Living Arrangements and Labor Market Volatility of Young Workers

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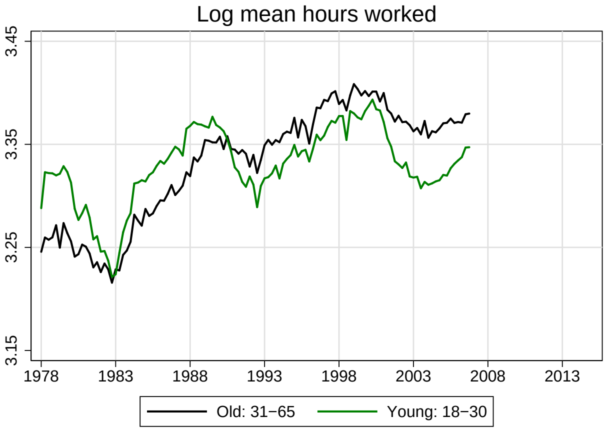
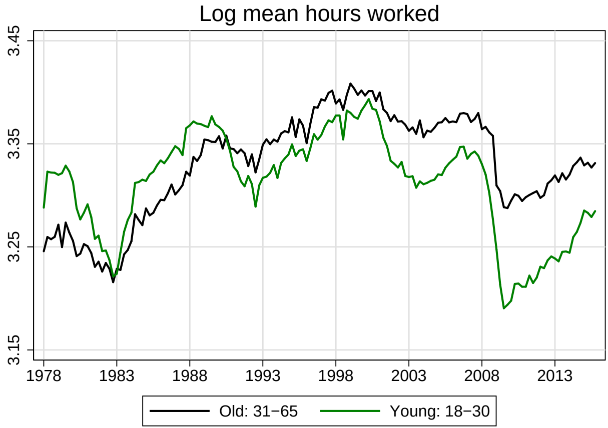
Perspectives on Neoclassical Labor Supply
AEA, January 4, 2020

Hours fluctuations for young people



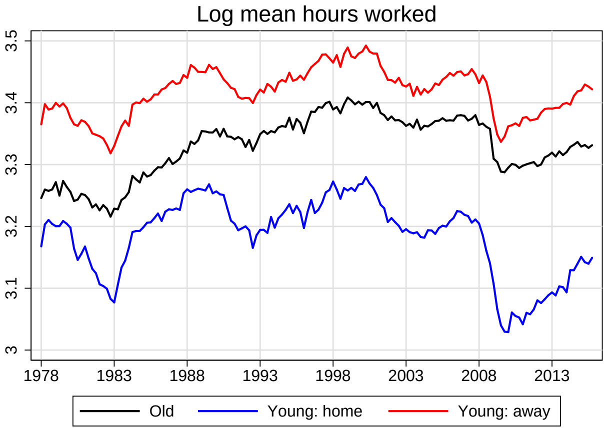
- Young people (18-30) larger cyclical volatility in “normal” cycles

Hours fluctuations for young people



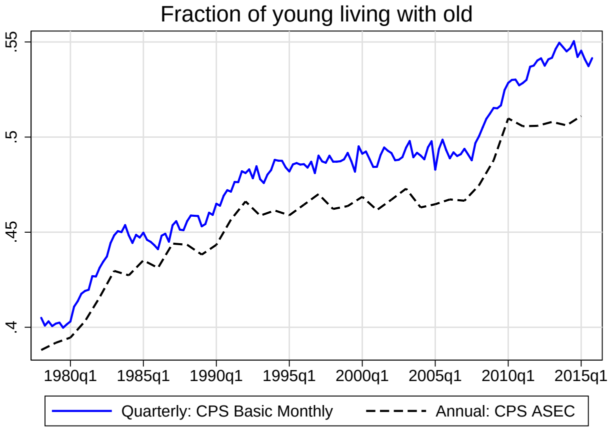
- Young people (18-30) larger cyclical volatility in "normal" cycles
- Harder hit during Great Recession

Living arrangements matter more than age



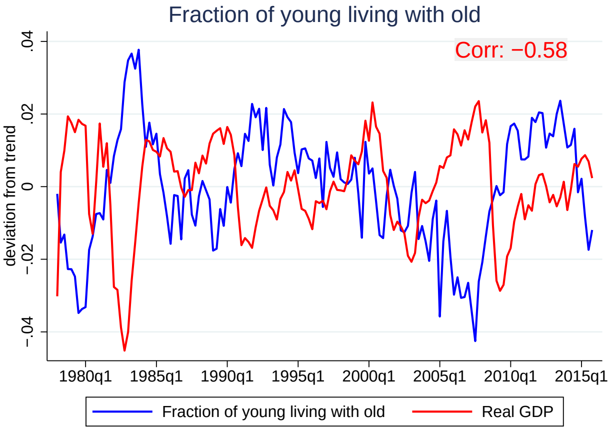
- Roughly half of 18-30 live with a 31-65 (home), half don't (away)
- Young people away: higher average hours, lower volatility
- Additional volatility concentrated among young at home

Living arrangements: endogenous, countercylical



- Secular upward trend since 1980
- Increased by >5pp during Great Recession, barely fallen

Living arrangements: endogenous, countercylical



- Counter-cyclical pre and post Great Recession

This paper

1. Quantitative theory of fluctuations in living arrangements and hours worked for young relative to old

    - Co-residence trade-off: implicit transfers vs disutility

    - Labor supply more responsive to wages: wedge between Marshallian elasticity of young living away vs together

This paper

1. Quantitative theory of fluctuations in living arrangements and hours worked for young relative to old
2. Estimate model with aggregate data
   - Relative hours, wages by age and coresidence
   - Dynamics of living arrangements
   - De-trended from 1978 to 2006
   - Key identifying assumptions:
     a. Selection: functional forms for dist of unobservables
     b. Labor supply vs demand: conditional on skills, living arrangements do not affect productivity

This paper

1. Quantitative theory of fluctuations in living arrangements and hours worked for young relative to old

2. Estimate model with aggregate data

3. Use estimated model as measurement device

    a. Size of implicit transfers? 13% of consumption of old

    b. Difference in Marshallian elasticity by living arrangements? 60% higher for young living with old

    c. Importance of coresidence for hours of young?
        - Possibility of in coresidence: 37% of variance
        - Endogeneity in coresidence: 6% of variance

    d. Labor supply vs demand for hours volatility of young?

    e. Implications for Frisch elasticity in RA models? 85% larger

This paper

1. Quantitative theory of fluctuations in living arrangements and hours worked for young relative to old
2. Estimate model with aggregate data
3. Use estimated model as measurement device
4. Interpret Great Recession experience of young relative to old
    - Given dynamics for hours of old, were hours, wages and living arrangements of young in line with expectations based on previous recessions?

Evidence

Living arrangements and hours of young, 78-06

Definitions: CPS data

- Population: 18-65 yr olds not in school
- Young: 18-30
- Old: 31-65
- Young away: no old people in household
- Young together: ≥ 1 old person in household

Living arrangements and hours of young, 78-06

Definitions: CPS data

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Quarterly moments relative to old, 1978-06:

	Young	Young Away	Young Together
Mean hours	1.00		
St dev log hours	1.58		

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	Young	Young Away	Young Together
Mean hours	1.00	1.10	0.88
St dev log hours	1.58	1.32	1.89

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	Young	Young Away	Young Together
Mean hours	1.00	1.10	0.88
St dev log hours	1.58	1.32	1.89

- St dev log fraction young with old ≈ 0.8
- Cyclical correlation with hours worked ≈ -0.6

Living arrangements and wages of young, 78-06

Annual moments relative to old, 1978-06:

	Young	Young Away	Young Together
Mean wages	0.65		
St dev log wages	1.07		

- Labor demand mechanism - Jaimovich, Pruitt, Siu (2013):
  - Technology with imperfect substitutability between old and young
  - Quantitative argument requires Frisch for young $= 7$, old $= \infty$

Living arrangements and wages of young, 78-06

Annual moments relative to old, 1978-06:

	Young	Young Away	Young Together
Mean wages	0.65	0.75	0.52
St dev log wages	1.07	1.18	1.11

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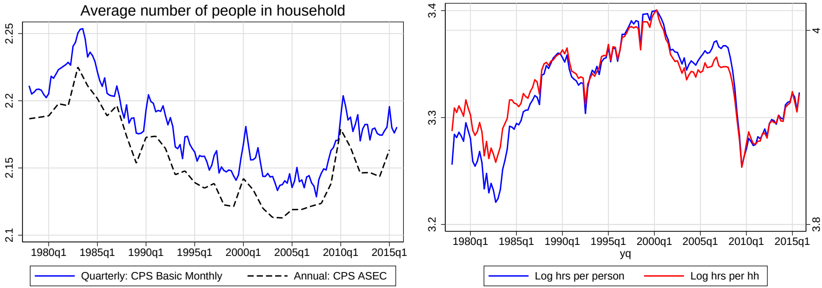
  - Technology with imperfect substitutability between old and young
  - Quantitative argument requires Frisch for young = 7, old = ∞
- Labor supply mechanism - this paper:
  - Selection into living arrangements
  - Imperfect substitutability by living arrangements implausible
  - Labor supply elasticities for old disciplined by micro estimates

Hours at the household level



- Household size moves a lot: trend and cyclical
- Hours per person more volatile than hours per household

Useful decomposition

- $H =$ total hours
- $N =$ number of individuals
- $F =$ number of households

$$\underbrace{\frac{H}{N}}_{\text{hours per person}} = \underbrace{\frac{H}{F}}_{\text{hours per household}} \div \underbrace{\frac{N}{F}}_{\text{persons per household}}$$

- Cyclical fluctuations

$$V\left(\log\frac{H}{N}\right) = \underbrace{V\left(\log\frac{H}{F}\right)}_{\text{hrs per hh}} + \underbrace{V\left(\log\frac{F}{N}\right)}_{\text{hh size}} - \underbrace{2COV\left(\log\frac{H}{F}, \log\frac{F}{N}\right)}_{\text{covariance term}}$$

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	Cyclical Variance, 78-06		Great Recession Change, 07-10	
	Quarterly	Annual	Quarterly	Annual
hrs per hh	85%	92%	84%	85%
hh size	5%	3%	16%	15%
covariance	10%	5%		

- Changes in household size offset around 8%-15% of changes in hours per person, at the household level

Useful decomposition 2

Model

Demographics

Old agents

- Identical
- Live in unitary households
- Can be invaded by a young agent

Young agents

- Two independent idiosyncratic shocks
  - Individual productivity ε
  - Distaste for living with old agents η
- Can invade an old households

At any point in time there are three types of agents:

1. Old: μ
2. Young alone: $(1-\mu)(1-x)$
3. Young together (with old): $(1-\mu)x$

Old agents

- Standard RA intertemporal problem

$$
\begin{aligned}
V^o(a; w^o, r) &= \max_{c^o, h^o, a'} u^o(c^o, h^o) + \beta \mathbb{E}\left[V^o\left(a'; w^{o'}, r'\right)\right] \\
\text{s.t.} \quad & c^o + a' = w^o h^o + (1+r)a
\end{aligned}
$$

- Standard preferences

$$
u^o(c, h) = \log c^o - \psi^o \frac{(h^o)^{1+\frac{1}{\nu^o}}}{1+\frac{1}{\nu^o}}
$$

- Aggregate uncertainty: w^o, r

Non-standard preferences of old

Young agents

- Young are hand-to-mouth

$$V^y(\varepsilon, \eta; w^y, c^o) \quad = \quad \max_{A,T}\{V^A(\varepsilon; w^y), V^T(\varepsilon, \eta; w^y, c^o)\}$$

- Young alone

$$\begin{aligned} V^A(\varepsilon; w^y) \quad &= \quad \max_{c,h} \frac{c^{1-\gamma}}{1-\gamma} - \psi^y \frac{h^{1+\frac{1}{\nu^y}}}{1+\frac{1}{\nu^y}} \\ \text{s.t.} \quad & \quad c = w^y \varepsilon h \end{aligned}$$

- Young together

$$\begin{aligned} V^T(\varepsilon, \eta; w^y, c^o) \quad &= \quad \max_{c,h} \frac{[c + \zeta(c^o)]^{1-\gamma}}{1-\gamma} - \psi^y \frac{h^{1+\frac{1}{\nu^y}}}{1+\frac{1}{\nu^y}} - \eta \\ \text{s.t.} \quad & \quad c = w^y \varepsilon h \end{aligned}$$

- Require $\gamma < 1$ for positive co-movement of wages and hours
- Implicit transfers from old (economies of scale): $\zeta(c^o)$

Technology

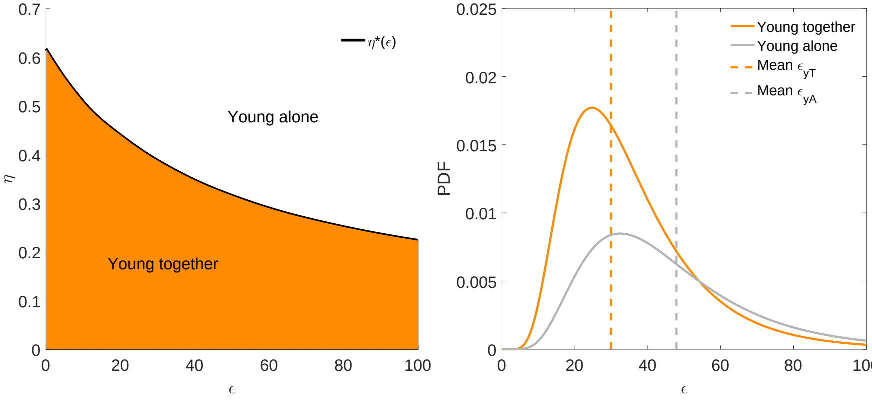
- Nested CES with capital-experience complementarity (Jaimovich-Pruitt-Siu, AER 2013)

$$F(K, N^y, N^o; Z) = \left[\alpha \left(ZN^y\right)^\sigma + (1-\alpha)\left(\lambda K^\rho + (1-\lambda)\left(ZN^o\right)^\rho\right)^{\frac{\sigma}{\rho}}\right]^{\frac{1}{\sigma}}$$

where N^y and N^o are labor inputs of young and old

- Technology generates higher hours and wage volatility for young
- Technology depends on age, but not living arrangements
- Structure on top of standard RBC model: shocks to Z

Selection into living arrangements for young



Recursive Competitive Equilibrium

- Aggregate state of economy $s \equiv (K, Z)$
- An equilibrium is a set functions
  - consumption $\{c^{yA}(\varepsilon, s), c^{yT}(\varepsilon, \eta, s), c^{o}(s\}$
  - hours worked $\{h^{yA}(\varepsilon, s), h^{yT}(\varepsilon, \eta, s), h^{o}(s)\}$
  - threshold for staying at home $\eta^{*}(s, \varepsilon)$
  - fraction of young that move in with the old $x(s)$

such that:

- old maximize given prices
- young maximize given prices and choice of old
- factor markets clear
- fraction of young living with old satisfies

$$x(s) = \int_{0}^{\infty} \int_{-\infty}^{\eta^{*}(s,\varepsilon)} dF_{\eta} \; dF_{\varepsilon}$$

where $\eta^{*}(s, \varepsilon)$ satisfies the indifference condition for all ε.

Intuition for identification

Functional form assumptions

- Productivity heterogeneity: $\varepsilon \sim \log N$
- Disutility heterogeneity: $\eta \sim N$
- Implicit transfer function: $\zeta(c^o) = \zeta_0 + \zeta_1 c^o$

10 parameters, 10 moments:

- Labor disutility old ψ^o: $E[h^o]$
- Labor disutility young ψ^y: $\frac{E[h^y]}{E[h^o]}$
- Productivity dist ε : $\frac{E[w^y]}{E[w^o]}, \frac{E[w^{yA}]}{E[w^{yT}]}$
- Young preferences γ, ν^y: $\frac{\sigma[h^{yA}]}{\sigma[h^o]}, \frac{\sigma[h^{yT}]}{\sigma[h^o]}$
- Implicit transfers ζ_0, ζ_1: $\frac{E[h^{yA}]}{E[h^{yT}]}, \rho(h, x)$
- Disutility dist η: $E[x], \frac{\sigma[x]}{\sigma[h^o]}$

Calibration strategy

Model fit

	Data	Model
Relative hours		
$E[h^y]/E[h^o]$	1.00	0.98
$E[h^{yA}]/E[h^{yT}]$	1.24	1.35
$\sigma[h^y]/\sigma[h^o]$	1.58	1.57
$\sigma[h^{yA}]/\sigma[h^{yT}]$	0.69	0.71
Relative wages		
$E[w^y]/E[w^o]$	0.65	0.64
$E[w^{yA}]/E[w^{yT}]$	1.44	1.32
$\sigma[w^y]/\sigma[w^o]$	1.07	1.12
$\sigma[w^{yA}]/\sigma[w^{yT}]$	1.06	1.04
Living arrangements		
$\sigma[x]/\sigma[h^o]$	0.75	0.75
$corr(x, h)$	-0.56	-0.56
M (%)	5.0	4.5
Contr F/N (%)	15.3	16.1

*Non-targeted moments.

Findings

Size of implicit transfers

$$\zeta(c^o) = \zeta_0 + \zeta_1 c^o$$

1. Average fraction of consumption of old

$$E\left[\frac{\zeta(c^o)}{c^o}\right] = 13\%$$

2. Average fraction of consumption of young together

$$E\left[\frac{\zeta(c^o)}{\zeta(c^o) + c^{yT}}\right] = 49\%$$

3. Average additional hours need to work by young together

$$E\left[\frac{\hat{h}^{yT} - h^{yT}}{h^{yT}}\right] = 37\%$$

Why does coresidence affect hours?

- Frisch elasticity for old = 0.72
- Marshallian elasticity for young alone

$$e^{yA} = \frac{(1-\gamma)\nu^y}{1+\gamma\nu^y}$$

- Marshallian elasticity for young together

$$e^{yT}(\varepsilon) = e^{yA} \times \frac{1+\frac{1}{1-\gamma}\frac{\zeta(c^O)}{c^{yT}(\varepsilon)}}{1+\frac{1}{1+\gamma\nu^y}\frac{\zeta(c^O)}{c^{yT}(\varepsilon)}}$$

- If $\gamma < 1$, $\zeta > 0$ then $e^{yT}(\varepsilon) > e^{yA}$
- If $\zeta = 0$ then $e^{yT}(\varepsilon) = e^{yA}$. Also e^{yT} increasing in ζ

Why does coresidence affect hours?

- Frisch elasticity for old = 0.72
- Marshallian elasticity for young alone

$$e^{yA} = 0.45$$

- Marshallian elasticity for young together

$$E\left[e^{yT}\right] = 0.73$$

- If $\gamma < 1$, $\zeta > 0$ then $e^{yT}(\varepsilon) > e^{yA}$
- If $\zeta = 0$ then $e^{yT}(\varepsilon) = e^{yA}$. Also e^{yT} increasing in ζ

Importance of coresidence for hours volatility

Experiment 1:

- Possibility of coresidence, no endogeneity of coresidence
- $x = \bar{x}$: fix thresholds $\eta^*(\varepsilon, s) = \eta^*(\varepsilon, \bar{s})$
- St dev of log total hours: 5.5% lower
- St dev of log of young hours: 6.4% lower

Experiment 2:

- No possibility of coresidence
- $x = 0$: all young live alone
- St dev of log total hours: 31.4% lower
- St dev of log of young hours: 37.2% lower

Demand vs. Supply channel

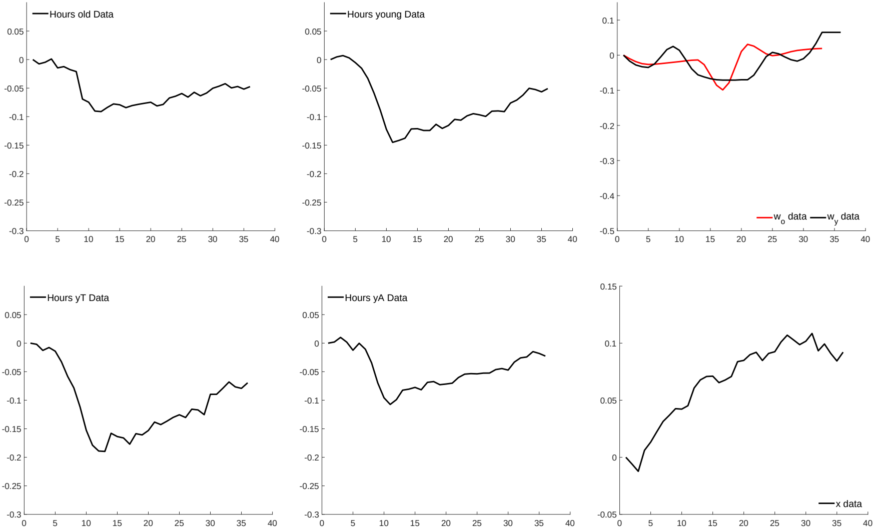
Implications for RA Frisch elasticity

- RA models: Frisch elasticity key for volatility of aggregate hours
  → useful metric for measuring strength of other channels
- What Frisch elasticity would RA model require to generate same volatility of hours as model with young people and coresidence?

Frisch elasticity for old (ν^o)	Implied Frisch in RA RBC model	Proportional Increase
0.72	1.33	85%
0.5	0.87	75%
1.0	2.15	115%
2.0	9.62	381%

The Great Recession

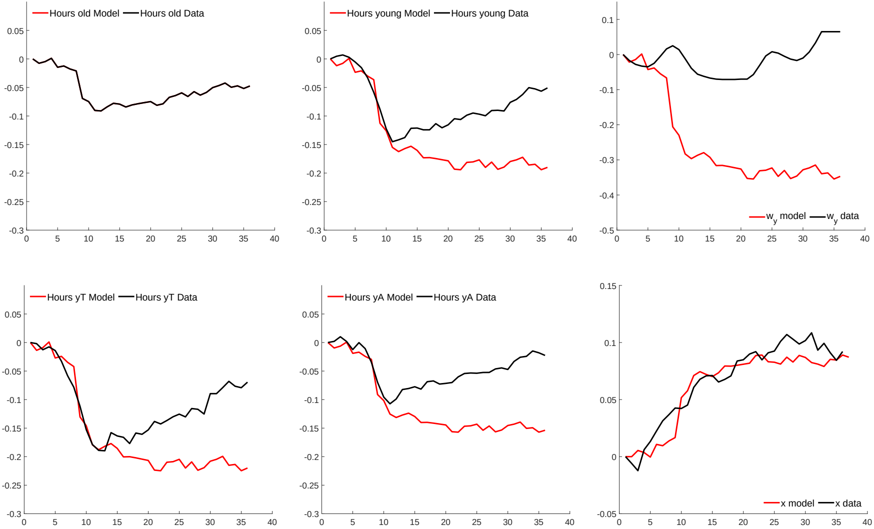
The Great Recession in the data



What does the model predict about the Great Recession?

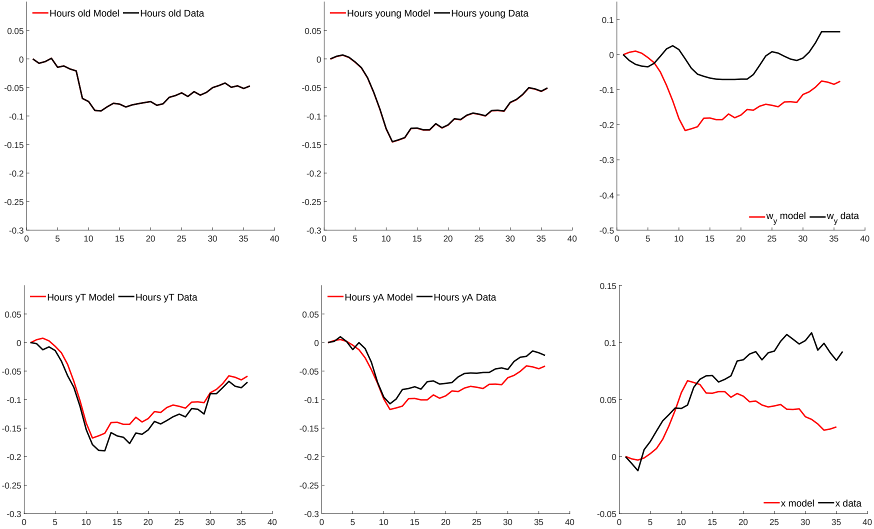
- The baseline model gets coresidence right and hours of the young only up to 10th quarter into the recession; misses the recovery.
- Reason: hours of the young recover faster than of the old
- What does it take for the model to account for these patterns?
  - Asymmetric TFP processes for young and old; fixes the hours but messes up the composition among young
  - Improved leisure technology: Aguiar, Bils, Charles, Hurst (2018). It becomes less painful to live with parents being equipped with better video games.

Only aiming hours of the old



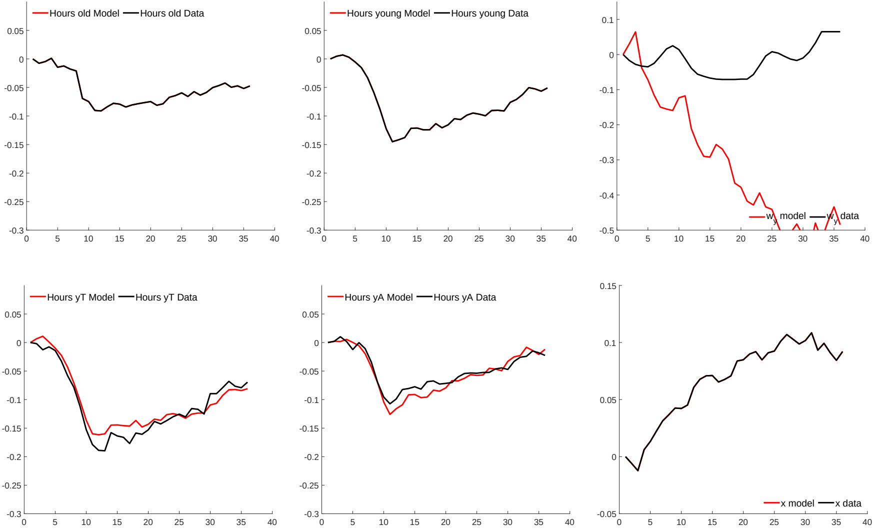
Model inputs

Asymmetric TFP shocks to match hours recovery



Model inputs

Asymmetric TFP shocks + improved leisure (ψ_y)



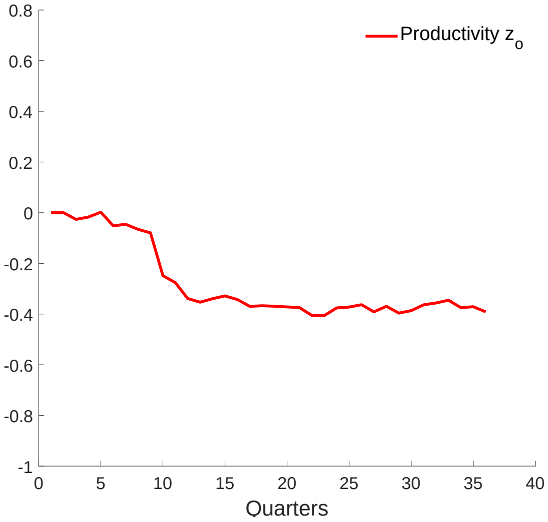
Model inputs

Improved leisure through η

Conclusions

- Young and old have different labor market outcomes. Living arrangements play central role in shaping the behavior of the young.
- We have provided a theory of how it works and mapped it to the data. This theory accounts for the average and cyclical behavior of the young and the old.
- A rational for differences between the micro and the macro (which is 85% larger) Frisch elasticities.
- Our theory + Aguiar et. al. (2018) mechanism accounts for steep rise of coresidence and different outcomes of young and old during the Great Recession.

Young hit harder in the GR, but recover faster



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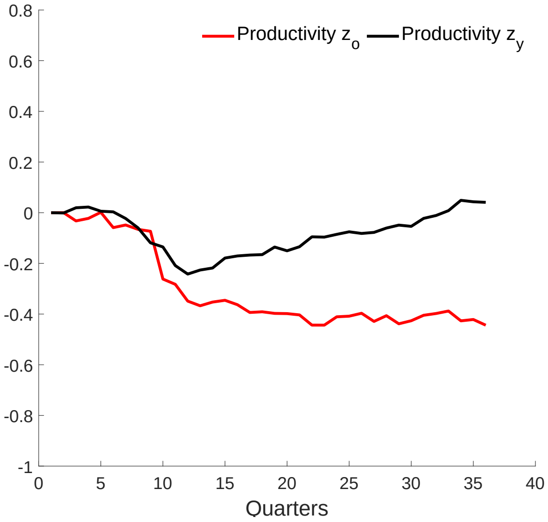
Young hit harder in the GR, but recover faster



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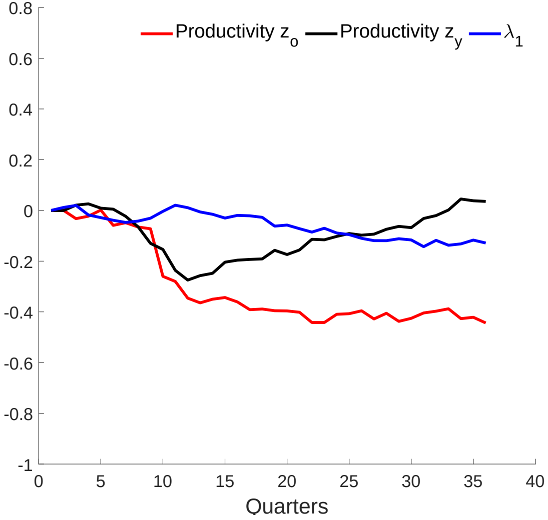

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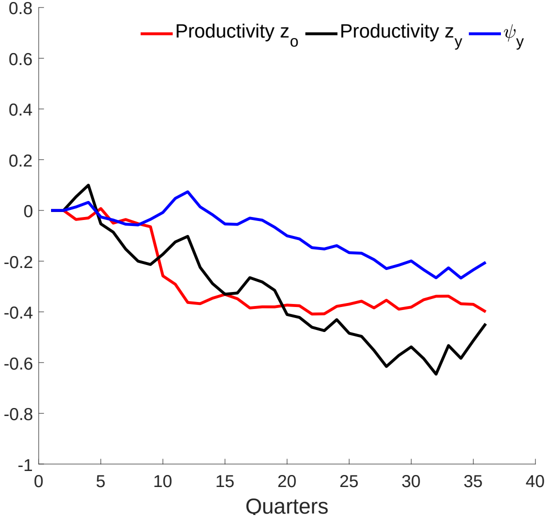

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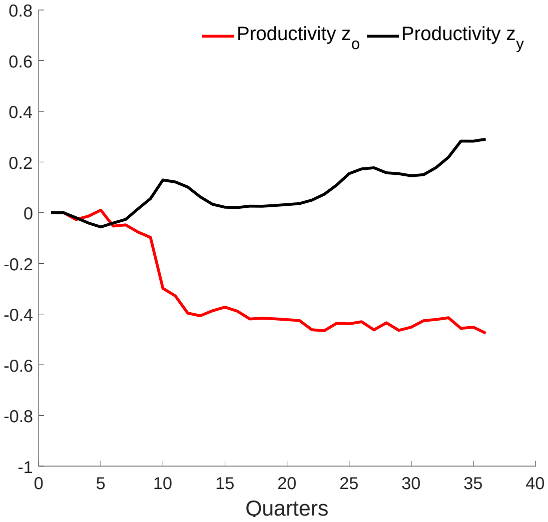

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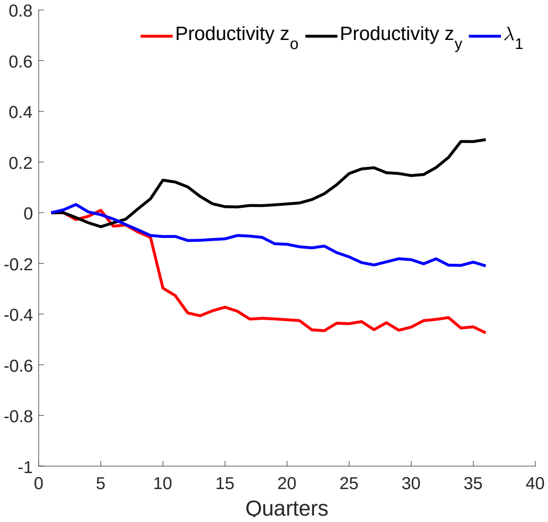

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Data: 1978-2015

- CPS Basic Monthly Surveys for hours (monthly)
- CPS ASEC for wages (annual)
- Individuals: 18-65 year olds, not in school, not in group quarters
- Households: households with at least one such person
- Household size: number of 18-65 year olds not in school
- Quarterly series: de-seasonalize using X12-ARIMA from BLS
- Detrending:
  - 1978-2006: Hodrick-Prescott and various other filters,
  - 2007-2010: Great Recession
  - 2011-2015: Great Recession recovery

Back

Useful decomposition 2

- Importance of endogeneity of coresidence: counterfactual series for hours assuming constant x = fraction of young living with old

- All variation in hours is due to variation in hours of two groups:

$$
\begin{aligned}
M &= \frac{V\left(\log h^{y}\right) - V\left(\log\left[\bar{x}h^{yT} + \left(1-\bar{x}h^{yA}\right)\right]\right)}{V\left(\log h^{y}\right)} \\
&\approx 5\%
\end{aligned}
$$

Back

Demand vs. Supply channel

	Data	RBC + Imp. Subst.	RBC + Liv. Arr.	Baseline Model
Relative hours				
$E[h^y]/E[h^o]$	1.00	1.01	0.99	0.98
$E[h^{yA}]/E[h^{yT}]$	1.24	-	1.37	1.35
$\sigma[h^y]/\sigma[h^o]$	1.58	1.58	1.60	1.57
$\sigma[h^{yA}]/\sigma[h^{yT}]$	0.69	-	0.72	0.71
Relative wages				
$E[w^y]/E[w^o]$	0.65	0.87	0.63	0.64
$E[w^{yA}]/E[w^{yT}]$	1.44	-	1.33	1.32
$\sigma[w^y]/\sigma[w^o]$	1.07	1.32	1.00	1.12
$\sigma[w^{yA}]/\sigma[w^{yT}]$	1.06	-	1.15	1.04
Living arrangements				
$\sigma[x]/\sigma[h^o]$	0.75	-	0.77	0.75
$corr(x, h)$	-0.56	-	-0.57	-0.56
M (%)	5.0	-	4.6	4.5

*Frisch for the old across experiments is 0.72. Back

Calibration strategy

Two sets of parameters from outside model:

1. Production function elasticities: Jaimovich-Pruitt-Siu (2013)
2. Frisch elasticity of old: baseline = 0.72
   Heathcote-Storesletten-Violante (2014)

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Estimate remaining parameters using cyclical fluctuations, 1978-06

1. Standard aggregates (r, I/Y, Capital Share, Solow residual)
2. Mean hours of old, young alone, young together
3. Mean wages of young alone, young together

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Estimate remaining parameters using cyclical fluctuations, 1978-06

1. Standard aggregates (r, I/Y, Capital Share, Solow residual)
2. Mean hours of old, young alone, young together
3. Mean wages of young alone, young together
4. St dev hrs of young along, young together relative to st dev hrs old
5. Mean fraction of young living with old
6. St dev fraction of young living with old relative to st dev hrs old
7. Correlation between fraction of young living with old and hours

Back

Old agents

- Standard RA intertemporal problem

$$
\begin{aligned}
V^o(a; w^o, r) &= \max_{c^o, h^o, a'} u^o(c^o, h^o) + \beta \mathbb{E}\left[V^o\left(a'; w^{o\prime}, r'\right)\right] \\
\text{s.t.} \quad & c^o + a' = w^o h^o + (1+r)a
\end{aligned}
$$

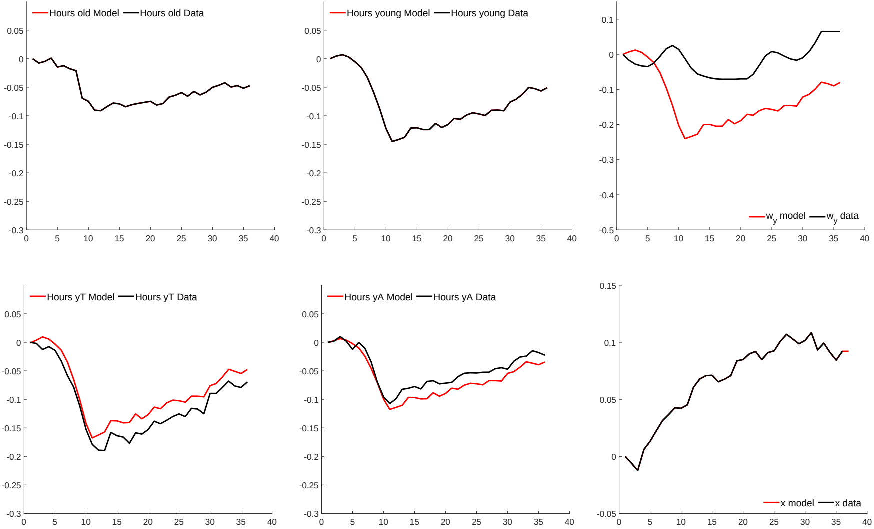
- Preferences taking into account young invasion

$$
\begin{aligned}
u(c^o, h^o, x) = &\left[1 - \frac{x(1-\mu)\gamma}{\mu}\right]\left[\frac{1}{1-\sigma^o}\left(\frac{c^o}{\zeta^o}\right)^{1-\sigma^o} - \psi^o \frac{(h^o)^{1+\frac{1}{\nu^o}}}{1+\frac{1}{\nu^o}}\right] \\
&+ \frac{x(1-\mu)\gamma}{\mu}\left[\frac{1}{1-\sigma^o}\left(\frac{c^o}{\zeta^o + \zeta^y}\right)^{1-\sigma^o} - \psi^o \frac{(h^o)^{1+\frac{1}{\nu^o}}}{1+\frac{1}{\nu^o}}\right]
\end{aligned}
$$

- Aggregate uncertainty: w^o, r

Back

Asymmetric TFP shocks + improved leisure (η)



Model inputs Back