# Single Mothers and the Welfare State

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# Motivation

- Becoming a single mothers is a risk associated with huge financial consequences in the US
- An increasingly large fraction of mothers raise their children without a father: 30 percent of all mothers in 2015
- Child care costs are substantial in the US with \$9,589 (\$28,354) in center care (at home); Further, even full-time working mothers spend up to 20hrs/week caring for their young children
- High poverty rates among single mothers: 77(55) percent of all single mothers with 3+(2) children live in poverty

# Research Questions

1. Why are so many single mothers living in poverty?
2. How can the current welfare system be improved for single mothers and what are its labor supply effects?
3. Who would be in favor of such a reform?

# Approach

- Life-cycle model of couples featuring marital transitions, the 'risk' to become a mother, and a detailed modeling of the US welfare state
- Calibrate model to 1965-69 cohort in U.S.
- Counterfactuals: Increase child care support (here: 100% reimbursement of child care costs)

# Outline

1. Stylized Facts
2. The Model
3. Calibrated Economy
4. Policy Analysis
5. Conclusions

# Stylized Facts

# Prevalence of Being a Single Mother

$\Rightarrow$ 15.7% of all mothers are single in 1965-69 sample

| Fraction of Single Mothers over Nr. of Kids (in %) | | | |
|---|---|---|---|
| Nr.Children | 1 | 2 | 3+ |
| Dropout | 4.9 | 6.2 | 7.5 |
| High school | 27.8 | 24.8 | 15.4 |
| College | 6.7 | 5.0 | 1.7 |
| Total | 39.45 | 35.99 | 24.6 |

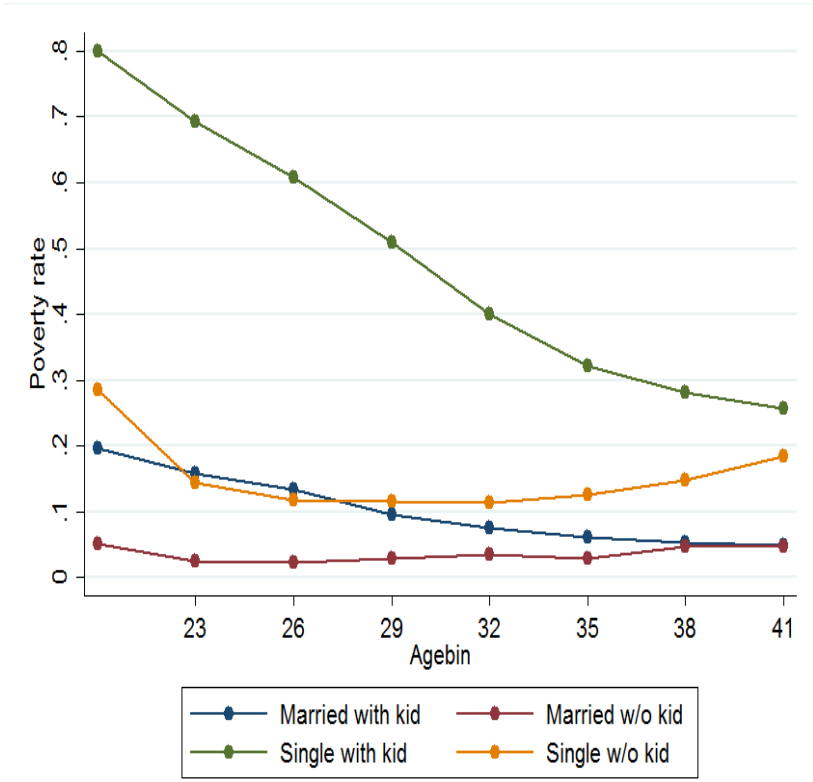
# Poverty Rates

| | Married | Divorced | Single |
|---|---|---|---|
| No children | 0.04 | 0.19 | 0.15 |
| One child | 0.05 | 0.25 | 0.41 |
| Two children | 0.06 | 0.30 | 0.55 |
| Three+ children | 0.14 | 0.52 | 0.77 |

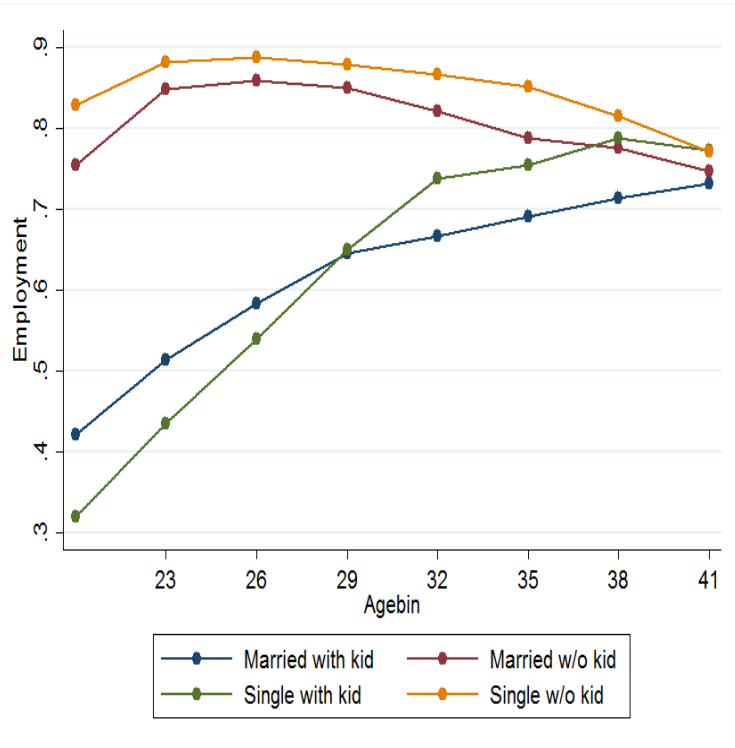
*Note:* Poverty according to the official poverty line. Cohort born 1965-69. CPS data.

▸ Poverty Rates cond. on education

# Female Life-cycle poverty and employment




(a) Poverty




(b) Employment

# The Model

# Model Overview

- Life cycle model of singles and couples between ages 23 and at most 83; Model period is 3 years
- Heterogeneity
  - Marital status: single, married, divorced, widowed
  - Children: No. and age of (young) children
  - Education (own and spousal): college, high school, dropout
  - Assets
  - Income states and female human capital

# Choices and Uncertainties

Choices

- Consumption-savings decision every period
- Female labor supply: full-time, part-time or not at all
  Working accumulates human capital
- Exogenous retirement at age 65; Men always work full-time

Uncertainties

- Marital transitions
- Childbirth
- Survival
- Labor income

# Maximization Problem I: Preferences

Period utility function married couple

$$U(\hat{c}_t, L_t) = \chi \left[ \ln \left( \frac{\hat{c}_t}{eq(n)} \right) - \Phi_{v,e} \frac{\left(L_{1,t} + \xi(n,k)\right)^{\gamma}}{\gamma} \right] + (1-\chi) \left[ \ln \left( \frac{\hat{c}_t}{eq(n)} \right) - \Phi_{v,e} \frac{L_{2,t}^{\gamma}}{\gamma} \right]$$

- $\hat{c}_t$ hh consumption, equivalence scaled $eq(n)$
- $L_{g,t}$ Labor supply (in time units)
- $\Phi_{v,e}$ Disutility of work, 2 types ($v = 1, 2$) dep. on education $e$
- $\xi(n,k)$ Time costs dep. on no. (n) and age (k) of children

# Maximization Problem II: Budget set

s.t. budget constraint (here: married household)

$$\begin{aligned}(1+\tau_c)\hat{c}_t + a^s_{t+1} \quad = \quad & (1-\tau^s_y)\cdot\left(Ra^m_t + \mathbf{I}_{L_{1,t}} y_{1,t} + y_{2,t}\right) \\ & -\tau_{ss}(\hat{y}_{1,t} + \hat{y}_{2,t}) \\ & +2T - (1-\nu_{\bar{y}})w_{n,k}\mathbf{I}_{L_{1,t}}.\end{aligned}$$

- $(1-\nu_{\bar{y}})w_{n,k}$ childcare costs
- $\hat{y}_{g,t} = \min\{\mathbf{I}_{L_{g,t}} y_{g,t}, y_{max}\}$
- $a^s_{t+1}$ depends on marital status $s$: $a^m_{t+1} = 2a^{u,d}_{t+1}$ and $a^d_{t+1} = 0.5a^m_{t+1}$

$\Rightarrow$ Recursive Optimization: Max. Value function, current utility and all discounted possible future value functions, s.t. budget constraint.

# 1st Stage Estimation

- Children
  - Birthrate differ by ages (between 23-38), marital status, and education (SIPP); Track no (0,1,2,3+) and age (0 to 12 years)
  - Child care costs for institutionalized care (SIPP)
  - Total hrs spent on childcare for full-time working female (ATUS)
- Marital transition probabilities
  Differ by education, gender and age (SIPP and CPS) ▸ details
- Survival rates
  Logit estimation by gender and education (HRS) ▸ details

# 1st Stage Estimation: Earnings

Labor income for women depends on human capital, $h$

$$y_{1,t,e} = (1 - \zeta_e) \cdot \left\{ \gamma_e + \alpha_e \cdot h_{t,e} + \bar{\alpha}_e \cdot h_{t,e}^2 \right\} + w_{t,e}$$

$\Rightarrow$ $h_{t+1} = h_t + (1 - (1 - \iota)\mathbf{I}_{L_t=0.5}) \cdot \mathbf{I}_{L_t=1} - \delta h_t \cdot (1 - \mathbf{I}_{L_t=1})$
$\iota$ captures part-time penalty (Blundell et al. 2015)

$\Rightarrow$ PSID data, males' coefficients $\gamma_{t,e}$, $\alpha_e$, $\bar{\alpha}_e$ used for females

$\Rightarrow$ Exogenous gender wage gap, $\zeta_{t,e}$, education-specific

$\Rightarrow$ Idiosyncratic component, $w_{t,e}$ standard estimation (Storesletten et al. (2004))

# Government

Follow Guner, Kaygusuz and Ventura (2017)

1. Childcare Support
   - Childcare subsidy program (CCDF)
   - Tax credits for children (CTC) and childcare expenditures (CD-CTC)
2. Earned Income Tax Credit (EITC)
3. Means-tested welfare payments: estimate effective transfer function using SSSI, TANF, SNAP, WIC, and housing assistance
4. Social Security: Own benefits based on progressive pay-out schedule and Auxiliary benefit system
5. Taxes: progressive income-, flat payroll- and consumption taxes

# Calibration Strategy

Calibrated parameters to match data moments

1. Employment

   *Targets*

   - Employment of females over age and education
   - Part-time employment of females over age and education

   *Parameters*

   - $\Phi_e^v$: two types $v$ of female disutility from working depending on education
   - $\alpha_e$: fraction of high-disutility types, $v$

2. Assets
   - Calibrate $\rho = 0.03$ to match asset-to-income ratio of 2.6 in economy

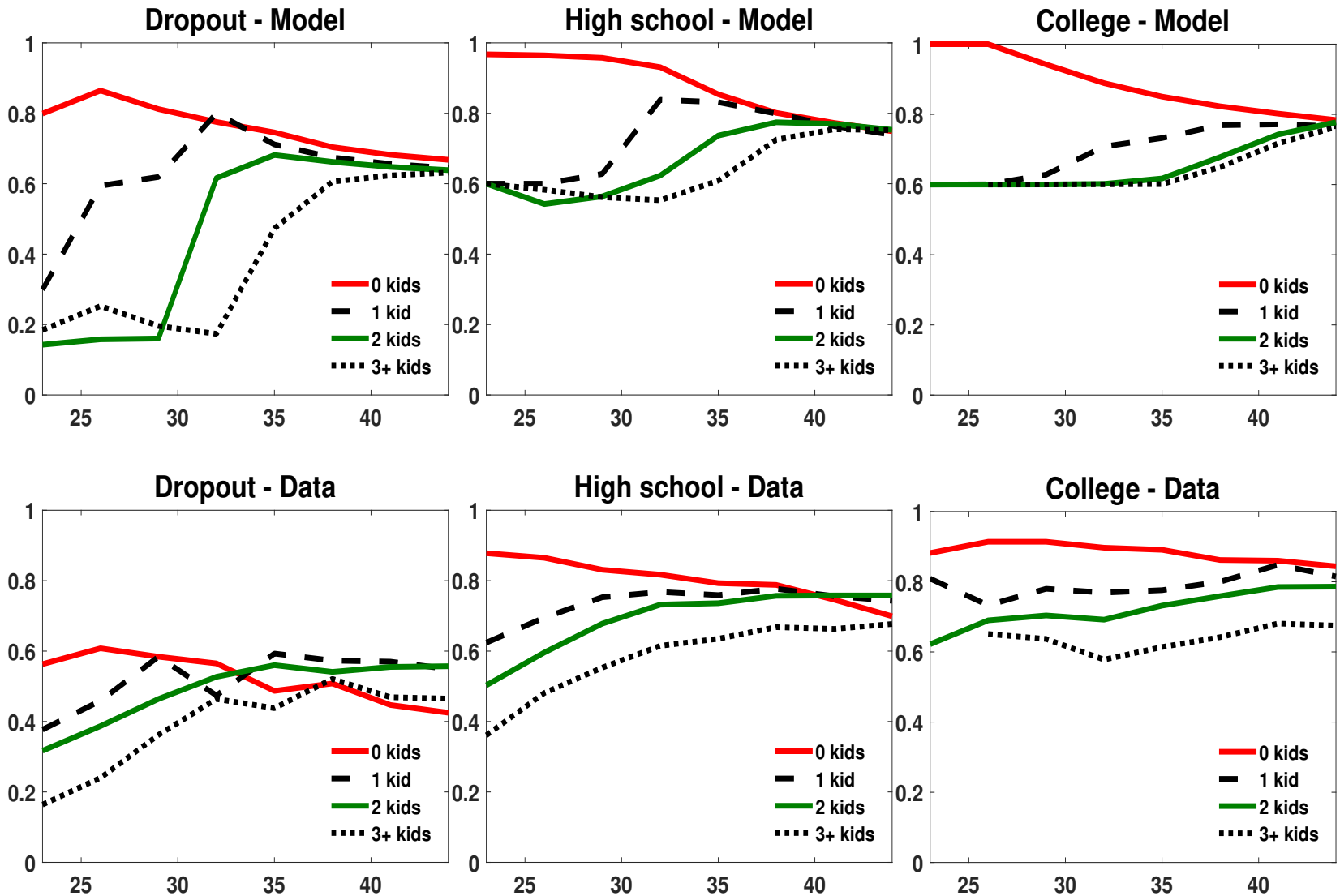
# Calibrated Economy

# Targeted Moments I: Female Employment

| | Total Employment | | Part Time | |
|---|---|---|---|---|
| | Model | Data | Model | Data |
| Dropout | 0.59 | 0.47 | 0.11 | 0.15 |
| High school | 0.75 | 0.73 | 0.20 | 0.19 |
| College | 0.79 | 0.79 | 0.19 | 0.19 |
| Total | 0.75 | 0.72 | 0.19 | 0.19 |

*Note:* CPS data, cohort 1965-69. Target: Average female employment, age 23-46.

# Non-Targeted: Employment over Kids



# Non-Targeted Moments II: Poverty

| | Never Married | | Married | |
|---|---|---|---|---|
| | Model | Data | Model | Data |
| Dropout-0Kid | 0.40 | 0.55 | 0.16 | 0.28 |
| Dropout-1Kid | 0.81 | 0.73 | 0.29 | 0.29 |
| Dropout-2Kids | 0.93 | 0.84 | 0.43 | 0.43 |
| Dropout-3Kids | 0.97 | 0.92 | 0.51 | 0.62 |
| Highschool-0Kid | 0.40 | 0.16 | 0.03 | 0.07 |
| Highschool-1Kid | 0.58 | 0.39 | 0.07 | 0.09 |
| Highschool-2Kids | 0.81 | 0.61 | 0.08 | 0.12 |
| Highschool-3Kids | 0.89 | 0.82 | 0.09 | 0.25 |
| College-0Kid | 0.05 | 0.06 | 0.0 | 0.03 |
| College1Kid | 0.35 | 0.11 | 0.01 | 0.03 |
| College2Kids | 0.39 | 0.29 | 0.02 | 0.03 |
| College3Kids | 0.40 | 0.34 | 0.02 | 0.08 |

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# Introduce 100% Childcare Subsidy

# Changes in Female Employment

| | Baseline | Reform |
|---|---|---|
| Dropout | 0.59 | 0.65 |
| High school | 0.75 | 0.76 |
| College | 0.79 | 0.79 |
| Total | 0.75 | 0.76 |

*Note:* CPS data, cohort 1965-69. Target: Average female employment, age 23-46.

# Changes in Poverty Rates

| | Never Married | | Married | |
|---|---|---|---|---|
| | Baseline | Reform | Baseline | Reform |
| Dropout-0Kid | 0.40 | 0.50 | 0.16 | 0.26 |
| Dropout-1Kid | 0.81 | 0.54 | 0.29 | 0.31 |
| Dropout-2Kids | 0.93 | 0.74 | 0.43 | 0.32 |
| Dropout-3Kids | 0.97 | 0.82 | 0.51 | 0.33 |
| Highschool-0Kid | 0.40 | 0.40 | 0.03 | 0.05 |
| Highschool-1Kid | 0.58 | 0.40 | 0.07 | 0.15 |
| Highschool-2Kid | 0.81 | 0.48 | 0.08 | 0.17 |
| Highschool-3Kid | 0.89 | 0.48 | 0.09 | 0.17 |
| College-0Kid | 0.05 | 0.07 | 0.00 | 0.00 |
| College-1Kid | 0.35 | 0.36 | 0.01 | 0.04 |
| College-2Kid | 0.39 | 0.39 | 0.02 | 0.05 |
| College-3Kid | 0.40 | 0.40 | 0.02 | 0.05 |

# Changes in Poverty Rates

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|---|---|---|---|---|
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| Dropout-0Kid | 0.40 | 0.50 | 0.16 | 0.26 |
| Dropout-1Kid | 0.81 | **0.54** | 0.29 | 0.31 |
| Dropout-2Kids | 0.93 | **0.74** | 0.43 | **0.32** |
| Dropout-3Kids | 0.97 | **0.82** | 0.51 | **0.33** |
| Highschool-0Kid | 0.40 | 0.40 | 0.03 | 0.05 |
| Highschool-1Kid | 0.58 | **0.40** | 0.07 | 0.15 |
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| College-0Kid | 0.05 | 0.07 | 0.00 | 0.00 |
| College-1Kid | 0.35 | 0.36 | 0.01 | 0.04 |
| College-2Kid | 0.39 | 0.39 | 0.02 | 0.05 |
| College-3Kid | 0.40 | 0.40 | 0.02 | 0.05 |

# Conclusions

- Young females face a substantial risk to end up in poverty if they become single mothers
- The current welfare measures are insufficient to prevent these high poverty rates $\Rightarrow$ Next: analyze more closely
- Extending child care subsidies already goes a long way in reducing poverty $\Rightarrow$ Next: analyze welfare

# Poverty and Nr. of Children

| | **Married** | **Divorced** | **Single** |
|---|---|---|---|
| Dropout - No kid | 0.15 | 0.57 | 0.51 |
| Dropout - 1 kid | 0.20 | 0.57 | 0.71 |
| Dropout - 2 kid | 0.26 | 0.61 | 0.78 |
| Dropout - 3+ kid | 0.39 | 0.77 | 0.89 |
| High school - No kid | 0.04 | 0.19 | 0.19 |
| High school - 1 kid | 0.05 | 0.25 | 0.38 |
| High school - 2 kid | 0.06 | 0.30 | 0.49 |
| High school - 3+ kid | 0.12 | 0.48 | 0.70 |
| College - No kid | 0.02 | 0.05 | 0.05 |
| College - 1 kid | 0.01 | 0.07 | 0.09 |
| College - 2 kid | 0.02 | 0.10 | 0.15 |
| College - 3+ kid | 0.03 | 0.15 | 0.23 |

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# Marital Transition Probabilities - Data

- Survey of Income and Program Participation (SIPP), wave 2008, marital history variable, 5,722 observations for 1950-54 cohort
  $\Rightarrow$ remarriage and divorce probabilities
- Current Population Survey (CPS), synthetic-panel using 1976-2015 waves
  $\Rightarrow$ Marriage probabilities and initials

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# Survival Probabilities - Data

- Survival rate: $\psi_{t,g,e}$ depends on age, gender, and education
- Not possible to use life-tables
- Estimate Logit Model using Health- and Retirement Study (HRS), waves 1992-2010

$$\begin{aligned} \text{Logit}(death) &= \alpha + \beta_1 age + \beta_2 edu + \beta_3 sex \\ &\quad + \beta_4 age \times edu + \beta_5 age \times sex \end{aligned}$$

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# Deterministic Income - Estimation

- Male SRC household heads aged 26-60 in PSID, waves 1969-2013
- Variable: household head's wages and salaries, CPI adjusted
- Eliminate outliers: drop top and bottom 1% of income distribution and all working less than 1,000 hours per year

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# Idiosyncratic Income - Estimation

- Time-invariant wage specification

$$w_{i,t,e} = z_{i,t,e} + \eta_{i,t,e}$$
$$z_{i,t,e} = \rho z_{i,t-1,e} + \varepsilon_{i,t,e}$$

  with $\eta_e \sim \mathcal{N}(0, \sigma_{\eta_e})$ and $\varepsilon_e \sim \mathcal{N}(0, \sigma_{\varepsilon_e})$.
- The parameter $\rho$, $\sigma_\eta^2$, and $\sigma_\epsilon^2$ are estimated via GMM following Storesletten et al. (2004).
- Persistent income component of spouses, $z_{i,t,e}$ and $z^s_{i,t,e^s}$ are correlated, where $\varepsilon$ is assumed to be jointly normal distributed with

$$\Sigma_\varepsilon = \begin{bmatrix} \sigma_{\varepsilon_e} & \sigma_{\varepsilon_e,\varepsilon^s_e} \\ \sigma_{\varepsilon^s_e,\varepsilon_e} & \sigma_{\varepsilon^s_e} \end{bmatrix} \tag{1}$$

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# Tax Parameters

| Tax Parameters | | |
|---|---|---|
| $\tau_c$ | Consumption tax | 7.5% |
| $\tau_{ss}$ | Payroll tax | 15.3% |
| $y_{max}$ | Earnings cap for payroll tax in 2010 | \$106,800 |
| $\alpha_s$ | Coefficient in $\tau_y^s$ (married/single) | 0.105/0.085 |
| $\beta_s$ | Coefficient in $\tau_y^s$ (married/single) | 0.034/0.0058 |
| $\bar{y}$ | Average earnings in 2010 | \$53,063 |
| | Government Consumption Ratio | 24% |

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# Calibrated 1st Stage Parameters

| Exogenous Parameters | | |
|---|---|---|
| $1/(\gamma-1)$ | Frisch-Elasticity | 0.7 |
| $\rho$ | Discount rate (yearly) | 0.01 |
| $\chi$ | Pareto-Weight | 0.5 |
| $eq$ | Consumption equivalence scaling | 1/1.5 |
| $\iota$ | Return of experience from part-time | 0.1 |
| $r$ | Interest rate (yearly) | 0.045 |

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