# Living Arrangements and Labor Market Volatility of Young Workers

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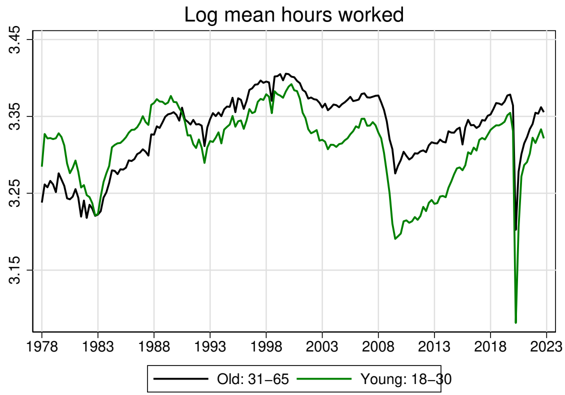
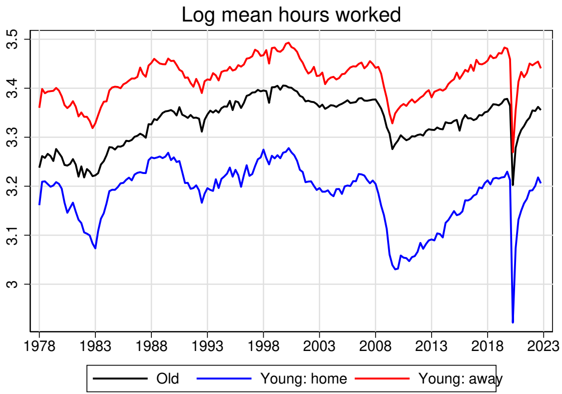
# Hours fluctuations for young people



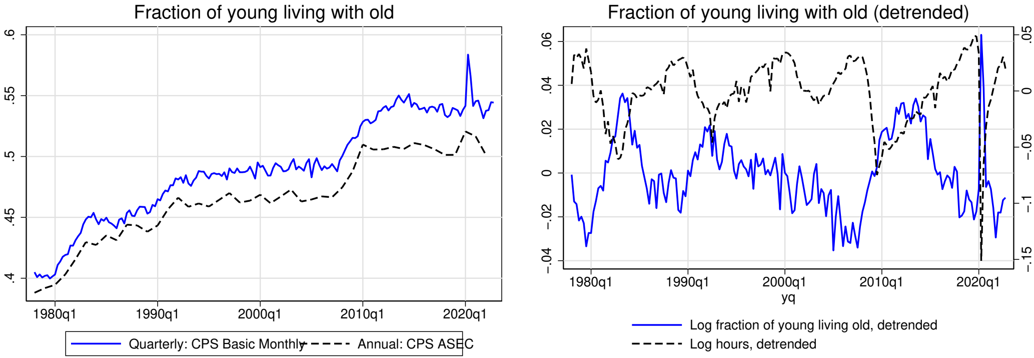

- Young people (18-30): larger cyclical volatility of hours.

# 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

# We document empirically that

1. Household sizes and types vary systematically over the business cycle:
    - In expansions hhs get smaller (mostly young people emancipate).

2. Living arrangements of young adults shape their labor market outcomes.
   People that live with parents:
    - Work less and for lower wages (relative to their peers living alone)
    - Have more volatile hours worked

3. If we decompose the volatility of hours per person into that of hours per household and household per person yielding that
    - 19% of volatility of hours per person due to variations in the size of the household in the data.

# Informed by this we

1. Provide a joint, parsimonious quantitative theory of the living arrangements of young adults and their labor market where there is
   - Endogenous selection of the young into living arrangements based on productivity, preferences and implicit transfers (economies of scale within the old household).
2. Use the model to asses the role of the household attachment channel for various issues
   - Key discliplining moments : relative (across living arrangements) wages and hours, relative volatilities of hours, correlation of hours worked and fraction of young living with old.

# Findings and Implications

1. Implicit transfers are sizeable:
   - 17% of consumption of the old and 44% of the consumption of young who co-reside.
   - Young living with old would have to work 14% more to compensate for the transfers.

2. Living alone is more rewarding and more expensive:
   - Less productive young live with the old despite high disutility.
   - Young alone are on average 30% more productive

3. Transfers imply the wedge between elasticities of labor supply:
   - Young living alone have Marshallian elasticity of labor supply around 50% lower relative to their peers living with the old.

4. Provide rational for higher macro Frisch elasticity in standard RA models:
   - We provide a new propagation and amplification channel of the aggregate shocks.
   - Frisch elasticity necessary in the RA RBC model to generate volatility delivered by our model is 70% higher than elasticity parameter imposed on our economy.

# Evidence

# Data: 1979-2022

- 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: Hodrick-Prescott and various other filters

# Living arrangements of young

Definitions:

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

Variation and volatility in household composition:

| | 18-30 | Never married | 18-30 & Never married |
|---|---|---|---|
| frac young | 0.31 | 0.28 | 0.19 |
| frac young together | 0.52 | 0.50 | 0.66 |
| st dev live together | 1.72% | 1.57% | 1.39% |
| corr with hours 18-65 | -0.73 | -0.62 | -0.71 |

# Living arrangements and labor market of young

Quarterly moments relative to old:

| | Young | Young Away | Young Together |
|---|---|---|---|
| Mean hours | 0.89 | | |
| St dev log hours | 1.73 | | |

Annual moments relative to old:

| | Young | Young Away | Young Together |
|---|---|---|---|
| Mean wages | 0.56 | | |
| St dev log wages | 1.23 | | |

# Living arrangements and labor market of young

Quarterly moments relative to old:

| | Young | Young Away | Young Together |
|---|---|---|---|
| Mean hours | 0.89 | 1.05 | 0.74 |
| St dev log hours | 1.73 | 1.28 | 2.08 |

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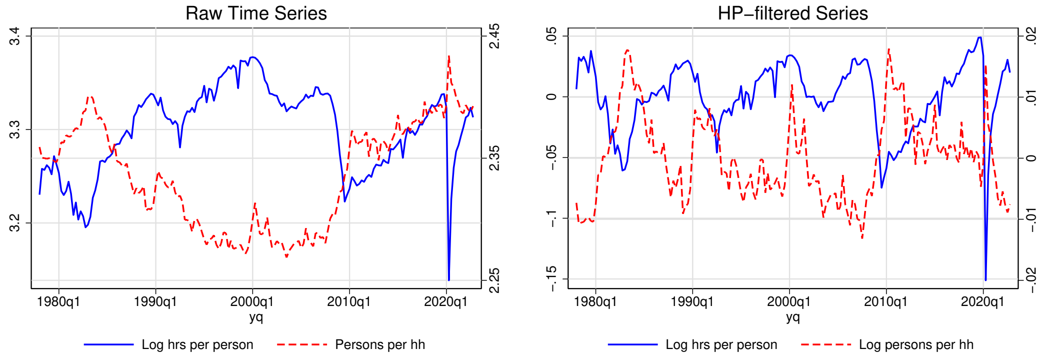
Annual moments relative to old:

| | Young | Young Away | Young Together |
|---|---|---|---|
| Mean wages | 0.56 | 0.74 | 0.44 |
| St dev log wages | 1.23 | 1.39 | 1.40 |

- Young away work like old and earn more than young together.
- Hours of young together twice as volatile as old.

# 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

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

- Cyclical fluctuations

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

# Useful decomposition

| | Quarterly Data | | Annual Data | |
|---|---|---|---|---|
| | **HP-filter** (%) | **Linear trend** (%) | **HP-filter** (%) | **Linear trend** (%) |
| **Hours:** $V\left(\log \frac{H}{N}\right)$ | | | | |
| Households per person + covariance | 19 | 34 | 17 | 34 |
| **Employment:** $V\left(\log \frac{E}{N}\right)$ | | | | |
| Households per person + covariance | 26 | 42 | 19 | 40 |

- Changes in household size offset 17%-19% of changes in hours per person
- They also offset 19%-26% of changes in employment share, at the household level

# 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:

$$M = \frac{V(\log h^y) - V\left(\log\left[\bar{x}h^{yT} + (1-\bar{x}h^{yA})\right]\right)}{V(\log h^y)} \approx 15\%$$

# Model

# Demographics

## Old agents

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

## Young agents

- Two independent idiosyncratic shocks
    - Individual productivity $\varepsilon$
    - Distaste for living with old agents $\eta$
- Can invade an old households

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

1. Old $\mu$ live in hhs of size $\gamma$
2. Young alone: $(1-\mu)(1-x)$
3. Young together (with old): $(1-\mu)\,x$

# Old agents

- Standard RA intertemporal problem

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

- Preferences potentially taking into account young invasion

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

- Aggregate uncertainty: $w^o, r$

# 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

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

- Require $\gamma^y < 1$ 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

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

  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 $Z$ is labor augmenting

# 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

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

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

# Mapping the model to the data

Functional form assumptions:

- Productivity heterogeneity: $\varepsilon \sim \log N$
- Disutility heterogeneity: $\eta \sim$ Extreme Value Type I
- Restriction: $\varepsilon$ and $\eta$ are independent
- Implicit transfer function: $\zeta(c^o) = \zeta_0 + \zeta_1 c^o$

Two set of parameters:

1. Externally calibrated (data and micro estimates):
   - Demographics: $\mu$,$\gamma$,$\zeta^o$, $\zeta^y$
   - Preferences old: $\nu^o$, $\sigma^o$
2. Endogenously calibrated (data and micro estimates):
   - Both first and second moments jointly discipline them.

# Targeted moments: data vs. the baseline model.

- We chose to match relative rather than absolute values of the standard deviations
- Alternative: pick parameters to match absolute values of hours of young and $x$
- Alternative is misleading. Technology shocks account for small fraction of aggregate volatility.

| Moment | Data | Model |
|---|---|---|
| **First Moments** | | |
| Investment/Output | 0.26 | 0.26 |
| Mean Hours Old | 0.62 | 0.60 |
| Mean Hours Young Together | 0.21 | 0.20 |
| Mean Hours Young Alone | 0.30 | 0.30 |
| Fraction of Young living with Old | 0.52 | 0.52 |
| Wage of young alone/Wage Old | 0.72 | 0.64 |
| Wage of young together/Wage Old | 0.41 | 0.44 |
| Share of Old Labor Income in GDP | 0.53 | 0.51 |
| **Second Moments** | | |
| $\sigma(h^y)/\sigma(h^o)$ | 1.73 | 1.72 |
| $\sigma(h^{yT})/\sigma(h^o)$ | 2.08 | 1.96 |
| $\sigma(h^{yA})/\sigma(h^o)$ | 1.28 | 1.48 |
| $\sigma(x)/\sigma(h^o)$ | 0.71 | 0.35 |
| $\sigma(w^y)/\sigma(w^o)$ | 1.19 | 1.20 |
| $\sigma(w^{yT})/\sigma(w^{yA})$ | 1.00 | 0.92 |
| Corr$(x, h)$ | -0.72 | -0.74 |

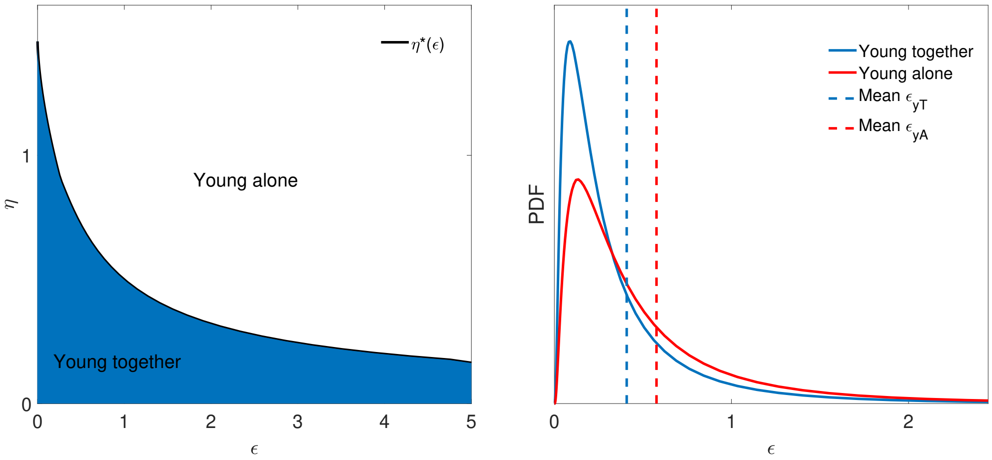
# Results

# Model Performance: non-targeted moments

- The model accounts for 75 % of the contribution of hhs size changes to volatility of hours worked.
- The model accounts for 60% of the contribution from coresidence endogeneity channel captured by moment M.

| **Moment** | **Data** | **Model** |
|---|---|---|
| Contribution H/F | 0.19 | 0.14 |
| Moment M | 0.15 | 0.09 |
| Correlation of hours of old and hhs size | -0.58 | -0.59 |
| Correlation of hours of young and hhs size | -0.63 | -0.82 |
| Correlation of total hours and hhs size | -0.62 | -0.74 |

# Selection into living arrangements for young



# Size of implicit transfers

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

1. Fraction of consumption of old
$$\frac{\zeta(c^o)}{c^o} = 16.6\%$$
2. Average fraction of consumption of young together
$$E\left[\frac{\zeta(c^o)}{\zeta(c^o) + c^{yT}}\right] = 44.4\%$$
3. Average additional hours need to work by young together
$$E\left[\frac{\hat{h}^{yT} - h^{yT}}{h^{yT}}\right] = 13.9\%$$

# Why does coresidence affect hours volatility?

- Frisch elasticity for old $\nu^o = 0.72$
- Marshallian elasticity for young alone

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

- Marshallian elasticity for young together

$$e^{yT}(\varepsilon) = e^{yA} \times \underbrace{\frac{1 + \frac{1}{1-\gamma}\frac{\zeta(c^o)}{c^{yT}(\varepsilon)}}{1 + \frac{1}{1+\gamma\nu^y}\frac{\zeta(c^o)}{c^{yT}(\varepsilon)}}}_{\uparrow \text{ in } \zeta(c^o)}$$

# Why does coresidence affect hours volatility?

- Frisch elasticity for old $\nu^o = 0.72$
- Marshallian elasticity for young alone

$$e^{yA} \quad = 0.35$$

- Marshallian elasticity for young together

$$E\left[e^{yT}\right] \quad = 0.52$$

# The role of coresidence

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: 7.5% lower
- St dev of log of young hours: 9.4% lower

Experiment 2:

- No possibility of coresidence
- $x = 0$: all young live alone
- St dev of log total hours: 30.3% lower
- St dev of log of young hours: 36.8% lower

# 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 the old | Implied Frisch in RA RBC | Proportional Increase |
|---|---|---|
| $\nu^o = 0.72$ (Baseline) | 1.23 | 70.8% |
| $\nu^o = 0.3$ | 0.82 | 173.3% |
| $\nu^o = 1.0$ | 1.48 | 48.1% |
| $\nu^o = 2.0$ | 2.85 | 42.5% |

# 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 Frisch elasticities.