Child Care Subsidies and Household Labor Supply

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Motivation

- Large empirical literature on effects of child care subsidies on female labor supply.

  Finding: availability and cost of child care is central determinant of female labor supply.

- This project: focus on the macroeconomic implications of child care subsidies.

  We ask: What are the labor supply, output, and welfare effects of subsidizing child care for the US economy?

What We Do

- Develop a life-cycle economy with heterogenous married and single agents, household labor supply decisions and costly childbearing — Guner, Kaygusuz and Ventura (2012).

- Parameterize this model to be consistent with cross-sectional observations on gender and skill premia, labor force participation, structure of marital sorting, and the cost of children.

- Use framework for a quantitative evaluation of child care subsidies.

Why We Care

- *"In today's economy, when having both parents in the workforce is an economic necessity for many families, we need affordable, high-quality childcare more than ever. It's not a nice-to-have – it's a must-have. So it's time we stop treating childcare as a side issue, or as a women's issue, and treat it like the national economic priority that it is for all of us."*

  – President Obama, State of the Union Address, January 20, 2015

- Subsidies are substantial in Europe (e.g. Sweden), but minuscule at U.S. (e.g. Child Care and Development Fund (CCDF)).
  We know little about hypothetical large expansions of existing subsidy arrangements.

Why We Care

- Subsidizing child care is an appealing form of government transfers.

- Female labor supply is quite elastic.
  - potentially large effects
  - subsidizing child care can contribute to reduce tax distortions and could possibly increase welfare.

Key Model Features

- Detailed modeling of extensive margin in heterogenous couples.
  - Permits quantification of major sources of labor supply gains.
- Model endogenous skill appreciation/depreciation of females conditional on labor supply.
  - Allows us to capture increases in female skills due to expansion of subsidies.
- Account for costly childbearing in married and single households. Model means-tested childcare subsidies.
  - Permits clean analysis of expansion of current arrangements.

Summary of Findings

- Child care subsidies lead to substantial effects on labor supply across different groups.
- Effects on married females are large.
- Effects on output are small or negative.
- Newborns gain as a group. Households with children gain substantially.
- Childcare subsidies are not supported by a majority of households and lead to welfare losses at the time of the reform.

Model – Demographics and Heterogeneity

- Life-cycle economy.
  - $j \in \{1, 2, .., J\}$
  - Age 1: 25-29

- Males (m) and females (f), who are heterogenous in their types (education).

- For males the type determines the productivity profile over the life-cycle.

- For females the type determines the initial level of endogenously changing productivity profile:

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

where $\chi(l)$ is an indicator function for $l > 0$ (hours worked by females).

- Additional within type heterogeneity.
  - Male labor endowments: $\varpi_m(z,j)\varepsilon_z$
  - Female labor endowments: $h\varepsilon_x$
- Agents are exogenously single (S) or married (M).
  - Marital status (who is married and who is not, and who is married with who) is exogenous, and does not change over the life-cycle.
  - Married agents age, retire, and die together.
- Population structure is stationary, with population growing at rate n.

Model – Children

- Married households and single females differ in terms of the number of children attached to them.
- Three possibilities: *without* any children ($b = 0$), *early* child bearers ($b = 1$), *late* child bearers ($b = 2$).
- Early child bearers have *two* children in ages $1 - 3$, while late child bearers have *two* children in ages $2 - 4$.

- If a female with children works, married or single, then the household has to pay for child care costs.
    - Child care costs depend on the age of the child.
- Young children also imply a fixed time cost for mothers.
- Children do not provide any utility.

Childcare Subsidies

- Households with childcare expenses are potentially eligible.
- Means-tested subsidies.
- Two key parameters: subsidy rate θ and income level for eligibility $\hat{I}$.

Model – Utility Cost of Joint Work

- At the start of their lives a married couple draws a *utility cost* of joint market work (q).
- *Residual heterogeneity* in labor force participation.
- For a given household, the initial draw of a utility cost depends on the type of the husband ($\zeta(q|z)$).

- Single male

$$U_m^S(c, l) = \log(c) - B(l)^{1+\frac{1}{\gamma}}.$$

- Single female

$$U_f^S(c, l, k_y) = \log(c) - B(l + \underbrace{k_y \varkappa}_{\text{time cost}})^{1+\frac{1}{\gamma}},$$

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

- Married female

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

- Married male

$$U_m^M(c, l_m, l_f, q) = \log(c) - B l_m^{1+\frac{1}{\gamma}} - \frac{1}{2}\chi\{l_f\}q.$$

Model – Taxes

- Income taxes depend on income, marital status, and presence of children in the household.
- There is a social security system financed by a flat payroll tax.
- Flat capital income tax on returns from asset holdings.

Model – Production

- Representative firm with a CRS technology
- Linear technology for childcare services.
- Total Output= $F(K, L_g)$+Childcare Services.

Decision Problem – Married Households with Children

- Households maximize discounted sum of individual utilities.
- Consumption and saving decisions for the household, labor supply decisions for spouses.
  - participation of female, hours for workers.
- Trade-off at the extensive margin.
  - Benefits of joint work: higher income, human capital appreciation for the female
  - Costs of joint work: child care costs (after subsidies), utility cost, disutility from work.

Model consistent with aggregate and cross-sectional observations. From data:

- Wage profiles of males, initial wages for females (CPS 2008),
- Depreciation of female efficiency units due to non-participation (Mincer and Ofek (1982)),
- Demographic structure (Census), child bearing status (Census and CPS June Supplement),
- Tax functions (Guner, Kaygusuz and Ventura (2014)).

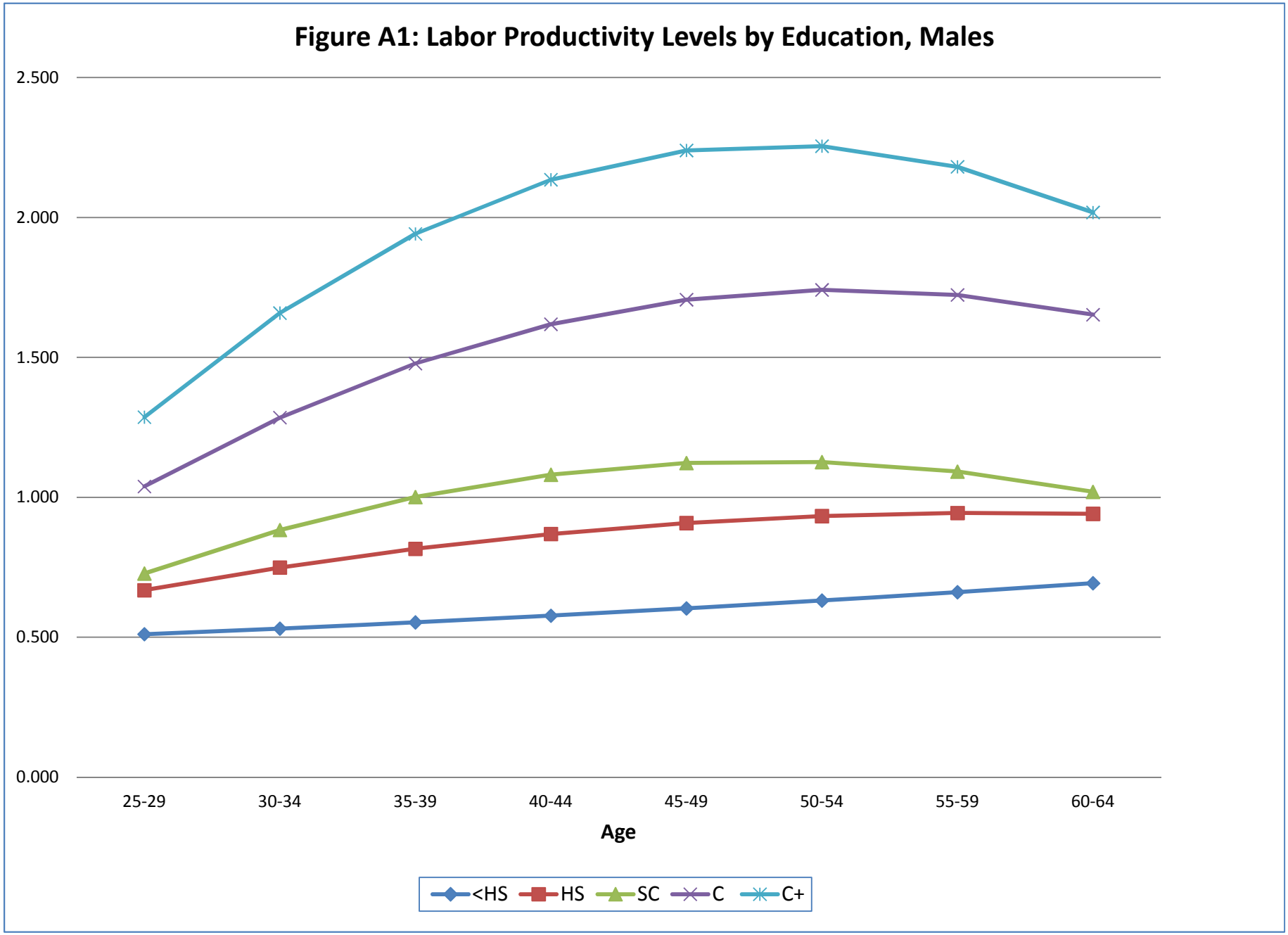
Figure A1: Labor Productivity Levels by Education, Males
2.500
2.000
1.500
1.000
0.500
0.000
25-29
30-34
35-39
40-44
45-49
50-54
55-59
60-64
Age
<HS
HS
SC
C
C+

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- Marital Structure, ages 30-39.
- About 74% married.

Fraction of Agents by Type, Gender and Marital Status

	Males			Females		
	All	Married	Singles	All	Married	Singles
<hs	11.72	8.41	3.31	9.77	7.03	2.74
hs	20.30	14.75	5.54	16.98	12.21	4.77
sc	33.37	24.29	9.08	35.48	25.31	10.17
col	22.51	17.10	5.41	24.17	19.06	5.11
col+	12.12	9.49	2.63	13.6	10.27	3.33

- Who is married with whom, ages 30-39.
- About 74% of people are married.
- About 50% of people marry someone of their own type.

Who is Married with Whom

	Females				
Males	<hs	hs	sc	col	col+
<hs	5.77	2.35	2.65	.047	0.12
hs	0.19	7.21	7.80	2.31	0.70
sc	1.49	5.34	16.85	6.82	2.38
col	0.29	1.27	5.41	11.18	4.83
col+	0.06	0.36	1.54	5.01	5.87

Child Bearing Status

- CPS June Supplement and Census 2008
- High types (col or col+) are more likely to be childless.
- High types (col or col+) are more likely to have their children late.
- Singles are more likely to be childless than married.

Model consistent with aggregate and cross-sectional observations. From data:

- Wage profiles of males, initial wages for females (CPS 2008),
- Depreciation of female efficiency units due to non-participation (Mincer and Ofek (1982)),
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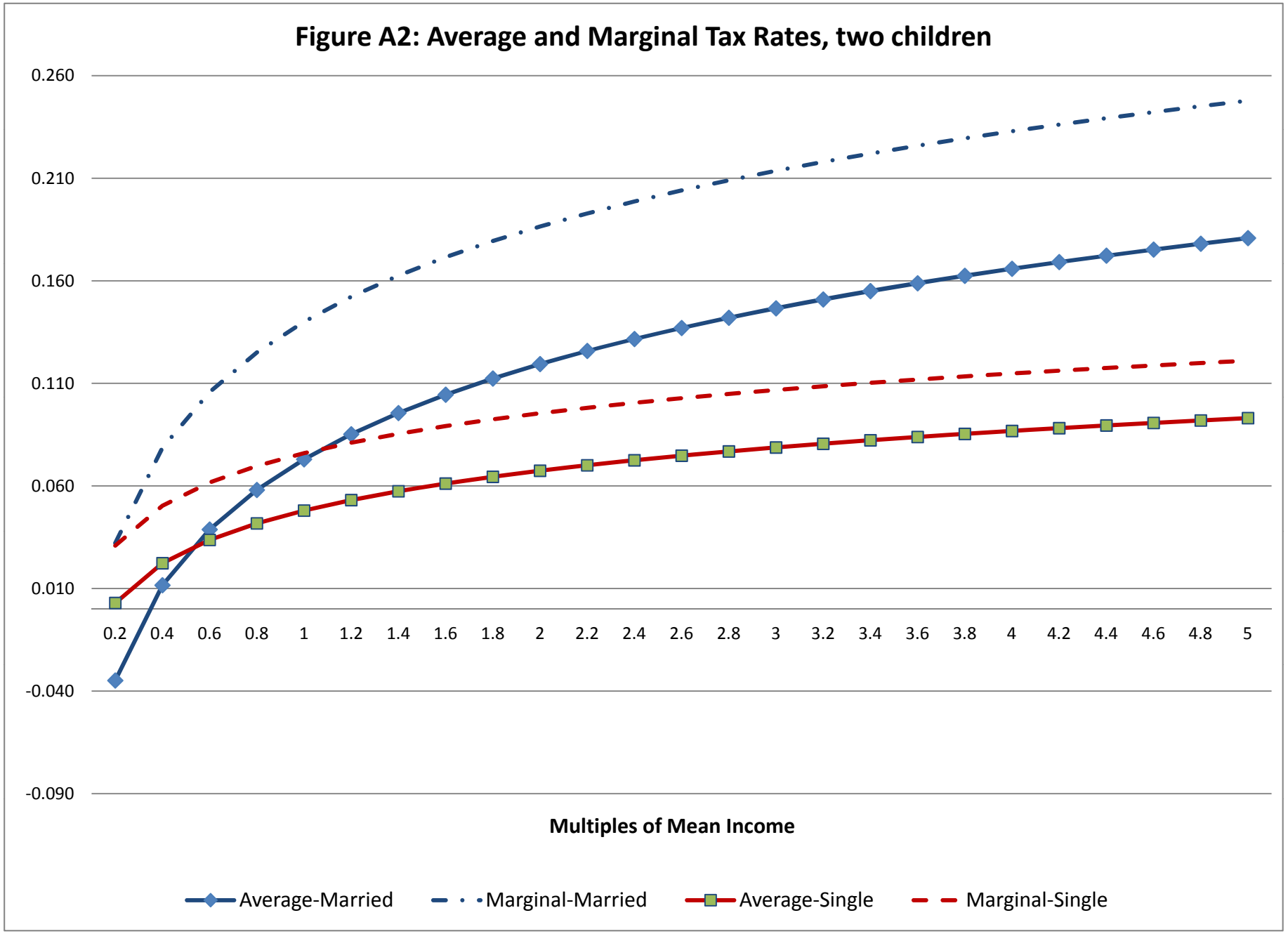


Figure A2: Average and Marginal Tax Rates, two children
0.260
0.210
0.160
0.110
0.060
0.010
-0.040
-0.090
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
2.2
2.4
2.6
2.8
3
3.2
3.4
3.6
3.8
4
4.2
4.4
4.6
4.8
5
Multiples of Mean Income
Average-Married
Marginal-Married
Average-Single
Marginal-Single

Quantitative Analysis

- Child care costs (Survey of Income and Program Participation 2005).
  - 10% of mean income for young children (less than 5 years old),
  - 7.7% of mean income for older children.
- Child care subsidies consistent with Child Care Development Fund.
  - 6% of the poorest households face a 75% subsidy rate.

Quantitative Analysis – Utility Cost

- We assume that the utility cost parameter is distributed according to a (flexible) gamma distribution, $\zeta(q|z)$
- Choose the parameters to match LFP for married females, ages 25-54.

Married Female LFP, 25-54

	Females				
Males	<hs	hs	sc	col	col+
<hs	44.0	64.8	71.3	76.9	79.2
hs	49.4	70.8	77.2	85.1	90.6
sc	51.7	69.9	75.8	83.5	90.4
col	47.1	64.0	68.6	73.0	82.9
col+	42.8	55.4	60.6	62.7	76.7
Total	46.4	68.8	73.9	74.9	81.9

- Exploit the information on the rise of LFP with wages.

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

- $\gamma = 0.4$ (based on available estimates)
- B is calibrated to match the labor hours per worker.
- $\varkappa$ is calibrated to match the LFP of married females with young (0 to 5) children.
- β is chosen to match capital-to-output ratio.

Model vs. Data

Statistic	Data	Model
Capital Output Ratio	2.93	2.94
Labor Hours Per-Worker	0.40	0.40
LFP of Married Females with Young Children (%)	62.6	61.6
Variance of Log Wages (males, ages 25-29)	0.227	0.227
Households with Children Receiving Subsidy (%)	5.5	6.1
Participation rate of Married Females (%), 25-54	72.2	70.8
Less than High School	46.4	51.8
High School	68.8	65.2
Some College	74.0	73.7
College	74.9	76.3
More than College	81.9	80.6
Total	72.2	70.8
With Children	68.3	65.2
Without Children	85.9	81.7

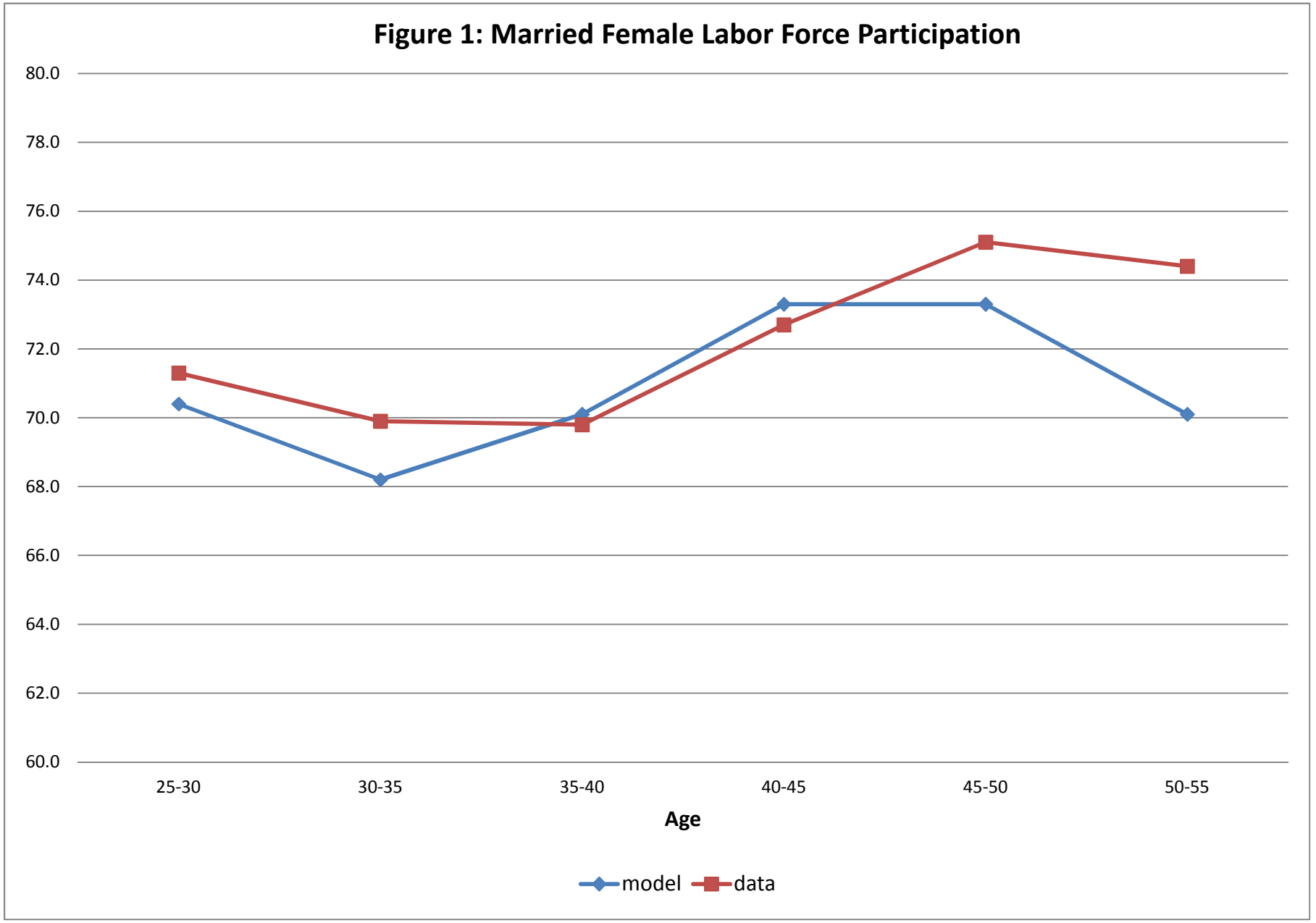
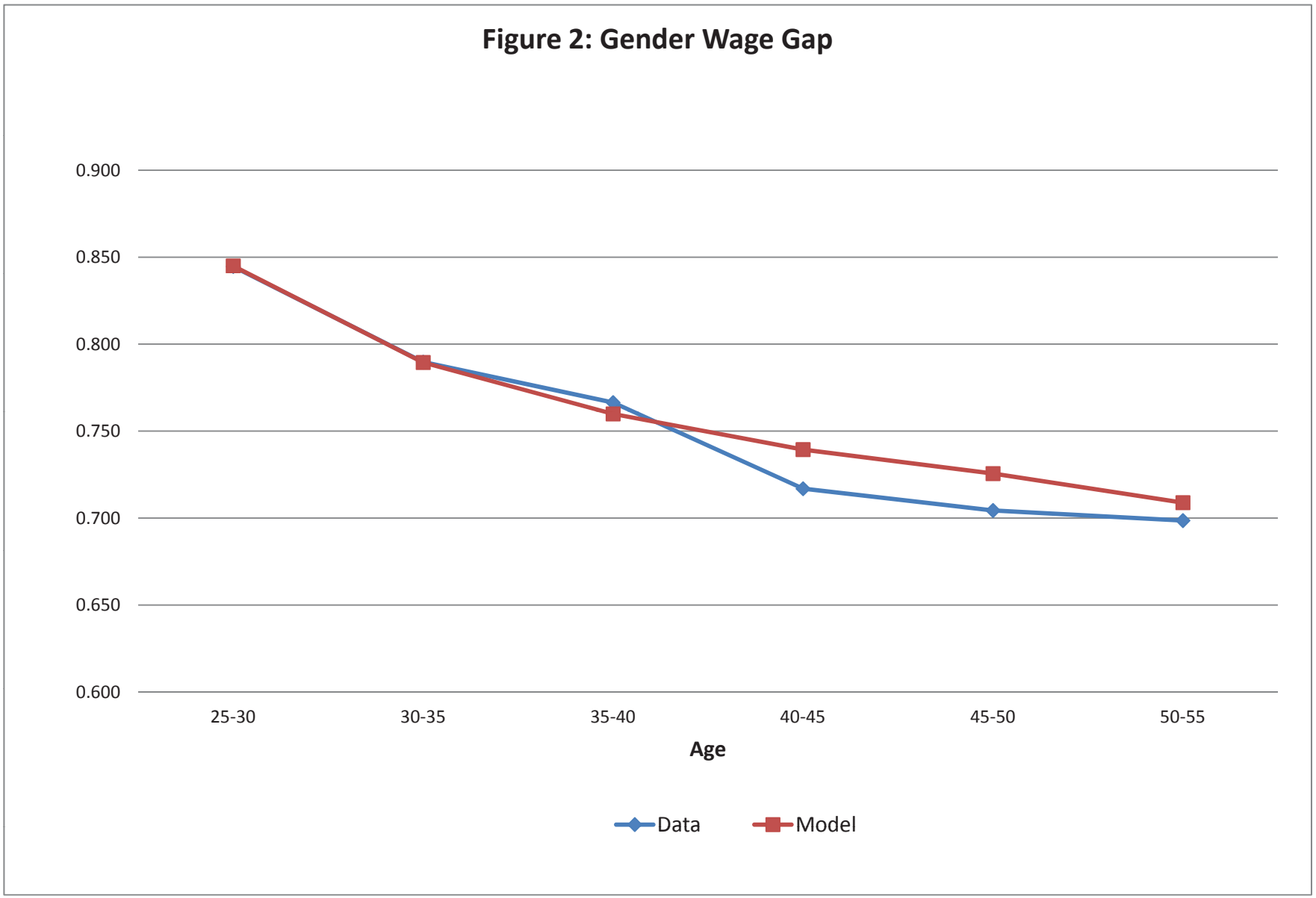


Figure 1: Married Female Labor Force Participation
80.0
78.0
76.0
74.0
72.0
70.0
68.0
66.0
64.0
62.0
60.0
25-30
30-35
35-40
40-45
45-50
50-55
Age
model
data

Figure 2: Gender Wage Gap



Expansion of Childcare Subsidies

- Benchmark Economy: $\theta = 75\%$ and $\hat{I} = 21\%$ of mean household income.
- Alternatives:
  - 3 subsidy rates: $\theta = 50\%, 75\%, 100\%$
  - 3 eligibility levels: $\hat{I} = 50\%$, 100% of mean income, All Eligible
- Additional linear taxes on income for balanced budget.
- Assumption: Benchmark is a small open-economy.

Aggregate Effects

Changes from Benchmark (%)

	$\widehat{I}$ =100%		All Eligible	
	$\theta = 50\%$	100%	50%	100%
Married LFP	4.0	7.6	5.8	10.1
Total Hours	0.5	0.3	0.9	1.0
Hours Married F.	3.0	5.1	4.7	7.6
Hours Per Worker (F)	-1.0	-2.8	-1.0	-2.6
Hours Per Worker (M)	-0.7	-1.7	-0.7	-1.5
Output	-0.3	-1.2	0.4	0.3
Tax Rate	0.6	1.4	0.8	1.8

Large effects on labor supply of married females!

Who Changes Participation More

% Change in Married Female LFP

	$\widehat{I}$ = 100%		All Eligible	
	θ = 50%	100%	50%	100%
Education				
< HS	12.0	29.9	12.8	32.3
HS	9.6	16.0	11.4	17.6
SC	4.2	7.6	5.9	9.6
Col	1.3	2.6	3.4	5.9
Col+	0.2	0.9	2.0	3.6
Child Bearing Status				
Early	6.7	12.6	8.7	15.3
Late	2.2	4.3	4.3	7.2

Consumption Compensation (%), Newborns at $t = t_0$

	$\widehat{I}$=100%		All Eligible	
	$\theta = 50\%$	100%	50%	100%
Single F				
No Children	-0.8	-1.9	-1.1	-2.4
Early	2.6	10.7	2.2	10.1
Late	2.1	8.2	1.8	7.6
Married F				
$<$ HS	-3.0	6.8	-3.3	6.3
HS	0.1	6.7	-0.2	6.2
SC	2.4	7.1	2.0	6.6
Col	1.3	3.2	0.9	2.6
Col+	1.3	2.4	1.0	1.8
Married				
No Children	-1.6	-1.7	-2.3	-4.8
Early	2.1	4.8	2.1	4.9
Late	0.6	1.8	0.8	2.2

Consumption Compensation (%). Households alive at $t = t_0$.

	$\widehat{I}$=100%		All Eligible	
	$\theta = 50\%$	100%	50%	100%
Age				
25-29	0.5	1.6	0.6	1.9
30-34	0.1	0.4	0.3	1.0
35-39	-0.6	-1.3	-0.5	-0.9
40-44	-1.1	-2.5	-1.3	-2.9
45-49	-1.2	-2.7	-1.6	-3.4
50-54	-1.0	-2.3	-1.1	-2.4
All	-0.5	-0.9	-0.6	-1.0
(%) Winners	10.1	11.5	15.1	15.9

Welfare: Steady States

Consumption Compensation (%), Newborns				
	$\widehat{l}$=100%		All Eligible	
	$\theta = 50\%$	100%	50%	100%
All Newborns	0.5	1.6	0.5	1.9
(%) Winners	35.6	40.4	47.0	52.9

Conclusions

- Child care subsidies lead to substantial effects on labor supply across different groups.
- Effects on married females are large.
- Effects on output are small or negative.
- Newborns gain as a group. Households with children gain substantially.
- Childcare subsidies are not supported by a majority of households and lead to welfare losses at the time of the reform.

- Child Care and Development Fund (CCDF)
- Approximately 1.71 million children (1 million) families in 2007. About 10 billion in total CCDF spending in FY 2007 (6000 per child) means-tested, conditional on work and geared to very young children
- To be eligible for CCDF funds, families must be engaged in a state-defined acceptable work activity (e.g., employment, education, or job training), have incomes below 85% of the state median income, and have at least one child ages 0–12.

Recent Literature

- Attanasio, Low and Sanchez-Marcos (2008) and Bick (2012): child care subsidies have quantitatively significant effects on female labor supply.
- Domeij and Klein (2012) compute welfare maximizing level of child care subsidies for German economy.
- Fehr and Ujhelyiova (2010) study implications of child care policies on fertility and female labor supply for German economy.

Model – Demographics and Heterogeneity

For $j = 1, ..., J_R, ...J$.

$$\underbrace{\Omega_j(z)}_{\text{all}} = \underbrace{\sum_{x \in X} M_j(x,z)}_{\text{married}} + \underbrace{\omega_j(z)}_{\text{single}}.$$

and

$$\Phi_j(x) = \sum_{z \in Z} M_j(x,z) + \phi_j(x).$$

- Population grows at rate n.
- Population structure is stationary so that age j agents are a fraction μ_j of the population.
- The weights are normalized to add up to one, and obey the recursion, $\mu_{j+1} = \mu_j/(1+n)$.

◂ Return

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

Tax Function Estimates

Estimates	Married (no child.)	Married (two child.)	Single (no child.)	Single (two child.)
η_1	0.1028	0.0789	0.1392	0.090
η_2	0.0582	0.0763	0.0481	0.0819
St. Errors				
η_1	0.0002	0.0003	0.0003	0.0011
η_2	0.0002	0.0003	0.0003	0.0020

Quantitative Analysis – Social Security

- Take $\tau_p = 0.086$ from the data (the average value of the social security contributions as a fraction of aggregate labor income for 1990-2000).

- Calibrate social security benefits for the lowest type single male, $p_m^S(z_1)$, to balance the budget. $p_m^S(z_1)$ is a fraction of average household income.

- Set all other benefits, $p_m^S(x)$, $p_f^S(z)$, and $p^M(x, z)$ to be consistent with data on social security benefits for retired households.

- Marital Structure, ages 30-39
- About 74% married

Fraction of Agents by Type, Gender and Marital Status

	Males			Females		
	All	Married	Singles	All	Married	Singles
<hs	11.72	8.41	3.31	9.77	7.03	2.74
hs	20.30	14.75	5.54	16.98	12.21	4.77
sc	33.37	24.29	9.08	35.48	25.31	10.17
col	22.51	17.10	5.41	24.17	19.06	5.11
col+	12.12	9.49	2.63	13.6	10.27	3.33

- Who is married with whom, ages 30-39
- About 74% of people are married
- About 50% of people marry someone of their own type

Who is Married with Whom

	Females				
Males	<hs	hs	sc	col	col+
<hs	5.77	2.35	2.65	.047	0.12
hs	0.19	7.21	7.80	2.31	0.70
sc	1.49	5.34	16.85	6.82	2.38
col	0.29	1.27	5.41	11.18	4.83
col+	0.06	0.36	1.54	5.01	5.87

- Child Bearing Status. From CPS June Supplement and Census
- High types (col or col+) are more likely to be childless or have their children late
- Singles are more likely to be childless than married

Childbearing Status, Single Females

	Childless	Early	Late
<hs	27.72	62.04	10.24
hs	26.68	59.95	13.37
sc	32.39	53.38	14.23
col	53.75	30.50	15.75
col+	56.17	23.06	20.77

Childbearing Status, Married Couples

	Childless					Early			
	Females					Females			
Male	<hs	hs	sc	col	col+	male	<hs	hs	sc
<hs	6.75	8.23	8.60	13.37	15.51	<hs	74.92	67.55	62.64
hs	9.04	10.60	8.76	14.76	12.66	hs	70.03	63.33	60.10
sc	6.82	10.52	9.53	12.66	13.08	sc	72.49	58.36	60.93
col	3.52	9.36	10.35	11.57	11.24	col	43.39	56.99	43.17
col+	5.90	10.57	9.55	9.45	13.28	col+	46.42	52.85	36.36

Fertility Differences

Singles		Married					
			Females				
		Male	<HS	HS	SC	COL	COL+
< HS	2.72	< HS	2.74	2.52	2.27	1.97	2.08
HS	2.19	HS	2.73	2.27	2.15	2.10	1.97
SC	2.00	SC	2.68	2.27	2.23	2.07	1.89
COL	1.84	COL	3.01	2.34	2.27	1.97	1.87
COL+	1.65	COL+	2.22	2.26	2.43	2.18	1.90

Child Care Cost Differences

	Young Children			Older Children	
	Single	Married		Single	Married
$<$ HS	1	1.12	$<$ HS	1	0.84
HS	1.20	1.41	HS	1.29	1.27
SC	1.58	1.22	SC	1.57	1.62
COL	1.58	1.55	COL	2.83	1.79
COL+	2.14	1.82	COL+	1.94	2.07

Universal Subsidies, 100% Subsidy Rate

	Baseline Results	Fertility Differences	Expenditure Differences
Married Fem. LFP	10.1	9.8	9.8
Total Hours	1.0	1.0	0.9
Total Hours (MF)	7.6	7.3	7.1
Hours per worker (f)	-2.6	-2.6	-2.6
Output	0.3	0.1	0.4
Tax Rate	1.8	1.8	1.7
Effects on Participation:			
<HS	32.3	33.5	22.2
HS	17.6	18.5	16.2
SC	9.6	9.5	9.0
COL	5.9	4.8	6.8
COL+	3.6	2.6	5.3
Early	15.3	14.9	14.1
Late	7.2	7.0	7.6

Welfare, Universal Subsidies, 100% Subsidy Rate

	Baseline Results	Fertility Differences	Expenditure Differences
Single F			
No Children	-2.4	-2.5	-2.3
Early	10.1	10.0	11.7
Late	7.6	7.0	9.0
$<$ HS	6.3	14.0	4.3
HS	6.2	6.0	4.7
SC	6.6	5.7	7.5
COL	2.6	1.7	4.9
COL+	1.8	0.5	3.8
Married			
No Children	-4.8	-5.0	-4.7
Early	4.9	4.5	5.3
Late	2.2	1.8	2.5
All	1.9	1.6	2.0

Decision Problem – Married Households with Children

$$V^M(a,h,x,z,\varepsilon_x,\varepsilon_z,q,b,j) = \max_{a',\, l_f,\, l_m} \{U_f^M(c,l_f,q,k_y) + U_m^M(c,l_m,l_f,q) + \beta V^M(a',h',x,z,\varepsilon_x,\varepsilon_z,q,b,j+1)\},$$

subject to

(i) With kids: if $b=\{1,2\}$, $j \in \{b, b+1, b+2\}$, then $k=1$

and

$$c + a' = \begin{cases} a(1+r(1-\tau_k)) + w(\varpi_m(z,j)\varepsilon_z l_m + h\varepsilon_x l_f)(1-\tau_p) \\ -T^M(I,1) - wd(j+1-b)(1-\theta)\chi(l_f) \text{ if } I \leq \widehat{I} \\ \\ a(1+r(1-\tau_k)) + w(\varpi_m(z,j)\varepsilon_z l_m + h\varepsilon_x l_f)(1-\tau_p) \\ -T^M(I,1) - wd(j+1-b)\chi(l_f), \text{ otherwise} \end{cases},$$