The Macroeconomic Consequences of Family Policies

Anson Linshuo Zhou
University of Wisconsin-Madison

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Motivation

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This Paper: What are the macroeconomic consequences of family policies?

1. Effects on fertility, human capital, social mobility, and welfare
2. Short-run versus long-run effects, and transition
3. Compare in-cash versus in-kind family policies

This Paper

A quantitative heterogeneous-agent GE-OLG model that combines:

1. Joint determination of **child quantity** and **child quality**
2. Rich life cycle with **endogenous demographic structure**
3. Home care versus **market childcare**

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2. Composition effects (changing composition of parents)
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Parameter(s) governing the trade-off between child quality and quantity:

- Disciplined by matching U.S. data and RCT evidence
- Validated using the Alaska Permanent Fund Dividend and other existing policies

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- Subsidized childcare and public education are less cost-effective in raising fertility, but offer other advantages

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Related Literature

Fertility, Family Policies, and the Aggregate Economy

- **Empirical:** Milligan (2005), Laroque and Salanié (2008), Drago et al. (2011), Luci-Greulich and Thévenon (2013), González (2013), Raute (2019)...
- **Structural: de la Croix and Doepke (2003), Kim, Tertilt and Yum (2021)**
- **Contribution: Develop a structural model tailored to analyzing family policies**

Income transfers, Children's Outcomes, and Social Mobility

- Benabou (2002), Heckman and Mosso (2014), Bastian and Michelmore (2018), **Daruich (2019)**, Abbott, Gallipoli, Meghir and Violante (2019), Mullins (2019), **Guner, Kaygusuz and Ventura (2020)**...
- **Contribution: Endogenize fertility choice and demographic structure**

Outline

1. Model
2. Calibration (2010 USA)
3. Validation – the Alaska Permanent Fund Dividend (APFD)
4. Counterfactual – Steady-State & Transition
5. Compare In-Cash vs In-Kind Policy Instruments
6. Conclusion

Model

Model: Life Cycle

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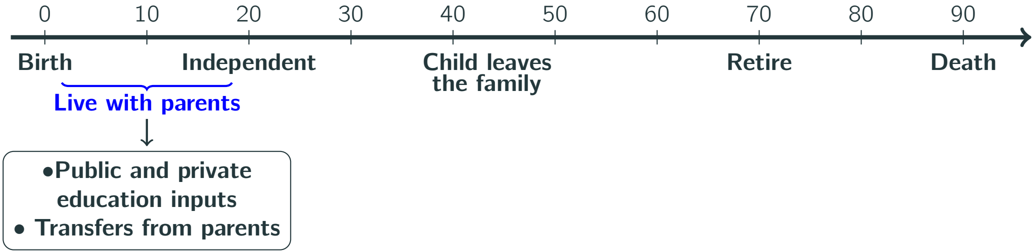

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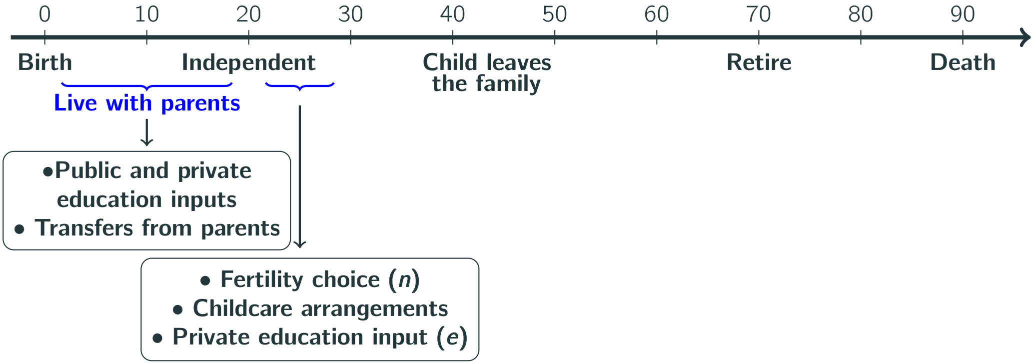

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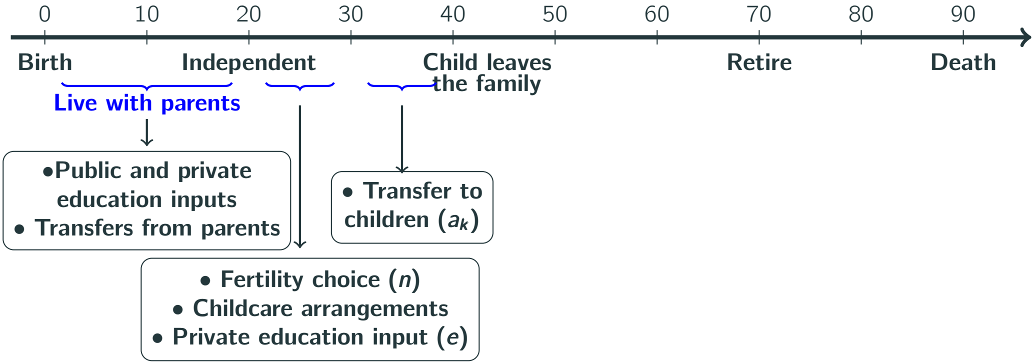

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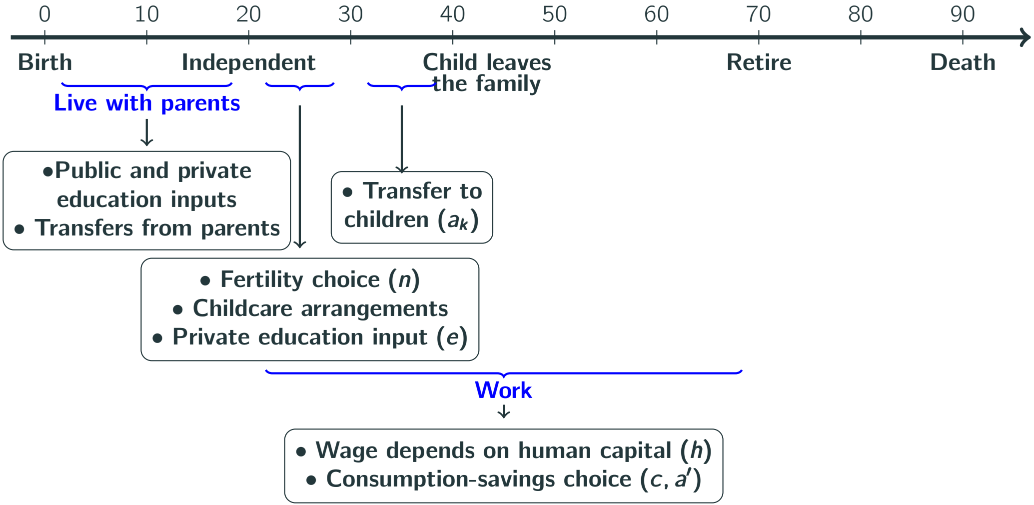

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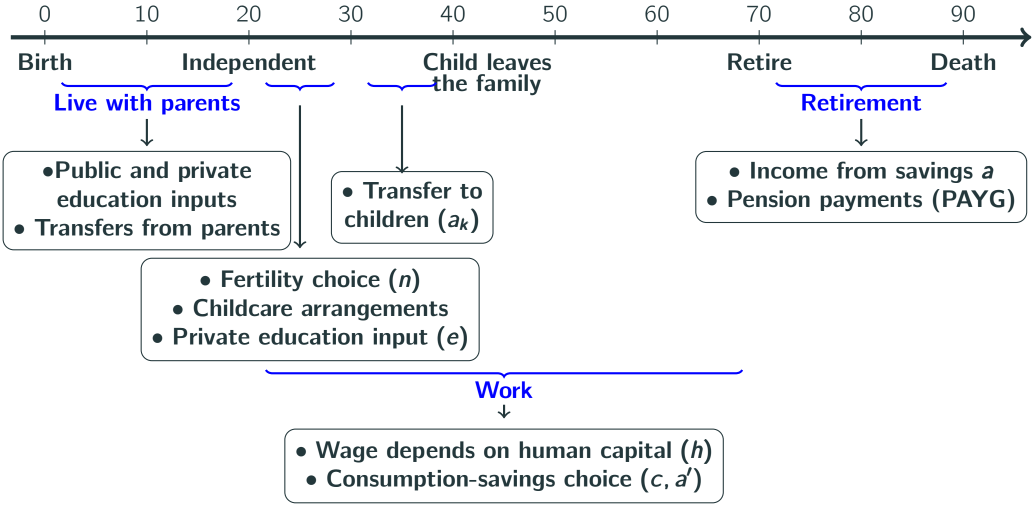
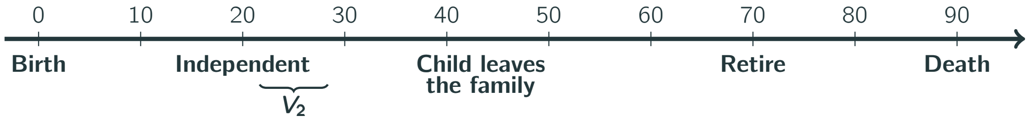


Fertility, Childcare and Skill Formation



$$V_2(h, a) = \max_{c, a', n, e, t_h, m \geq 0} \quad u(c/\Lambda(n)) + \beta \mathbb{E} V_3(h', a', n, \mathbb{E} h_k)$$

---

h : parents' skills

a : assets

n : fertility

t_h : total home care

m : market care

e : private educ. input

χ : childcare time

p_m : market care price

$\Lambda(n)$: equivalence scale

$\mathcal{S}$: childcare subsidy

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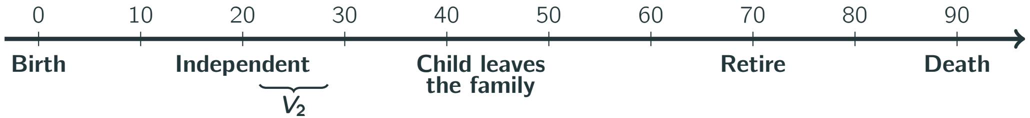

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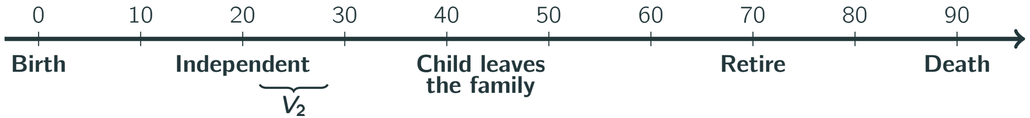

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Fertility, Childcare and Skill Formation

0 10 20 30 40 50 60 70 80 90

Birth (0) — **Independent** (20) — **Child leaves the family** (40) — **Retire** (70) — **Death** (90)

$\underbrace{\hspace{3em}}_{V_2}$

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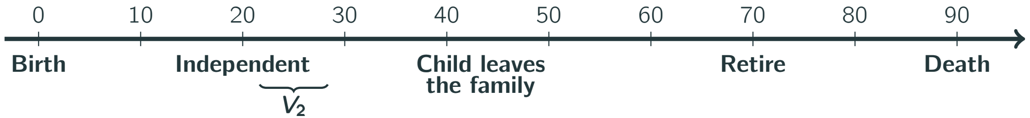

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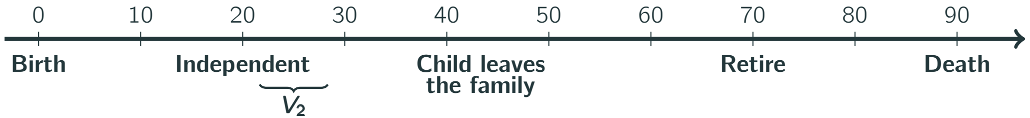

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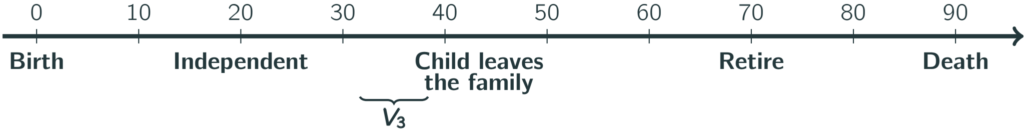
Two simplifying modeling assumptions:

1. $G(h,\mathcal{E},e,\epsilon)$ captures the overall skill formation of children from age 0 to 20
2. Time cost χ is non-educational and parents investments are summarized by e.

   High-quality public childcare can be implemented by raising $\mathcal{S}$ and $\mathcal{E}$ jointly in the model

Parent-to-Child Transfer



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$$y = wh$$

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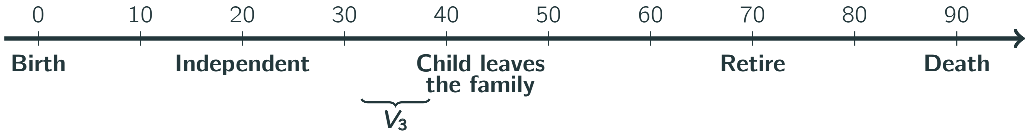

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Child quantity (n) interacts with child quality ($\mathbb{E}h_k, a_k$) in two ways:

1. [BC]: higher n raises marginal costs of ($\mathbb{E}h_k, a_k$) a lá Becker and Lewis (1973)
2. Preferences: complements or substitutes – calibrated to match data

► later periods

quantity-quality Trade-off

- Consider increase in $\mathcal{B}$ on private educational input e:

$$\underbrace{MU_c \cdot n}_{\text{marginal costs of } e} = \underbrace{\frac{\partial v(n, \mathbb{E}h_k, a_k)}{\partial \mathbb{E}h_k} \cdot \frac{\partial \mathbb{E}h_k}{\partial e}}_{\text{marginal benefits of } e} \qquad \textbf{FOC } [e]$$

- When n is fixed, $\mathcal{B} \uparrow$ (income effect), $MU_c \downarrow \implies e \uparrow$
- When n is endogenous, $\mathcal{B} \uparrow$ (“price” change), $n \uparrow \implies e$ could fall (quantitative prediction depends on calibrated parameters)

Family Policy Mechanisms with Endogenous Fertility

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Composition Effects

- Average child human capital:

$$\underbrace{\overline{h}_k}_{\text{average } h_k} = \iint \underbrace{\frac{n^*(h, a)}{N}}_{\text{fertility weight}} \cdot \underbrace{h_k^*(h, a, \cdot)}_{\text{individual child's } h_k} \; d \underbrace{\mu_2}_{\text{parents' dist.}} \; d\epsilon$$

- Family policies change the fertility weights, i.e. composition of parents

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Firms, Government, and Equilibrium

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- Government fiscal budget:

$$\underbrace{\left(\sum_{j=2}^{6}\omega_j\int\mathcal{T}(y_j^*, a_j^*, n_j^*)\,d\mu_j\right)}_{\text{labor and capital income taxes}} + \underbrace{\tau_c\left(\sum_{j=2}^{8}\omega_j\int c_j^*\,d\mu_j + \omega_2\int n^*\cdot(p_m\cdot m^* + e^*)\,d\mu_2\right)}_{\text{consumption taxes}} =$$

$$\underbrace{\underbrace{(\omega_0+\omega_1)}_{\text{mass of children}}\cdot\mathcal{E}}_{\text{public education}} + \underbrace{\omega_2\left(\underbrace{\int n^*\cdot\mathcal{B}\,d\mu_2}_{\text{baby bonus}} + \underbrace{\int(1+\tau_c)\cdot n^*\cdot p_m\cdot\mathcal{S}\,d\mu_2}_{\text{subsidized childcare}}\right)}_{\text{family policy expenditures}} + \underbrace{\pi\left(\sum_{j=7}^{8}\omega_j\int wh\,d\mu_j\right)}_{\text{pension payments}} + \underbrace{\mathcal{X}}_{\textbf{others}}$$

► stationary equilibrium ► childcare channel

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- **Demographic Structure Effects**: Family policies change $\{\omega_j\}_{j=0}^{8}$. Effects on fiscal burden depends on relative costs of old versus child

► stationary equilibrium ► childcare channel

Calibration

Model Parameters

Table 1: Model Parameters

	Interpretation	Value	Source
	Preferences		
β	discount rate	0.98^{10}	standard
γ	elasticity of substitution	0.73	CPS
ψ	fertility preference	2.30	CPS
θ	human capital preference	2.85	PSID
ν	transfer preference	0.29	PSID
	Childcare arrangement		
χ	childcare cost	0.18	ATUS
ι	economies of scale at home	0.7	ATUS
υ	substitutability of care	0.38	SIPP
p_m	price of full-time care	\$6,860	NACCRRA
	Taxes and pension		
τ_y^n, λ_y^n	tax levels and progressivity	misc.	TAXSIM
τ_c	consumption tax	0.07	McDaniel (2007)
τ_a	capital income tax	0.27	McDaniel (2007)
π	pension replacement rate	0.40	OECD Database

	Interpretation	Value	Source
	Child human capital production		
Z	normalizing scalar	2.50	median income =1
σ_ϵ	ability shock dispersion	0.58	PSID
ρ	intergenerational spillover	0.30	Chetty et al. (2014)
ξ	substitution of education	0.9	CEX
$\mathcal{E}$	public education	\$12,000	NCES
κ	input productivity	0.13	Gárcia et al. (2020)
	Adults' human capital evolution		
η	learning curvature	1.22	PSID
$\{\zeta\}_{j=2}^5$	learning level	misc.	PSID
μ_z	skill depreciation	-0.23	PSID
σ_z	shock dispersion	0.38	PSID
	Firm production function		
A	total factor productivity	1	normalization
α	capital share	0.33	standard
δ_k	capital depreciation	0.04^{10}	standard

- 14 parameters are calibrated within the model

► moment fit

► childcare ► adult skill ► firm and gov.

Preferences

Utility from child quantity and quality:

$$v(n, \mathbb{E}h_k, a_k) = \underbrace{\Psi(n)}_{\text{child discounting}} \cdot \underbrace{(\theta \cdot u(\mathbb{E}h_k) + \nu \cdot u(a_k))}_{\text{utility from child quality}}$$

$$\underbrace{\Psi(n) = 1 - \exp(-\psi n)}_{\text{increasing \& concave in } n} \qquad u(x) = \frac{x^{1-\gamma}}{1-\gamma} \qquad \gamma \in (0,1) \quad x \in \{\mathbb{E}h_k, a_k, c\}$$

- Results robust to dynastic altruism and separable preferences

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$$\underbrace{\Psi(n) = 1 - \exp(-\psi n)}_{\text{increasing \& concave in } n} \qquad u(x) = \frac{x^{1-\gamma}}{1-\gamma} \qquad \gamma \in (0,1) \quad x \in \{\mathbb{E}h_k, a_k, c\}$$

- Results robust to dynastic altruism and separable preferences
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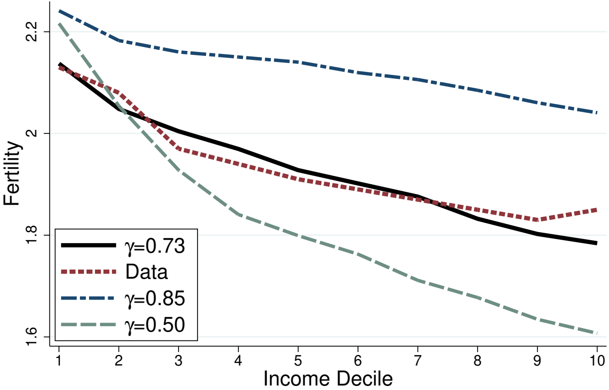
- $\{\psi, \theta, \nu\}$ matches aggregate fertility and average spendings on quality
- γ - elasticity of intergenerational substitution (EGS) (Córdoba and Ripoll 2019)
- Conditional on other parameters, **γ determines fertility elasticity**. Higher $\gamma \implies$ smaller fertility responses, larger quality responses (c.f. Soares 2005) ► intuition

Identification of γ

- γ identified by **fertility-income profile** (Córdoba, Ripoll and Liu 2016). Higher $\gamma \implies$ Higher MRS of quantity for quality $\implies$ flatter profile



- Calibrated γ generates realistic life-cycle profile of net worth

►net worth

- **Children's skill production function**:

$$h_k = \underbrace{Z}_{\text{scalar}} \cdot \underbrace{\epsilon}_{\text{shock}} \cdot \underbrace{h^{\rho}}_{\text{spillover}} \cdot \left(\underbrace{\mathcal{E}^{\xi}}_{\text{public education}} + \underbrace{e^{\xi}}_{\text{private input}} \right)^{\kappa/\xi}$$

$$\log(\epsilon) \sim \mathcal{N}\left(-\frac{\sigma_{\epsilon}^2}{2}, \sigma_{\epsilon}^2\right)$$

- Highlight of parameters:
  - $\rho = 0.3$ - rank-rank mobility (Chetty, Hendren, Kline and Saez 2014)
  - $\mathcal{E} = 0.16$ - \$12k per pupil per year (NCES)
  - $\kappa = 0.13$ - **RCT evidence** from García, Heckman, Leaf and Prados (2020)

► mobiltiy fit ► RCT

Validation

Does the model generate responses that match empirical estimates?

External validation using **Alaska Permanent Fund Dividends (APFD)**

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- Established in 1982 after discovery of the petroleum. Equal transfer to **all residents** regardless of income, employment or age
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- Ideal setting to test fertility responses:
  1. Large in scale ($\approx$ \$1.5k per year) relative to other family policies
  2. Simple implementation that is income- or work-tested
- Recalibrate $\{\mathcal{T}(\cdot), \psi, \gamma\}$. Implement APFD in the model: universal basic income (UBI) to parents and children by \$1.5k. The model predicts:
  1. Completed fertility rises by **0.16** children per women
  2. Larger responses from households with lower human capital

Difference-in-Difference Analysis

- CPS June Fertility Supplement 1982-2018, Alaskan women aged 40-55 divided into "not treated", "partially treated" ($T_1 = 1$), and "fully treated" ($T_2 = 1$)

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$$\text{fertility} = \beta_0 + \beta_1 T_1 + \boldsymbol{\beta_2} T_2 + \text{State FE} + \text{Year FE} + \epsilon$$

- Regression results confirm model predictions:

		(1)	(2)	(3)
	Model	Full Sample	Low Education	High Education
β_1		0.098***	0.216***	0.074***
		(0.027)	(0.036)	(0.021)
β_2	0.16	0.172***	0.296***	0.105***
		(0.032)	(0.041)	(0.025)
# Obs		146,804	69,511	77,293

► Australia ► Spain ► Cherokee

Counterfactual

Main Counterfactual

- Evaluate **baby bonuses $\mathcal{B}$** of different sizes
  - Timing: unexpected and permanent policy change
  - Source of funds: τ_c balances budget each period

► role of gov.

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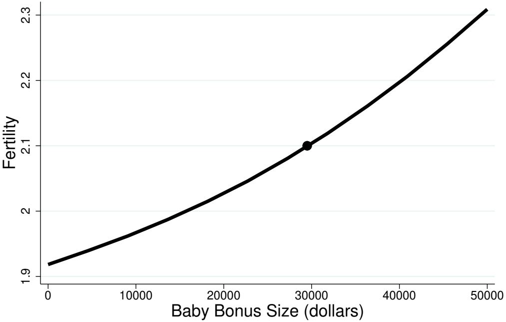
  2. Welfare of existing households and those born in transition
- Roadmap of results:
  - Long-run effects
  - Transition and distributional effects across generations
- Other policies: subsidized childcare $\mathcal{S}$ and public education $\mathcal{E}$

► role of gov.

Fertility Effects of Cash Rewards to Childbirth

Figure 1: Effects on aggregate fertility



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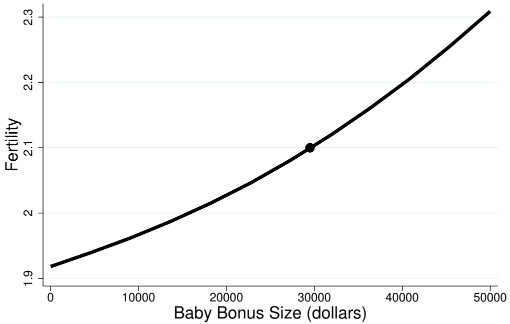
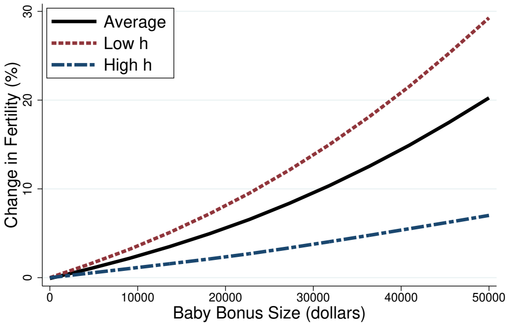


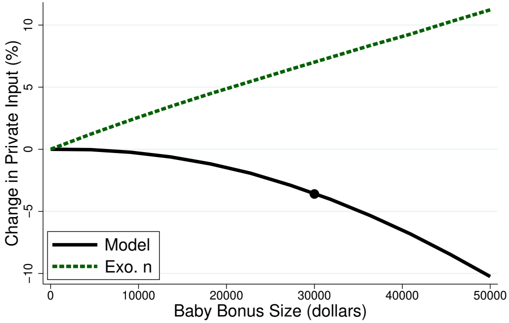
Figure 2: Heterogeneous fertility response



- $\mathcal{B}$ **=\$30k** raises aggregate fertility rate to the replacement level (benchmark policy), costing around 1.8% of GDP in the new equilibrium
- Parents with lower human capital respond more in fertility – larger proportional change in the shadow price of child ($e^*(h)$ and wh)

Effects on e and Average Human Capital

Figure 3: Average private input e



- Average private input (e) **falls by 4%** – **quantity-quality trade-off**

Effects on e and Average Human Capital

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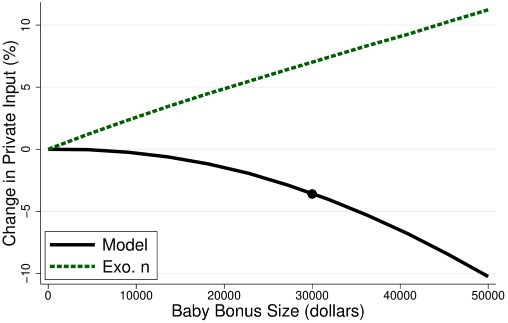
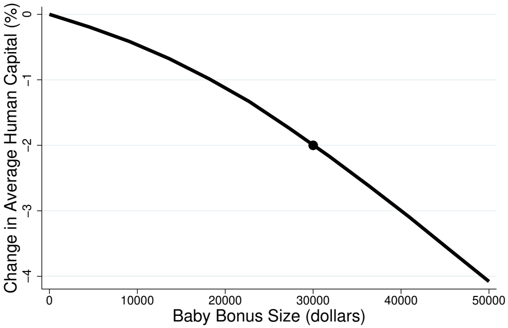
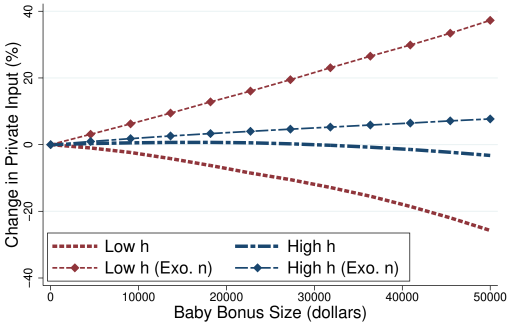


Figure 4: Average human capital



- Average private input (e) **falls by 4%** – **quantity-quality trade-off**
- Average human capital **falls by 2%** due to **composition effects** and reduced private input e

Figure 5: Heterogeneous response in e



- Larger reductions in e among parents with low h as their n increases more

Average Human Capital and Social Mobility

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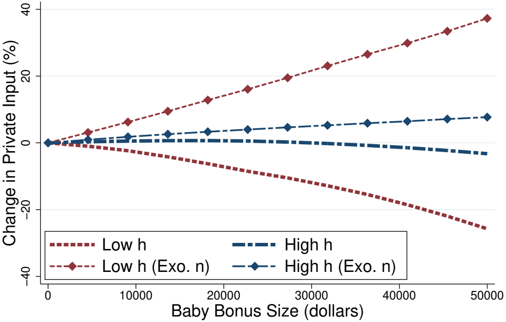
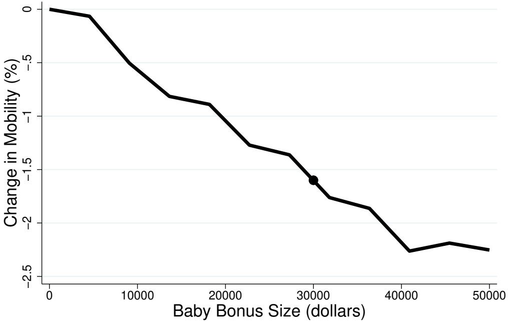


Figure 6: Intergenerational mobility



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Average Human Capital and Social Mobility

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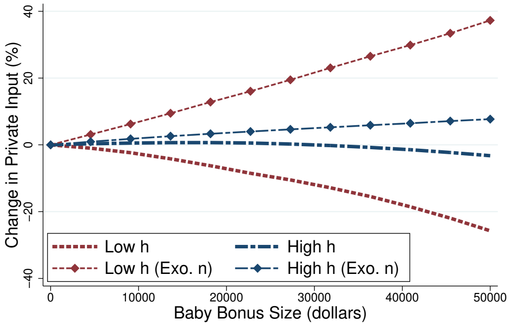

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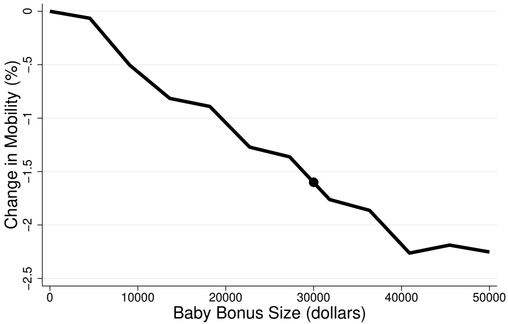
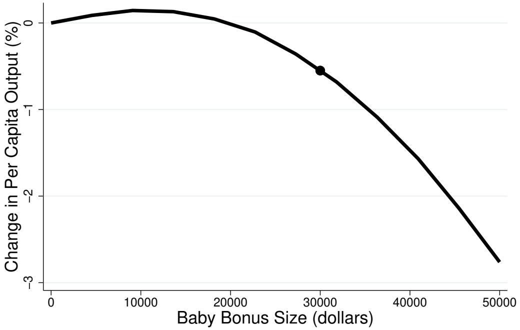


- Larger reductions in e among parents with low h as their n increases more
- Intergenerational mobility **decreases by 1.8%**
- Results will be **stronger** when baby bonus is targeted at low-income households

Output and Tax

Figure 7: Per capita output



- Per capita output **falls by 0.6%**

► age structure

Output and Tax

Figure 7: Per capita output

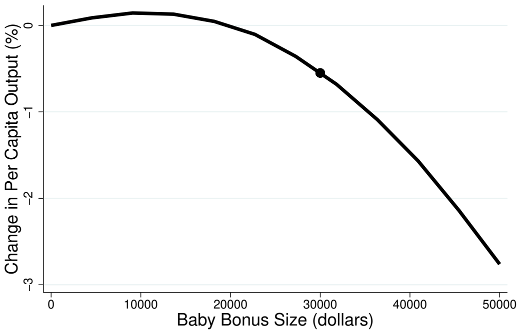
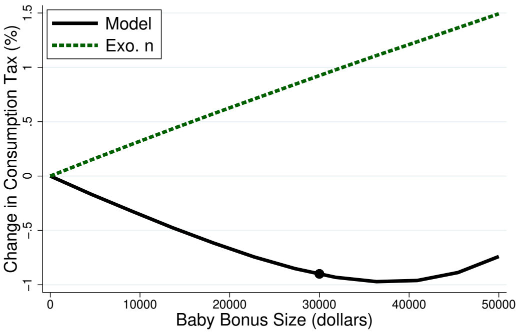


Figure 8: Change in consumption tax

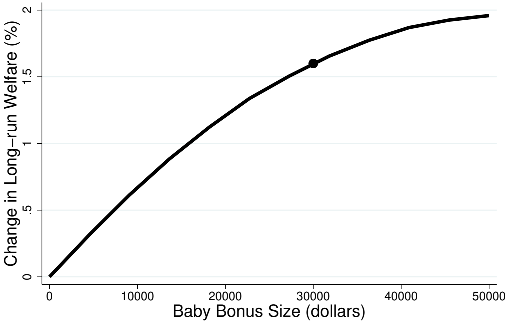


- Per capita output **falls by 0.6%**
- **Demographic structure effects**: consumption taxes **reduces by 0.9%**

▸ age structure

Welfare Effects

Figure 9: Change in welfare



- Long-run welfare $\mathcal{W}$ increases by 1.6% as (1) higher fertility, (2) lower taxes, and (3) "social safety net"

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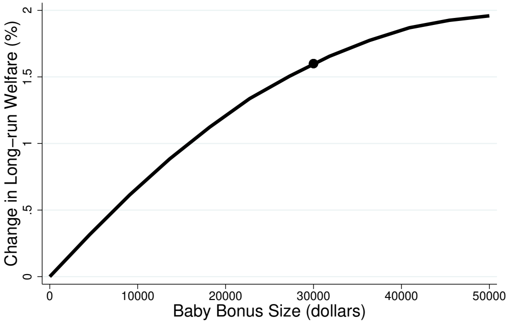
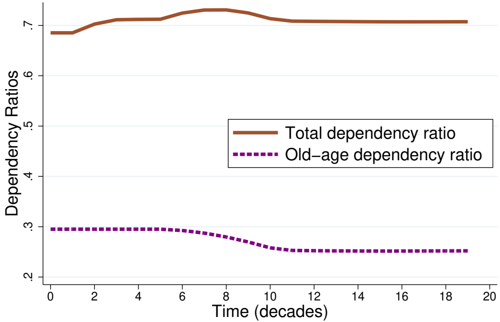


- Long-run welfare $\mathcal{W}$ increases by 1.6% as (1) higher fertility, (2) lower taxes, and (3) “social safety net"
- FSD in μ is **neither necessary nor sufficient** for better policies - need to consider ω (c.f. Chu and Koo 1990)

Transition Path of $\mathcal{B} = \$30,000$ - Replacement Fertility

Figure 10: Change in dependency ratios



- Higher child-related government expenditures in the first few decades beyond the direct policy costs ($\mathcal{E}$ and $\mathcal{T}(n, \cdot)$)

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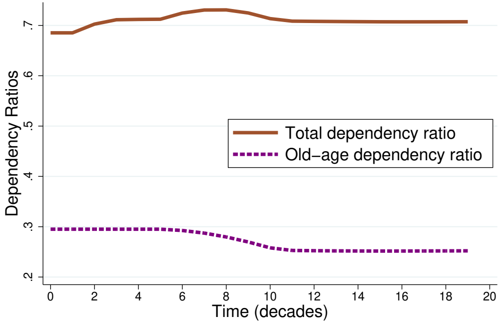
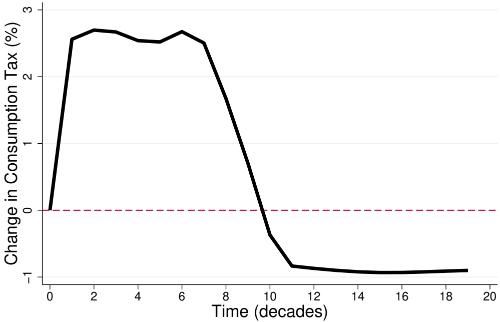


Figure 11: Change in consumption tax

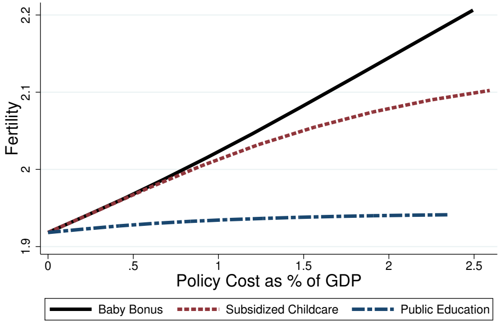


- Higher child-related government expenditures in the first few decades beyond the direct policy costs ($\mathcal{E}$ and $\mathcal{T}(n, \cdot)$)
- With τ_c changing to balance the budget, welfare effects for:
  - Newborns in transition – positive but smaller than 1.6%
  - Existing baby bonus recipients – positive, existing non-recipients – negative

► plot

Highlights of Policy Comparisons

Figure 12: Effects on Fertility



- $\mathcal{S}$ and $\mathcal{E}$ are less cost-effective in raising fertility

Highlights of Policy Comparisons

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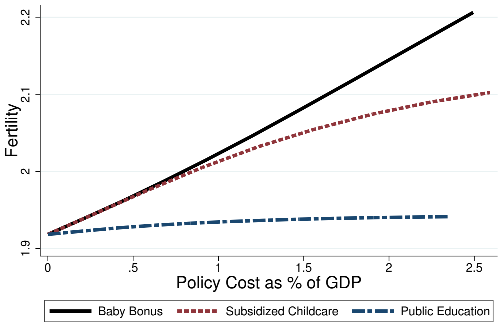
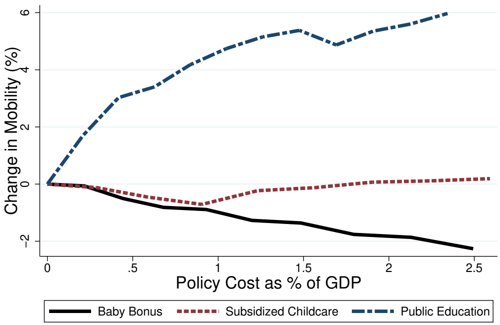


Figure 13: Effects on Mobility



- $\mathcal{S}$ and $\mathcal{E}$ are less cost-effective in raising fertility
- $\mathcal{E}$ is most effective in improving mobility - larger effects when targeted at low-income families

Baby Bonus versus Subsidized Childcare

Figure 14: Effects on Income Growth

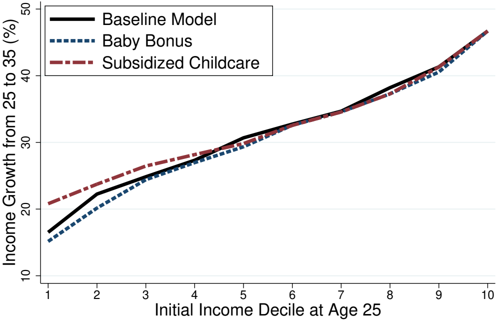
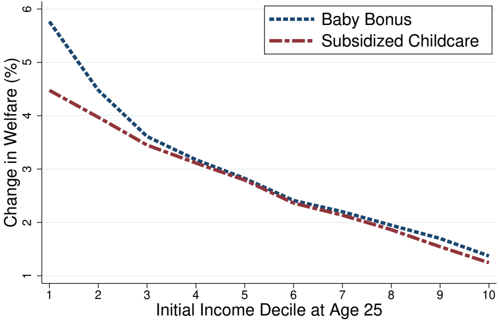


Figure 15: Effects on Welfare



- Subsidized childcare reduces inequality in income growth

Baby Bonus versus Subsidized Childcare

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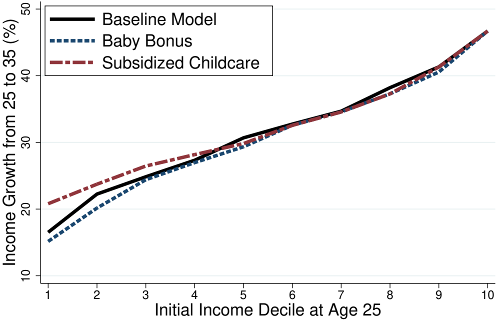
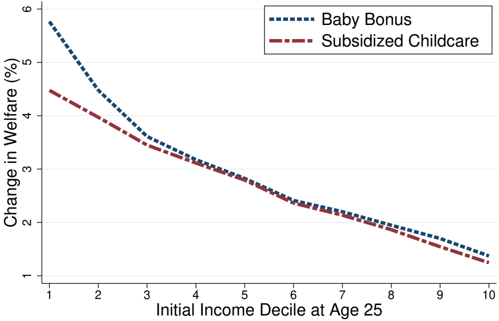


Figure 15: Effects on Welfare



- Subsidized childcare reduces inequality in income growth
- Low-income households prefers cash transfers of the same face value

Conclusion

What I do:

- Develop a quantitative GE-OLG model to study the macroeconomic consequences of family policies
- Calibrate the model to match U.S. data and validate using empirical evidence

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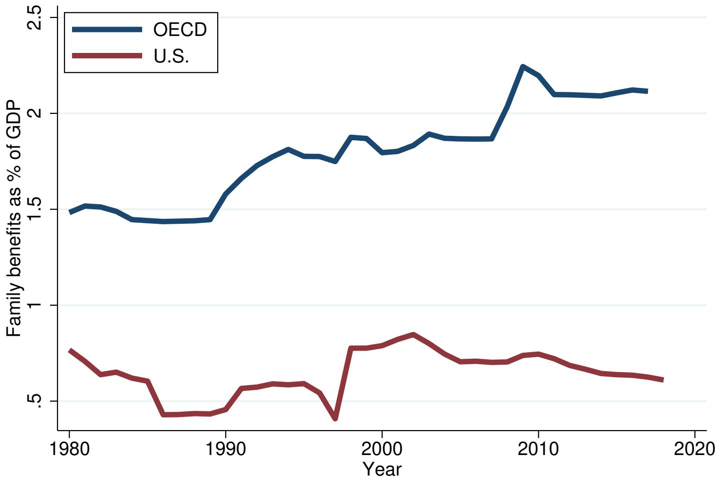
What I Find:

1. \$30k cash benefit at birth raises fertility to the replacement level, but reduces average human capital and social mobility by 2%
2. Long-run welfare rises 1.6% due to endogenous demographic structure changes
3. Government needs to finance higher child-related expenditures in transition
4. In-kind policies have smaller fertility effects, but offer other advantages

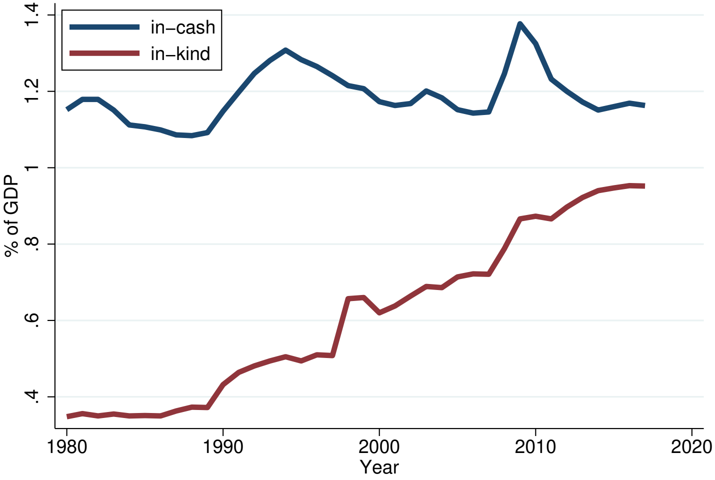
Time Trend of Public Expenditures on Child Benefits



Source: OECD database

► back to intro

Expenditure Breakdown



Source: OECD database

► back to intro

Working Without Children and Retirement

- For households working without children, $j \in \{4, 5, 6\}$:

$$V_j(h, a) = \max_{c, a' \geq 0} \quad u(c/\Lambda(0)) + \beta \mathbb{E} V_{j+1}(h', a')$$

$$(1 + \tau_c)c + a' = (1 + r)a + y - \mathcal{T}(y, a, 0)$$

$$h' = L_j(h, 1, z)$$

- For retired households, $j \in \{7, 8\}$:

$$V_j(h, a) = \max_{c, a' \geq 0} u(c/\Lambda(0)) + \beta \delta_j V_{j+1}(h, a')$$

$$(1 + \tau_c)c + a' = (1 + r)a + \pi \cdot wh - \mathcal{T}(0, a, 0)$$

$$V_9(\cdot) \equiv 0$$

where π is pension replacement rate

► back to transfer

Stationary Equilibrium

- Invariant distribution: Demographic structure $\{\omega_j\}_{j=0}^{8}$ and distribution of agents over states $\{\mu_j\}_{j=0}^{8}$ are invariant over time periods
- Households optimize utility and firms maximize profits
- Prices clear markets
- Government balances budget in period to period
- Externalities/incompleteness that government could address:
  1. **Fiscal externalities of childbearing and childrearing**
     - Private returns $\neq$ social returns (i.e. $\{\omega_j\}_{j=0}^{8}$ and $\{\mu_j\}_{j=0}^{8}$)
  2. **Borrowing constraints** (Daruich 2019, Abbott et al. 2019 . . .)

► back to eqm. ► back to counterfactual

Endogenous Childcare Arrangements

- Standard models where a child costs fixed amount of time, total income y:

$$y = wh\underbrace{\left(1 - \underbrace{(\chi - \mathcal{S})}_{\text{time cost}} \cdot n\right)}_{\text{labor supply}} + n \cdot \mathcal{B}$$

which implies $\mathcal{S}$ is <u>equivalent</u> to a baby bonus $\frac{\mathcal{B}}{wh}$

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- **Endogenous childcare arrangements**: (in-kind) subsidized childcare induces more labor supply from parents with $m^*(h, a) \leq \mathcal{S}$

- Affects inequalities in wage growth since $h_{j+1} = L_j(\cdot, t_w)$

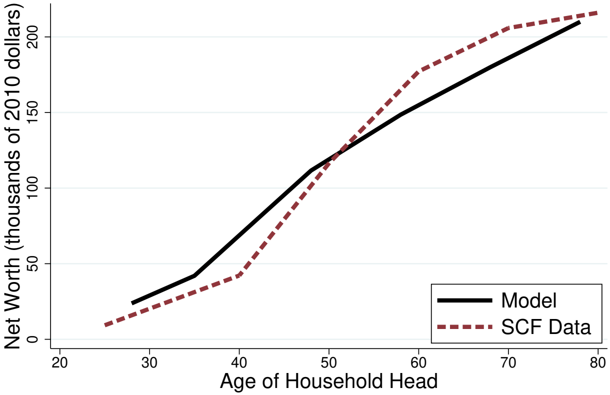
► back to model ► back to result

Model Fit

Parameter	Interpretation	Moment	Data	Model
γ	elasticity of substitution	fertility differential	0.12	0.12
ψ	fertility preference	average fertility	1.92	1.92
θ	human capital preference	average investment as % of income	13.4	13.5
ν	transfer preference	average transfer	$48,381	$48,400
ι	economies of scale at home	childcare time by # children	1.7	1.7
υ	substitutability of care	average care spending as % of income	16	16
Z	normalizing scalar	median income = 1	N/A	N/A
σ_ϵ	ability shock dispersion	Gini of earnings at $j = 2$	0.29	0.29
ρ	intergenerational spillover	intergenerational elasticity of earnings	0.34	0.33
ξ	substitution of education	investment by parents' education	misc.	misc.
κ	input productivity	return on per dollar investment (NPV)	$1.3	$1.29
η	learning curvature	income growth by initial decile	0.1	0.09
$\{\zeta\}_{j=2}^{5}$	learning level	income growth by age	misc.	misc.
σ_z	shock dispersion	Gini of earnings at $j = 6$	0.39	0.39

► back

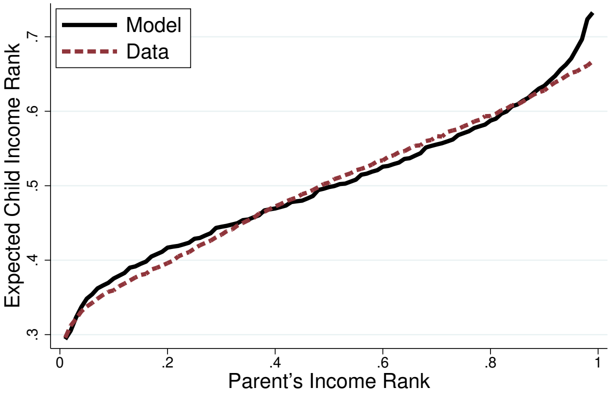
Net Worth by Age: Model and Data



- Net worth by age of household head from SCF summary tables

►back

Intergenerational Mobility: Model vs Data



- Rank-rank slope = 0.34 (Chetty, Hendren, Kline and Saez 2014)

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Child's Skill Production Function Cont'd

Use **RCT evidence** to estimate the productivity of inputs κ:

$$h_k = Z \cdot \epsilon \cdot h^{\rho} \left(\mathcal{E}^{\xi} + e^{\xi}\right)^{\boldsymbol{\kappa}/\xi}$$

- García, Heckman, Leaf and Prados (2020)
  - Two US early childhood development programs (ABC, CARE) in 1970s
  - Cost $\approx$ \$13.5k per year for five years - total \$67.5k per child
  - Followed up into adulthood and observe education/income
  - For every dollar invested, children's lifetime labor income increases by **\$1.3**
- Apply similar policy in the model: expand existing $\mathcal{E}$ by \$67.5k
  - **Small scale**: prices and taxes remain unchanged
  - **Target**: children of parents at 10th percentile of earnings
- Comparing labor income changes with program costs gives $\kappa = 0.13$

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Costs of Child and Childcare

- OECD equivalence scale:
$$\Lambda(n) = 1.7 + 0.5 \cdot n$$

- **Childcare arrangements**:
$$n \cdot \chi = \left(t_h^{\upsilon/\iota} + (n \cdot m)^{\upsilon}\right)^{1/\upsilon}$$

  Set $\chi = 0.18$ (Folbre 2008). Returns to scale within family calibrated to be $\iota = 0.7$

- Elasticity of substitution: $\upsilon = 0.38$ - average share of income spent on childcare by education (SIPP) (Herbst 2018)

- **Price of full-time childcare**: $p_m = \$6,860$ per year for child aged 0-10 (The National Association of Child Care Resource & Referral Agencies 2011)

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Fertility Response

- Consider simplified problem for low-h parents, i.e. quality margin not operative

$$\max_{c,n} \quad u(c) + \Psi(n)u(\mathcal{E})$$

$$c + n \cdot \chi = 1$$

- First-order condition for n:

$$\underbrace{\Psi'(n) \cdot u(\mathcal{E})}_{\text{MB of } n} = \underbrace{\lambda \cdot \chi}_{\text{MC of } n}$$

- Plug in $u(c) = \frac{c^{1-\gamma}}{1-\gamma}$, we have

$$\Psi'(n) = (1-\gamma) \cdot \chi \cdot \frac{\lambda}{\mathcal{E}^{1-\gamma}} \Longrightarrow \boldsymbol{\Delta\Psi'(n) \propto (1-\gamma) \cdot \Delta\chi}$$

Conditional on other parameters, higher $\gamma \Longrightarrow$ smaller n response

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Skill Evolution for Adults

- **Human capital of working adults** evolves:

$$h_{j+1} = L_j(h_j, t_w, z') = \exp(z')\left[h_j + \zeta_j(h_j \cdot t_w)^\eta\right]$$

$$\log(z) \sim \mathcal{N}(\mu_z, \sigma_z)$$

- $\{\zeta_j\}_{j=2}^{5}$ - age-earnings profile (CPS)
- $\eta = 1.22$ - inequality in wage growth (CPS)
- $\mu_z = -0.23$ - 2% skill depreciation
- $\sigma_z = 0.38$ - life-cycle Gini coefficient of earnings (Huggett, Ventura and Yaron 2011)

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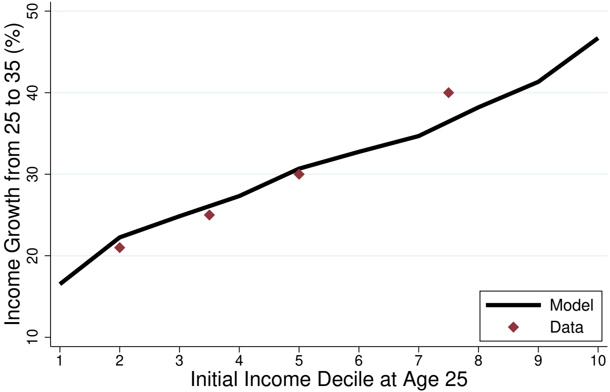
Inequality in Wage Growth: Model vs Data



- Growth rate of average income from age 25 to 35 by education in CPS-ASEC data (2008-2014)

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Other Parameters

- **Firms' production function**: capital share $\alpha = 0.33$ and 4% capital depreciation
- **Government taxes**
  - **Income taxes**:
$$\mathcal{T}(y, a, n) = y \cdot (1 - \tau_y^n y^{-\lambda_y^n}) + \tau_a ra$$
    where $\{\tau_y^n, \lambda_y^n\}_{n=0}^{6}$ estimated using TAXSIM
  - **Tax rates** from McDaniel (2014): $\tau_c = 0.07$ and $\tau_a = 0.27$
  - **Pension replacement rate**: $\pi = 40\%$

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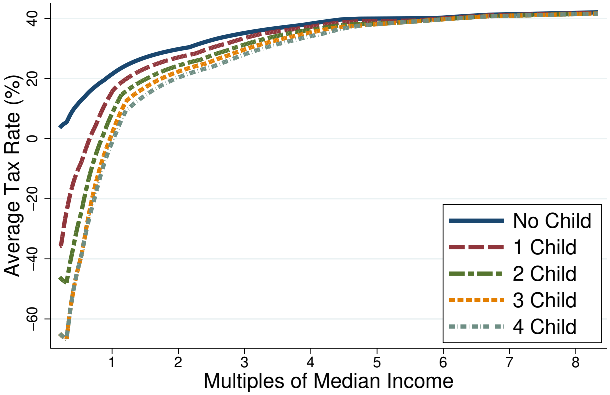
Income Taxes: Model vs Data



- Child tax benefits (reduction in tax rates) are larger for low-income households

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Australian Baby Bonus

- **A$3,000 baby bonus**[1] to every child born on or after July 1st 2004
- Risse (2010) and Drago et al. (2011) find:
  - Significant fertility responses and evidence for long-term/quantum effects
  - Baby bonus needed for additional birth around A$126,000 $\approx 4\times$GDPPC
  - Larger fertility responses from low-income households
- Gaitz and Schurer (2017) finds that the baby bonus was **ineffective** in boosting learning, socio-emotional or physical health outcomes of pre-school children

[1] More details: (1) Announced on Mar 12th 2004, (2) universal coverage, lump-sum payment, (3) Equivalent to 4 times average weekly earnings, (4) Equivalent to $2,800 in 2010 USD.

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- Results from baby bonus counterfactual are consistent with above findings:
  - Significant fertility effects that are larger among low-income households
  - Baby bonus needed for additional birth = $3.5\times$GDPPC
  - Child human capital reduces due to quantity-quality trade-off

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[1] More details: (1) Announced on Mar 12th 2004, (2) universal coverage, lump-sum payment, (3) Equivalent to 4 times average weekly earnings, (4) Equivalent to $2,800 in 2010 USD.

Spanish Baby Bonus

- **€$2,500 baby bonus**[2] to every child born on or after July 1st 2007
- González (2013) finds:
  - Total fertility rate increased
  - Mothers reduced labor supply
  - Fewer children were enrolled in formal childcare

[2]More details: (1) Announced on July 3rd 2007, (2) universal coverage, lump-sum payment, (3) Equivalent to 4.5 times the monly gross minimum wage for full-time worker, (4) Equivalent to $3,500 in 2010 USD.

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  - Total fertility rate increased
  - Mothers reduced labor supply
  - Fewer children were enrolled in formal childcare
- Results from model are consistent with above findings:
  - Baby bonus needed for additional birth / GDPPC = 3.6 (data) vs 3.5 (model)
  - Parents reduce labor supply as fertility raises → more childcare needs
  - Parents demand less market care as relative costs of home care falls due to economies of scale in home production of childcare

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Georgia's Cherokee Land Lottery in 1832

- Georgia allocated more than 18,000 parcels of land via large-scale lottery in 1832. More than 98% of eligible man participated
- Shock in wealth rather than change in price of child
- Winners were about $748 wealthier than losers by 1850[3]
- Bleakley and Ferrie (2016) finds:
    - Parents increase fertility slightly
    - Decedents of winners have no better adult outcomes than the sons of nonwinners

[3] Equivalent to 1,010 days of earnings for an unskilled laborer in the South

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- Bleakley and Ferrie (2016) finds:
  - Parents increase fertility slightly
  - Decedents of winners have no better adult outcomes than the sons of nonwinners
- As skill price increases, Cherokee results provides:
  1. Upper bound for fertility responses
  2. Lower bound for child quality responses
- Model predictions consistent with these predictions:

$$n^*(h, a') \leq n^*(h, a) \quad e^*(h, a') \gg e^*(h, a)$$

for fixed h and $a' > a$

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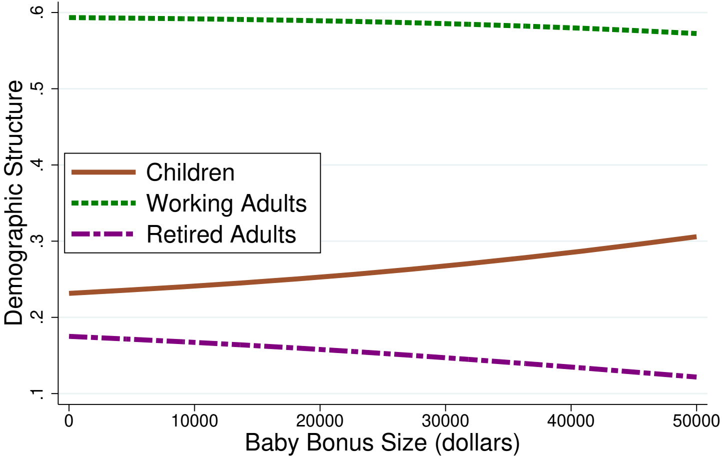
[3] Equivalent to 1,010 days of earnings for an unskilled laborer in the South

Change in Demographic Structure



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Distributional Welfare Consequences

Figure 16: Newborns in Transition

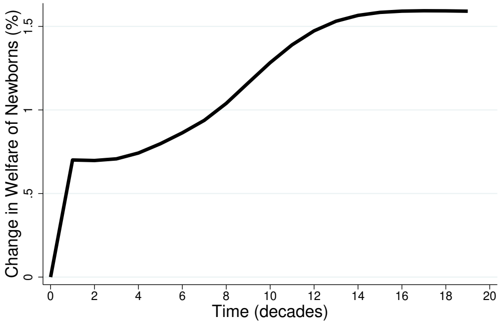
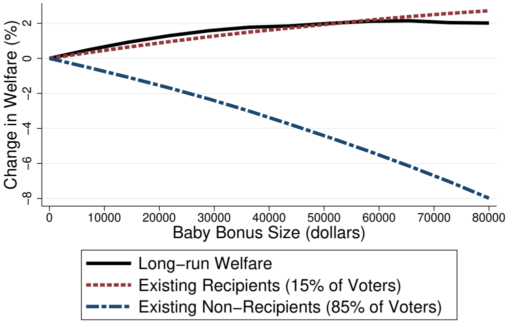


Figure 17: Long-run and Existing Households



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