Business Cycles and Household Formation: The Micro versus the Macro Labor Elasticity

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The Issue

- Macroeconomists like larger labor elasticities than Labor economists (? and ?).

- Many macro arguments have been incoroporated by better measuring what households do (others not yet (i.e. retirement)).
  1. Extensive and not only intensive margin.
  2. Secondary Earner.

  This yields a value of 0.72 (?).

- Today we want to add another margin of adjustment:

Changes in household composition.

The logic

- Most micro data sets are based on relatively stable people.
- Moreover, in order to have a useful panel, economists prune the data to erradicate households with varying composition.
- This missmeasures the labor elasticity for two reasons:
  - The people that change their household status are typically different than those that do not (single, younger, poorer).
  - In addition, changing the household where one lives changes the willingness to work for any given labor elasticity (moving in with relatives while cutting hours work).

This paper

1. **Document some new facts**

   Household composition is cyclical
   Changes in composition related to labor market outcomes

2. **Measure its effect on the macro elasticity**

   This margin changes the macro elasticity that is consistent with an environment where people in stable households have the elasticity measured at the micro level.

The plan

We view the world as consisting of two types of people:

(a) People who live in stable households (non-marginal people, old)

(b) People in unstable households (marginal people, young)

We will take the following steps:

1. Measure the volatility of household composition
2. Measure the hours volatility of people in unstable households.
3. Build a model with both types of people, and in which household composition is an endogenous outcome.
4. Assume an elasticity of 0.72 (or whatever) for stable households.
5. Set elasticity for unstable people so that their relative hours volatility is what we observe.
6. Compare the implied macro elasticity in our model with endogenous household composition, with the measured (assumed) elasticity of people in stable households.

The Literature

- **?** noted the higher variance of young hours.

- **?** argue that the Great Moderation, was due in part (.20–.33) to demographic changes that reduced the share of the young people in all G7.

- **?**, **?**, **?**, **?**, and **?** also document differences in age variation and posed RBC models (some OLG) to explore the business cycle implications of skill differences.

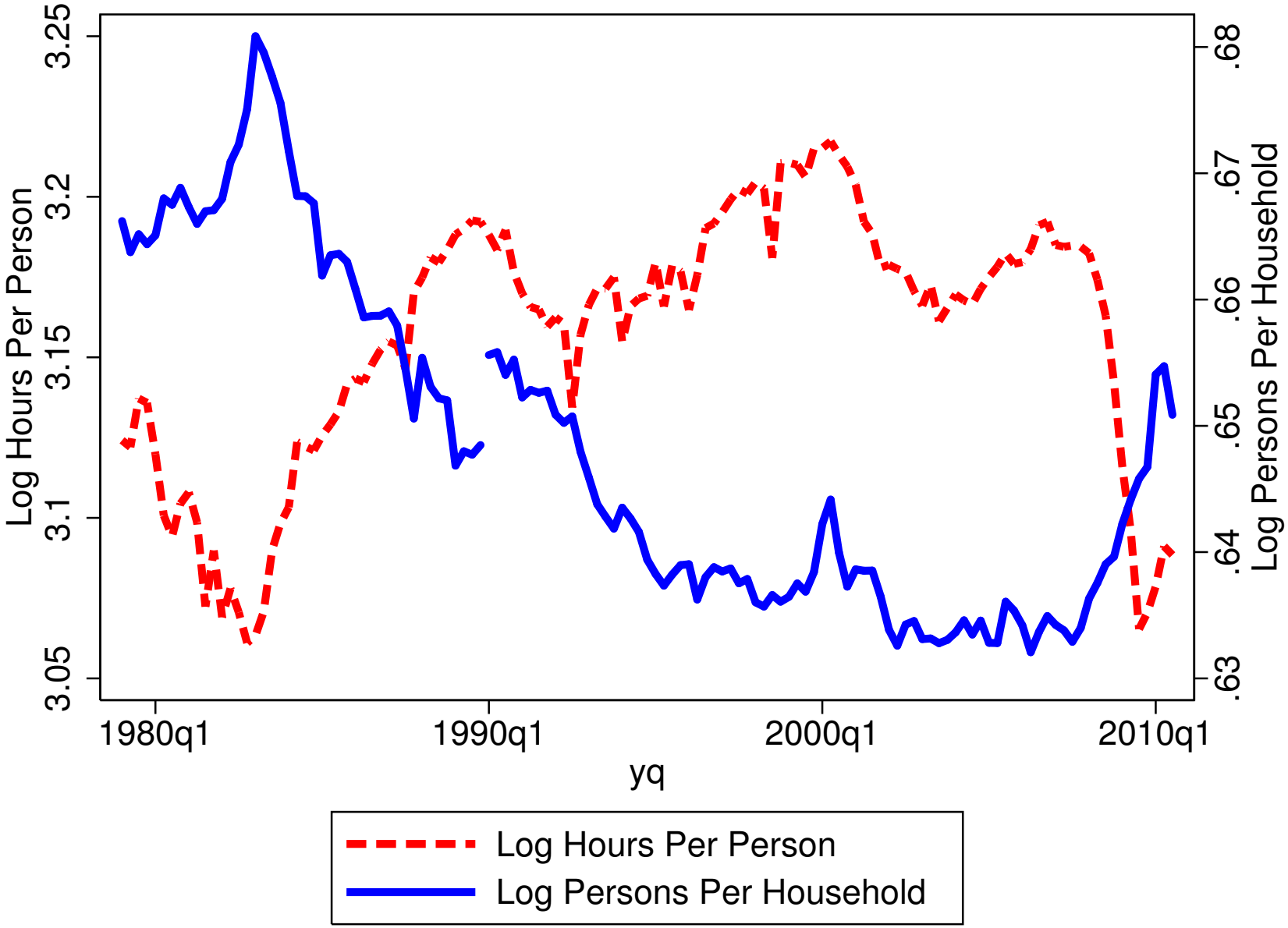
- **?** account for the higher volatility of the young via wage movements with a CES prod function. The young are different in production not in preferences.

- **?** shows the importance of coresidence.

A primer on the facts

1. **Household size and composition are cyclical**
2. Changes in household size account for around 15% of cyclical variance of hours worked
3. Marginal people (i.e those with unstable household structures) have higher labor market volatility than non-marginal people (i.e those in stable households)

1. Household size and composition are cyclical



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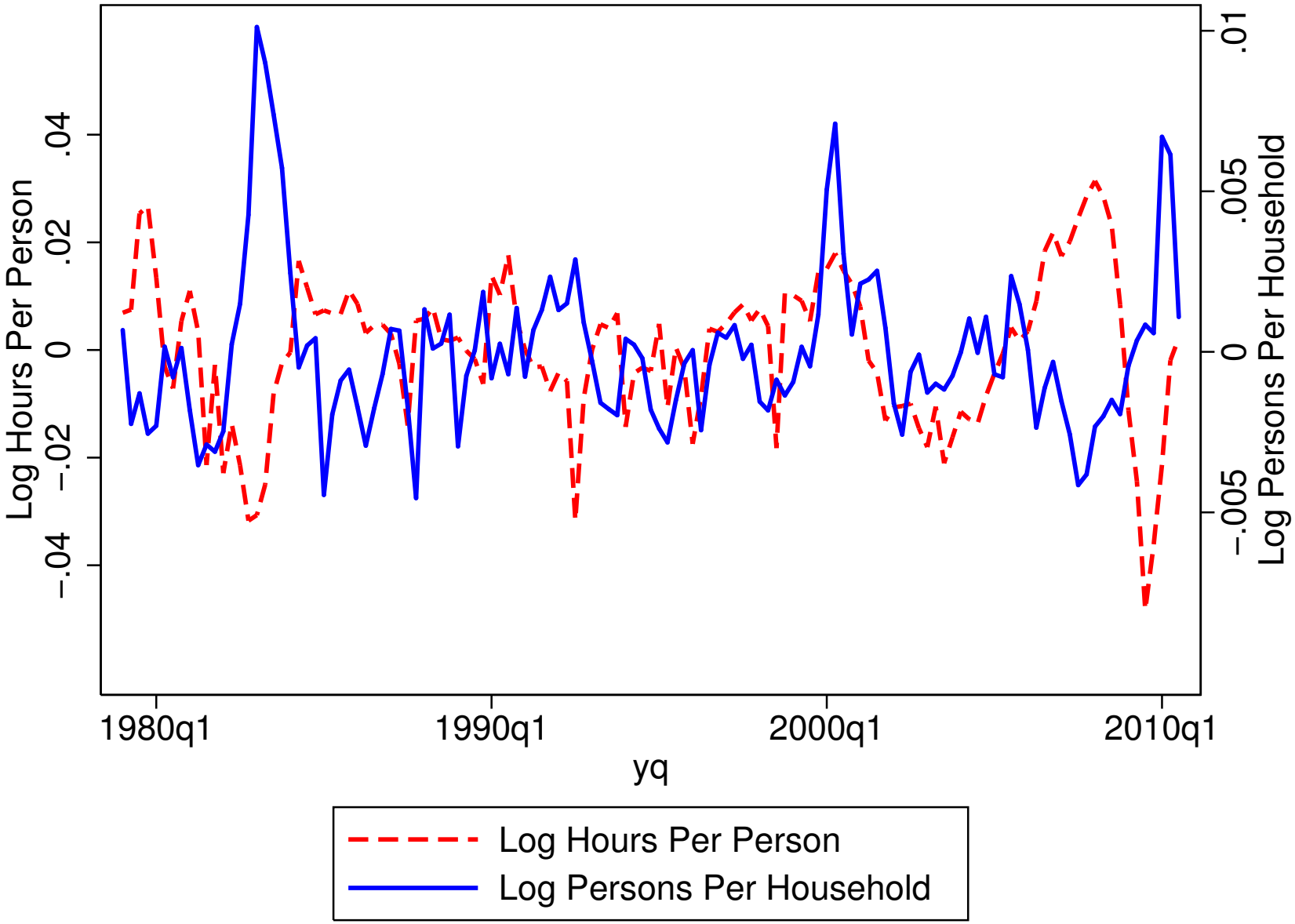

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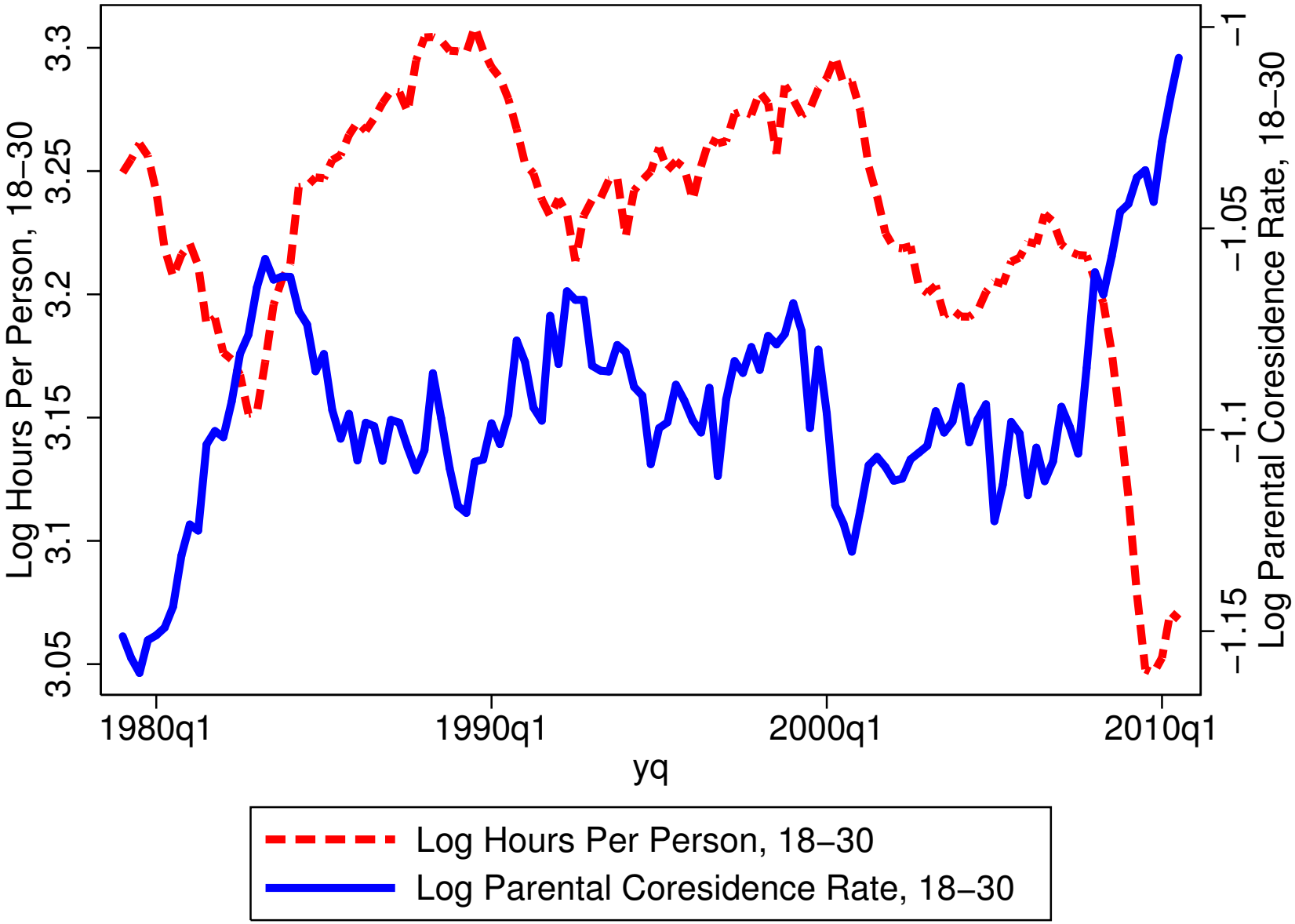

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2. Decomposition of hours per person

H = Total weekly hours worked
N = Number of persons
B = Number of employed persons
F = Number or households (or dwellings or families)

Consider the decomposition

$$\underbrace{\frac{H}{N}}_{\text{hours per person}} = \underbrace{\frac{H}{B}}_{\text{hours per body}} \times \underbrace{\frac{B}{N}}_{\text{bodies per person}}$$

$$\underbrace{\frac{H}{N}}_{\text{hours per person}} = \underbrace{\frac{H}{B}}_{\text{hours per body}} \times \underbrace{\frac{B}{F}}_{\text{bodies per household}} \times \underbrace{\frac{F}{N}}_{\text{households per person}}$$

Quarterly data: Basic monthly surveys from CPS, 1977-2010

2. Decomposition of hours per person

Percentage of Variance of HP-Filtered Log $\frac{H}{N}$

	Annual Data (%)	Quarterly Data (%)
$\text{Var}(\frac{H}{B})$	8	27
$\text{Var}(\frac{B}{F})$	47	31
$2*\text{Cov}(\frac{H}{B}, \frac{B}{F})$	31	27
$\text{Var}(\frac{H}{F})$	86	85
$\text{Var}(\frac{F}{N})$	3	5
$2*\text{Cov}(\frac{H}{F}, \frac{F}{N})$	11	10
Contribution due to $\frac{F}{N}$	14	15

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3. Unstable have higher labor market volatility

Young vs Old

		Annual	Quarterly
Mean hours	18-30	24.6	25.4
	31-65	28.1	28.2
Var filtered log hours	18-30	9.64	4.16
$\times 10^{-4}$	31-65	2.91	1.52
Var filtered log hh size	18-30	6.89	2.72
$\times 10^{-5}$	31-65	2.05	0.80

Single vs Married

		Annual	Quarterly
Mean hours	Never married	24.2	24.9
	Others	28.0	28.0
Var filtered log hours	Never married	10.28	4.23
$\times 10^{-4}$	Others	3.14	1.57
Var filtered log hh size	Never married	9.51	3.62
$\times 10^{-5}$	Others	1.99	0.78

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The Model

- It is a standard RBC model augmented with other agents
  1. The additional agents are hand to mouth.
  2. Their hours move.
  3. Some of them move in with the standard households.
  4. These things move in a cyclical way.

Demographics

Continuum of agents or people of measure 1.

The stable (or independent or old) (μ)

- Live in groups of size γ: there are $\frac{\mu}{\gamma}$ of these households
- Can be invaded by a young, but only after they have made their choice of consumption and hours worked

The unstable (or dependent or young) $(1-\mu)$

- Can join (invade) a stable household after observing the state and realization of an i.i.d. idiosyncratic shock $\eta \sim F(\eta;\lambda)$
- Let x be the fraction of young that invade an old household
- So at any point there are three types of households:
  (i) old alone, (ii) young alone and (iii) young together.

The young and their impatience

The young are hand to mouth agents, $\beta^y = 0$.

If living alone, A, their preferences are given by

$$u(c^{yA}, h^{yA}) = \frac{\left(c^{yA}\right)^{1-\sigma}}{1-\sigma} - \psi^y \frac{\left(h^{yA}\right)^{1+\frac{1}{\nu^y}}}{1+\frac{1}{\nu^y}}$$

If living together with an old household, T, their preferences are

$$u\left(c^{yT}, c^o, h^{yA}, \eta\right) = \frac{\left(c^{yA} + \frac{(c^o)^\xi}{\zeta^y}\right)^{1-\sigma}}{1-\sigma} - \psi^y \frac{\left(h^{yT}\right)^{1+\frac{1}{\nu^y}}}{1+\frac{1}{\nu^y}} - \eta$$

ζ^y, ξ reflect economies of scale: how much free riding the young get.

The old

The old like (or cannot say no to) the young.

$$u(c^o, h^o, x) =$$
$$\left[1 - \frac{x(1-\mu)\gamma}{\mu}\right]\left[\log \frac{c^o}{\zeta^{oo}} - \psi^o \frac{(h^o)^{1+\frac{1}{\nu^o}}}{1+\frac{1}{\nu^o}}\right] +$$
$$\frac{x(1-\mu)\gamma}{\mu}\left[\log\left(\frac{c^o}{\zeta^{oo}+\zeta^o}\right) - \psi^o \frac{(h^o)^{1+\frac{1}{\nu^o}}}{1+\frac{1}{\nu^o}}\right]$$

- ζ^{oo} indicates the economies of scale among the old
- ζ^o indicates the (meager) economies of scale from the consumption of the young.
- The old discount the future at rate β.

Budget constraints

- The young are lousy workers $\epsilon^y < 1$ and eat what they get

$$c^{yA} = \epsilon^y \; w \; h^{yA}, \qquad\qquad c^{yT} = \epsilon^y \; w \; h^{yT}$$

- The old have a standard budget constraint

$$c^o + a' = w \; h^o + a \, (1 + r)$$

Production

This structure is on top of a growth model:

$$C + K' = z\ K^{\alpha}\ N^{1-\alpha}$$

where z is an AR(1) productivity shock,

$$\begin{aligned} C &= \frac{\mu}{\gamma} c^{o} + (1-\mu)\ \ [x\, c^{yT} + (1-x) c^{yA}], \\ N &= \frac{\mu}{\gamma} h^{o} + (1-\mu)\epsilon^{y} [x\, h^{yT} + (1-x) h^{yA}], \\ H &= \frac{\mu}{\gamma} h^{o} + (1-\mu)\ \ [x\, h^{yT} + (1-x) h^{yA}], \end{aligned}$$

$\{C, N, H\}$ are aggregate consumption, labor input and hours

Capital is owned by the old, so wealth is total capital: $a = K$

This structure achieves

1. Simplicity

   - Equilibrium has same elements as standard RA model, but with different implications.
   - Aggregate states $\{z, K\}$ are sufficient statistics for wealth and prices.

2. Equilibrium is not optimal

   - Feelings of the old are not taken into account when household structure is decided.

Equilibrium

A set of functions for:

(i) consumption $\{c^{yA}(z,K), c^{yT}(.), c^{o}(.)\}$
(ii) hours worked $\{h^{yA}(z,K), h^{yT}(.), h^{o}(.)\}$
(iii) threshold for staying at home $\eta^*(z,k)$,; and
(iv) fraction of young that move in with their old $x(z,K)$,

such that:

(i) the young maximize given the choice of the old
(ii) the old maximize given the expected choices of the young
(iii) prices are competitive; and
(iv) fraction of households moving with their elderly satisfies

$$x(z,K) = F(\eta^*(z,K);\lambda)$$

where $\eta^*(z,K)$ satisfies

$$u(c^{yA}(z,K), h^{yA}(z,K)) = u\left(c^{yT}(z,K) + c^{o}(z,K), h^{yA}(z,K), \eta^*\right)$$

i.e. the marginal young are indifferent.

Quantitative Exercise

- How does the volatility of hours compare vs a standard model when we
  1. Allow for marginal, unattached, dependent, young workers.
  2. These workers can move in and out of other households.

- Our quantitative exercise
  1. Sets the elasticity for old households from micro meauserements.
  2. Specifies the parameters that determine the size volatility of the behavior of young households.
  3. Looks at the aggregate properties of our economy.
  4. Asks what elasticity would be needed in a RA model to generate the same total hours volatility as in our model.

The crucial decision

- *What criteria to use to set the parameters that determine the volatilities of young hours and of the movements of the young in and out of the households of the old?*

- The discipline comes from setting those parameters so that:

The fraction of the variance of hours accounted by the model of hours of the old is the **SAME** *than that of the hours of the young and of the fraction of the young living with the old.*

- Another important issue

Moreover, we also want to get the correlation of hours and the number of households because of the accumulated wealth effect.

Calibration of the Model, Baseline (Young are < 30) (I)

Table: Parameters set directly without solving the model

	Description	Target variable	Target	Value
α	Capital share	US Capital share	0.67	0.67
β	discount rate	r	0.04	0.9902
ν^o	Frisch elast. of old	-	0.72	0.72
ϵ^y	Old wage Premium	US < 30 wages	0.57	0.57
μ	Fraction of old	Fraction of over 30	0.684	0.684
		Size of U.S. hholds	1.798	1.798
γ	Old household size	headed by over 30	1.798	1.798
		Irrelevant		
ζ^{oo}	Economies of scale within old	OECD	1.7	1.7
ζ^o	economies of scale together for old	OECD	0.5	0.5

Calibration of the Model, Baseline (Young are < 30) (II)

Table: Parameters that require solving for the steady state
Targets that are first moments of variables

	Description	Target variable	Target	Value
A	Units	y	1	1.265
δ	Depreciation rate	i/y	0.24	0.026
ψ^o	Ut weight of hours of old	h_o	0.503	4.426
ψ^y	Ut weight of hours of young	h_y^T	0.2105	5.5411
λ_1	Shape parameter of Gamma distribution	x	0.5023	10.8776
σ^y	Risk aversion of young (1/IES)	h_y^A	0.2972	0.2893

Calibration of the Model, Baseline (Young are < 30) (III)

Table: Parameters that require solving the whole model
Targets that are second moments of variables

	Description	Target variable	Target	Value
λ_2	Scale parameter of Gamma distribution	$\text{Var}(x)/\text{Var}(h_o)$	0.458	0.095
ν^y	Frisch elasticity of young	$\text{Var}(h_y^T)/\text{Var}(h_o)$	4.013	1.188
ζ^y	Ave Economies of scale for young	$\text{Var}(h_y^A)/\text{Var}(h_o)$	1.777	2.147
ξ	Marginal Ec of scale for young	$\text{Corr}(x, h)$	-0.477	0.732
ρ	AR(1) productivity shock	Autocorr(Solow residual)	0.94	0.942
σ^z	st dev productivity shock	Var(Solow residual)	3.19	0.620%

Table: Results

	var(h)	var(h_o)	var(h_y)	var(h_y^A)	var(h_y^T)	var(x)	corr(x, h)
Data							
Young are under 30	2.026	1.519	4.160	2.700	6.096	0.696	-0.4774
RBC RA, $\nu = .72$,	*0.0910*	-	-	-	-	-	-
Multiple Household economies							
Benchmark (< 30)	*0.1513*	*0.1074*	0.2930	0.1909	0.4309	0.0492	-0.4774
$V(x) = 0$ & Bch pr	0.1472	0.1074	0.2793	0.1909	0.4309	-	-
$var(x) = 0$	*0.1489*	0.1093	0.2795	0.1908	0.4318	-	-

- Prices induced by the young exacerbates the volatility of the old.
- Corresidence makes the variance larger but
- Prices due to coresidence reduce its role.

Small contribution of coresidence: $\Delta Var(h) = 1.61\%$

- Is this a contradiction with the 15% contribution of persons per household to the total variance of hours?

No it is not: Percentage of Variance of HP-Filtered Log $\frac{Hours}{Pop}$

	Data	Bench	High* $V\left(\frac{Hh}{Pop}\right)$
$\text{Var}\left(\frac{Hours}{Household}\right)$	85	86.8	83.6
$\text{Var}\left(\frac{Households}{Pop}\right)$	5	2.8	5.0
$2*\text{Cov}\left(\frac{H}{Hh}, \frac{Hh}{Pop}\right)$	10	10.4	11.35
Contribution due to $\frac{Hh}{Pop}$	*14*	*15*	*16.35*
$V(h)$	-	*0.1513*	*0.1512*

- * We target directly $V\left(\frac{Hh}{Pop}\right)$ instead of $\frac{V(x)}{Var(h_o)}$.

Representative Agent Representation of Multiple Hhold Ec

How much larger is the Macro elasticity than the Micro elasticity given the explicit consideration of the young and the corresidence?

Table: Implied Frisch Elasticity RBC RA to match $var(h)$

Economy	Implied ν	% increase
Benchmark calibration (young are under 30)	1.0272	*42.7*
$var(x) = 0$, (no coresidence)	1.0153	41.0
Young as under 30 and single	0.9023	25.3
$var(x) = 0$, (no coresidence)	0.8988	24.8

Conclusions

1. Household sizes are countercyclical.
2. The contribution of the volatility of household sizes to the volatility of hours worked is about 15%.
3. The existence of young, relatively disenfranchised households is an important item in the determination of the volatility of hours.
4. Volatility of total hours go up by 66.3%.
5. Ignoring coresidence total hours go up by 63.6%.
6. The macro elasticity goes up by 42.7% (41.0%).

References

Coresidence over the Business Cycle

	Data: All		Data: Participants	
	HP-filtered	Cyclical	HP-filtered	Cyclical
sd log hours - sd log away	0.42	0.30	0.38	0.19
sd log emp - sd log away	0.52	0.36	0.51	0.24
corr log hours, log away	0.54		0.20	
corr log emp, log away	0.57		0.20	

Model	sd log away / sd log emp	corr log away, log emp
$\phi = 1.0$	2.84	0.29
$\phi = 0.8$	2.56	0.54
$\phi = 0.7$	2.43	0.52
$\phi = 0.5$	2.20	0.72