Rethinking the Welfare State

(Preliminary)

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NBER SI – Macro Public Finance

Motivation

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- Inequality of earnings over the life-cycle
    - household structure – married and single households, males and females

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- The role of public policy
    - Nonlinear taxation and social security;
    - Social insurance programs (means-tested tax credits – Earned Income Tax Credit, Child Tax Credit and Means-tested transfers – AFDC/TANF, Food Stamps, SSI, Housing Assistance)

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- What are the roles of public policy and household decisions in shaping economic inequality?
- What is the extent of insurance under incomplete markets when two-earner households are explicitly considered?
- What are the effects of policy reforms? – focus today.

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- Develop a life-cycle economy that has the *potential* to account for these facts
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    - labor supply decisions at intensive and extensive margins
    - progressive taxation of household incomes
    - means-tested tax benefits and transfers

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- Use this framework to evaluate quantitatively i) changes in *current welfare system*, ii) a system that replaces current *taxes and transfers* with
  - Proportional income tax
  - **Negative income tax**

Facts

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- Current Population Survey (CPS) $\rightarrow$ earnings and hours
  - Household heads and their spouses between ages 25 to 60
  - Drop all observations with hourly wage that is less than federal minimum wage
  - Drop if yearly hours is less than 520 hours per year for those above age 30, less than 260 for those below age 30, and all observations more than 5820 hours of work
  - Huggett, Ventura and Yaron (2010), Heathcote, Perri and Violante (2010).

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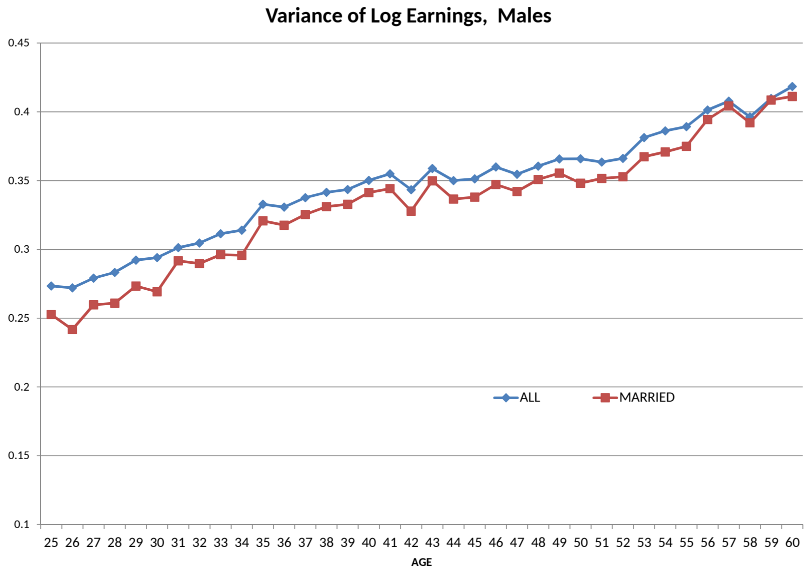
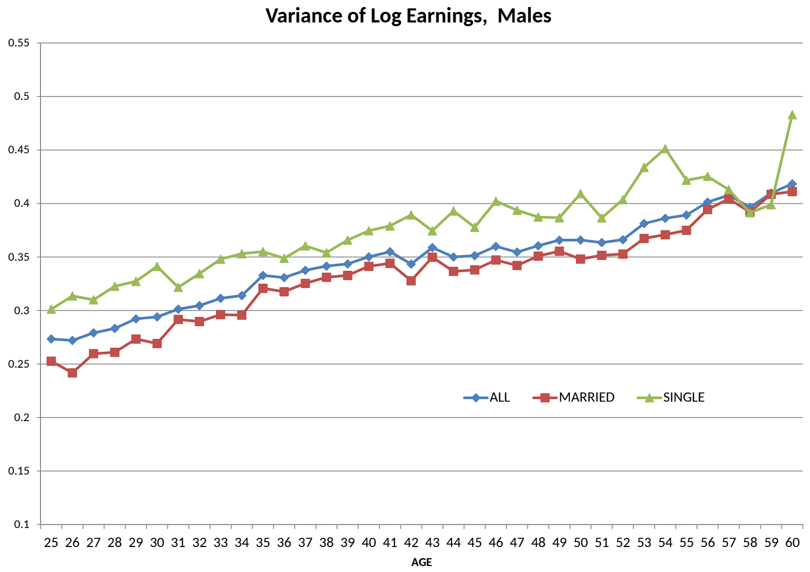
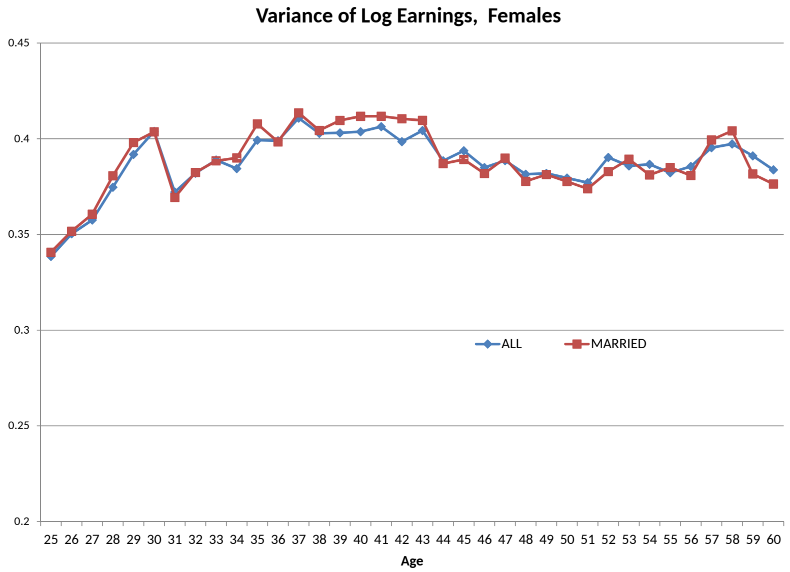
- Estimate

$$stat_{a,t} = \beta_a' \mathbf{D}_a + \beta_t' \mathbf{D}_t + \varepsilon_{a,t}$$

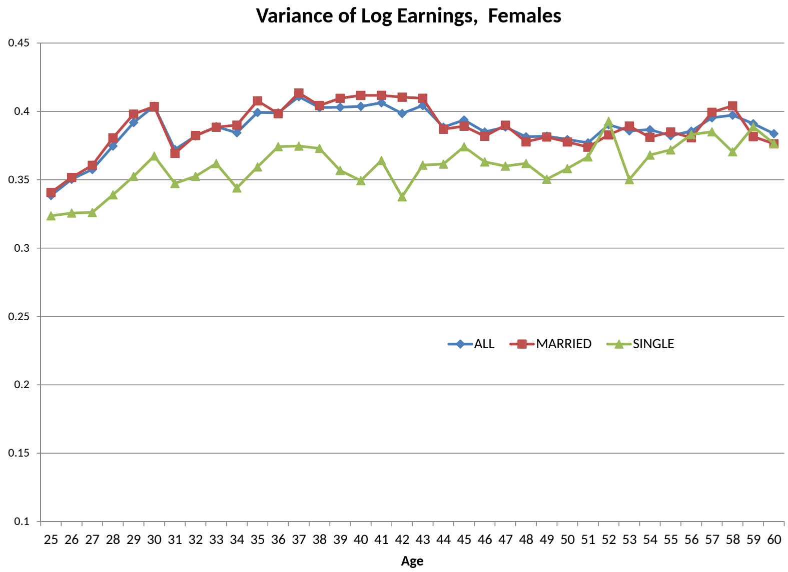

Variance of Log Earnings, Males
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
ALL
MARRIED
25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60
AGE

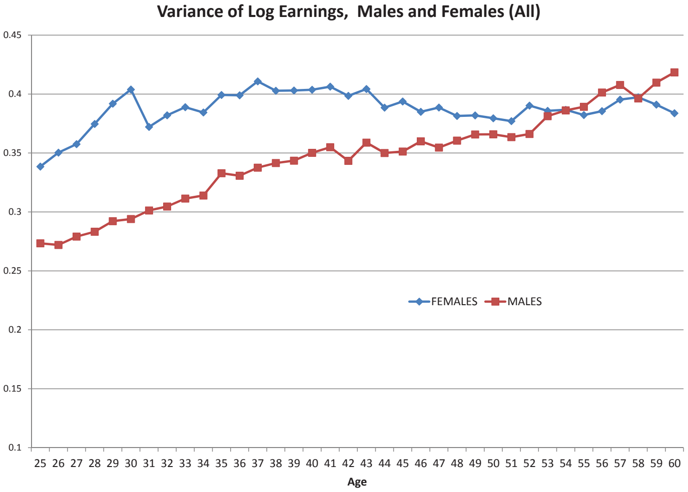


Variance of Log Earnings, Males
0.55
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60
AGE
ALL
MARRIED
SINGLE

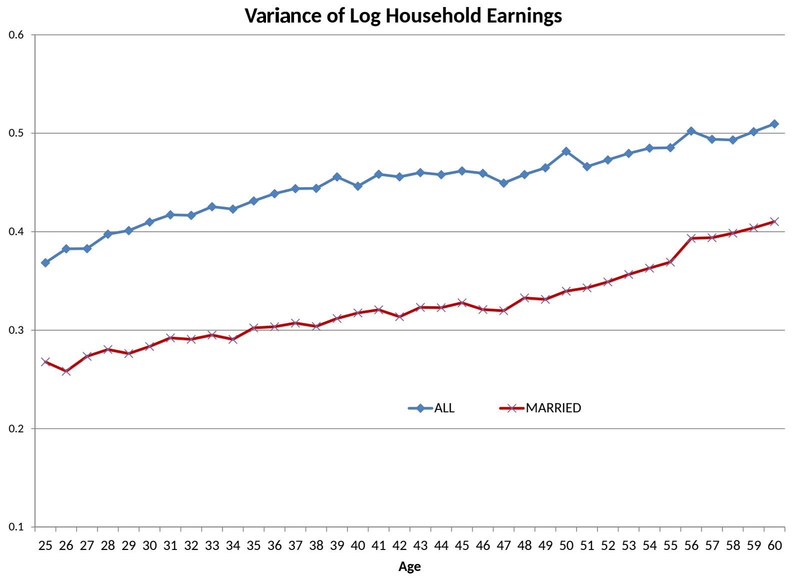


Variance of Log Earnings, Females
0.45
0.4
0.35
0.3
0.25
0.2
25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60
Age
ALL
MARRIED

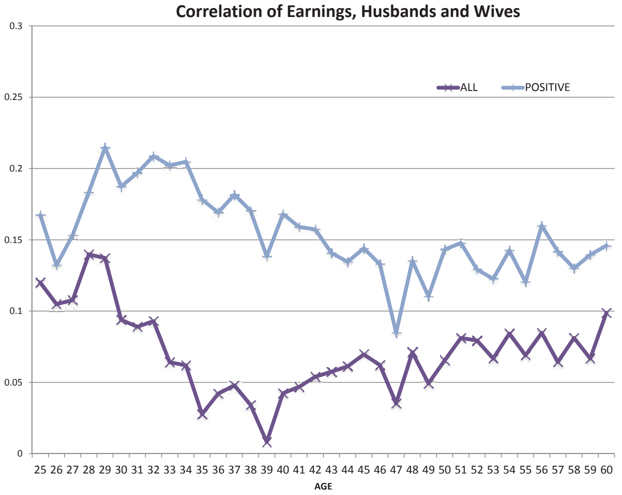

Variance of Log Earnings, Females
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
ALL
MARRIED
SINGLE
25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60
Age



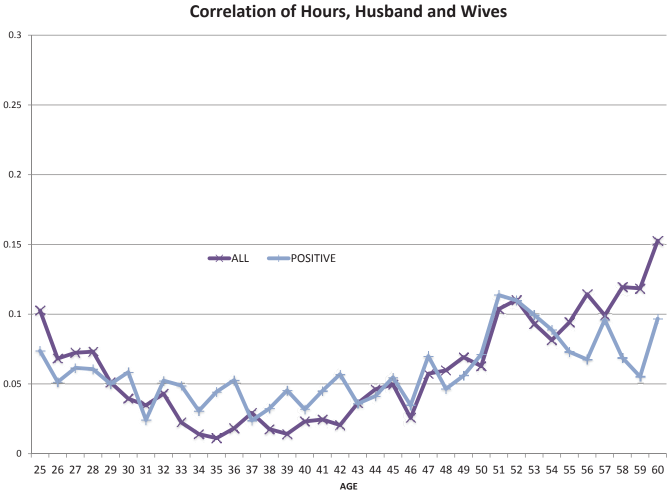
Variance of Log Earnings, Males and Females (All)
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
FEMALES
MALES
25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60
Age



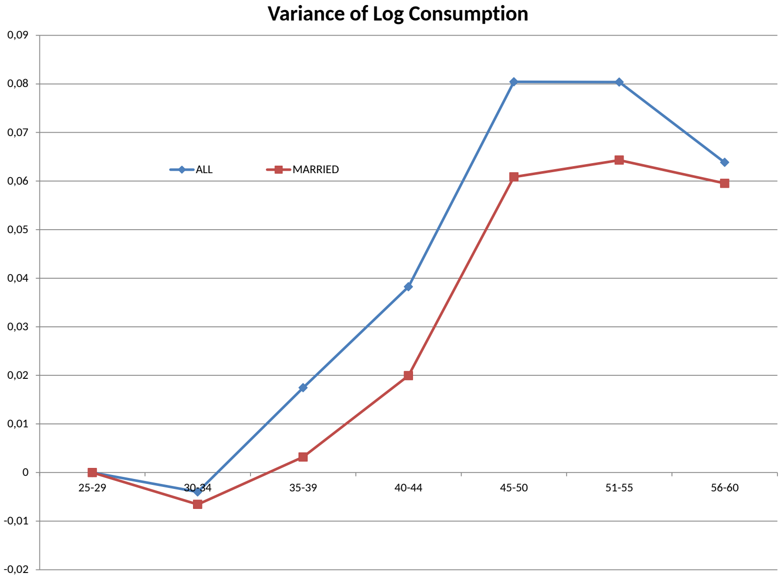
Variance of Log Household Earnings
0.6
0.5
0.4
0.3
0.2
0.1
ALL
MARRIED
25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60
Age



Correlation of Earnings, Husbands and Wives
0.3
0.25
0.2
0.15
0.1
0.05
0
ALL
POSITIVE
25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60
AGE



Correlation of Hours, Husband and Wives
0.3
0.25
0.2
0.15
0.1
0.05
0
ALL
POSITIVE
25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60
AGE


Variance of Log Consumption
0,09
0,08
0,07
0,06
0,05
0,04
0,03
0,02
0,01
0
-0,01
-0,02
ALL
MARRIED
25-29
30-34
35-39
40-44
45-50
51-55
56-60

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- The correlation between earnings (hours) of husbands and wives is low and slightly U-shaped over the life–cycle.

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    - Costly childbearing
- Policy
    - Tax credits and transfers conditional on income and number of children. Non-linear taxes.
- Model extension of prior work; Guner, Kaygusuz, and Ventura (2012a, 2012b, 2015).
    - Taxation of secondary earners.
    - Gender-based taxation.
    - Child-related transfers.

Model – Demographics and Heterogeneity

- Life-cycle economy, $j = 1, ..., J_R, ...J$. [25,26,.......,65,.....,80]
- Males (m) and females (f), differ in their types/education.
  - Male types, $z \in Z$. Map into productivity profiles, $\varpi_m(z, j)$.
  - Female types, $x \in X$. Map into initial productivity levels, $h_1 = \eta(x)$, and after age 1, h evolves endogenously.
- Agents can be single or married.Marital status is exogenous, and does not change over the life-cycle.

Model – Demographics and Heterogeneity

- Married households and single females differ in terms of the number of children attached to them.
  - Three possibilities: *without*, *early*, *late* $(b = 0, 1, 2)$
- If a female with children works, married or single, then the household has to pay for child care costs.
- Young (age 1) children imply a time cost for mothers, $\varkappa$
  - Children do not provide any utility.
- Joint market work for married couples also implies a utility cost, q
  - *Residual heterogeneity* in labor force participation.

Model – Female Skills

- Female types, $x \in X$. These types map into initial productivity levels, $h_1 = \eta(x)$, and after age 1, h evolves endogenously.

- After age 1, labor market productivity of females evolves endogenously – Attanasio, Low, Sanchez-Marcos 2008

$$h' = \exp[\ln h + \underbrace{\alpha_j^x}_{\text{growth}} \chi(l) - \underbrace{\delta}_{\text{dep.}} (1 - \chi(l))],$$

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- Given costs (children and utility cost of joint work) and benefits (earnings plus human capital accumulation), females decides whether to work or not.

Model – Idiosyncratic Productivity Shocks

- For an age-j single male of type z, earnings are given by

$$\underbrace{w}_{\text{wage}} * \underbrace{\varpi(j,z) * \exp(\eta_j^{s,m})}_{\text{labor endowment}} * \underbrace{l_m}_{\text{labor supply}},$$

  where $\varpi(z,j)$ is the age-earning profile given z, $\eta_j^{s,m}$ is a *persistent* shock.

- For $j > 1$, the persistent shock is governed by an AR(1) process

$$\eta_{j+1}^{s,m} = \rho_{s,m}\eta_j^{s,m} + \varepsilon_{j+1}^{s,m},$$

  with $\varepsilon_{j+1}^{s,m} \sim N(0, \sigma^2_{\varepsilon^{s,m}})$.

- Initial value is a Gaussian draw:

$$\eta_1^{s,m} \sim N(0, \sigma^2_{\eta_1^{s,m}})$$

Model – Idiosyncratic Productivity Shocks

- For a single female of age-j who has human capital h_j, earnings are given by

$$\underbrace{w}_{\text{wage}} * \underbrace{h_j * \exp(\eta_j^{s,f})}_{\text{labor endowment}} * \underbrace{l_f}_{\text{labor supply}}$$

- For $j > 1$, let

$$\eta_{j+1}^{s,f} = \rho_{s,f}\eta_j^{s,f} + \varepsilon_{j+1}^{s,f}$$

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Model – Idiosyncratic Productivity Shocks

- Married couples

$$w * \underbrace{h_j * \exp(\eta_j^{m,f})}_{\text{labor endowment}} * \cancel{w} * l_f + w * \underbrace{\varpi(j,z) * \exp(\eta_j^{m,m})}_{\text{labor endowment}} * l_m,$$

- For $j > 1$, the bivariate AR(1) process is

$$\eta_{j+1}^{m,m} = \rho_{m,m}\eta_j^{m,m} + \varepsilon_{j+1}^{m,m} \quad , \quad \eta_{j+1}^{m,f} = \rho_{m,f}\eta_j^{m,f} + \varepsilon_{j+1}^{m,f}$$

with

$$(\varepsilon_{j+1}^{m,m}, \varepsilon_{j+1}^{m,f}) \sim N\left(\begin{array}{cc} 0 \\ 0 \end{array} , \begin{array}{cc} \sigma^2_{\varepsilon^{m,m}} & \sigma_{\varepsilon^f \varepsilon^m} \\ \sigma_{\varepsilon^f \varepsilon^m} & \sigma^2_{\varepsilon^{f,f}} \end{array} \right),$$

- Initial values for persistent shocks for couples are draws from a bivariate normal distribution. Therefore,

$$(\eta_1^{m,m}, \eta_1^{m,f}) \sim N\left(\begin{array}{cc} 0 \\ 0 \end{array} , \begin{array}{cc} \sigma^2_{\eta_1^{m,m}} & \sigma_{\eta_1^m \eta_1^f} \\ \sigma_{\eta_1^m \eta_1^f} & \sigma^2_{\eta_1^{f,f}} \end{array} \right)$$

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- Parameters: $\{\rho, \sigma^2_{\varepsilon}, \sigma_{\varepsilon^f \varepsilon^m}, \sigma^2_{\eta_1^{s,m}}, \sigma^2_{\eta_1^{s,f}}, \sigma^2_{\eta_1^{m,m}} = \sigma^2_{\eta_1^{m,,f}}, \sigma_{\eta_1^m \eta_1^f})$

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- Single male

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where $k_y \in \{0, 1\}$ is an indicator for young (age-1) children.

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- Married female

$$U_f^M(c,l_f,q,k_y) = \log(c) - B(l_f + k_y \varkappa)^{1+\frac{1}{\gamma}} - \underbrace{\frac{1}{2}\chi\{l_f\}q}_{\text{utility cost}},$$

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Model – Government I

- Income tax functions $T^M(I, k)$ and $T^S(I, k)$
  - k is an indicator for children Tax functions

$$\textit{average tax rate}\ (\textit{income}) = \eta_1 + \eta_2 \log(\textit{income}) + \varepsilon,$$

- We estimate these functions from Internal Revenue Service (IRS) micro data – Guner, Kaygusuz and Ventura (2014)
- Besides the income and payroll taxes, each household pays an additional flat capital income tax for the returns from his/her asset holdings, τ_k.
- There is a social security system financed by a flat payroll tax, τ_p
  - Social Security payments are indexed by agents' permanent types (education)

Model – Government II

- Earned Income Tax Credit (EITC) and Child Tax Credit (CTC)
    - Model them exactly as they are in the tax code
- Transfers
    - Survey of Income and Program Participation (SIPP), 1995-2013
    - Estimate effective transfer functions.
    - Include AFDC/TANF, SSI, Food Stamps/SNAP, WIC
- Total transfer functions $TR^M(I, k)$ and $TR^S(I, k)$

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$$
\begin{aligned}
V_j^M(a, h, \eta_j^{m,f}, \eta_j^{m,m}; \theta) \quad &= \quad \max_{a',\, l_f,\, l_m} \{[U_f^M(c, l_f, q, k_y) + U_m^M(c, l_m, l_f, q)] \\
&+ \quad \beta E V_{j+1}^M(a', h', \eta_j^{m,f'}, \eta_j^{m,m\prime}; \theta)\},
\end{aligned}
$$

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\end{aligned}
$$

subject to (with kids)

$$
\begin{aligned}
& c + a' + \underbrace{d\chi(l_f)}_{\text{child care costs}} \\
= \;& a(1 + r(1 - \tau_k)) + w(\varpi_m(z, j)\exp(\eta_j^{m,m}) l_m + h \exp(\eta_j^{m,f}) l_f)(1 - \tau_p) \\
- \;& \underbrace{T^M(w\varpi_m(z, j)\exp(\eta_j^{m,m}) l_m + w \exp(\eta_j^{m,f}) h l_f + ra, 1)}_{\text{taxes}} \\
& + \underbrace{TR^M(w\varpi_m(z, j) l_m + w h l_f + ra, 1)}_{\text{transfers}}
\end{aligned}
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$$\begin{aligned} & c + a' + \underbrace{d\chi(l_f)}_{\text{child care costs}} \\ = \; & a(1 + r(1-\tau_k)) + w(\varpi_m(z,j)\exp(\eta_j^{m,m}) l_m + h\exp(\eta_j^{m,f}) l_f)(1-\tau_p) \\ - \; & \underbrace{T^M(w\varpi_m(z,j)\exp(\eta_j^{m,m}) l_m + w\exp(\eta_j^{m,f}) h l_f + ra, 1)}_{\text{taxes}} \\ & + \underbrace{TR^M(w\varpi_m(z,j) l_m + whl_f + ra, 1)}_{\text{transfers}} \end{aligned}$$

$$h' = G(x, h, l_f, j)$$

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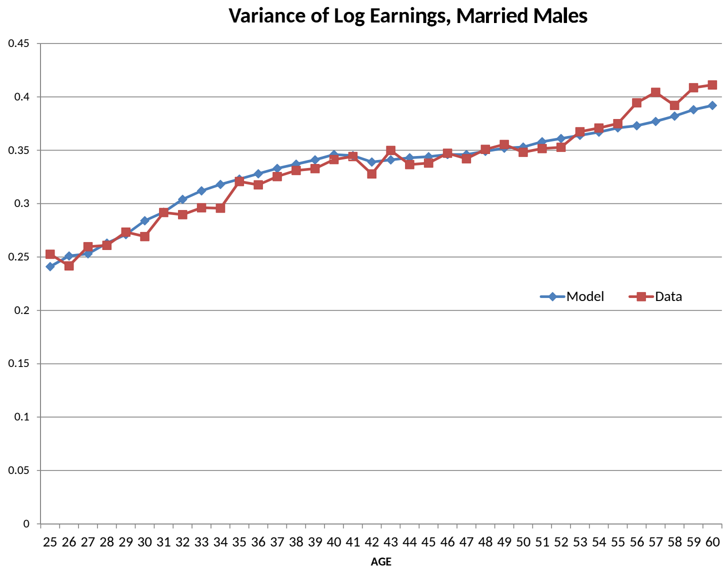
- Taxes and transfers from data. **Tax-Transfers**
- Choose parameters of q distribution to match participation of married females 25-54.

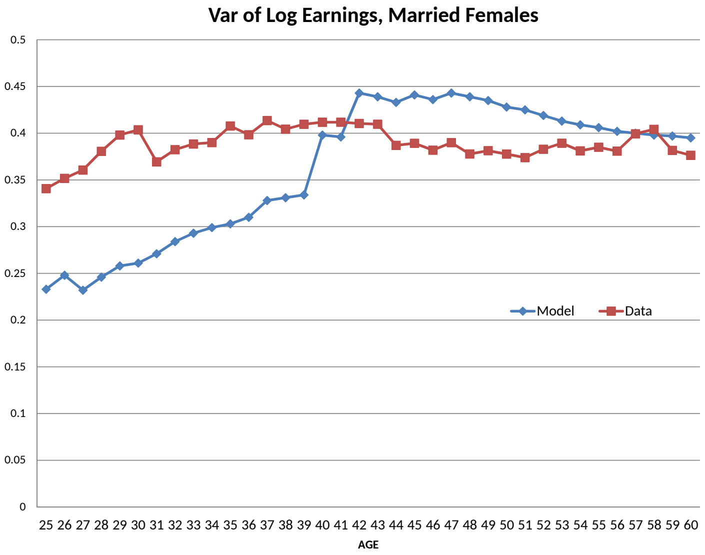
Quantitative Analysis – Shocks

- 7 parameters: $\{\rho, \sigma_{\varepsilon}, \sigma_{\varepsilon^f \varepsilon^m}, \sigma_{\eta_1^{s,m}}, \sigma_{\eta_1^{s,f}}, \sigma_{\eta_1^{m,m}} = \sigma_{\eta_1^{m,f}}, \sigma_{\eta_1^m \eta_1^f})$
- $\rho = 0.958$ – Kaplan (2012)
- $\sigma_{\varepsilon}^2 = 0.011$ – var. of log earnings, married males.
- $\sigma_{\varepsilon^f \varepsilon^m} = 0.0034$ – corr. of earnings b/w hus. and wives, 45-54
- $\sigma^2_{\eta_1^{s,m}} = 0.21$ – var. of log earnings, single males, 25-29
- $\sigma^2_{\eta_1^{s,f}} = 0.24$ – var. of log earnings, single females, 25-29
- $\sigma^2_{\eta_1^{m,m}} = \sigma^2_{\eta_1^{m,f}} = 0.11$ — var. of log earnings, married males, 25-29
- $\sigma_{\eta_1^m \eta_1^f} = 0.042$ – corr. of earnings b/w hus. and wives, 25-29

Model and Data

Statistic	Data	Model
Capital Output Ratio	2.93	2.97
Labor Hours Per-Worker	0.40	0.4
LFP of Married Females with Young Children (%)	62.6	60.2
LFP of Married Females (%), 25-54		
Less than High School	61.8	61.1
Some College	74.0	73.1
College	74.9	76.6
More than College	81.9	80.5
Total	72.2	70.3
With Children	68.3	66.6


Variance of Log Earnings, Married Males
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60
AGE
Model
Data


Var of Log Earnings, Married Females
0.5
0.45
0.4
0.35
0.3
0.25
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0.1
0.05
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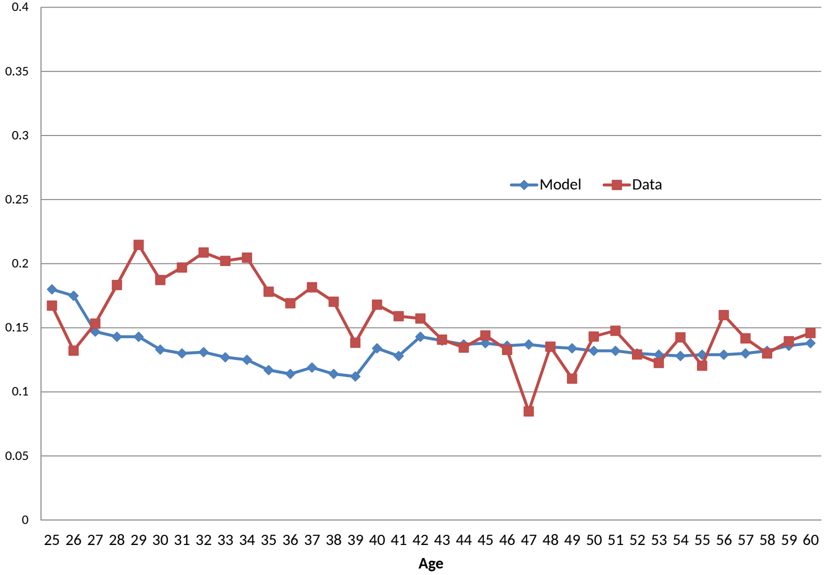
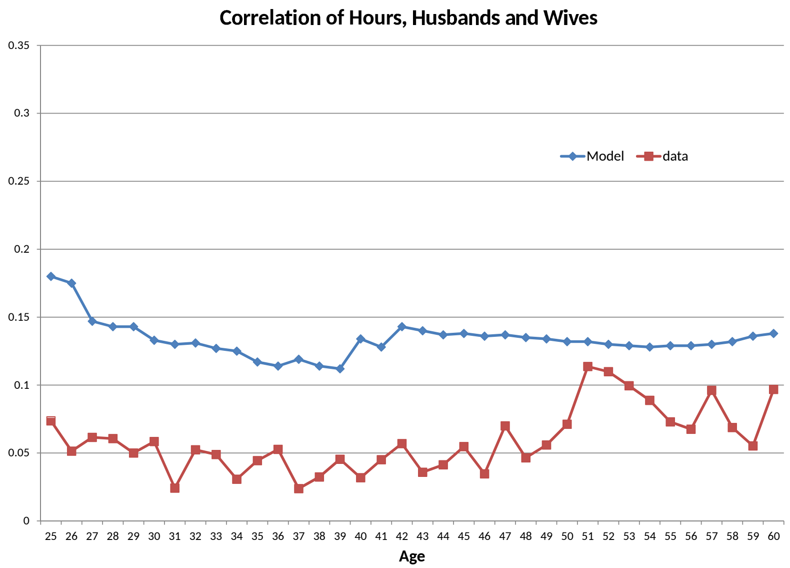
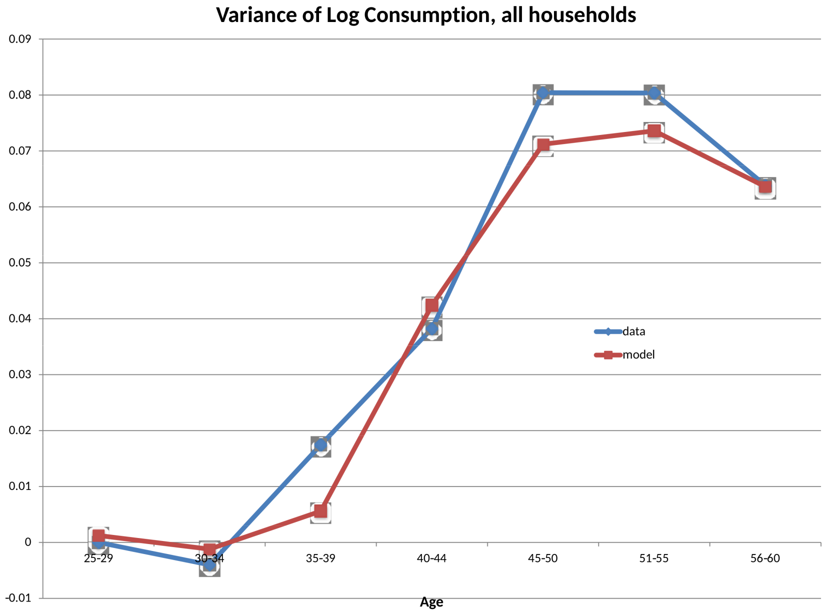
Model
Data
25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60
AGE

Correlation of Earnings, Husbands and Wives




Correlation of Hours, Husbands and Wives
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Model
data
25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60
Age


Variance of Log Consumption, all households
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
-0.01
25-29
30-34
35-39
40-44
45-50
51-55
56-60
Age
data
model

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- More work is needed in case of females.
- Captures life-cycle pattern of earnings correlations.
- Does a very good job generating the rise in consumption inequality
- To do:
  - Better match of data. Shock parameterization.
  - Match correlations of hours between husbands and wives.

Rethinking the Welfare State

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- Replace all taxes and transfers with a proportional tax.
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% Change from Benchmark Economy

	Proportional Tax	Negative Income Tax (2.5%)	Negative Income Tax (5%)
Output	9.9	0.8	-16.1
Married Fem. LFP	5.8	2.0	-5.5
Agg. Hours	5.3	1.3	-4.6
Agg. Hours (mar. fem.)	9.3	2.5	-8.4
Hours per worker (female)	5.0	1.3	-3.7
Hours per worker (male)	3.9	0.7	-3.7
Tax Rate	9.6%	16.3%	26.0%
Welfare (CV, %)	-3.1	-1.5	-3.1
Winning Households (%)	51%	33.5%	29.2

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- Asymmetric welfare effects.

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- Each household receives a transfer of 2.5% of mean HH income in all dates and states. PLUS 2.5% per child if children are present.

Rethinking the Welfare State

% Change from Benchmark Economy

	Proportional Tax	NIT (2.5%)	NIT (5%)	NIT (2.5%, v.2)
Output	9.9	0.8	-16.1	-17.1
Married Fem. LFP	5.8	2.0	-5.5	-12.9
Agg. Hours	5.3	1.3	-4.6	-9.2
Agg. Hours (mar. fem.)	9.3	2.5	-8.4	-18.2
Hours per worker (female)	5.0	1.3	-3.7	-6.6
Hours per worker (male)	3.9	0.7	-3.7	-6.6
Tax Rate	9.6%	16.3%	26.0%	31.0
Welfare (CV, %)	-3.1	-1.5	-3.1	1.6
Winning Households (%)	51%	33.5%	29.2	46.9

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- Much more to come...