)$$

Instrument Relevance

Mechanism:

- ▶ Perceived wealth (Campbell & Cocco 2007).
- ▶ Borrowing constraints (Campbell & Cocco 2007).
- ▶ Bequest motive (Kopczuk & Lupton 2007).

Empirical evidence on MPC:

- ▶ General: Case et al. (2005; 2013), Carroll et al. (2011).
- ▶ Older households: Campbell & Cocco (2007).
- ▶ Great Recession: Angrisani et al. (2015), Christelis et al. (2015).

Estimation results

Second-stage	$\Delta ln(h_{int+1})$	
	Coeff.	S.E.
Elasticity		
$\Delta ln(c^s_{imt+1})$	-0.65*	0.37

First-stage	$\Delta ln(c^s_{imt+1})$	
	Coeff.	S.E.
Instrument		
$D_{GR}\Delta ln(W_{it})$	0.14**	0.06
F-statistic	5.6	

Observations ($N \times T$)	2,500

Interpretation

- $\beta_{n2} = \frac{\Delta ln(h_{int+1})}{\Delta ln(c^s_{imt+1})} = -0.65$.

- Less than perfect substitute.

- Bigger than elasticity found by Hicks (2015): -0.03 (endogeneity/food).

- Average effect: drop in consumption of 40 dollars (p/y) increases home production by about 7.6 hours (p/y): shadow wage **$5.30**.

- Reasonably lower than minimum wage in retirement (Ghez & Becker 1975).

Interpretation

Elasticity primarily determined by:

- 'Young'.
- Healthy.
- House price drop.
- Low (absolute) house price.
- Mortgage-free.
- Positive net housing value.
- Middle household income.
- High c_m^s.
- Low h_n.

Lower bound

	h_n		c_m^s	
	Mean	S.E.	Mean	S.E.
Non-retired	19.8	0.26	5,177.5	103.4
Retired	23.2	0.23	3,747.8	64.0
Δ	3.4***	0.35	-1,429.7***	115.3

Conclusion

- ▶ 'Small' substitution effects ($\frac{\Delta ln(h_{int+1})}{\Delta ln(c^s_{imt+1})} = -0.65$).

- ▶ High substitutability assumed in theoretical (macro) models.

- ▶ Estimates are credible lower bound.

- ▶ Small scope for substituting c^s_{mt} ($\approx 12\%$).

- ▶ Non-negligible possibilities to substitute away from market consumption.