Child-Related Transfers, Household Labor Supply and Welfare

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São Paulo – September 2019

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  What are the effects on labor supply and welfare from expanding these transfers in the U.S. ?

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  Both Clinton and Trump were proposing expansions of child-related transfers... Expansion of Child Credits in Tax Reform 2018.

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  - Independent of childcare expenditures or labor market status of parents.
- Childcare Credit (CDCTC)
  - Non-refundable tax credit for child care expenditures for all households with working parents.
  - Upper limits. Mostly serves middle and high income working households.

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- Model skill depreciation of females due to childbearing disruptions.
  - Allows us to capture changes in female skills due to policy variation.
- Detailed modelling of existing policies in dynamic model.
  - Allows us to quantify aggregate and welfare effects.

Model – Heterogeneity

- Life-cycle economy, $j = 1, ..., J_R, ...J$.
- Males (m) and females (f), heterogenous in their types (education).
- Male types, $z \in Z$. These types map into productivity profiles, $\varpi_m(z, j)$.

Model – Heterogeneity

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

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

- Additional permanent heterogeneity (within each type).
  - Male labor endowments: $\varpi_m(z, j)\varepsilon_z$
  - Female labor endowments: $h\varepsilon_x$.

Model – Household Structure

- Agents can be single (S) or married (M).
- Married agents age, retire, and die together. Stationary demographics.
- Individuals value consumption and dislike work. Married households dislike joint work.
- Married agents maximize discounted sum of individual utilities.

Model – Children and Child Care Costs

- Households differ in terms of the number of children attached to them
  - Single females $k(x)$
  - Married households $k(x, z)$
- They also differ whether they have access to informal care, $g \in \{0, 1\}$.
- Three possibilities: *without* any children, *early* child bearers, *late* child bearers, denoted by $b = \{0, 1, 2\}$
- Early child bearers have children in ages $j = 1, 2, 3$ while late child bearers have children in ages $j = 2, 3, 4$.

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  - the age of the child, $s = 1, 2, 3$.
  - whether the household has access to informal care, $g \in \{0, 1\}$
  - the type (education) of the household.
- Child care services required
  - Single female $d(s, x, g)k(x)$
  - Married household $d(s, x, z, g)k(x, z)$

Model – Child Related Transfers

- Child care subsidies
  - Eligibility depends on household income (I)
- Cost of childcare is
  - $wd(s, x, z, g)k(x, z)(1 - \theta)$ if $I \leq \widehat{I}$
  - $wd(s, x, z, g)k(x, z)$ otherwise.
- Two parameters: **subsidy rate** (θ) and **eligibility** ($\widehat{I}$).

Model – Child Related Transfers

- Tax Credits
  - Child Credit – *potential credit* is a flat amount up to a certain income level, and then declines with income.
  - Childcare Credit – *potential credit* = $min\{maximum\ credit, earnings_m, earnings_f, childcare\ expenditure\}$*$rate$
    - *rate* declines by household income, then flat.
  - Childcare Credits are not refundable, but Child Credits are partially refundable.

Extensive Margin

- At the start of their lives married households draw a shock, q, which stands for the *utility costs* of joint market work for married couples.

- *Residual heterogeneity* in labor force participation.

Preferences

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- Single male

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

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- Married male

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

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Note: γ is same for males and females

Model – Production

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

Decisions – Big Picture

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  - Benefits: higher household income, future human capital.

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- Presence and generosity of child-related transfers affect the cost and benefits of work.

Decisions – Married with Children

Let $\mathbf{s}^M \equiv (x, z, \varepsilon_x, \varepsilon_z, q, b, g)$.

$\mathbf{s}^M \rightarrow$ exogenous states.

Decisions – Married with Children

$$
\begin{aligned}
V^M(a,h,\mathbf{s}^M,j) &= \max_{a',\ l_f,\ l_m} \{[U_f^M(c,l_f,q,k_y)+U_m^M(c,l_m,l_f,q)] \\
&\quad +\beta V^M(a',h',\mathbf{s}^M,j+1)\}
\end{aligned}
$$

st

$$
\begin{aligned}
c+a' &= a(1+r(1-\tau_k))+w(\varpi_m(z,j)\varepsilon_z l_m+h\varepsilon_x l_f)(1-\tau_p) \\
&\quad -T^M(I,k(x,z))+TR^M(I,D,k(x,z)) \\
&\quad -wd(j+1-b,x,z,g)k(x,z)\chi(l_f)
\end{aligned}
$$

$$
h' = \mathcal{H}(x,h,l_f,j),
$$

with $I \equiv w(\varpi_m(z,j)\varepsilon_z l_m+h\varepsilon_x l_f)+ra$ and

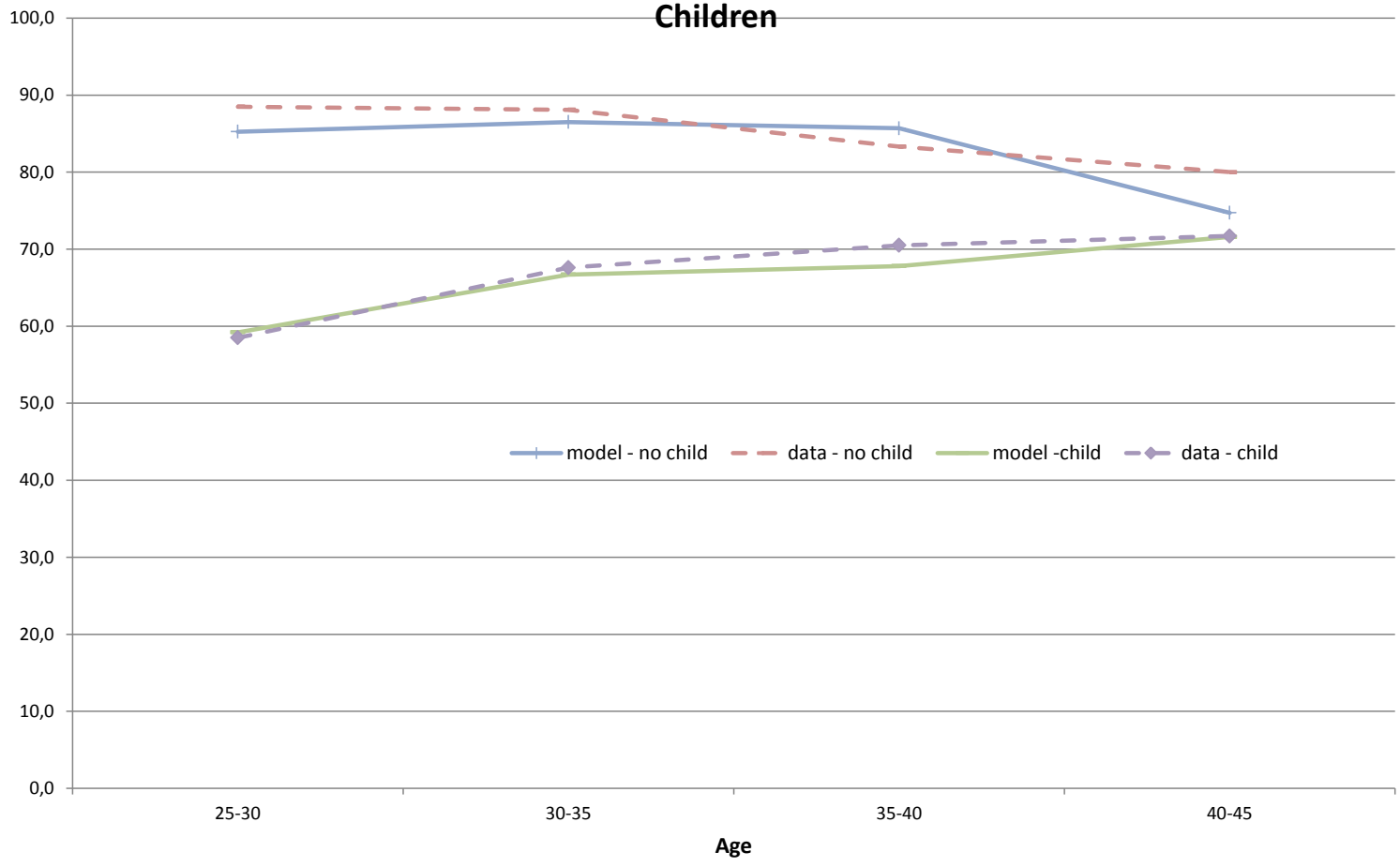
$D \equiv wd(j+1-b,x,z,g)k(x,z).$

Benchmark Economy

Model and Data

Statistic	Data	Model
Capital Output Ratio	2.93	2.93
Labor Hours Per-Worker	0.40	0.40
LFP of Married Females with Young Children (%)	62.6	63.8
Variance of Log Wages (ages 25-29)	0.227	0.227
Participation rate of Married Females (%), 25-54	72.2	71.5
Less than High School (<HS)	46.4	47.2
High School (HS)	68.8	66.4
Some College (SC)	74.0	73.4
College (COL)	74.9	73.6
More than College (COL+)	81.9	79.9
With Children	68.3	66.1
Without Children	85.9	83.3

Figure 3: Married Female Labor Force Participation by the Presence of Children



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- *Make Subsidies Universal*
- Additional linear taxes on income for revenue neutrality.

  Assumption: Benchmark economy is a small open-economy.

Expansion of Childcare Subsidies (%)

	Universal Subsidies (75%)
Participation Married Females	10.2
Total Hours	1.8
Total Hours Married Females	8.6
Hours per worker (females)	-1.1
Hours per worker (males)	-1.5
Human Capital (Married Females)	2.8
Output	0.5
Tax Rate	1.2

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- Significant increase in married female labor force participation and total hours

Expansion of Childcare Subsidies (%)

	Universal Subsidies (75%)
Effects on Participation:	
By Education	
$<$ HS	25.4
HS	13.3
SC	9.1
COL	9.4
COL+	5.2
By Child Bearing Status	
Early	14.9
Late	8.2

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- The effect on labor supply is much stronger for those with lower education

Expansion of Child Credits

- Take the additional tax rate from the universal expansion of child care subsidies with 75% subsidy rate.
- Use additional resources to increase the maximum credits for Child Credit program.
    - Recall that the program does not require market work.
    - Full Expansion: we also make it fully refundable.

Expansion of Child Credits (%)

	Universal Subsidies (75%)	Child Credit Expansion
Participation Married Females	10.2	-2.4
Total Hours	1.8	-1.4
Total Hours Married Females	8.6	-3.1
Hours per worker (females)	-1.1	-1.1
Hours per worker (males)	-1.5	-0.7
Human Capital (Married Females)	2.8	-0.8
Output	0.5	-1.7
Tax Rate	1.2	1.2

Expansion of Child Credits (%)

	Universal Subsidies (75%)	Child Credit Expansion
Effects on Participation:		
By Education		
$<$ HS	25.4	-6.4
HS	13.3	-4.4
SC	9.1	-2.5
COL	9.4	-1.2
COL+	5.2	-0.7
By Child Bearing Status		
Early	14.9	-4.0
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- Sharply different effects on labor supply

Role of Endogenous Skills (%)

Keeping Female Skills at the Benchmark Level (%)

	Universal Subsidies (75%)	Child Credit Expansion
Participation Married Females	4.3	-3.8
Total Hours	0.2	-1.9
Total Hours (MF)	2.3	-4.0
Hours per worker (f)	-2.4	-1.6
Human Capital (Married Females)	0.0	-0.0

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Hours per worker (f)	-2.4	-1.6
Human Capital (Married Females)	0.0	-0.0

With subsidies, rise in female labor supply is much smaller. With Child Credits, the decline in female labor supply is stronger.

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  Increases are *asymmetric* – concentrated at low-skilled females.
- Expansion of Child Tax Credits has depressing effects on participation rates and labor supply.

  Declines in participation rates are also concentrated in low-skilled females
- Quantitatively, endogenous skills of females matter. Changes in participation rates are (much) smaller when female skills are exogenous.

Expansion of Childcare Credit

- Take the additional tax rate from the universal expansion of child care subsidies with 75% subsidy rate.
- Use additional resources to shift up the entire Childcare Credit schedule.
- Note that some households can receive more than their childcare expenditures.

Expansion of Childcare Credit (%)

	Universal Subsidies (75%)	Child Credit Expansion	Childcare Credit
Participation Married Females	10.2	-2.4	10.6
By Education			
$<$ HS	25.4	-6.4	32.0
HS	13.3	-4.4	16.9
SC	9.1	-2.5	10.4
COL	9.4	-1.2	7.0
COL+	5.2	-0.7	2.8
By Child Bearing Status			
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Largest effect on participation rates. Concentrated at the bottom of the skill distribution.

Welfare

	Childcare Subsidy (75%)	Child Credit	Childcare Credit
Single F			
No Children	-1.41	-1.40	-1.46
Early	4.25	5.99	10.06
Late	3.40	3.58	7.40
$<$ HS	1.85	8.43	6.95
HS	2.54	4.93	6.66
SC	2.41	2.39	6.40
COL	1.08	0.33	2.43
COL+	0.56	-0.54	1.19
Married			
No Children	-3.16	-3.14	-3.29
Early	2.90	3.59	5.80
Late	0.50	0.85	1.51
All Newborns	0.84	1.28	2.51
(%) Winners	48.0	54.3	50.9

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- Tax credits lead to much larger gains for newborn households than childcare subsidies. Expansion of childcare credits generate largest gains.
- Only Child Credit and Childcare Credit expansions lead to majority support among newborns.
- There is no support for expanding child-related transfers among all households alive.

ADDITIONAL SLIDES

New Child Credit

	Universal Subsidies (75%)	Child Credit Expansion	Childcare Credit Expansion	New Child Credit
Tax Rate (%)	1.2	1.2	1.2	1.35
Participation MF	10.2	-2.4	10.6	-2.6
By Education				
$<$ HS	25.4	-6.4	32.0	-7.2
HS	13.3	-4.4	16.9	-4.8
SC	9.1	-2.5	10.4	-2.8
COL	9.4	-1.2	7.0	-1.3
COL+	5.2	-0.7	2.8	-0.3
By Child Bearing Status				
Early	14.9	-4.0	17.0	-4.4
Late	8.2	-1.5	6.9	-1.4

Welfare Effects: All Households

	Childcare Subsidy (75%)	Child Credit	Childcare Credit	New Child Credit
Age				
25-29	0.84	1.28	2.51	1.73
30-34	0.38	0.39	1.46	0.72
35-39	-0.81	-0.76	-0.23	-0.60
40-44	-1.84	-1.88	-1.84	-2.06
45-49	-2.39	-2.36	-2.51	-2.78
50-54	-1.86	-1.88	-1.99	-2.17
All	-0.82	-0.74	-0.36	-0.73
(%) Winners	14.6	13.6	15.5	15.5

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- **Types:** less than high school ($<$hs), high school (hs), some college (sc), college (col) and post-college (col+).
- From data:
  - Demographic structure (Census)
    - Who is single and who is married in each education level
    - Who is married with whom
  - Wage profiles of males, initial wages for females (Census)
  - Infer depreciation rates from changes in gender gap over life cycle.

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- From SIPP, we calculate the cost differences in childcare, by type, marital status, access to informal care and age of children.

  High (married) types spend more on childcare than low types.

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- Use tax functions estimated from IRS data.
- Childcare Subsidies, as they work in the US
  - $\theta = 0.75$. Set $\widehat{I}$ so poorest 5.5% households with children receive a subsidy.
- Credits are modelled as they work in practice.

Figure 1: Potential CTC and CDCTC (a household with 2 children)

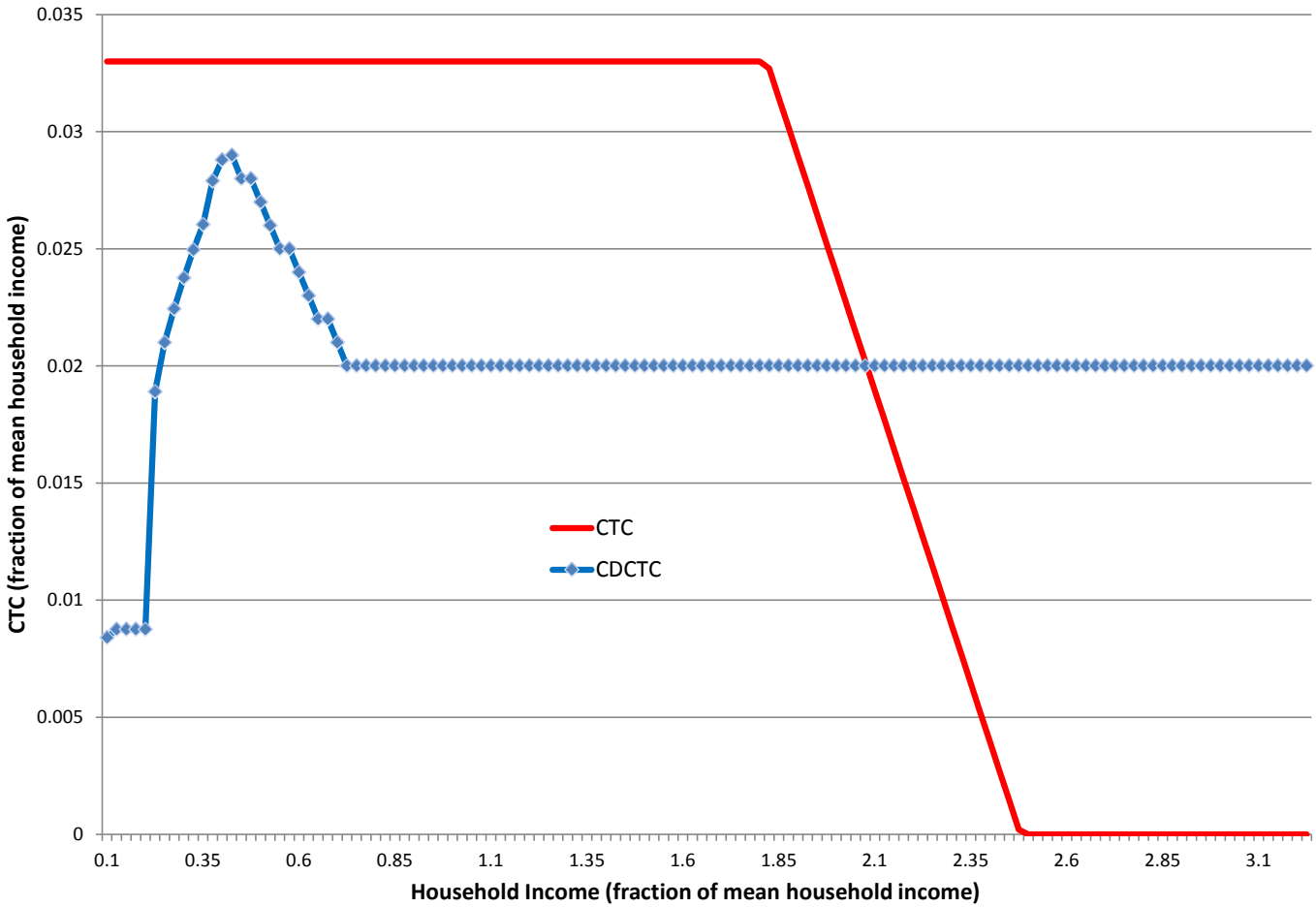


Figure 2: Married Female Labor Force Participation by Skill

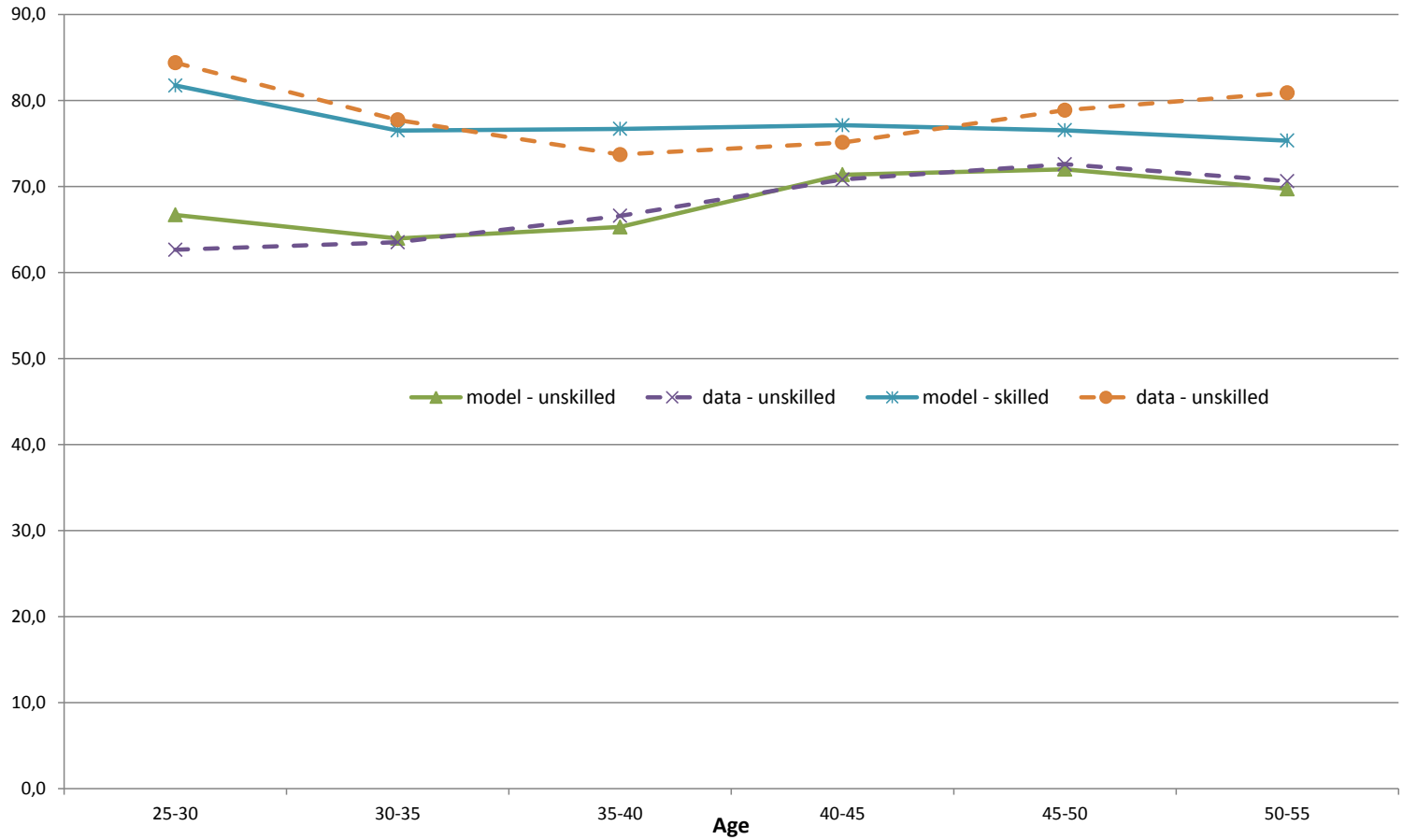
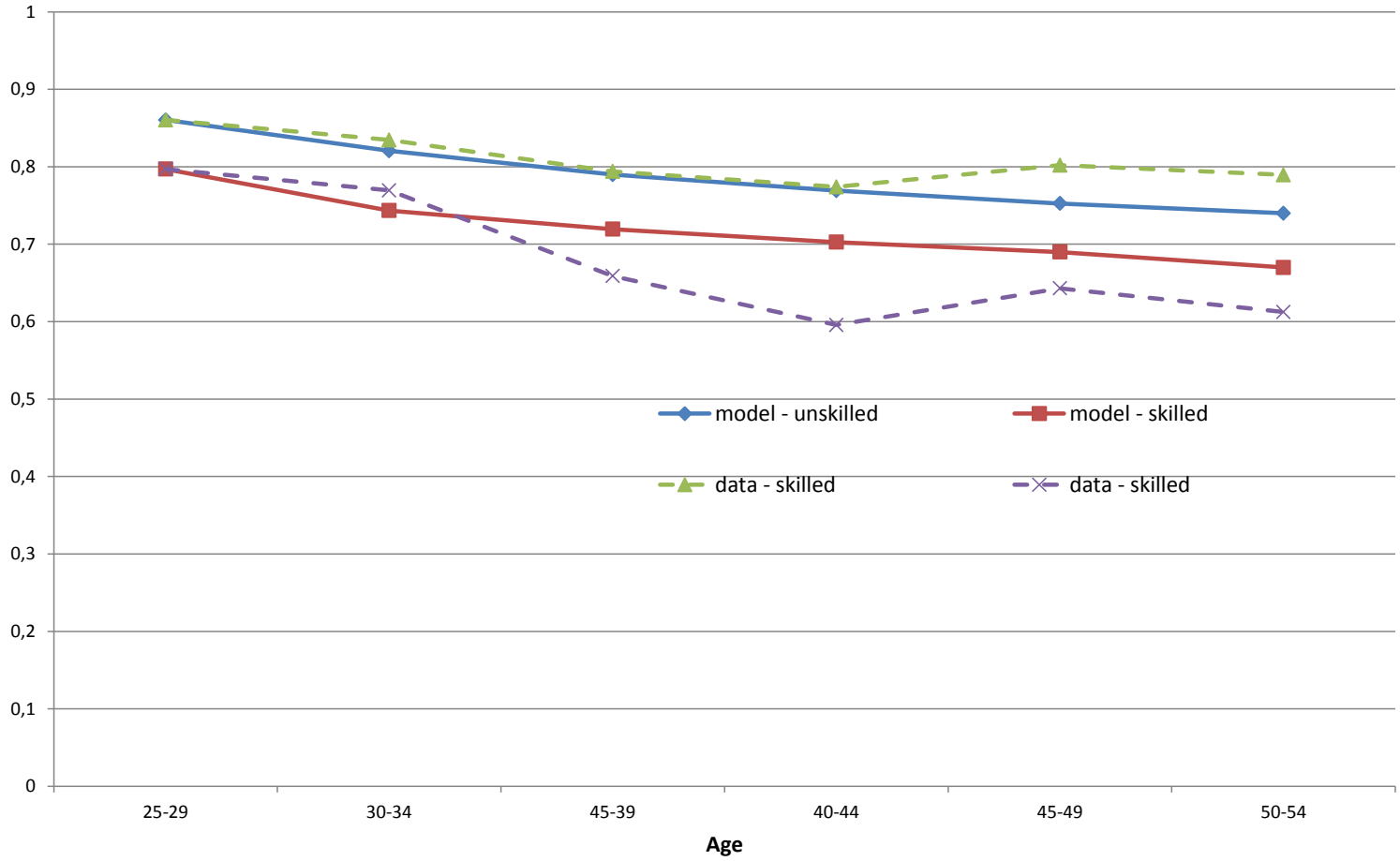


Figure 4: Gender Gap, model vs. data



Model – Taxes and Other Transfers

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- Households pay taxes on their total income $T^M(I, k)$ and $T^S(I, k)$

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Model – Taxes and Other Transfers

- Households pay taxes on their total income $T^M(I, k)$ and $T^S(I, k)$
- Flat payroll tax that taxes individual labor incomes, represented by τ_p, to fund social-security transfers. Additional capital income tax at rate τ_k.
- For a household with income level I, number of children k and total child care expenditure D, the total tax credits and transfers are represented by $TR_f^S(I, D, k)$, $TR_m^S(I, D, k)$ and $TR^M(I, D, k)$.

  (Transfers include welfare payments and EITC).

Quantitative Analysis - Cost of Joint Work

- Utility cost parameter is distributed according to $\zeta(q|z)$.
- Parameters match LFP for married females, ages 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 (type).

Quantitative Analysis – Children

- 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-	27.7	62	10.2
hs	26.7	60	13.4
sc	32.4	53.4	14.2
col	53.8	30.5	15.8
col+	56.2	23.1	20.8

Quantitative Analysis – Children

Childbearing Status, Married Couples

	Childless					Early				
	Females					Females				
Male	<hs	hs	sc	col	col+	<hs	hs	sc	col	col+
<hs	6.8	8.2	8.6	13.4	15.5	74.9	67.6	62.6	46.3	18.6
hs	9	10.6	8.8	14.8	12.7	70	63.3	60.1	43.4	41
sc	6.8	10.6	9.5	12.7	13.1	72.5	58.4	60.9	41.1	32.4
col	3.5	9.4	10.4	11.6	11.2	43.4	57	43.2	32.6	21.4
col+	5.9	10.6	9.6	9.5	13.3	46.4	52.9	36.4	30.6	15.5

Quantitative Analysis – Children

- Child Bearing Status. From CPS June Supplement and Census

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

Quantitative Analysis – Children

- The Survey of Income and Program Participation

Fraction of Households Using Informal Care

	Young Children			Older Children	
	Single	Married		Single	Married
$<$ HS	0.216	0.464	$<$ HS	0.01	0.12
HS	0.133	0.309	HS	0.16	0.04
SC	0.271	0.301	SC	0.18	0.06
COL	0.232	0.183	COL	0.04	0.05
COL+	0.076	0.161	COL+	0.01	0.03

Quantitative Analysis – Children

- The Survey of Income and Program Participation (SIPP)

Child Care Cost Differences by Education, Per Child

	Young Children					Older Children	
	Informal		Formal			Single	Married
	Single	Married	Single	Married			
$<$ HS	1.06	1.25	1	2.05	$<$ HS	1	1.12
HS	1.16	1.27	1.53	1.75	HS	1.20	1.41
SC	1.28	1.17	2.17	2.10	SC	1.58	1.22
COL	1.88	1.59	2.62	2.10	COL	1.58	1.55
COL+	1.87	2.16	2.94	3.32	COL+	2.14	1.82

Other Taxes and Transfers

- The Earned Income Tax Credits (EITC), which works as a wage subsidy for households below a certain income level.
- Each household below a certain income level also receives a transfer from the government as a function of its marital status and income.
  - Captures the other aspects of the welfare system in the US, such as the TANF and Food Stamps.
- For a household with income level I, number of children k and total child care expenditure D, the total tax credits and transfers are represented by $TR_f^S(I, D, k)$, $TR_m^S(I, D, k)$ and $TR^M(I, D, k)$.

Quantitative Analysis – Human Capital Accumulation

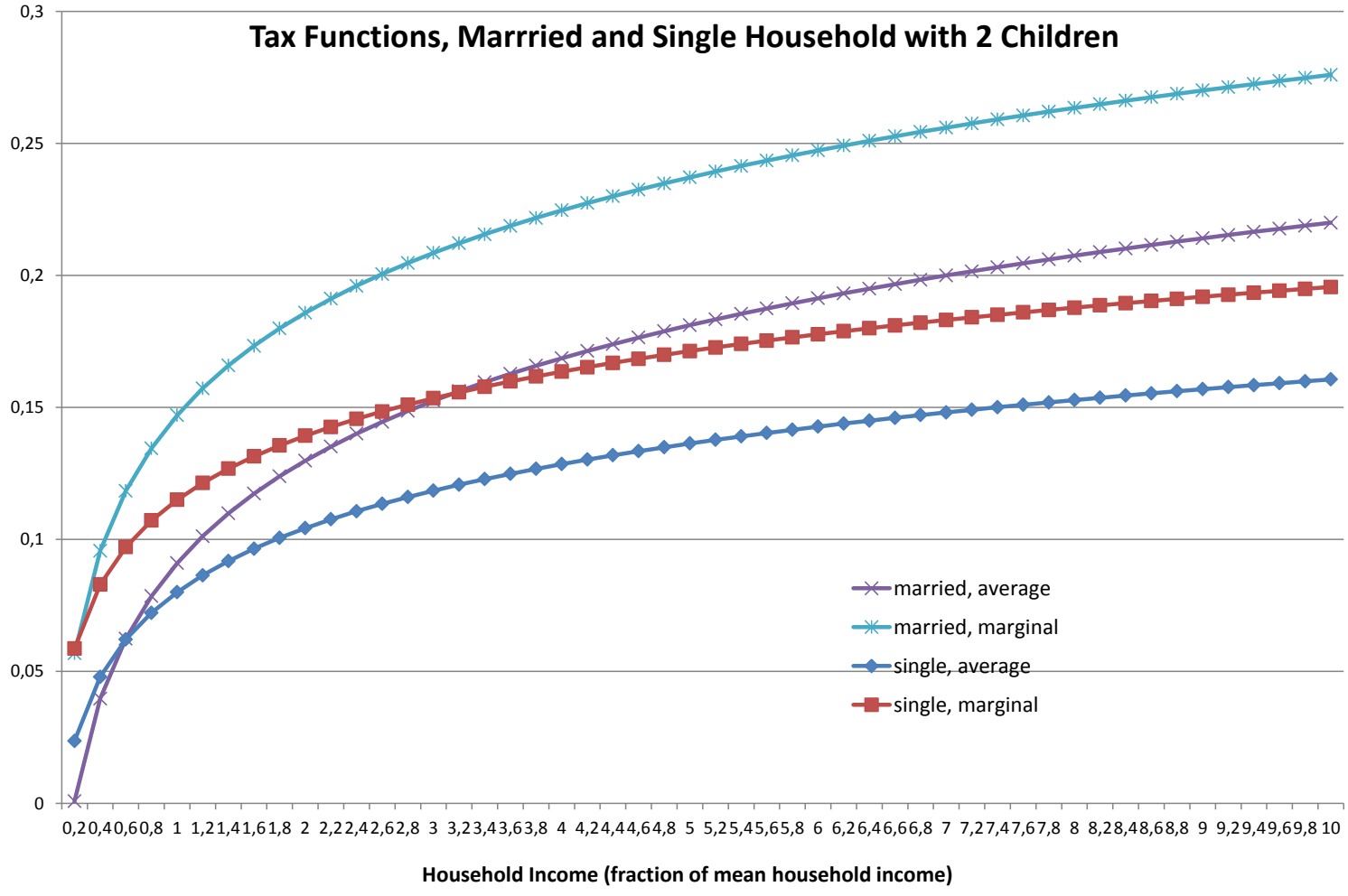
- To calibrate human capital process

$$h' = \exp[\ln h + \alpha_j^x \chi(I) - \delta_x(1 - \chi(I))],$$

- Based on the PSID, we set $\delta_x = 0.009$ for the unskilled group and $\delta_x = 0.022$ for the skilled group.
- Then, we select α_j^x so that if a female of a particular type x works in every period, her wage profile has exactly the same shape as males.
- Select these parameters before we run the model

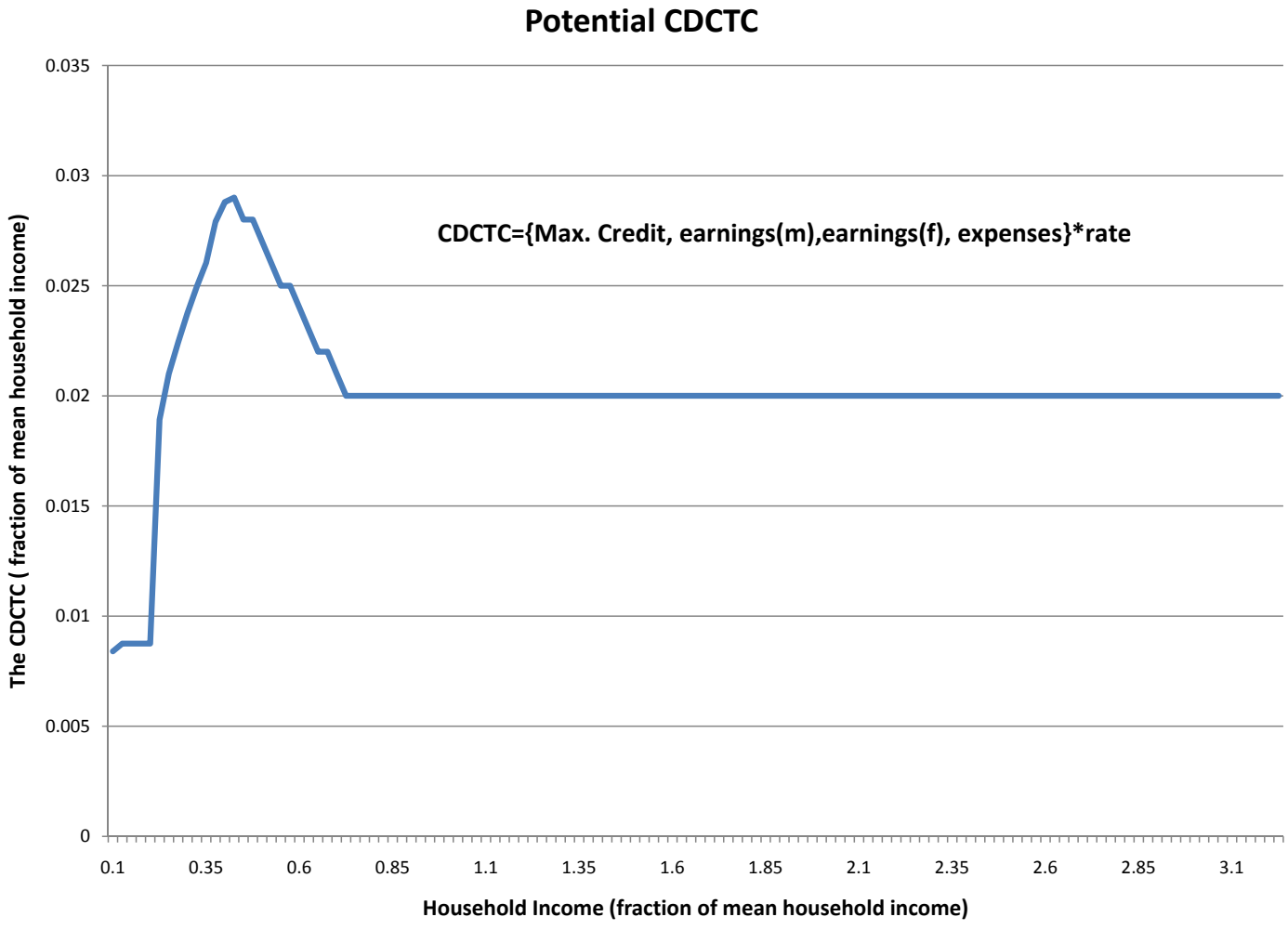
Quantitative Analysis – Government

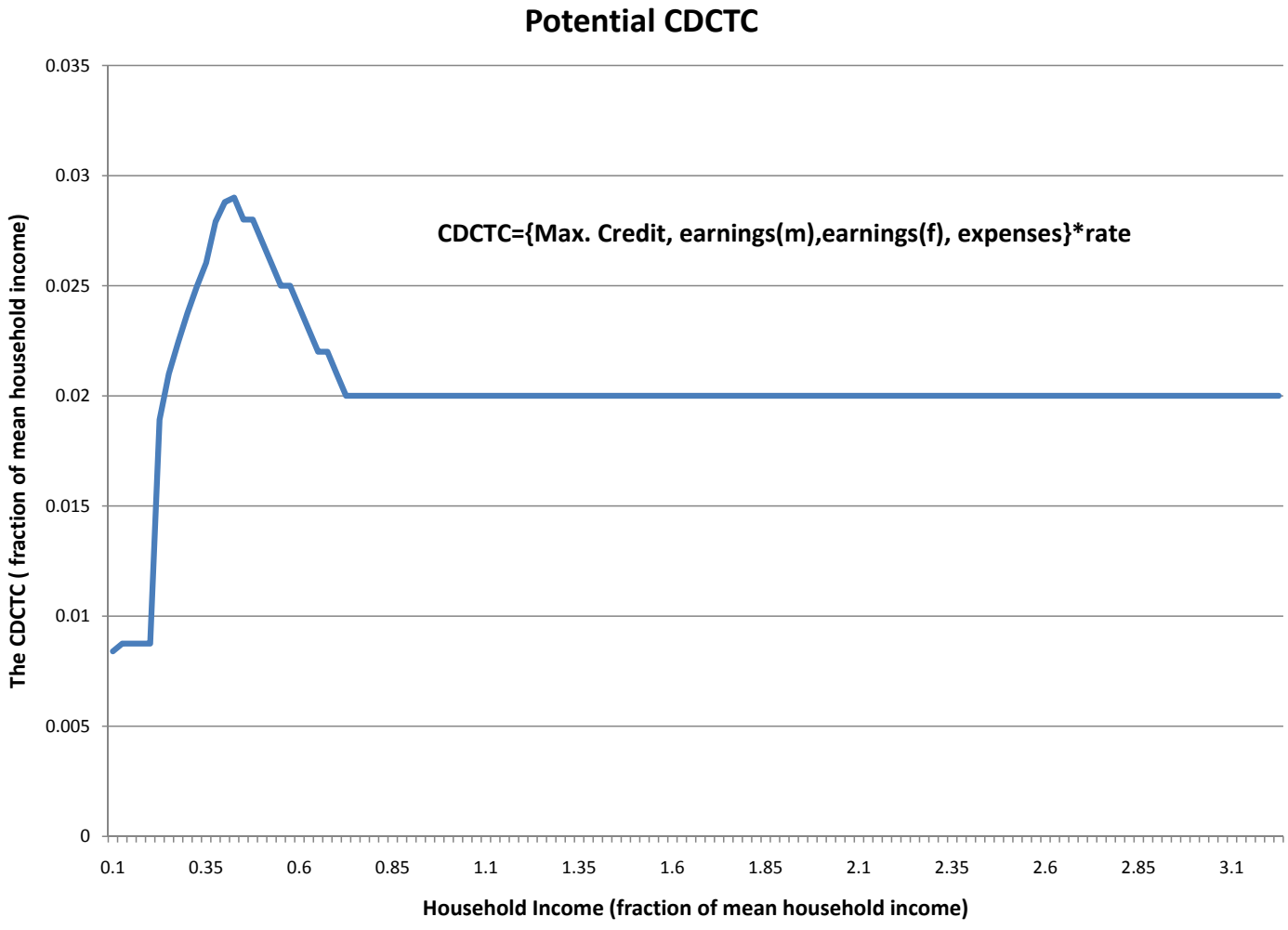
- Estimate *effective tax* functions from micro tax data - Guner, Kaygusuz and Ventura (2014)


Tax Functions, Marrried and Single Household with 2 Children
0,3
0,25
0,2
0,15
0,1
0,05
0
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 5,2 5,4 5,6 5,8 6 6,2 6,4 6,6 6,8 7 7,2 7,4 7,6 7,8 8 8,2 8,4 8,6 8,8 9 9,2 9,4 9,6 9,8 10
Household Income (fraction of mean household income)
married, average
married, marginal
single, average
single, marginal

Quantitative Analysis – Government

- Childcare Subsidies, as they work in the US
  - $\theta = 0.75$ (i.e. 75% subsidy) and set $\widehat{l}$ such that the poorest 5.5% of families with children receive a subsidy.
- The CTC and CDCTC are modelled as they actually work
- The EITC is modelled as it actually works
- Welfare transfers are estimated using the Survey of Income and Program Participation (SIPP)


Potential CDCTC
CDCTC={Max. Credit, earnings(m),earnings(f), expenses}*rate
The CDCTC (fraction of mean household income)
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
0.1
0.35
0.6
0.85
1.1
1.35
1.6
1.85
2.1
2.35
2.6
2.85
3.1
Household Income (fraction of mean household income)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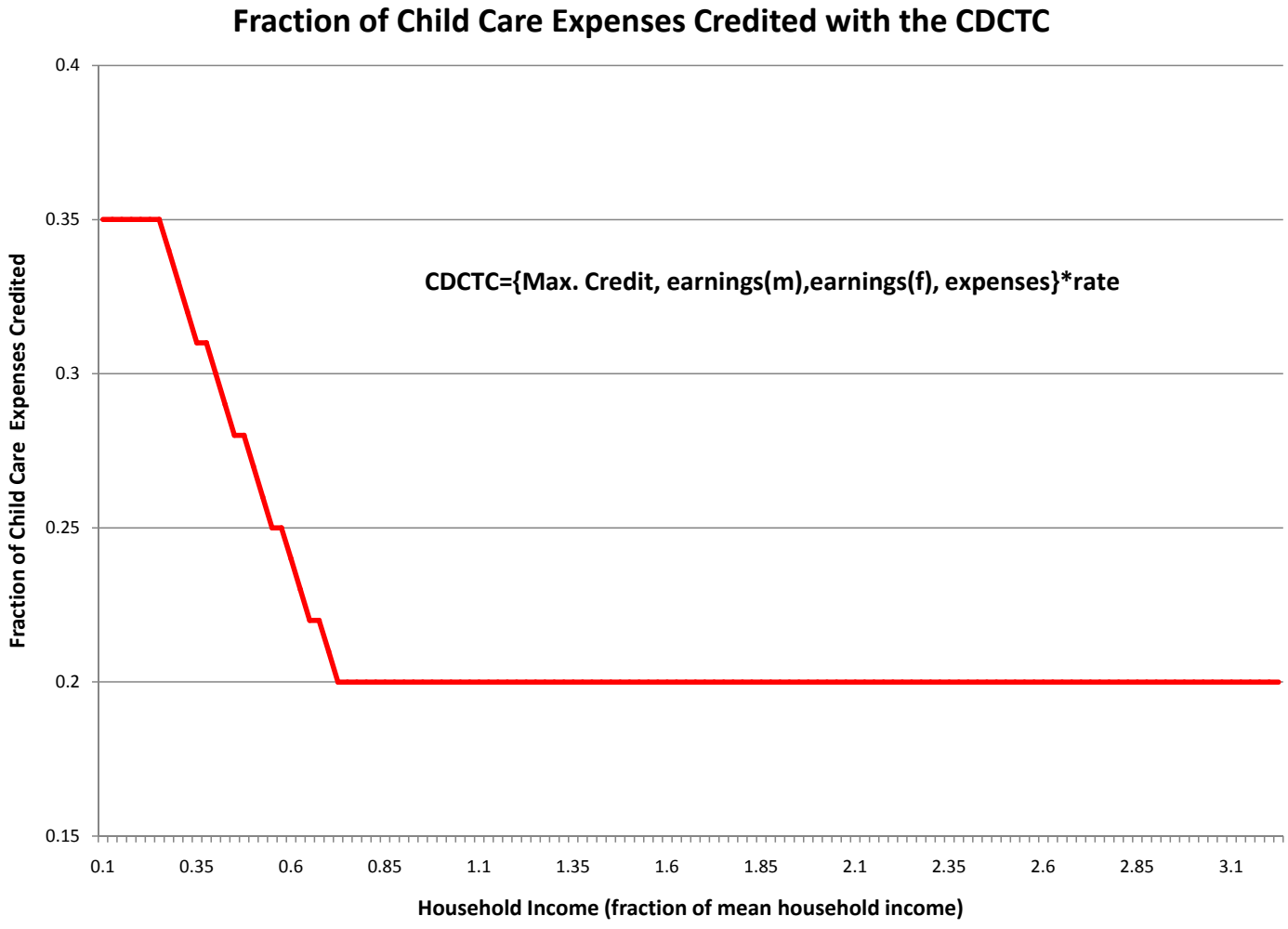
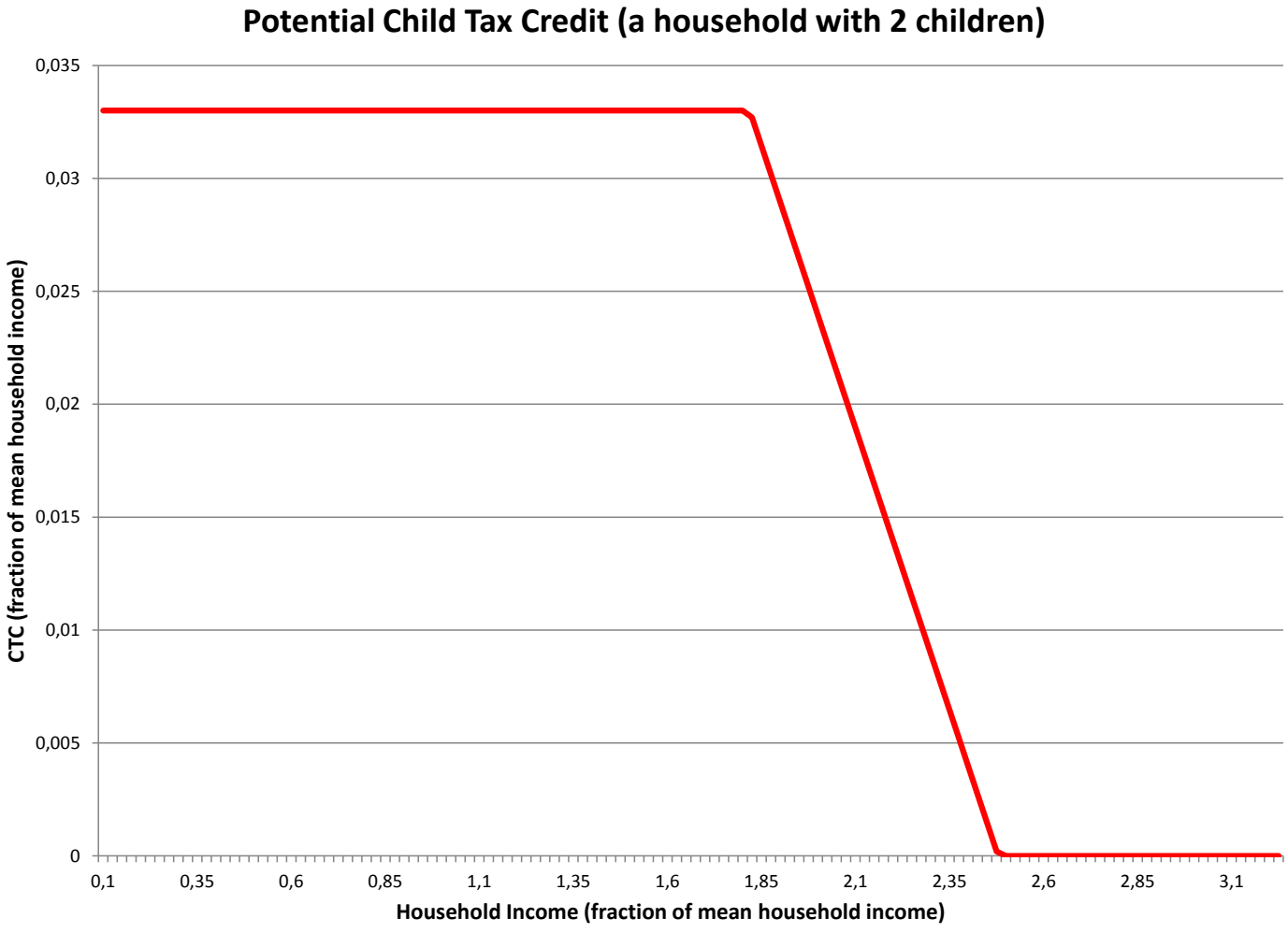
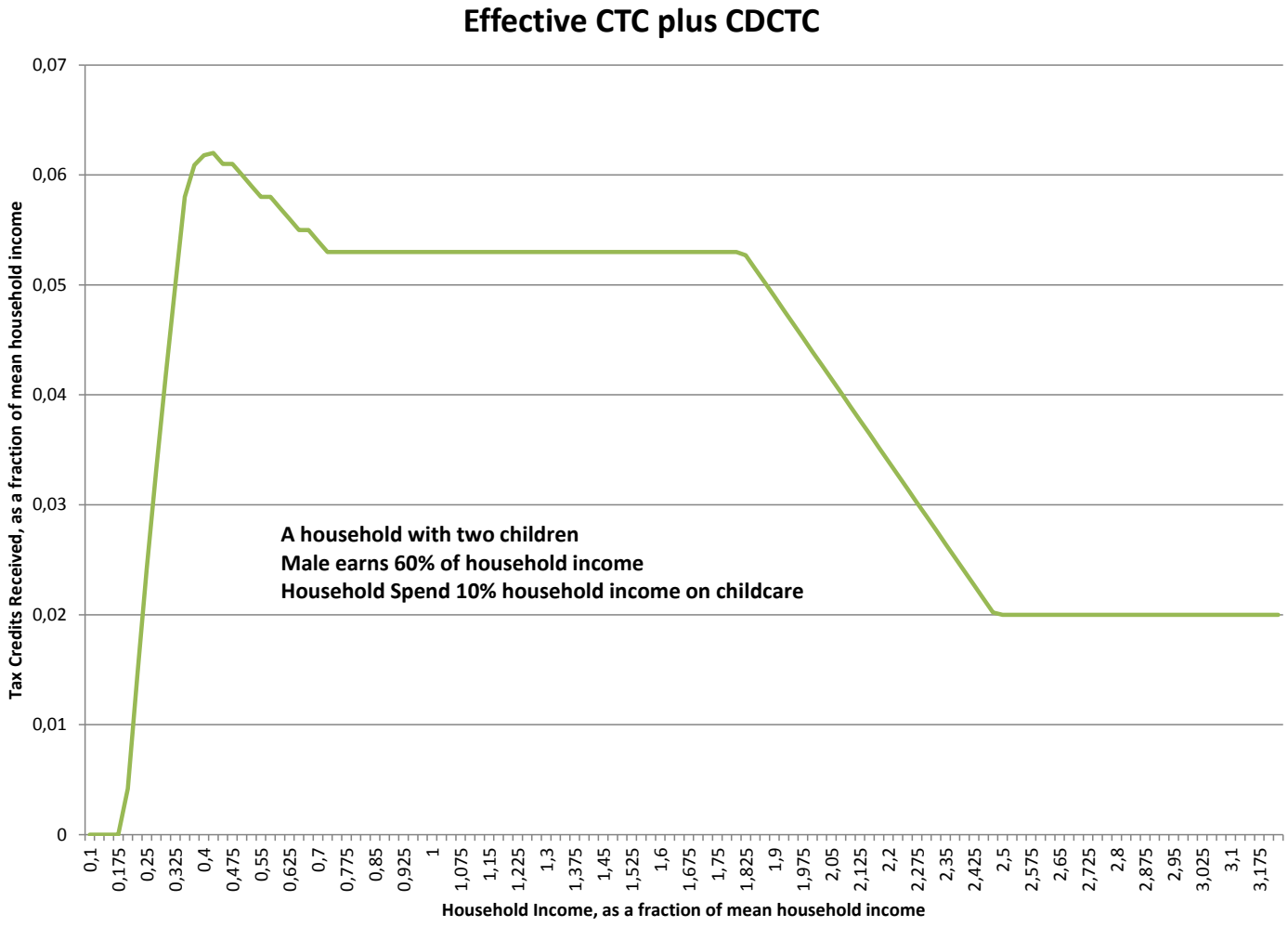
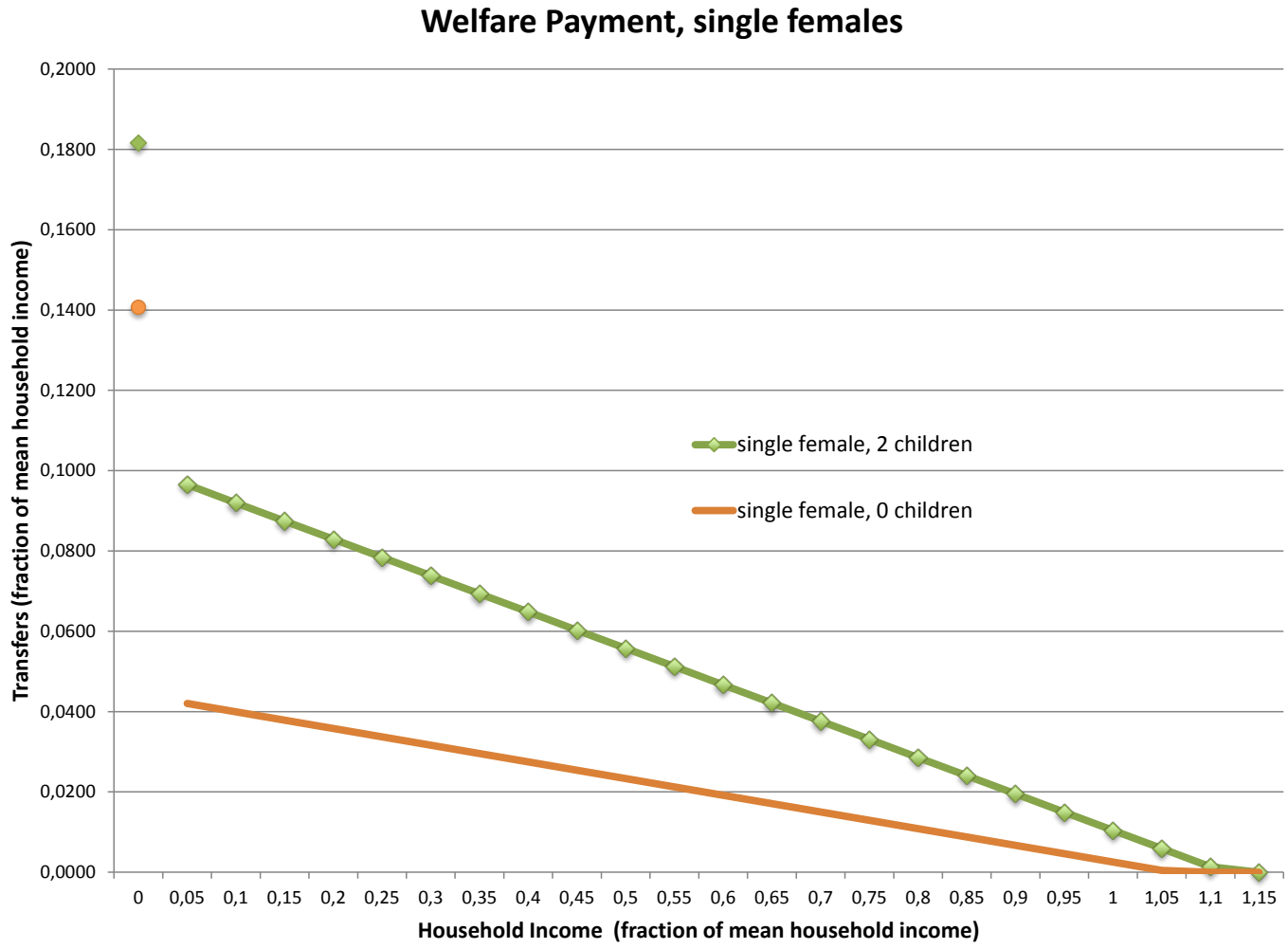
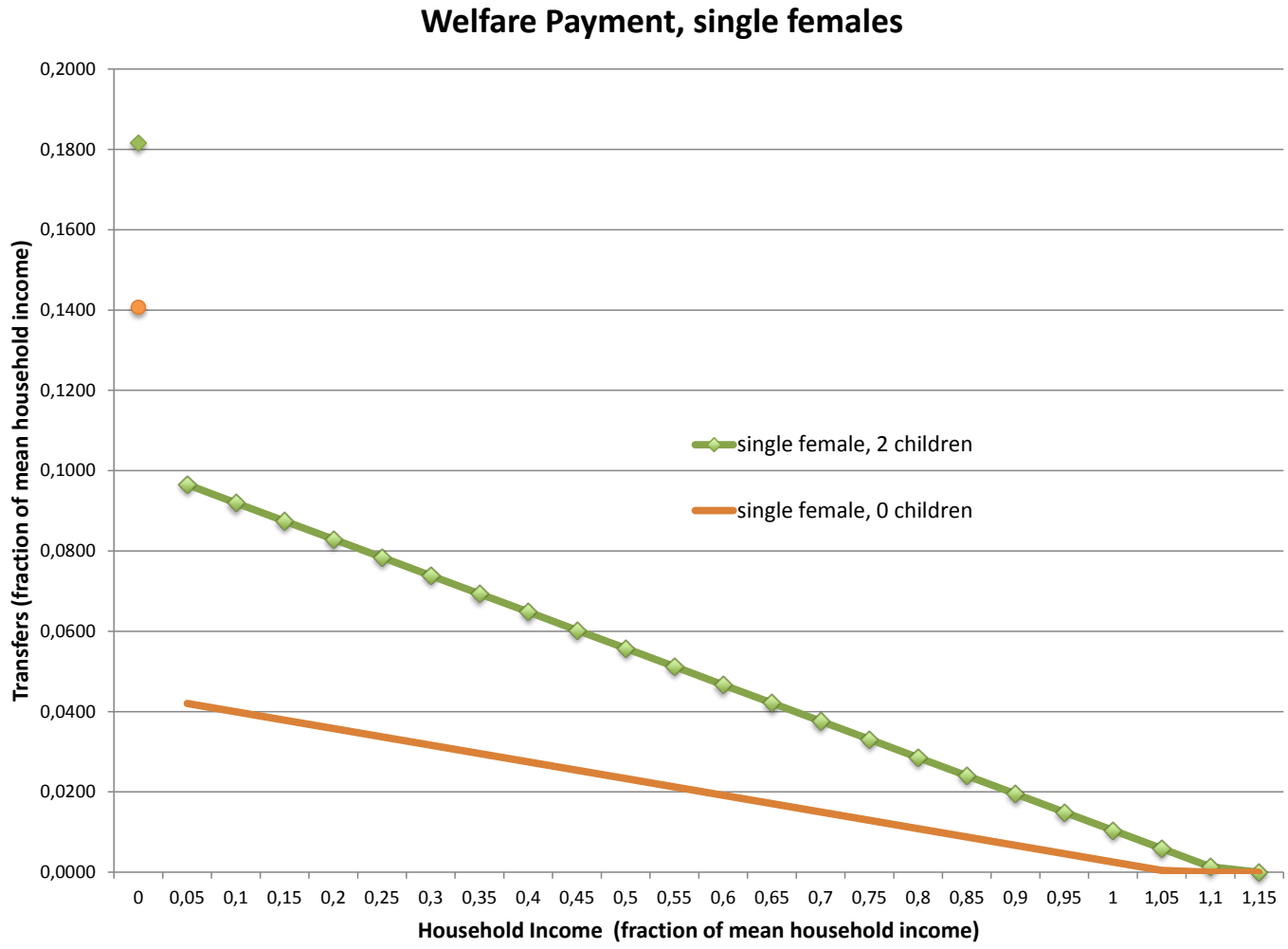
The CDCTC (fraction of mean household income)
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
0.1
0.35
0.6
0.85
1.1
1.35
1.6
1.85
2.1
2.35
2.6
2.85
3.1
Household Income (fraction of mean household income)

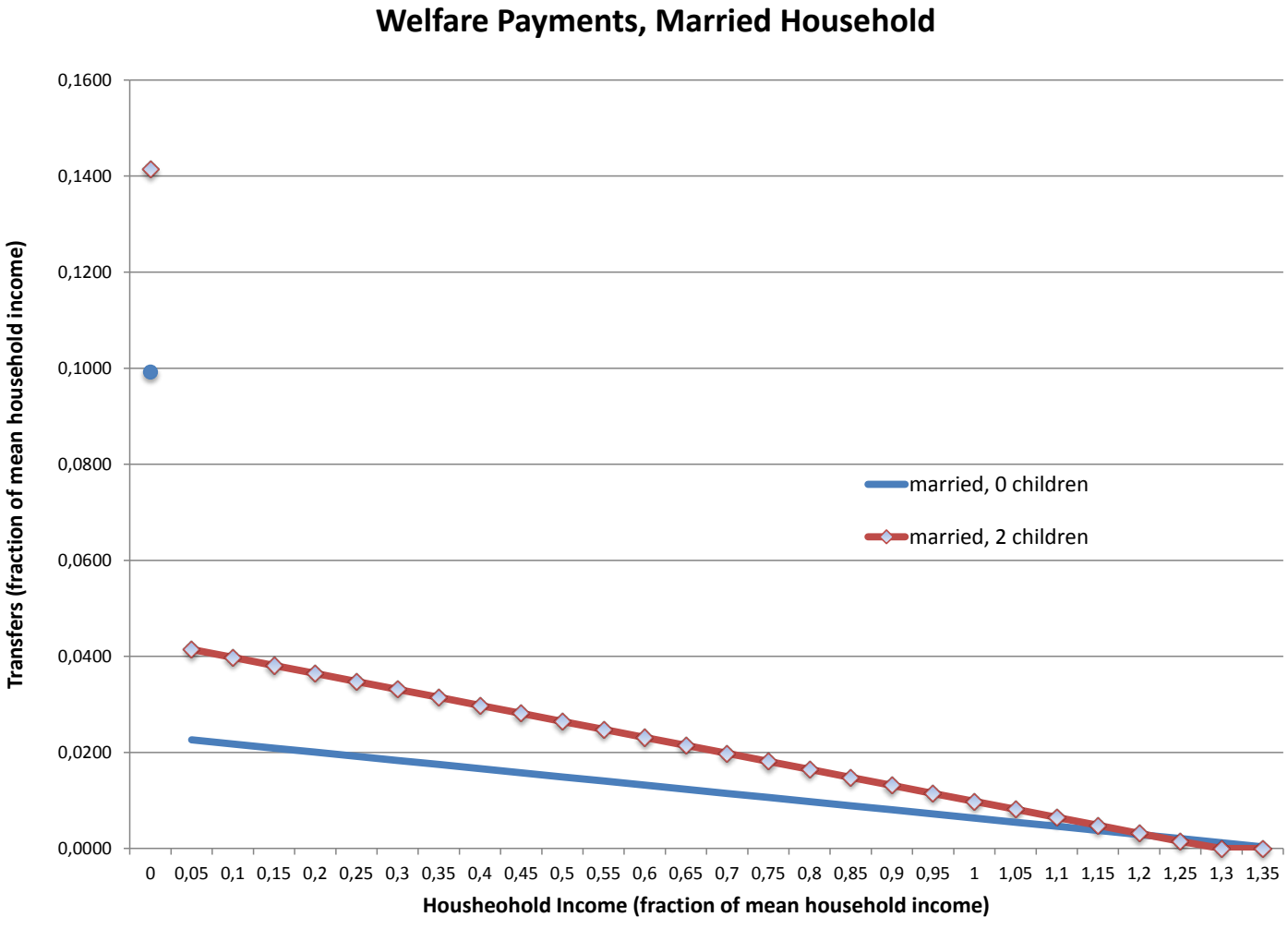

Fraction of Child Care Expenses Credited with the CDCTC
0.4
0.35
0.3
0.25
0.2
0.15
Fraction of Child Care Expenses Credited
CDCTC={Max. Credit, earnings(m),earnings(f), expenses}*rate
0.1
0.35
0.6
0.85
1.1
1.35
1.6
1.85
2.1
2.35
2.6
2.85
3.1
Household Income (fraction of mean household income)

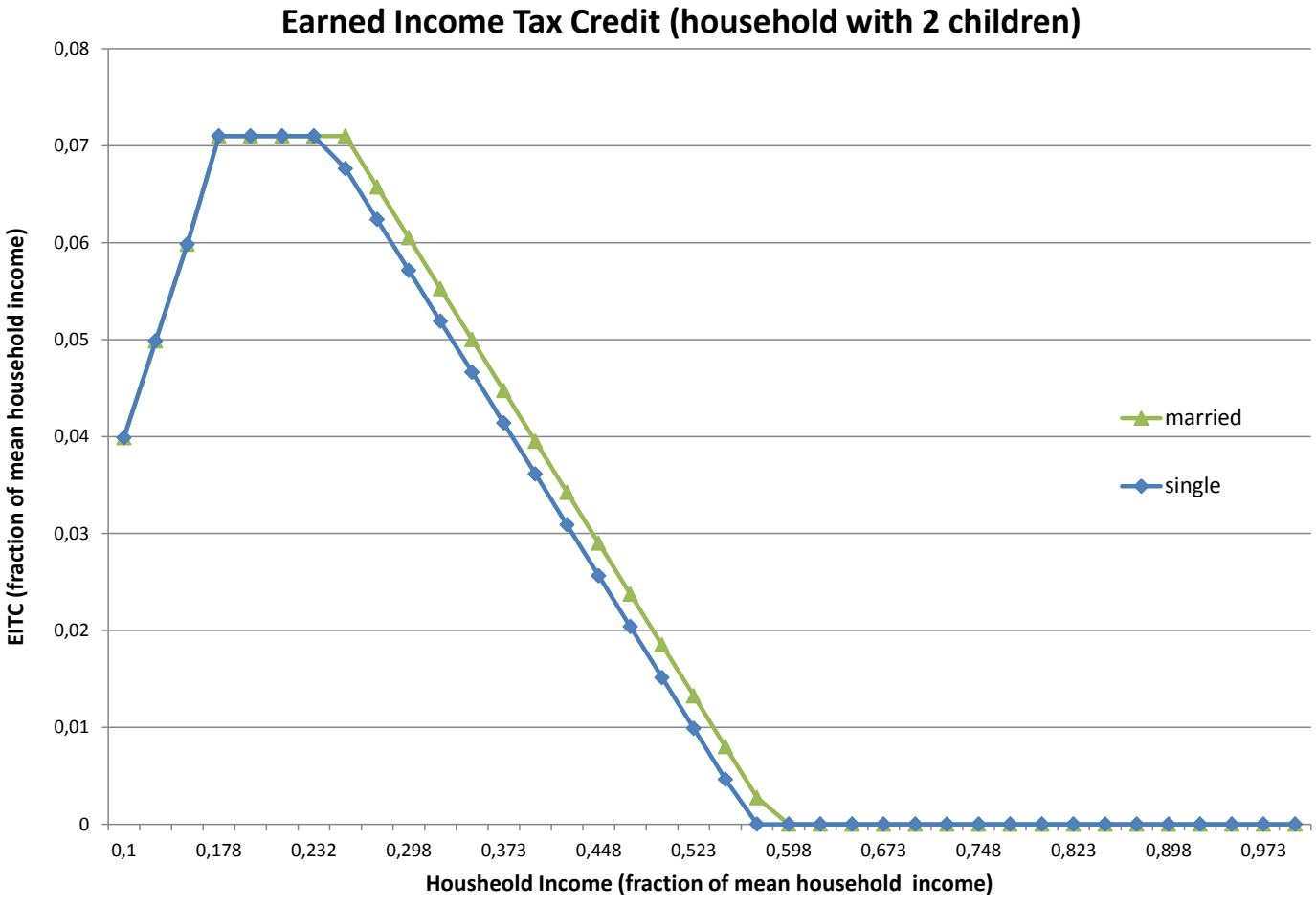

Potential Child Tax Credit (a household with 2 children)
CTC (fraction of mean household income)
0,035
0,03
0,025
0,02
0,015
0,01
0,005
0
0,1
0,35
0,6
0,85
1,1
1,35
1,6
1,85
2,1
2,35
2,6
2,85
3,1
Household Income (fraction of mean household income)


Effective CTC plus CDCTC
Tax Credits Received, as a fraction of mean household income
0,07
0,06
0,05
0,04
0,03
0,02
0,01
0
A household with two children
Male earns 60% of household income
Household Spend 10% household income on childcare
0,1
0,175
0,25
0,325
0,4
0,475
0,55
0,625
0,7
0,775
0,85
0,925
1
1,075
1,15
1,225
1,3
1,375
1,45
1,525
1,6
1,675
1,75
1,825
1,9
1,975
2,05
2,125
2,2
2,275
2,35
2,425
2,5
2,575
2,65
2,725
2,8
2,875
2,95
3,025
3,1
3,175
Household Income, as a fraction of mean household income


Welfare Payment, single females
0,2000
0,1800
0,1600
0,1400
0,1200
0,1000
0,0800
0,0600
0,0400
0,0200
0,0000
Transfers (fraction of mean household income)
single female, 2 children
single female, 0 children
0
0,05
0,1
0,15
0,2
0,25
0,3
0,35
0,4
0,45
0,5
0,55
0,6
0,65
0,7
0,75
0,8
0,85
0,9
0,95
1
1,05
1,1
1,15
Household Income (fraction of mean household income)


Welfare Payment, single females
0,2000
0,1800
0,1600
0,1400
0,1200
0,1000
0,0800
0,0600
0,0400
0,0200
0,0000
Transfers (fraction of mean household income)
single female, 2 children
single female, 0 children
0
0,05
0,1
0,15
0,2
0,25
0,3
0,35
0,4
0,45
0,5
0,55
0,6
0,65
0,7
0,75
0,8
0,85
0,9
0,95
1
1,05
1,1
1,15
Household Income (fraction of mean household income)


Welfare Payments, Married Household
Transfers (fraction of mean household income)
0,1600
0,1400
0,1200
0,1000
0,0800
0,0600
0,0400
0,0200
0,0000
married, 0 children
married, 2 children
0
0,05
0,1
0,15
0,2
0,25
0,3
0,35
0,4
0,45
0,5
0,55
0,6
0,65
0,7
0,75
0,8
0,85
0,9
0,95
1
1,05
1,1
1,15
1,2
1,25
1,3
1,35
Housheohold Income (fraction of mean household income)


Earned Income Tax Credit (household with 2 children)
EITC (fraction of mean household income)
0,08
0,07
0,06
0,05
0,04
0,03
0,02
0,01
0
0,1
0,178
0,232
0,298
0,373
0,448
0,523
0,598
0,673
0,748
0,823
0,898
0,973
Housheold Income (fraction of mean household income)
married
single

Quantitative Analysis – Preferences

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

- $\gamma = 0.4$ (based on available estimates)
- φ is calibrated to match the labor hours per worker.
- η is calibrated to match the LFP of married females with young (0 to 5) children.
- β is chosen to match capital-to-output ratio.
- q is assumed to be distributed according to a Gamma distribution
  - parameters are match LFP for married females, ages 25-54.

Quantitative Analysis - 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

Quantitative Analysis - Marital Sorting

- 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

Quantitative Analysis – Heterogeneity

Initial Productivity Levels, by Type and Gender

	males (z)	females (x)	x/z
$<$ HS	0.511	0.426	0.813
HS	0.668	0.542	0.811
SC	0.728	0.639	0.878
COL	1.039	0.809	0.779
COL+	1.287	1.065	0.828

Quantitative Analysis –Government

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

Tax Functions

Estimates	Married			Single		
	(no child)	(2 child.)	(3 child.)	(no child)	(2 child.)	(3 child.)
η_1	0.096	0.091	0.082	0.121	0.080	0.069
η_2	0.053	0.056	0.056	0.035	0.035	0.032

Quantitative Analysis – Social Security Benefits

	Single Males	Single Females
$<$ HS	1	0.858
HS	1.126	0.999
SC	1.184	1.050
COL	1.274	1.063
COL+	1.282	1.122

	Females				
Males	$<$HS	HS	SC	COL	COL+
$<$ HS	1.708	1.873	1.904	1.890	1.911
HS	1.870	1.989	2.042	2.065	2.095
SC	1.887	2.018	2.040	2.101	2.249
COL	1.912	2.140	2.196	2.224	2.321
COL+	2.091	2.149	2.234	2.300	2.365

Quantitative Analysis – Human Capital Accumulation

Labor Market Productivity Process for Females (α_J^x)

	Types				
Age	<HS	HS	SC	COL	COL+
25-29	0.038	0.114	0.194	0.213	0.254
30-34	0.041	0.086	0.125	0.140	0.157
35-39	0.042	0.063	0.077	0.091	0.095
40-44	0.044	0.044	0.038	0.053	0.048
45-49	0.045	0.027	0.003	0.020	0.007
50-54	0.046	0.012	-0.031	-0.010	-0.033
55-60	0.047	-0.003	-0.069	-0.042	-0.078

Expansion of the CDCTC

- Sharp differences between the previous exercises
  - flat rate subsidies versus transfers to all households with children that decline with income

- We consider an expansion of the CDCTC that captures elements of both programs.

- We construct a fully refundable, revenue neutral expansion of the CDCTC program that provides a mixture of childcare subsidies and transfers that decline with household income.

- Recall that *potential credit* $= min\ \{$*maximum credit*, $earnings_m$, earnings_f, *childcare expenditure*$\}$**rate*

- We multiply *rate* by a constant (5.75), and if the credit is higher than the childcare expenditure, the household gets a transfer

Figure: CTC, CDCTC expanded

Comparing Different Programs

- Calculate the subsidy and transfer for each program

Childcare Subsidies and Transfers in Policy Exercises

	Universal Subsidies		CTC Expan.		CDCTC Expan.	
Income deciles	Subs.(%)	Trans.	Subs. (%)	Trans.	Subs. (%)	Trans.
1st	75	0	0	0.11	100	0.07
2nd	75	0	0	0.10	100	0.06
3rd	75	0	0	0.09	90	0.04
4th	75	0	0	0.06	71	0.01
5th	75	0	0	0.06	52	0
6th	75	0	0	0.05	50	0
7th	75	0	0	0.04	42	0
8th	75	0	0	0.05	56	0
9th	75	0	0	0.05	49	0
10th	75	0	0	0.04	67	0.01

Expansion of the CDCTC (%)

Expansion of Tax Credits (%)

	Universal Subsidies (75%)	CTC Expansion	CDCTC Expansion
Participation Mar. Fem.	8.8	-2.4	5.2
Total Hours	1.4	-1.6	-0.1
Total Hours (MF)	7.1	-3.1	3.5
Hours per worker (f)	-1.3	-1.6	2.1
Hours per worker (m)	-1.2	-0.7	-1.5
Output	0.4	-1.2	-0.4
Tax Rate (%)	1.3	1.3	1.3

Expansion of the CDCTC (%)

Expansion of Tax Credits (%)

	Universal Subsidies (75%)	CTC Expansion	CDCTC Expansion
Effects on Participation:			
By Education			
$<$ HS	21.5	-3.8	21.6
HS	12.1	-1.8	10.5
SC	8.0	-2.1	5.2
COL	7.4	-0.9	3.5
COL+	4.7	-0.5	1.5
By Child Bearing Status			
Early	12.6	-2.6	9.4
Late	7.2	-1.0	4.1

Make the CTC and CDCTC fully refundable

Expansion of Tax Credits (%)

	Universal Subsidies (75%)	CTC Expansion	CDCTC Expansion	100% Refundability
Participation Mar. Fem.	8.8	-2.4	5.2	-0.8
Total Hours	1.4	-1.6	-0.1	-0.4
Total Hours (MF)	7.1	-3.1	3.5	-0.9
Hours per worker (f)	-1.3	-1.6	2.1	-0.3
Hours per worker (m)	-1.2	-0.7	-1.5	-0.2
Output	0.4	-1.2	-0.4	-0.1
Tax Rate (%)	1.3	1.3	1.3	0.2

Welfare

Welfare Effects (Newborns)

	Universal Subsidies (75%)	CTC Expansion	CDCTC Expansion
Single F			
No Children	-1.58	-1.51	-1.55
Early	3.99	10.41	15.32
Late	3.43	8.05	12.37
$<$ HS	1.47	16.32	11.91
HS	2.20	9.17	10.86
SC	2.20	5.44	10.00
COL	1.19	1.96	5.49
COL+	0.63	0.61	3.19

Welfare

Welfare Effects (Newborns)

	Universal Subsidies (75%)	CTC Expansion	CDCTC Expansion
Married			
No Children	-3.51	-3.36	-3.45
Early	2.71	3.87	3.74
Late	0.71	2.29	1.52
All Newborns	0.66	2.02	2.31

Welfare

Welfare Effects (Newborn Married Households)

	Universal Subsidies (75%)					CTC Expansion				
	Females					Females				
Males	<HS	HS	SC	COL	COL+	<HS	HS	SC	COL	COL+
<HS	0.36	2.90	3.55	4.06	5.42	12.59	9.93	7.20	4.02	2.64
HS	0.10	1.54	2.13	3.04	5.41	6.97	4.04	3.27	2.04	1.10
SC	0.28	1.06	1.80	2.36	3.34	5.21	2.82	2.66	1.16	0.22
COL	-1.06	-0.34	0.09	0.30	1.32	2.88	1.20	0.99	-0.19	-0.44
COL+	-2.29	-1.68	-1.21	-0.62	-0.17	0.21	0.09	0.22	-0.27	-1.22

Welfare

Welfare Effects

	Universal Subsidies (75%)	CTC Expansion	CDCTC Expansion
Age			
25-29	0.66	2.02	2.31
30-34	0.18	1.13	1.42
35-39	-1.04	-0.29	-0.16
40-44	-2.13	-1.90	-1.94
45-49	-2.44	-2.28	-2.38
50-54	-2.19	-2.03	-2.13
All	-1.01	-0.47	-0.40
(%) Winners	13.3	12.55	10.90
Steady States:			
Newborns	0.71	1.94	2.30
(%) Winners	45.9	38.01	32.88

Robustness

- *Redo* everything keeping male hours at the benchmark level
- *Redo* everything under a closed economy assumption
- Consider a production function where skills are not fully substitutable
  - Consumption and investment goods are produced according to

$$Y = F(K, S, U) = K^{\alpha} L_g^{1-\alpha}$$

with

$$L_g \equiv \left(\nu S^{\rho} + (1-\nu) U^{\rho}\right)^{\frac{1}{\rho}}, \quad \rho \in (-\infty, 1)$$

  - *Recalibrate* the benchmark economy and *redo* everything.

Robustness - Male Hours

Policy Experiments Under
Fixed Labor Supply of Males ((%)

	Universal Subsidies (75%)	CTC Expansion	CDCTC Expansion
Participation Married Females	8.5	-1.1	4.9
Total Hours	1.7	-1.1	0.5
Total Hours (MF)	6.6	-1.6	3.5
Hours per worker (f)	-1.3	-1.3	-1.8
Output	1.5	-0.3	0.9
Tax Rate (%)	1.0	1.0	1.0

Robustness - Closed Economy

Policy Experiments in a Closed Economy (%)

	Universal Subsidies (75%)	CTC Expansion	CDCTC Expansion
Participation Married Females	8.9	-2.0	4.9
Total Hours	1.4	-1.4	0.1
Total Hours (MF)	7.2	-2.7	3.6
Hours per worker (f)	-1.3	-1.6	-1.8
Output	0.2	-1.4	-0.6
Tax Rate (%)	1.2	1.2	1.2

Robustness - Imperfect Skill Substitutability

Policy Experiments Under Imperfect Skill Substitutability (%)

	Universal Subsidies (75%)	CTC Expansion	CDCTC Expansion
Participation Married Females	8.5	-2.3	4.4
Total Hours	1.4	-1.6	-0.1
Total Hours (MF)	6.8	-3.0	2.9
Hours per worker (f)	-1.1	-1.9	-1.9
Output	0.6	-1.1	-0.2
Skill Premium	-0.2	0.8	0.3
Tax Rate (%)	1.2	1.2	1.2

Related Literature

- Heckman (1974), Hotz and Miller (1988), Blau and Hagy (1998): the effect of childcare costs on female labor supply
- Attanasio, Low and Sanchez-Marcos (2008): reduction in child care costs and the rise of female labor supply.
- Bick (2016): childcare subsidies have quantitatively significant effects on female labor supply.
- Domeij and Klein (2013): optimality of childcare subsidies in life-cycle economies. They compute the welfare-maximizing level of childcare subsidies for German economy.
- Rogerson (2007) – use of tax revenue to finance government transfers of service sector goods that are tied to female work

Quantitative Analysis – Government

- Estimate effective tax functions from micro tax data - Guner, Kaygusuz and Ventura (2014)

- 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.