Low-Income Families, Maternal Labor Supply, and Welfare Reform

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Motivation

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- Low-income married couples with children:
  - 61% participation by married mothers
  - 95% participation by married fathers
- Low-income families: Adding second income of secondary earner will often push the couple out of eligibility region for means-tested transfers
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  - 95% participation by married fathers
- Low-income families: Adding second income of secondary earner will often push the couple out of eligibility region for means-tested transfers
- Formal child care can be very expensive and disallow dual-earner families
- Are there easily implementable reforms within the current tax-transfer system that can alleviate participation costs for secondary earners?

This Paper

- Build a dynamic structural life-cycle model where married couples with children face uninsurable idiosyncratic labor market and child care cost risk
- Extensive and intensive margin of labor supply; Consumption-saving choice; Female human capital; Implement U.S. tax-transfer system in great detail

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- Calibrate model using 2018-2020 CPS data and quantify participation costs
- Main findings on mothers' employment:
  - Expanding tax credits for child care expenditures: +6.2pp
  - Introducing a secondary-earner EITC deduction: +6.0pp
  - Joint reform: +12.7pp
- Reforms are self-financing (Female human capital matters!) and increase welfare

Literature

Theoretical and quantitative:

- Hannusch (2022), Guner, Kaygusuz and Ventura (2020,2023), Borella, de Nardi and Yang (2023), Ortigueira and Siassi (2022), Bick and Fuchs-Schündeln (2017,2018), Bick (2016)

Empirical:

- Blundell, Costa-Dias, Meghir and Shaw (2016), Eissa and Hoynes (2004), Meyer (2010), Blundell and Shephard (2011), Chetty, Friedman and Saez (2013)

Demographics

- Time is discrete
- Population of interest: Married couples with 1, 2 or 3 dependent children
- Life cycle: $s = \underbrace{1, \ldots, 47}_{\text{Working age}}, \underbrace{48, \ldots, 62}_{\text{Retirement}}$
- Couples enter with newborn child at biological age of 20 (s=1) and die together for certain at an age of 82

Fertility Process

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- Life cycle: $s = \underbrace{1, \ldots, 47}_{\text{Working age}}, \underbrace{48, \ldots, 62}_{\text{Retirement}}$
- Couples enter with newborn child at biological age of 20 (s=1) and die together for certain at an age of 82
- Two exogenous stochastic fertility draws, at $\tilde{s}_1 = 4$ and $\tilde{s}_2 = 9$
- Children live with their parents until they reach age 18, at which they leave the household and can no longer be claimed as dependents
- Retired couples receive benefit b

Fertility Process

Preferences

$$U(c, l_f, l_m; k) = \frac{\left(\frac{c}{\psi(k)}\right)^{1-\sigma} - 1}{1-\sigma} + \varphi \frac{(1-l_f)^{1-\zeta} - 1}{1-\zeta} - \nu_f \mathbb{1}_{l_f>0} - \nu_m \mathbb{1}_{l_m>0}$$

- Couple decides together on consumption c, hours worked of female l_f and of male l_m
- Equivalence scales $\psi(k)$ to account for household size depending on composition of children k

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- Couple decides together on consumption c, hours worked of female l_f and of male l_m
- Equivalence scales $\psi(k)$ to account for household size depending on composition of children k
- We model labor supply:
  - Females: Intensive and extensive margin
  - Males: Extensive margin (Data: Less than 10% work part time)
- Can save in risk-free asset a at exogenous interest rate r

Earnings

- Couple's labor income:

$$e \equiv h l_f z_f w + \omega(s) l_m z_m w,$$

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$$h' = D(h, l_f) = \exp\left[\ln(h) + \alpha \mathbb{1}(l_f > 0) - \delta(1 - \mathbb{1}(l_f > 0))\right]$$

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- Males: deterministic age-specific component $\omega(s)$
- For each individual, labor productivity depends on an idiosyncratic stochastic component z, where

$$\ln z'_g = \ln z_g + \epsilon, \qquad \text{with } \epsilon \sim N(0, \sigma^2_{\epsilon,g}),\ g \in \{f, m\}$$

- Exogenous wage per efficiency unit, w, constant over time

Child Care Costs

Child Care Costs

- Child care cost function:

$$\Gamma(l_f, l_m, k, \eta) = \max\{\eta, 0\} \times \mathbb{1}_{\{l_m>0 \wedge l_f>0\}}$$

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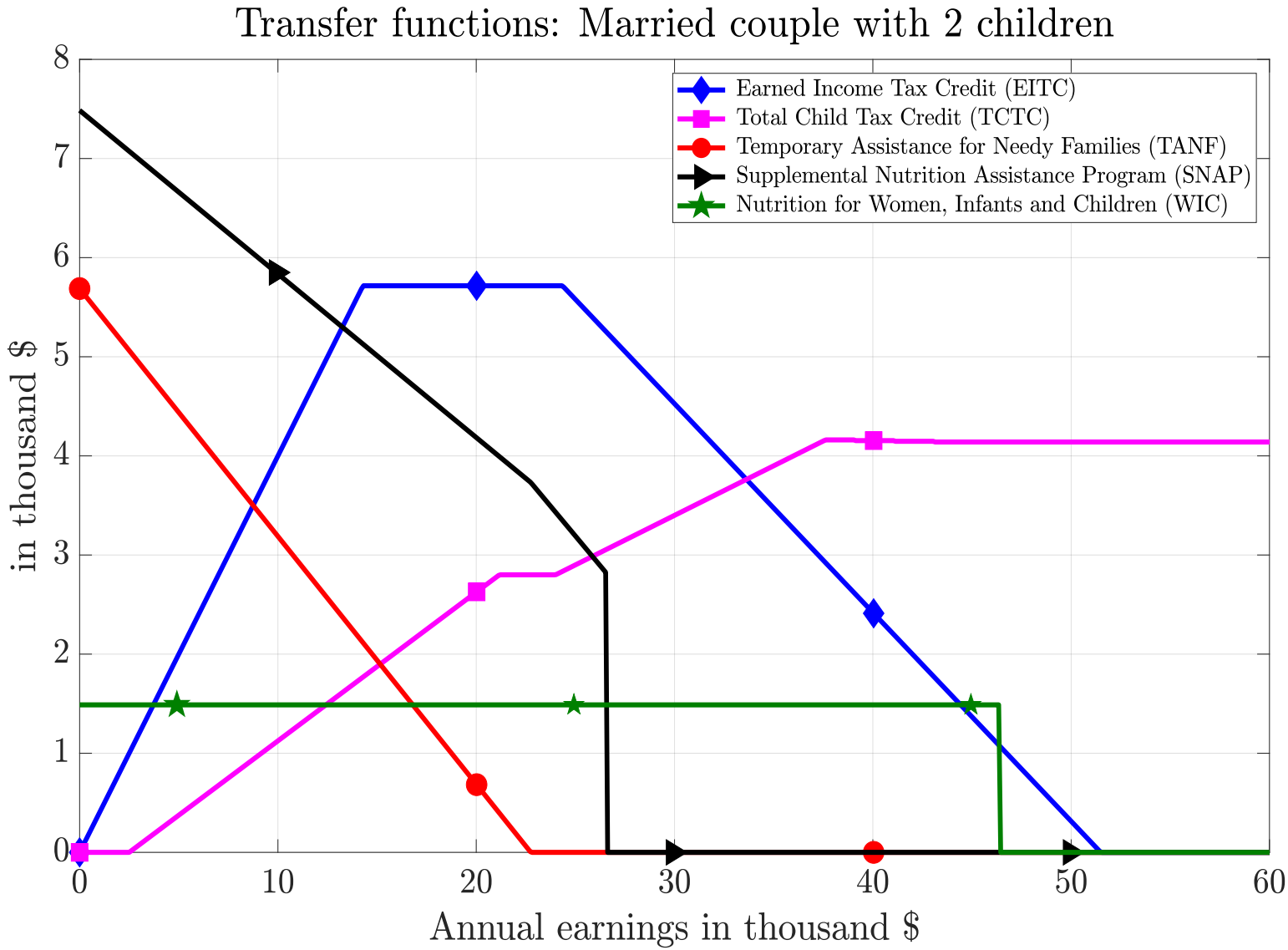
- $\eta \sim N(\mu_i, \sigma_i)$ with prob ν_i, and is set to zero with prob $1 - \nu_i$
- Distinguish between families with
  - At least one child below the age of 5 ($i = y$)
  - Youngest child between 5 and 12 years of age ($i = o$)
- Redraw η when: (i) A child is born; (ii) A child in the household turns 5

Taxes and Transfers

- We include these U.S. tax-transfer programs:
  1. Income and payroll taxes
  2. Earned Income Tax Credit (EITC)
  3. Child Tax Credit (CTC)
  4. Child and Dependent Care Tax Credit (CDCTC)
  5. Temporary Assistance for Needy Families (TANF)
  6. Supplemental Nutrition Assistance Program (SNAP)
  7. Supplemental Nutrition Program for Women, Infants and Children (WIC)

- Embed them in great detail, including all the kinks and non-convexities
- Net transfer function $TT(a, e, l_f, l_m, k, \eta)$



Net transfer function

Bellman equations for couples with children

$$v^s(a, z_f, z_m, h, k, \eta) = \max_{c, l_f, l_m, a'} \left\{ U(c, l_f, l_m; k) + \beta \mathbb{E}\Big[v^{s+1}(a', z_f', z_m', h', k', \eta') \Big] \right\}$$

subject to

$$c + \Gamma(l_f, l_m, k, \eta) + a' = e + (1 + r)a + TT(a, e_f, e_m, k, \eta),$$

$$e = h z_f w l_f + \omega(s) z_m w l_m,$$

Laws of motion for h', z_f', z_m', k' and η',

$l_f \in [0, 1]$, $l_m \in \{0, \bar{l}\}$, and $a' \geq 0$.

Data

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- Married couples without a college degree and with one to three children
- After sample selection: 6,048 married couples

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	Mothers	Fathers
Employment rate	60.6%	94.8%
Avg annual hours worked*	1,718	2,125
Avg annual earnings* ($)	30,311	49,119
Avg hourly wages* ($)	16.56	21.48

* Conditional on working.

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- Targets: Employment rates, hours worked, hourly earnings, evolution of wages by age, child care expenditures, wealth

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Table 3: Model fit– Employment and earnings

	Data	Model		Data	Model
A. Mothers' employment (%)					
1 child	67.60	66.06	y children†	53.09	53.89
2 children	60.51	60.24	o children†	65.42	65.39
3 children	50.80	39.69			

Notes: † Here, y refers to couples with at least one small child (between 0 and 4 years), and o refers to couples with children who are all at least 5 years old. All statistics for earnings are conditional on working.

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3 children	50.80	39.69			
B. Earnings ($)					
Mothers			Fathers		
Average	29,886	29,554	Average	49,119	44,409
p25	16,495	16,808	p25	29,109	31,767
p75	39,289	38,348	p75	61,910	54,651
Households					
Average	64,954	60,008			
p25	36,000	40,692			
p75	85,000	75,642			

Notes: † Here, y refers to couples with at least one small child (between 0 and 4 years), and o refers to couples with children who are all at least 5 years old. All statistics for earnings are conditional on working.

Table 4: Model fit– Child care costs

	At least one child under 5		All children aged 5-12	
	Data	Model	Data	Model
Share paying child care* (%)	38.1		17.7	
Child care paid† ($)				
Average*	7,054		4,519	
Median	5,206		3,068	
p25	3,000		1,293	
p75	9,395		5,893	

* Calibration target. † Conditional on paying child care.

▸ Elasticities

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	Data	Model	Data	Model
Share paying child care* (%)	38.1	37.3	17.7	17.3
Child care paid† ($)				
Average*	7,054	7,025	4,519	4,323
Median	5,206	5,000	3,068	4,000
p25	3,000	3,000	1,293	1,000
p75	9,395	9,000	5,893	6,000

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(Dis-)Incentives for Employment

- Participation tax rate for secondary earner:

$$PTR = \frac{TT(a, e_f, e_m, k, \eta) - TT(a, 0, e_m, k, \eta)}{e_f}$$

  as induced by the design of the tax-transfer system (higher taxes, lower transfers)

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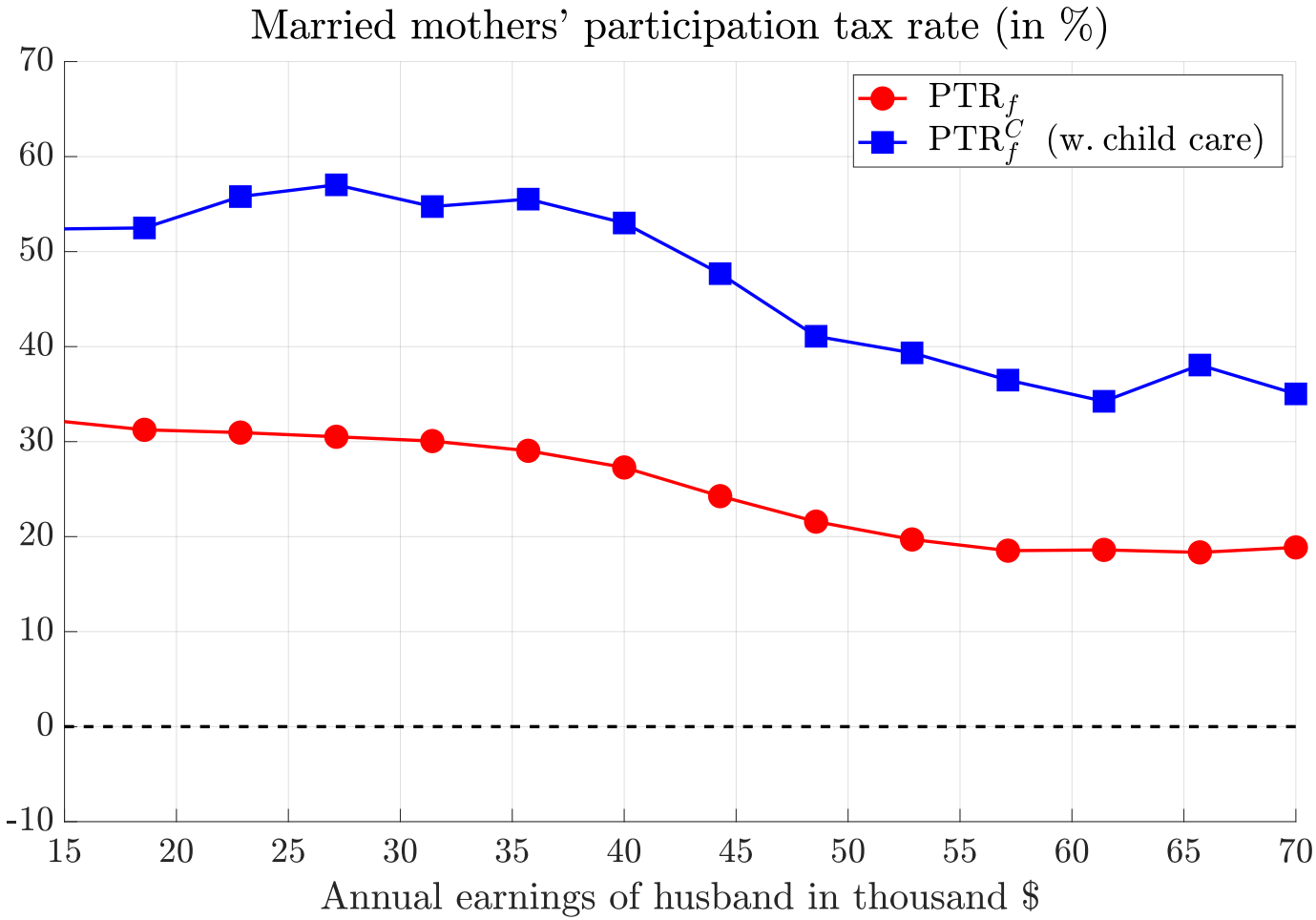
- To measure actual participation cost, add child care costs:

$$PTR_{ccc} = \frac{TT(a, e_f, e_m, k, \eta) - TT(a, 0, e_m, k, \eta) + \Gamma(l_f, l_m, k, \eta)}{e_f}$$

(Dis-)Incentives for Employment



Average participation tax rate: 24.8 %

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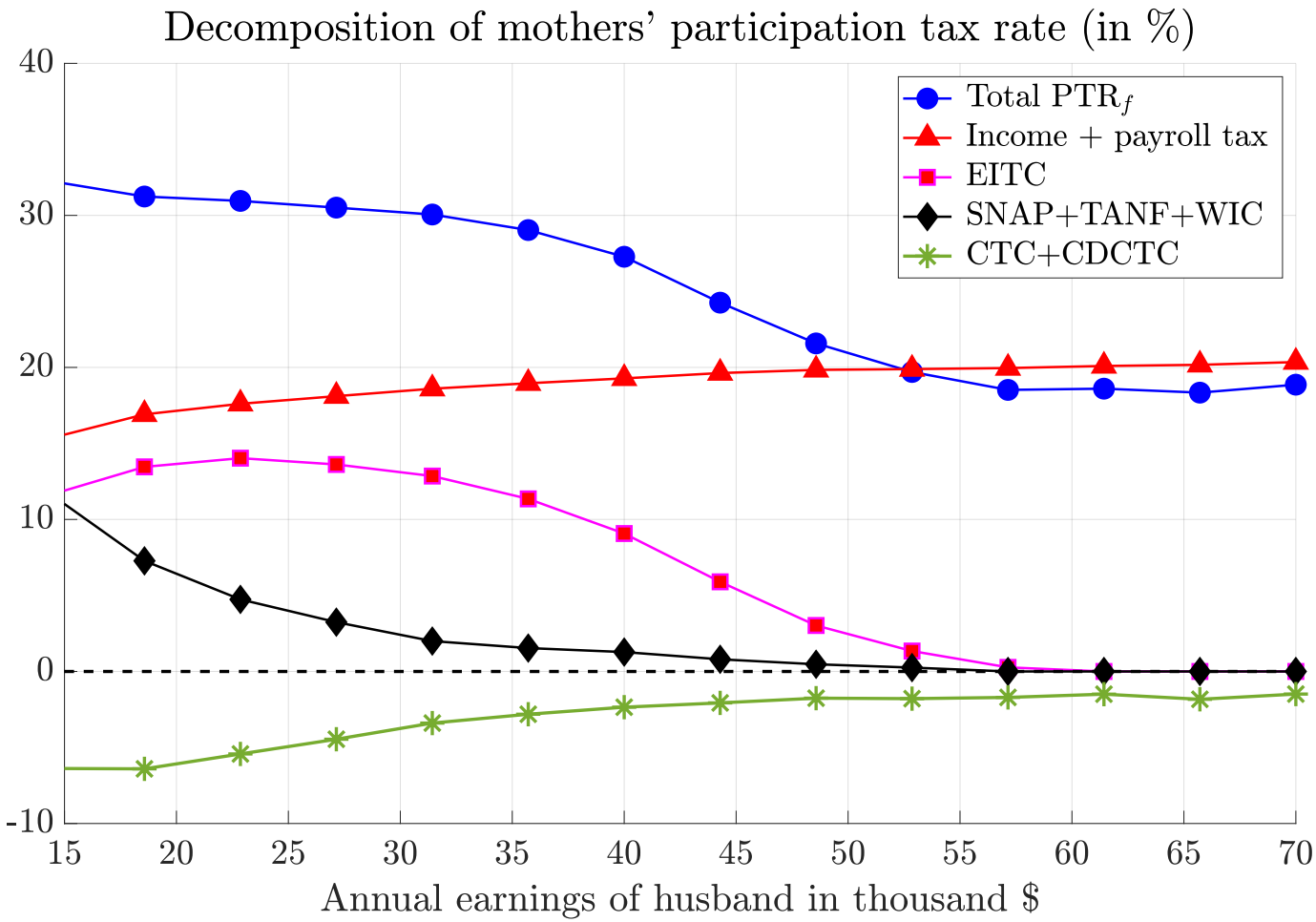

▸ Numbers

Policy Analysis

- **R1: Full deductibility of child care costs**
  - Child and Dependent Care Tax Credit (CDCTC)
  - Benchmark: 20-35% of child care costs (upper limit 6000 $) are deductible
  - Reform: 100% of child care costs (no upper limit) are deductible

Policy Analysis

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- **R2: Secondary-earner deduction**
  - Earned Income Tax Credit (EITC)
  - Benchmark: Family income is considered for eligibility/credit
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  - Reform: Discard secondary earner's income for eligibility/credit
- **R3: Combination of R1 and R2**

R1: Expanding Child Care Tax Credit

Table 7a: Full deductibility of child care expenses through CDCTC

	Bench	Reform			
Mothers' employment (%)	60.8	67.0			
y children (0-4)	53.9	64.1			
o children (5-18)	65.4	68.9			
1 child	66.1	71.7			
2 children	60.2	66.5			
3 children	39.7	48.3			

* Includes SNAP, TANF and WIC.

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3 children	39.7	48.3			
Fathers' employment (%)	94.8	95.8			
Dual-earner couples (%)	55.6	62.8			
Mothers' avg hours	1,700	1,725			
Household earnings ($)	60,008	62,829			
Mothers' avg wage ($)	16.3	16.7			
Gender wage gap (%)	23.5	21.6			

* Includes SNAP, TANF and WIC.

R1: Expanding Child Care Tax Credit

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Mothers' employment (%)	60.8	67.0	CDCTC recip (%)	10.9	17.4
y children (0-4)	53.9	64.1	CDCTC per HH ($)	666	4,881
o children (5-18)	65.4	68.9	EITC recip (%)	34.9	30.6
1 child	66.1	71.7	EITC per HH ($)	2,604	2,670
2 children	60.2	66.5	SNAP* recip (%)	20.4	18.0
3 children	39.7	48.3	SNAP* per HH ($)	1,411	1,471
Fathers' employment (%)	94.8	95.8	Taxes paid per HH ($)	9,110	9,307
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Fathers' employment (%)	94.8	95.8	Taxes paid per HH ($)	9,110	9,307
Dual-earner couples (%)	55.6	62.8	Average PTR (%)	24.8	20.9
Mothers' avg hours	1,700	1,725	Paying child care *y* (%)	37.3	50.5
Household earnings ($)	60,008	62,829	Paying child care *o*(%)	17.3	22.2
Mothers' avg wage ($)	16.3	16.7	Avg child care *y* ($)	7,025	8,832
Gender wage gap (%)	23.5	21.6	Avg child care *o* ($)	4,323	4,934

* Includes SNAP, TANF and WIC.

R2: Expanding Earned Income Tax Credit

Table 7b: Secondary-earner deduction for EITC

	Bench	Reform		Bench	Reform
Mothers' employment (%)	60.8	66.8			
y children (0-4)	53.9	59.6			
o children (5-18)	65.4	71.7			
1 child	66.1	70.3			
2 children	60.2	67.4			
3 children	39.7	50.8			
Fathers' employment (%)	94.8	95.8			
Dual-earner couples (%)	55.6	62.6			
Mothers' avg hours	1,700	1,684			
Household earnings ($)	60,008	61,499			
Mothers' avg wage ($)	16.3	16.1			
Gender wage gap (%)	23.5	23.8			

* Includes SNAP, TANF and WIC.

R2: Expanding Earned Income Tax Credit

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	Bench	Reform		Bench	Reform
Mothers' employment (%)	60.8	66.8	CDCTC recip (%)	10.9	14.6
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o children (5-18)	65.4	71.7	EITC recip (%)	34.9	58.0
1 child	66.1	70.3	EITC per HH ($)	2,604	2,789
2 children	60.2	67.4	SNAP* recip (%)	20.4	17.2
3 children	39.7	50.8	SNAP* per HH ($)	1,411	1,357
Fathers' employment (%)	94.8	95.8	Taxes paid per HH ($)	9,110	9,098
Dual-earner couples (%)	55.6	62.6	Average PTR (%)	24.8	18.1
Mothers' avg hours	1,700	1,684	Paying child care *y* (%)	37.3	44.3
Household earnings ($)	60,008	61,499	Paying child care *o*(%)	17.3	19.6
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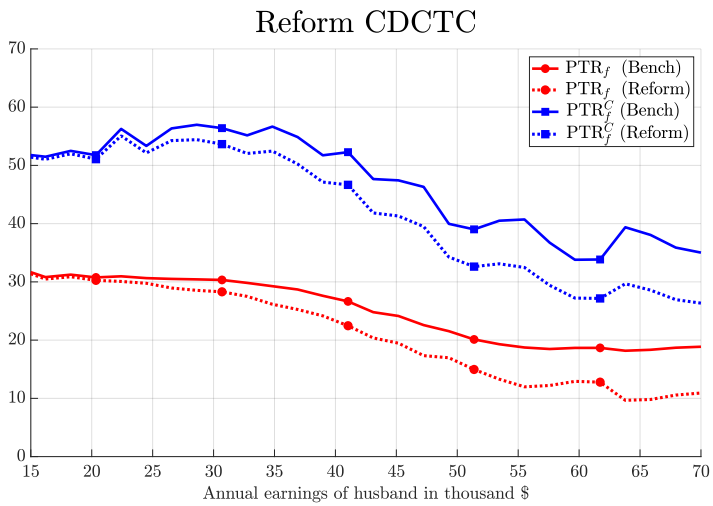
Participation tax rate (in %)



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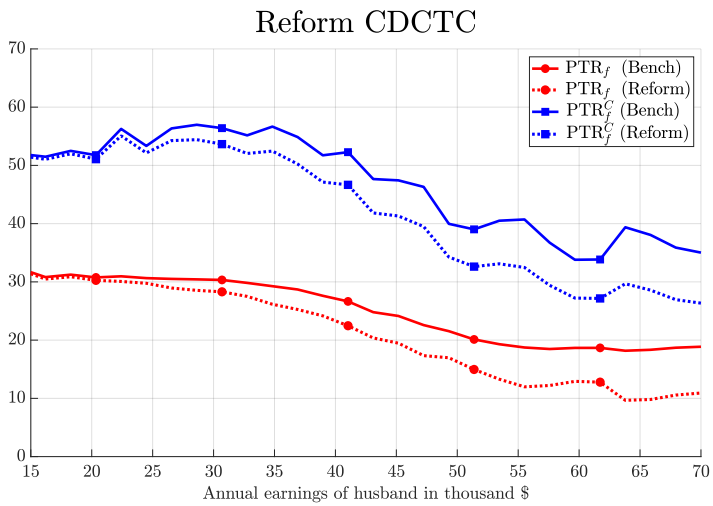
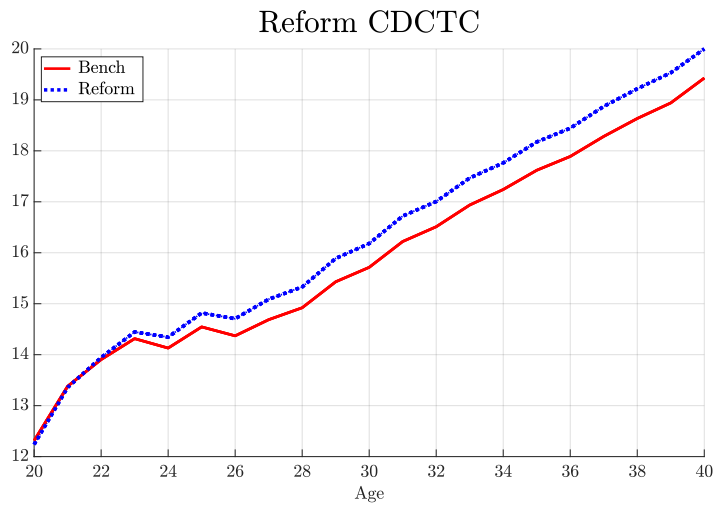
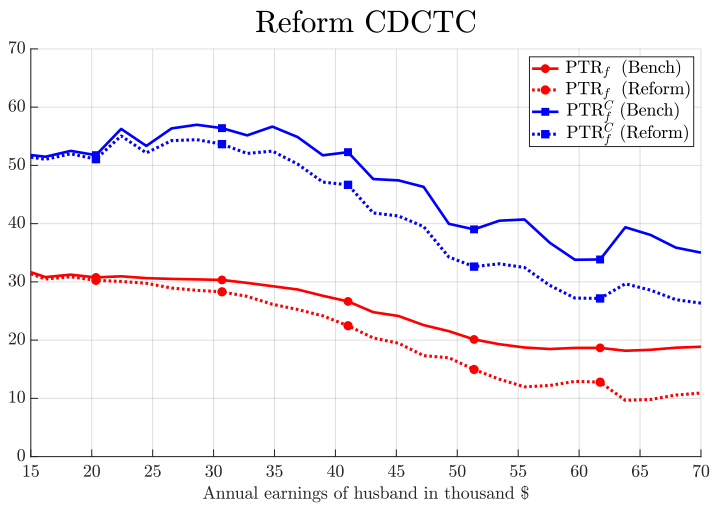
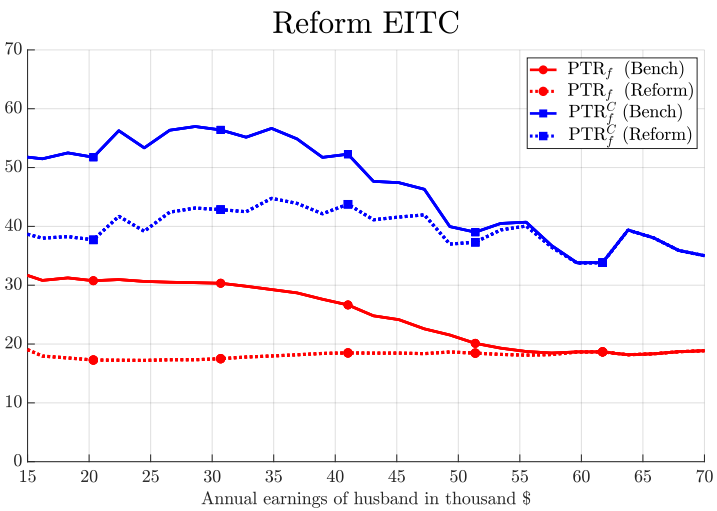


Hourly wage (in $)



Participation tax rate (in %)





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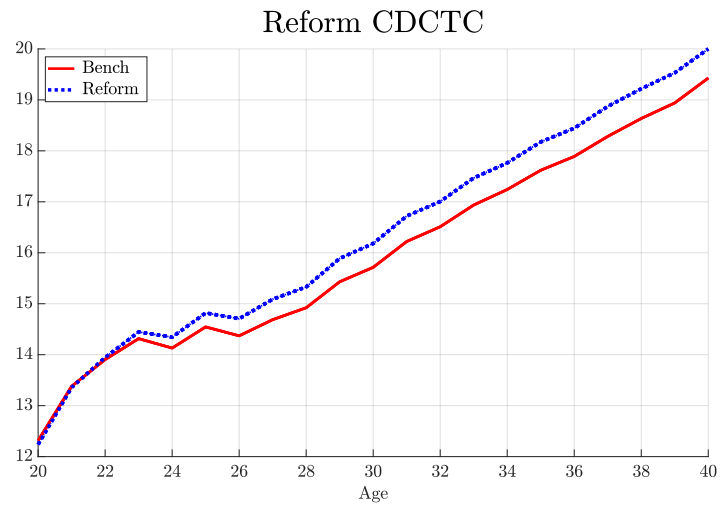
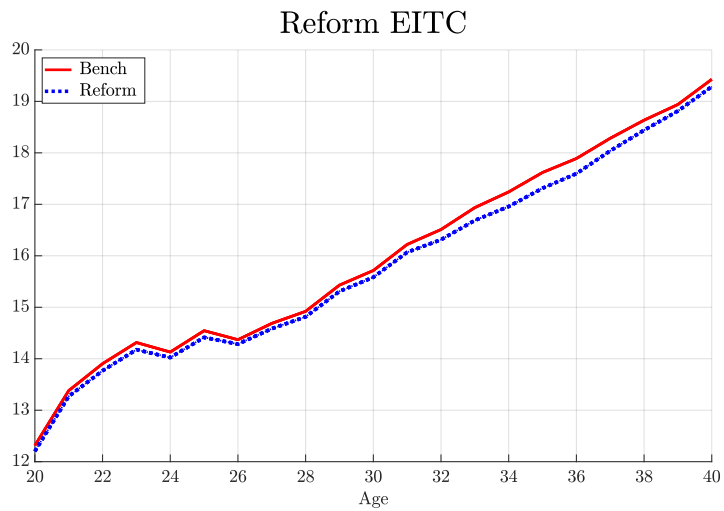


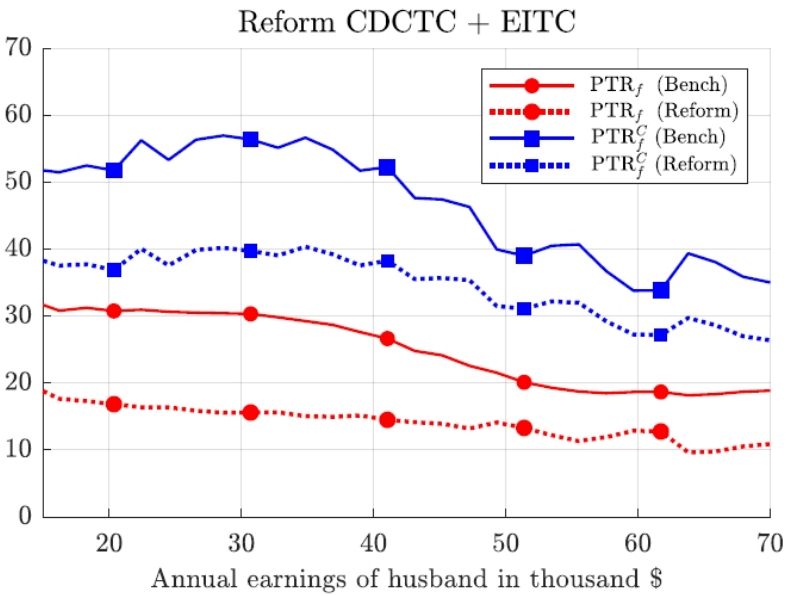


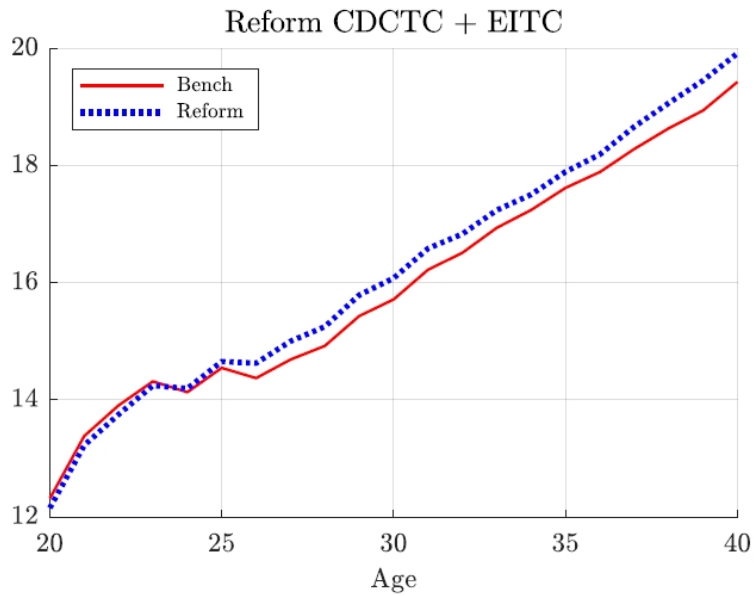
R3: Combined Reform

Table 7: Policy Analysis

	Benchmark	Reform		
		CDCTC	EITC	Both
Mothers' employment (%)	60.8	67.0	66.8	73.5
y children (0-4)	53.9	64.1	59.6	70.8
o children (5-18)	65.4	68.9	71.7	75.3
Fathers' employment (%)	94.8	95.8	95.8	96.5
Dual-earner couples (%)	55.6	62.8	62.6	70.0
Mothers' avg wage ($)	16.3	16.6	16.1	16.5
Gender wage gap* (%)	23.5	21.6	23.8	22.0
Average PTR (%)	24.8	20.9	18.1	14.4
Taxes paid per HH ($)	9,110	9,307	9,098	9,287

* CDCTC: Full deductibility of child care costs. EITC: Secondary-earner deduction.



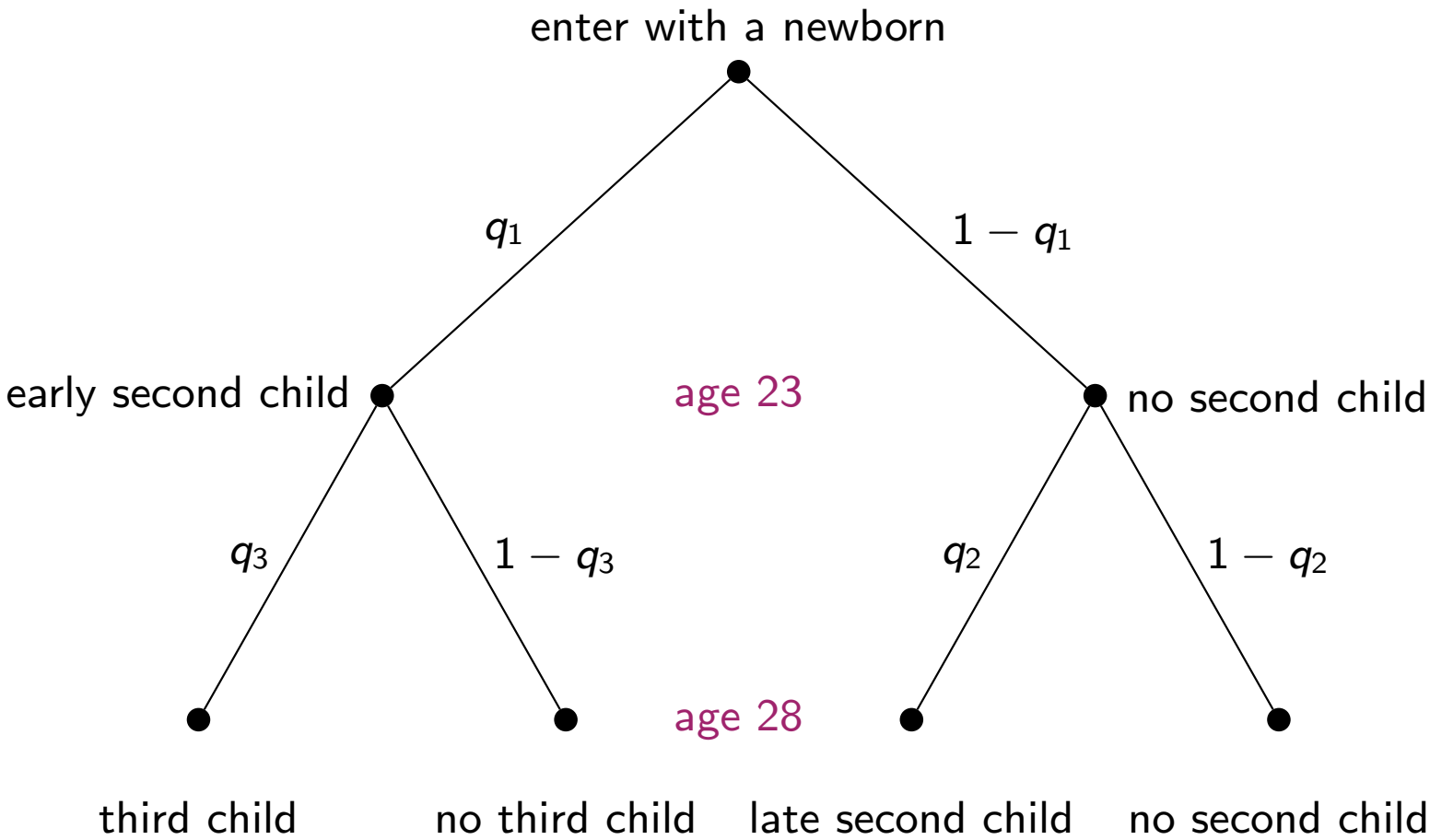


▸ Welfare Analysis

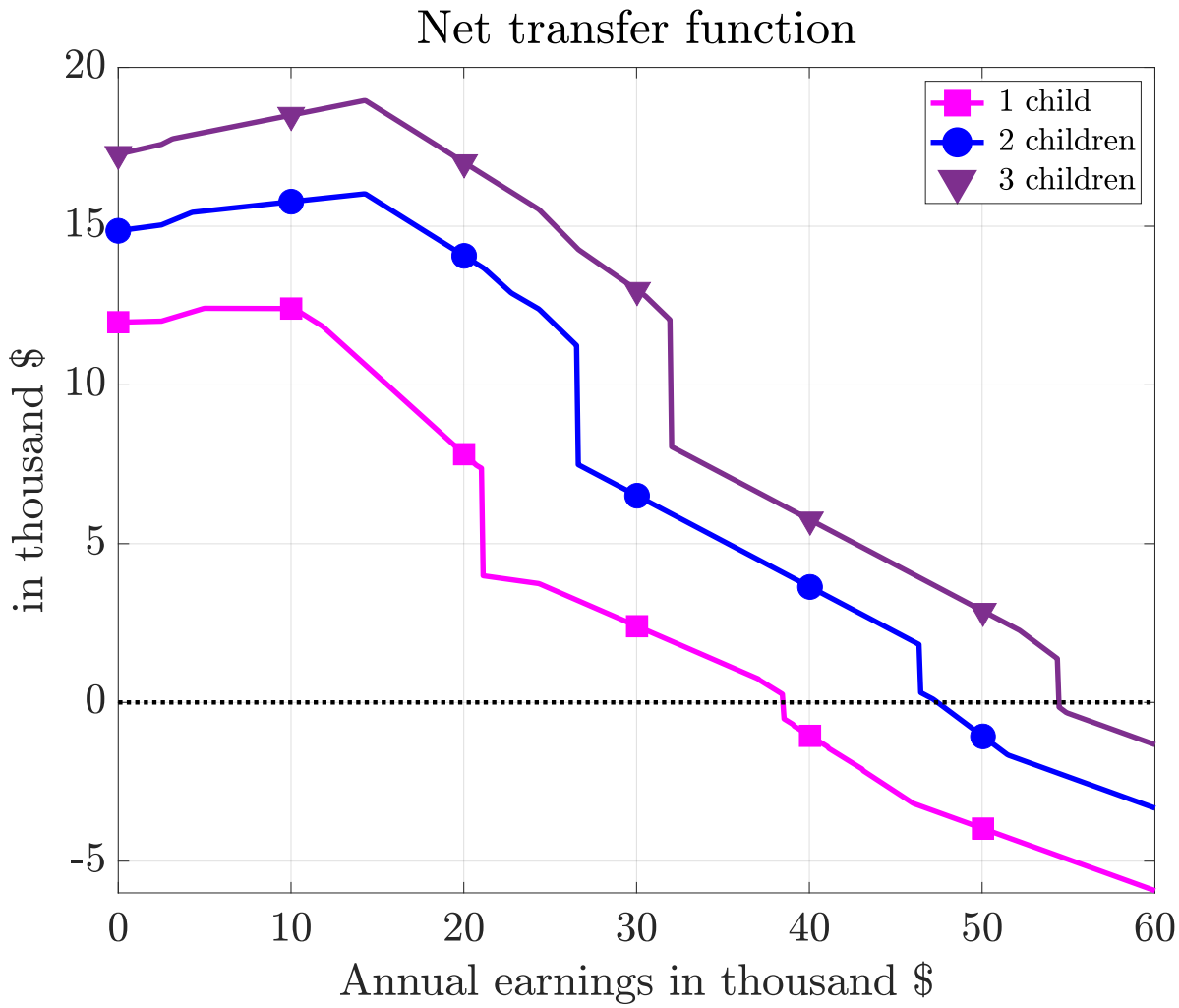
Concluding Remarks

- It is well understood that the design of the tax-transfer system has important implications for family labor supply
- In this paper, we quantify to what extent easily-implementable reforms of existing tax credits can promote maternal labor supply
- Expanding tax credits for child care and earned income can be self-financing, welfare-improving, and highly effective at raising mothers' employment rates
- Future work could address: General equilibrium effects, endogenous fertility, marital formation/dissolution, child outcomes (e.g. skill formation)

Fertility Process



Demographics



Transfer programs

Externally calibrated parameters

Description	Param.	Value	Description	Param.	Value
Real interest rate	r	0.025	Male full-time hours	$\bar{l}$	0.38
Risk aversion	σ	1.5	Male productivity	$\omega(s)$	CPS
Non-market time	ζ	3	Depr. human capital	δ	0.009
Equivalence scale	ψ_0	1.414	Child arrival prob. at $\tilde{s}_1$	q_1	0.45
Equivalence scale	ψ_1	1.899	Prob 2nd child at $\tilde{s}_2$	q_2	0.55
Equivalence scale	ψ_2	2.158	Prob 3rd child at $\tilde{s}_2$	q_3	0.66
Equivalence scale	ψ_3	2.404			

▸ Calibration

Internally calibrated parameters

Description	Param.	Value	Moment	Target	Model
Discount factor	β	0.997	Average wealth	82.2	80.7
Utility weight	φ	0.0810	Average hours	0.314	0.311
Participation cost	$\nu_{f,1}$	0.0660	Empl f (kids)	0.606	0.608
Participation cost	$\nu_{f,0}$	0.0287	Empl f (no k.)	0.680	0.679
Participation cost	ν_m	0.0540	Empl m	0.948	0.948
Wage rate	w	63.2	Avg hourly wage	19.4	19.4
Hum cap growth	α	0.0245	Wage growth	0.026	0.026
Initial product.	$(\sigma^f_{\epsilon,0}, \sigma^m_{\epsilon,0})$	(0.19,0.43)	IQR wages 20-22	(4.4,8.1)	(4.3,6.0)
Random walk	$(\sigma^f_{\epsilon}, \sigma^m_{\epsilon})$	(0.09,0.09)	IQR wages 35-37	(10,15)	(10,15)
Inf. child care	(κ_y, κ_o)	(0.05,0.68)	Frac child care	(0.4,0.2)	(0.4,0.2)
Mean CC distr.	(μ_y, μ_o)	(12.5,4.1)	Avg child care	(7.1,4.5)	(7.0,4.3)
Std CC distr.	(σ_y, σ_o)	(12,4.5)	IQR child care	(6.4,4.6)	(6.0,5.0)
Pension benefit	b	39.0	AIME formula	–	–

▸ Calibration

Fertility process

Share of Parents with One, Two and Three Children

Parents' mean age	20-23		24-27		28-32		33-37	
	Data	Model	Data	Model	Data	Model	Data	Model
1 Child (%)	68	89	50	55	25	25	21	25
2 Children (%)	26	11	38	45	47	45	45	45
3 Children (%)	7	0	12	0	28	30	34	30

▸ Model fit

Child Care Cost Elasticity

- Elasticities of female employment with respect to child care prices
- Empirical literature: Morrissey (2017) reports range from -0.025 to -1.1
- Relevant population in most studies: Mothers with child(ren) below age of 6
- Model elasticity: -0.74
- Comparability partially limited by selected population: Anderson and Levine (1999) find that less educated mothers respond more elastically

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Labor Supply Elasticities of Mothers

Table 5: Extensive-margin labor supply elasticities of mothers

	Positive wage change		Negative wage change	
	Long run	Short run	Long run	Short run
All mothers	0.77	1.02	0.82	0.40
$y^{\dagger}$ children	0.91	1.05	0.85	0.50
$o^{\dagger}$ children	0.69	0.98	0.79	0.33
1 child	0.75	0.99	0.72	0.25
2 children	0.79	1.06	0.91	0.51
3 children	0.86	1.10	1.02	0.76

NOTES: † Here, y refers to married couples with at least one small child (between 0 and 4 years), and o refers to married couples with children who are all at least 5 years old.

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Total Hours Elasticities of Mothers

Table A2: Total hours elasticities of mothers

	Positive wage change		Negative wage change	
	Long run	Short run	Long run	Short run
All mothers	0.86	1.06	0.77	0.31
$y^{\dagger}$ children	1.11	1.22	0.76	0.20
$o^{\dagger}$ children	0.71	0.91	0.77	0.38
1 child	0.89	1.09	0.70	0.13
2 children	0.83	1.05	0.83	0.39
3 children	0.84	1.02	0.95	0.76

NOTES: † Here, y refers to married couples with at least one small child (between 0 and 4 years), and o refers to married couples with children who are all at least 5 years old.

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Labor Supply Elasticities of Fathers

Table A3: Extensive-margin labor supply elasticities of fathers

	Positive wage change		Negative wage change	
	Long run	Short run	Long run	Short run
All fathers	0.25	0.17	0.22	0.22
$y^{\dagger}$ children	0.42	0.29	0.40	0.38
$o^{\dagger}$ children	0.10	0.08	0.09	0.11
1 child	0.26	0.16	0.20	0.20
2 children	0.20	0.16	0.24	0.26
3 children	0.30	0.24	0.26	0.24

NOTES: † Here, y refers to married couples with at least one small child (between 0 and 4 years), and o refers to married couples with children who are all at least 5 years old.

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(Dis-)Incentives for Employment

Table 6: Decomposition of married mothers' participation tax rates

	All			
Overall	24.8			
Income and payroll tax	+ 19.0			
EITC	+ 6.4			
SNAP + TANF + WIC	+ 2.5			
CTC + CDCTC	− 3.0			

NOTES: Adding up the numbers can lead to small deviations due to rounding.

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(Dis-)Incentives for Employment

Table 6: Decomposition of married mothers' participation tax rates

	All	1 child	2 children	3 children
Overall	24.8	23.7	26.2	25.1
Income and payroll tax	+ 19.0	+ 19.0	+ 19.0	+ 19.2
EITC	+ 6.4	+ 4.6	+ 8.3	+ 9.6
SNAP + TANF + WIC	+ 2.5	+ 2.0	+ 2.6	+ 3.3
CTC + CDCTC	− 3.0	− 1.8	− 3.6	− 7.1

NOTES: Adding up the numbers can lead to small deviations due to rounding.

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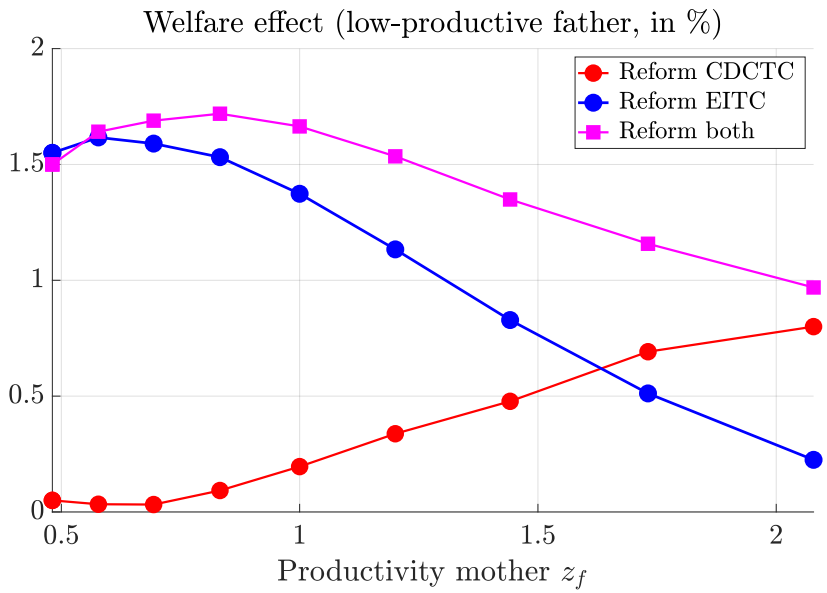
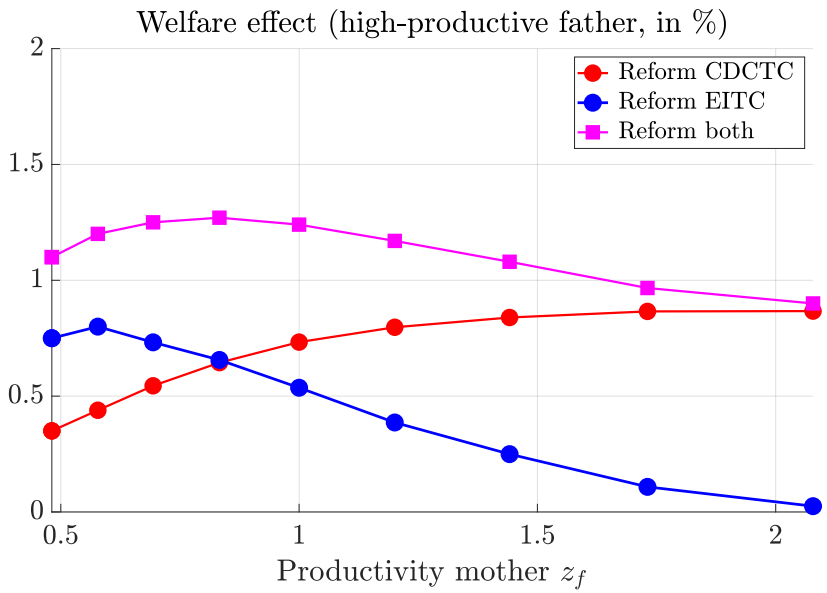
Welfare Analysis





All three reforms imply welfare gains for entering couples:

1. Reform 1: **+0.30 percent**
2. Reform 2: **+0.93 percent**
3. Reform 3: **+1.33 percent**

(measured in terms of lifetime consumption) ▸ Back