

The Macroeconomic Consequences of Family Policies

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June 6, 2021

Motivation: Dual Role of Family Policies

Family policies: a class of policies that promote childbearing and childrearing

Encourage Childbirth to Combat Population Aging

- Prevalent in OECD countries with low fertility (>2% of GDP) ▶ trend
- Baby bonus in Australia 2004 (\approx \$2,100). Treasurer Peter Costello: "One (baby) for the Mum, one for the Dad, and one for the country"
- Increasingly relevant for the U.S. as Census data sends warning signals
- Popular and large in scale \rightarrow cost-effectiveness and aggregate impacts?

Boost Child Outcomes and Social Mobility

- Goals of \$3k+ Child Tax Credit, \$1.8 trillion American Families Plan - "an investment in our kids, our families, and our economic future"
- Effective in achieving stated policy goals?

What are the macroeconomic consequences of large-scale family policies?

- Suppose the government gives parents a baby bonus
 - ① Will it improve children's outcomes and boost social mobility?
 - ② How will it affect population growth, output and social welfare?
- A quantitative GE-OLG model:

$$\text{Endogenous Fertility} + \underbrace{\text{Endogenous Intergenerational Linkages}}_{\text{child human capital formation} + \text{inter-vivos transfers}}$$

- Previous studies and policy recommendations: family policies as transfers to existing child \rightarrow quality margin
- This paper: family policies change the "price" of child \rightarrow **add quantity margin**

Overview of Channels

- Considering **endogenous fertility** incorporates key policy channels:
 - ① **Quality/quantity trade-off**: higher fertility raises the marginal cost of child quality (Becker and Lewis 1973)
 - ② **Composition effects**: families that increase fertility more gain representation in future economies
 - ③ **GE effects**: changes in age structure affects pension and taxes
- **Fertility elasticities**, i.e. magnitude of fertility responses to financial incentives
 - ① Disciplined by parameters that are calibrated within the model
 - ② Validated externally using policy - Alaska Permanent Fund Dividend

Preview of Key Results

Consider a \$31k baby bonus:

(1) $\approx 1.1\times$ expansion of CTC from 2010-2021 in NPV

(2) offsets the average cost of raising one child by 19% (USDA)

- ① Average fertility increases by 10% (1.9 \rightarrow 2.1) while average private education investment **reduces** by 5%
- ② Average human capital falls by 1.25%. Social mobility falls by 1.6%
- ③ Long-run welfare¹ **rises by 3.6%** as tax rates decreases in equilibrium

Compare policy counterfactuals: baby bonus, childcare subsidy, and education

- **Education expenditures** are more effective than family policies in improving child outcomes and social mobility with mild effects on fertility

¹Average utility of new-borns under the veil of ignorance

Education Policies, Income transfers, and Mobility

- Benabou (2002), **de la Croix and Doepke (2003)**, Heckman and Mosso (2014), Bastian and Micheltore (2018), **Daruich (2019)**, Abbott, Gallipoli, Meghir and Violante (2019), Mullins (2019), **Guner, Kaygusuz and Ventura (2020)**...
- **Contribution: Considering fertility responses could reverse policy effects on child human capital and social mobility**

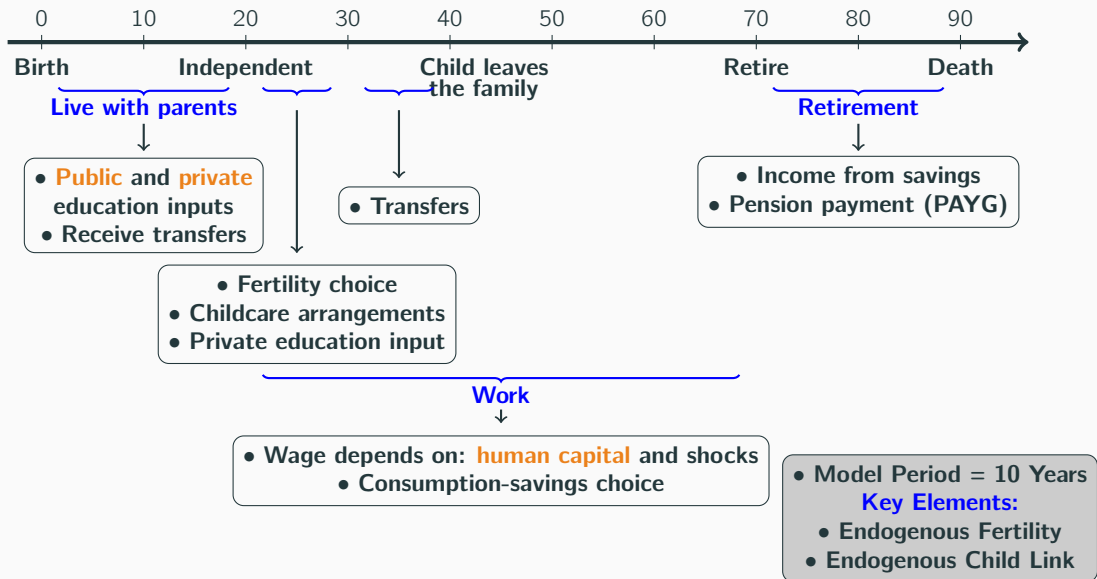
Family Policies, Fertility and Child Outcomes

- **Empirical:** Milligan (2005), Laroque and Salanié (2008), Drago et al. (2011), Luci-Greulich and Thévenon (2013), González (2013), Raute (2019)...
- **Structural:** Fan and Stark (2008), Liao (2013), **Tertilt, Kim and Yum (2021)**
- **Contribution: Propose and calibrate a quantitative model that is suitable for analyzing large-scale policies beyond fertility effects**

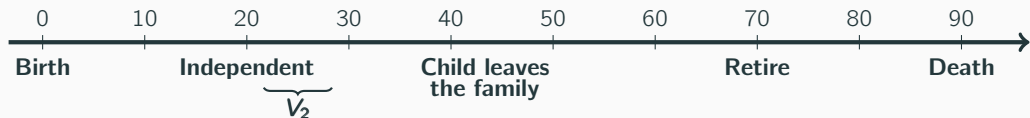
- ① Model: Role of endogenous fertility
- ② Calibration (2010 USA)
- ③ Validation
- ④ Counterfactual Results
- ⑤ Conclusion

Model

Model: Timeline



Fertility, Childcare and Skill Formation



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

$$n \cdot \chi = \left(t_h^{v/\nu} + (n \cdot m)^v \right)^{1/v} \quad \text{[time cost]}$$

$$y = wh \cdot (1 - t_h) \quad \text{[labor income]}$$

$$(1 + \tau_c)(c + mp_m(1 - \mathcal{S})n + e \cdot n) + a' = (1 + r)a + y - \mathcal{T}(y, a, n) + \mathcal{B} \cdot n \quad \text{[BC]}$$

$$h' = L(h, 1 - t_h, z') \quad h_k = G(h, \mathcal{E}, e, \epsilon) \quad \text{[technology]}$$

h : parents' skills

a : assets

n : fertility

t_h : home care

m : market care

e : private educ. input

χ : childcare needs

p_m : market care price

$q(n)$: equivalence scale

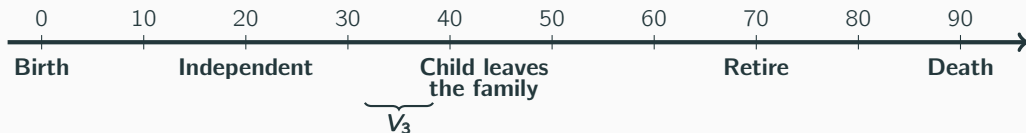
\mathcal{S} : childcare subsidy

\mathcal{B} : baby bonus

\mathcal{E} : public education

Two simplifying modeling assumptions:

Parent-to-Child Transfer



$$V_3(h, a, n, \mathbb{E}h_k) = \max_{c, a', a_k \geq 0} u(c/q_n) + \beta \mathbb{E}V_4(h', a') + \underbrace{v(n, \mathbb{E}h_k, a_k)}_{\text{utility from quantity and quality}}$$

$$y = wh \cdot 1$$

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

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

- First-order conditions for child "quality" choices e and a_k :

$$\frac{\partial v(n, \mathbb{E}h_k, a_k)}{\partial \mathbb{E}h_k} \cdot \frac{\partial \mathbb{E}h_k}{\partial e} = \lambda_2 \cdot (1 + \tau_c) \cdot n \quad \text{FOC [e]}$$

$$\frac{\partial v(n, \mathbb{E}h_k, a_k)}{\partial a_k} = \lambda_3 \cdot n \quad \text{FOC [a}_k\text{]}$$

where marginal costs are proportional to n

► later periods

Fertility Elasticity - Quality/Quantity Trade-off

Consider the effect of an increase in baby bonus \mathcal{B} on transfers a_k (fixing e for now)

When fertility elasticity $\frac{dn^*}{d\mathcal{B}} = 0$, i.e. exogenous fertility

- Increase in \mathcal{B} is an income transfer, a_k rises unambiguously:

$$\underbrace{\lambda_3 \downarrow}_{\text{income effect on } MU_c} \cdot n \Rightarrow \frac{v(n, \mathbb{E}h_k, a_k \uparrow)}{\partial a_k} \quad \text{FOC } [a_k]$$

When fertility elasticity $\frac{dn^*}{d\mathcal{B}} \neq 0$, i.e. endogenous fertility

- Increase in \mathcal{B} is a price change, n rises \implies effects on a_k is ambiguous:

$$\underbrace{\lambda_3 ?}_{\text{change in } MU_c \text{ as } n \uparrow} \cdot \underbrace{n \uparrow}_{\text{fertility response}} = \frac{\partial v(n \uparrow, \mathbb{E}h_k, a_k ?)}{\underbrace{\partial a_k}_{\text{interaction in preferences}}} \quad \text{FOC } [a_k]$$

- a_k could fall when child benefits are more generous - **quality/quantity trade-off**

Heterogeneous Fertility Elasticities - Composition Effects

- Heterogeneous fertility elasticities: size of transfer relative to income differs
- Families that increase fertility more gain representation
- Intergenerational persistence of $h \implies$ **composition effects** on aggregate h.c.
- **Insight:** Even when policy effects on each child's human capital is positive, overall impact on aggregate human capital could still be negative

Firms and the Government

- Representative firm with Cobb-Douglas production function:

$$Y = AK^\alpha H^{1-\alpha}$$

- Denote age structure as $\{\omega_j\}_{j=0}^8$ (with $\sum_{j=0}^8 \omega_j = 1$) and distribution of households across state space as $\{\mu_j\}_{j=0}^8$. **Government fiscal budget:**

$$\underbrace{\left(\sum_{j=2}^6 \omega_j \int \mathcal{T}(y_j^*, a_j^*, n_j^*) d\mu_j \right)}_{\text{labor and capital income taxes}} + \underbrace{\left(\sum_{j=2}^8 \omega_j \int \tau_c c_j^* d\mu_j \right)}_{\text{consumption tax}} = \underbrace{\left(\sum_{j=7}^8 \omega_j \int w\pi h d\mu_j \right)}_{\text{pension payments}}$$

$$+ \underbrace{(\omega_0 + \omega_1) \cdot \mathcal{E}}_{\text{public education}} + \omega_2 \left(\underbrace{\int n^* \cdot \mathcal{B} d\mu_2}_{\text{baby bonus}} + \underbrace{\int (1 + \tau_c) m^* n^* p_m \cdot \mathcal{S} d\mu_2}_{\text{subsidized childcare}} \right) + \underbrace{x}_{\text{other spendings}}$$

- GE Effects: Fertility responses change $\{\omega_j\}_{j=0}^8$** and tax burden via τ_c . Key motivation for family policies, absent in models with exogenous fertility

Why may family policies improve welfare?

Long-run welfare²: **average value** of newborn under the veil of ignorance:

$$\mathcal{W} := \int V_2 d\mu_2$$

Welfare of current households \longrightarrow transition path results (in progress)

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 ...)

²See Parfit (1984) - "repugnant conclusion", Golosov, Jones and Tertilt (2007) - " \mathcal{A}, \mathcal{P} -efficiency", and de la Croix and Doepke (2021) - "soul incarnation" for more discussions of welfare with endogenous fertility

Calibration

Model Parameters

Table 1: Model Parameters

Interpretation		Value	Source	Interpretation		Value	Source
Preferences				Child human capital production			
β	discount rate	0.98^{10}	standard	Z	normalizing scalar	2.57	median income =1
γ	elasticity of substitution	0.61	CPS	σ_ϵ	ability shock dispersion	0.45	PSID
ψ	fertility preference	1.92	CPS	ρ	intergenerational spillover	0.28	Chetty et al. (2014)
θ	quality preference	2.02	PSID	ξ	substitution of education	0.9	ATUS
ν	transfer preference	0.34	PSID	\mathcal{E}	public education	0.15	NCES
Childcare arrangement				κ	input productivity	0.17	García et al. (2020)
χ	childcare cost	0.18	Folbre (2008)	Adult human capital evolution			
ι	economies of scale at home	0.7	Folbre (2008)	η	learning curvature	0.61	PSID
υ	substitutability of care	0.5	SIPP	ζ	learning level	0.72	PSID
p_m	price of full-time care	0.13	NACCRRA	μ_Z	skill depreciation	-0.23	PSID
Taxes and pension				σ_Z	shock dispersion	0.42	PSID
τ_y^n, λ_y^n	tax levels and progressivity	misc.	TAXSIM	Firm production function			
τ_c	consumption tax	0.07	McDaniel (2007)	A	total factor productivity	1	normalization
τ_a	capital income tax	0.27	McDaniel (2007)	α	capital share	0.33	standard
π	pension replacement rate	0.40	OECD Database	δ_k	capital depreciation	0.04^{10}	standard

- 13 parameters are **calibrated** within the model using SMM
- Model matches salient features of fertility, childcare, parental investment, transfers, child skill formation, and lifecycle earnings profile

Utility from child quantity and quality³

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

$$\Psi(n) = 1 - \exp(-\psi n) \quad u(x) = \frac{x^{1-\gamma}}{1-\gamma} \quad \gamma \in (0, 1) \quad x \in \{\mathbb{E}h_k, a_k, c\}$$

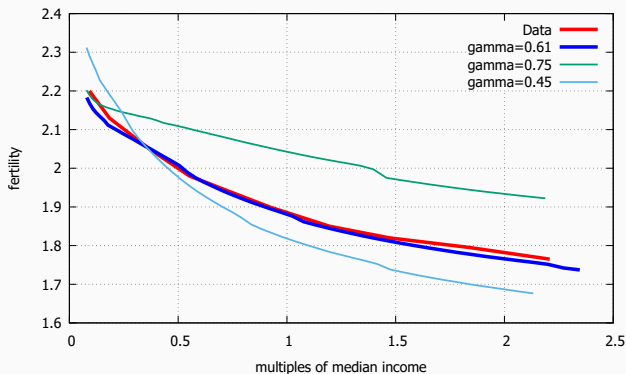
- $\{\psi, \theta, \nu\}$ matches aggregate fertility and average spendings on quality
- γ - elasticity of intergenerational substitution (EGS) (Córdoba and Ripoll 2019)
- Conditional on other parameters, **γ determines fertility elasticity**. Higher $\gamma \implies$ smaller fertility responses

► intuition

³Results robust to separable preferences and dynastic altruism

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



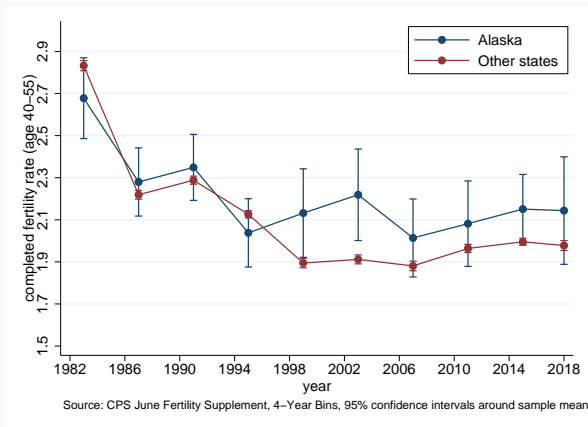
Validation

Does the model generate responses that match empirical estimates?

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

- Established in 1982 after discovery of the petroleum. Equal transfer to **all residents** regardless of income, employment or age
- **Pronatal effects**: allows parent to claim dividend on behalf of a child with no requirements on how parents use a child's dividend.
- Ideal policy variation to test fertility responses:
 - ① Similar institution and cultural background
 - ② Large in scale (\approx \$1.5k per year) relative to other family policies
- Apply same policy in the model: universal basic income (UBI) to parents and children by \$1.5k. Model predictions are consistent with empirical evidence:
 - ① Completed fertility rises by **4.2%** (\approx Kelly, Timilsina and Yonzan 2020)
 - ② Larger responses from households with lower human capital (Cowan and Douds 2020)
 - ③ Positive but small effects on education investments

Evidence from Completed Fertility Rates



- Changes in completed fertility rate alleviates worries about effects on birth timing
- Model-predicted 4.2% (0.1) increase is consistent with average differences between Alaska and the other states

Counterfactual Results

Evaluate baby bonus \mathcal{B} of different scale

- **Budget balance:** consumption tax adjusts to balance budget each period
- **General equilibrium:** wage, interest rates, and population distributions adjust

Outcomes of Interest

- Aggregate fertility, average human capital, per capita income, consumption taxes and intergenerational income mobility ($\frac{1}{TGE}$)
- Social welfare in consumption equivalence (changes)

Outline

- **Long-run effects** - comparing new steady-state economy to baseline economy
- **Transition, alternative funding methods** (in progress)

Figure 1: Effects on aggregate fertility

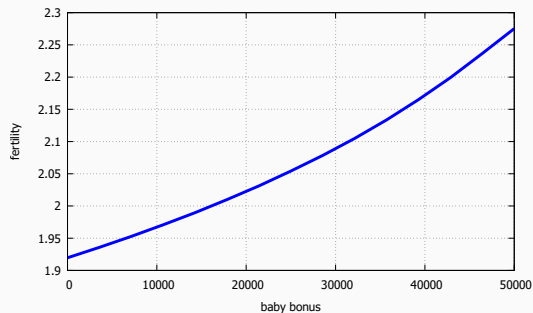
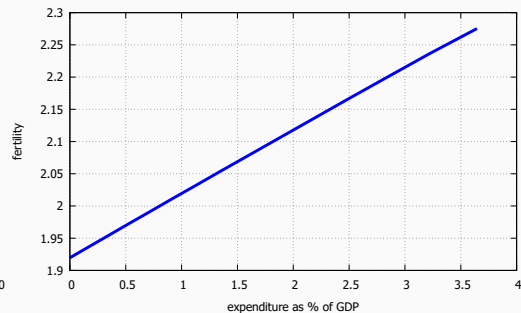


Figure 2: Expenditure share



- Baby bonus needs to be at least **\$31k** to raise aggregate fertility rate to **replacement level** (2.1, commonly stated long-run policy goal). The policy costs around **1.8%** of GDP in the new equilibrium
- From now on, consider $\mathcal{B} = \$31\text{k}$ as the benchmark policy ($\approx 1.1\times$ expansion of CTC from 2010-2021 in NPV)

Figure 3: Average private investment

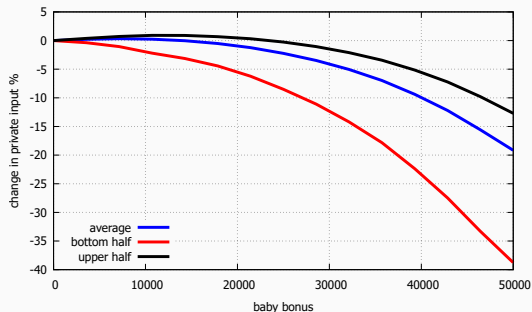
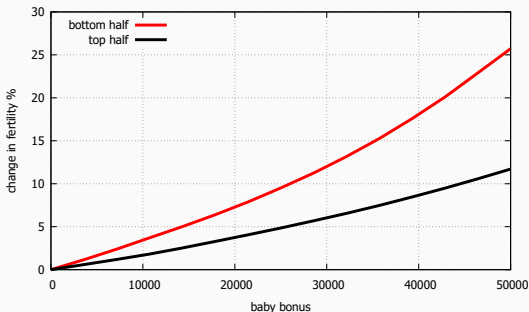


Figure 4: Heterogeneous fertility response



- **Quality/quantity trade-off:** Parents **reduce** private investments by 5%
- **Composition effects:** Parents with lower human capital respond more in fertility

Average Human Capital and Social Mobility

Figure 5: Average human capital

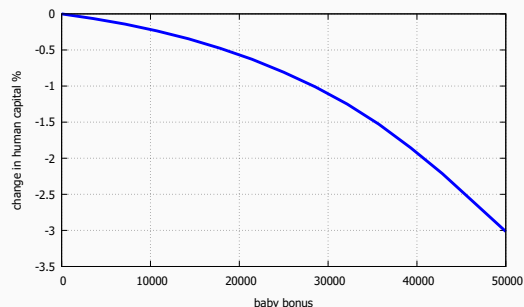
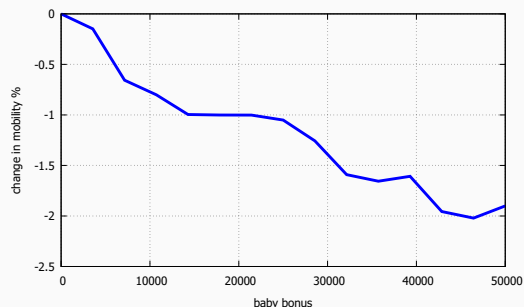


Figure 6: Intergenerational mobility



- Average human capital falls by **1.25%** with $B = \$31,000$
- Intergenerational mobility **decreases by 1.6%** due to heterogeneous responses
- Results are **stronger** when baby bonus is targeted at low-income households

Output and Tax: GE Effects

Figure 7: Per capita output

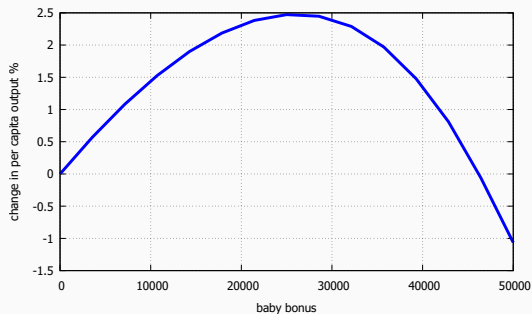
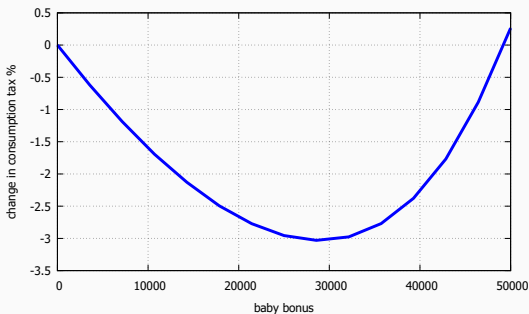


Figure 8: Change in consumption tax



- Per capita output rises initially due to changes in **age structure**
- **GE effects**: government can reduce consumption tax by 3%
- Larger baby bonus is **not always beneficial** as (1) average human capital worsens, and (2) public education expenditure rises

► budget

► age structure

Figure 9: Welfare-Fertility Expansion Path

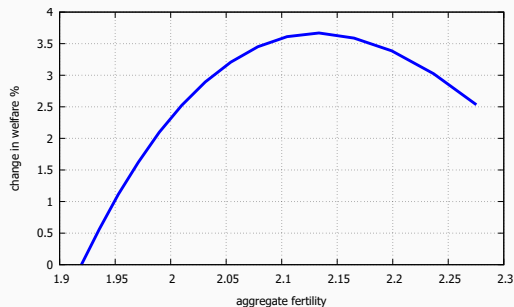
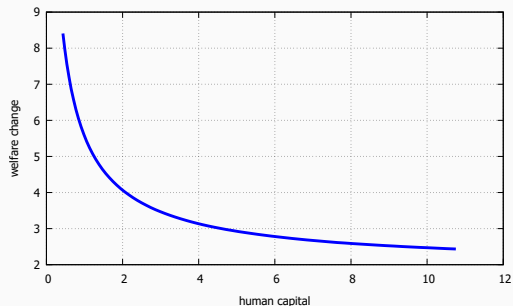
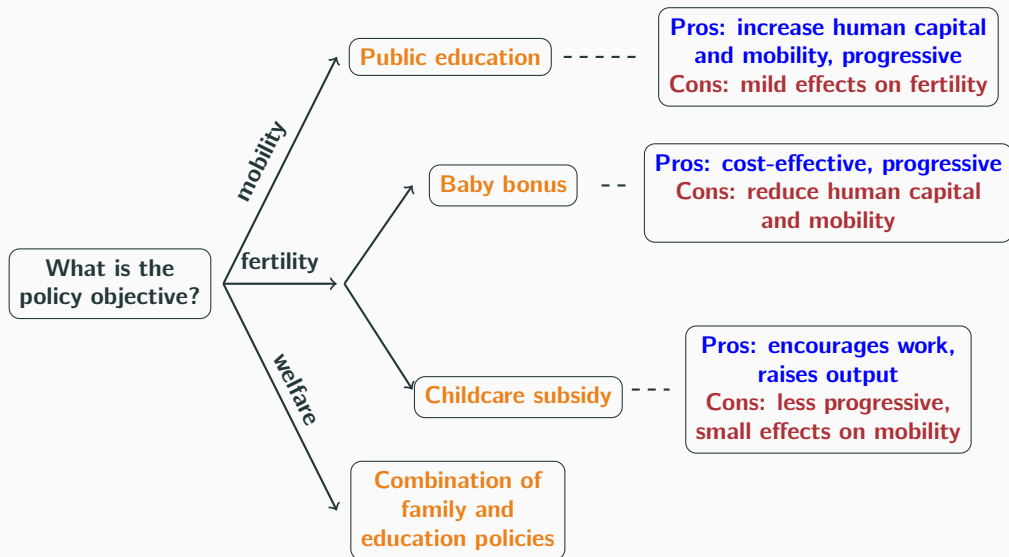


Figure 10: Change in welfare



- Welfare maximized around replacement fertility, **3.6%↑** in the long-run
- **Progressive**: large welfare improvement for parents with low human capital

Summary of Policy Comparisons



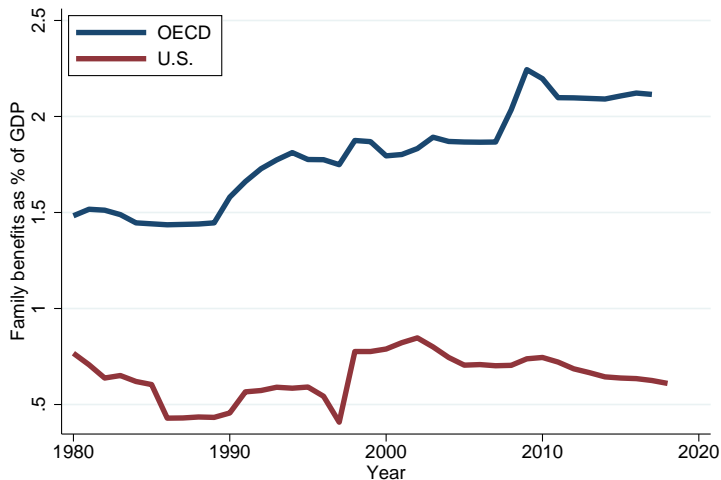
Study macroeconomic consequences of large-scale family policies

- Model **endogenous child quantity and quality** in a GE-OLG model
- Discipline **fertility elasticity** using data moments and validate using policy

Results:

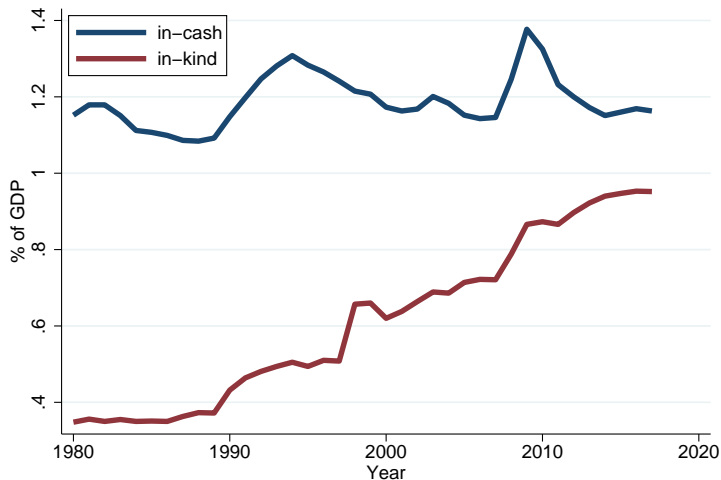
- ① Compared with previous studies where fertility is fixed, introducing endogenous fertility reverses policy implications on child outcome and social mobility
- ② A \$31k baby bonus raises fertility to replacement level and improves welfare by **3.6%** via effects on age structure and taxes in the general equilibrium
- ③ Public education is effective in improving child outcome, social mobility and welfare despite having mild effects on fertility

Time Trend of Public Expenditures on Child Benefits



Source: OECD database

Expenditure Breakdown



Source: OECD database

Working Without Children and Retirement

- For households working without children:

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

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

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

- For retired households:

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

$$(1 + \tau_c)c + a' = (1 + r - r\tau_a)a + \pi \cdot wh$$

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

where π is pension replacement rate

Stationary Equilibrium

- **Distributions:**

- Demographic structure $\{\omega_j\}_{j=0}^8$ and distribution of agents over states $\{\mu_j\}_{j=0}^8$ are invariant over time periods
- Distribution of initial states is determined by older generations and shock processes

- **Households Optimize:** Households choose consumption, savings, fertility, childcare arrangements, child investments and inter-vivos transfers such that utility is maximized

- **Firms maximize profits**

- **Prices clear markets**

- **Government balances budget in period to period**

Child's Skill Production Function

- Children's skill production function:

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

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

- $\rho = 0.28$ - rank-rank mobility (Chetty, Hendren, Kline and Saez 2014)
- $\mathcal{E} = 0.15$ - \$12k per pupil per year (NCES)
- $\kappa = 0.17$ - **RCT evidence** from García, Heckman, Leaf and Prados (2020)

Child's Skill Production Function Cont'd

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

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

- **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 $\kappa = 0.17$**

Costs of Child and Childcare

- OECD equivalence scale:

$$q(n) = 1.7 + 0.5 \cdot n$$

- **Childcare arrangements:**

$$n \cdot \chi = \left(t_h^{v/\iota} + (n \cdot m)^v \right)^{1/v}$$

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

- Elasticity of substitution: $v = 0.5$ - average share of income spent on childcare by education (SIPP) (Malik 2019)
- **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)

Fertility Response

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

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

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

- 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

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

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

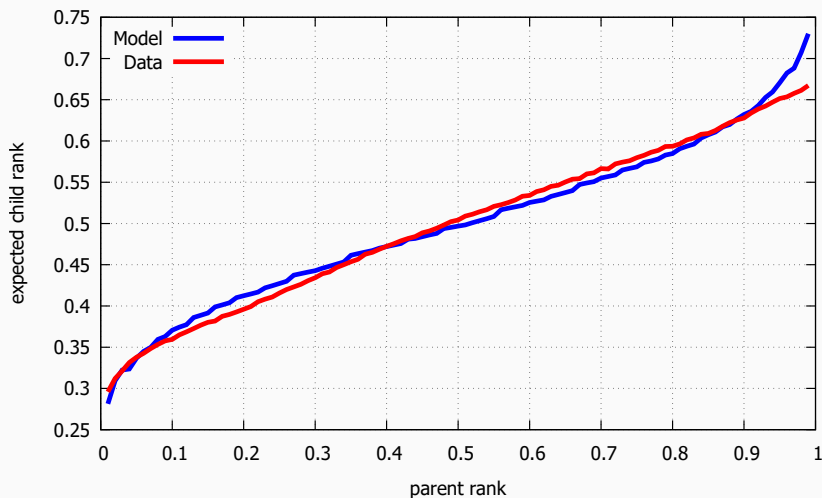
- **Human capital of working adults** evolves:

$$h_{j+1} = \exp(z) (h_j + \zeta(h_j t))^{\eta}$$

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

- $\eta = 0.61, \zeta = 0.72$ - lifecycle earnings (PSID) (Huggett, Ventura and Yaron 2011)
- $\mu_z = -0.23, \sigma_z = 0.42$ - 2% skill depreciation and lifecycle Gini coefficient of earnings (Huggett, Ventura and Yaron 2011)

Intergenerational Mobility: Model vs Data



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

- **Firms' production function:** capital share $\alpha = 0.33$ and 4% capital depreciation
- **Government taxes**

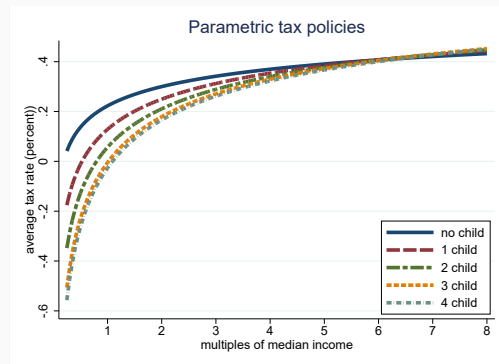
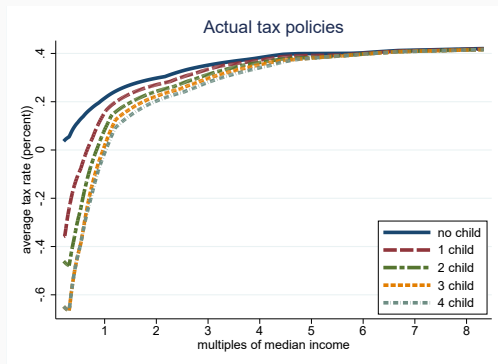
- **Income taxes:**

$$\mathcal{T}(y, a, n) = y \cdot (1 - \tau_y^n y^{-\lambda_y^n}) + \tau_a r a$$

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:** $\pi = 40\%$

Income Taxes: Model vs Data



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

Baby Bonus in Australia

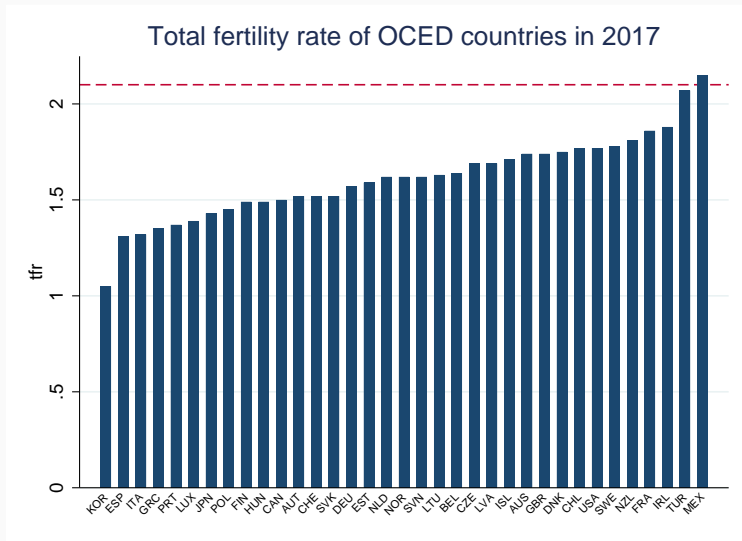
- **A\$3,000 baby bonus**⁴ to every child born on or after July 1st 2004
- Peter Costello (Treasurer of Australia): "One (baby) for the Mum, one for the Dad, and one for the country"
- $\text{tfr}_{\text{AUS},2004} = 1.77 > 1.73 = \text{tfr}_{\text{USA},2018}$ before the Covid Baby Bust [▶ other](#)
- Drago et al. (2011) finds:
 - Significant fertility responses and evidence for long-term/quantum effects
 - Cost for an additional birth to be at least A\$126,000⁵
 - 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

[▶ back to validation](#)[▶ back to results](#)

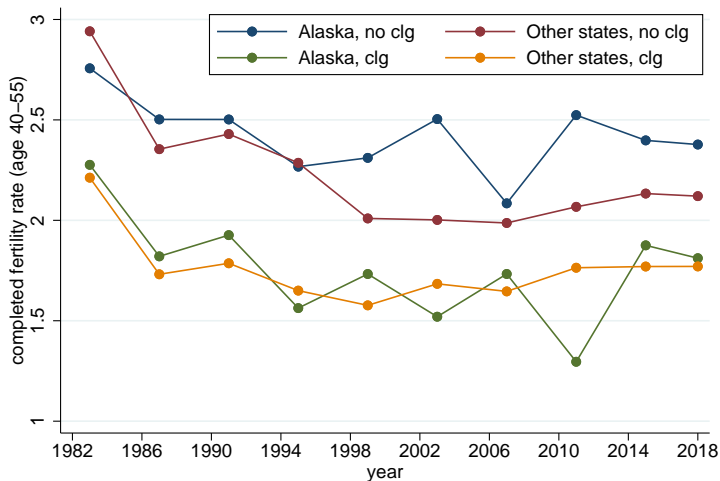
⁵More details: (1) Announced on Mar.12th 2004, (2) universal coverage, lump-sum payment, (3) Equivalent to 4 times average weekly earnings, (4) Equivalent to \$2,800 in 2010 USD.

⁵Equivalent to \$117,600 in 2010 USD. Quantitative model predicts \$130,000 is needed for an additional birth (for the U.S.).

Total Fertility Rate Across Countries

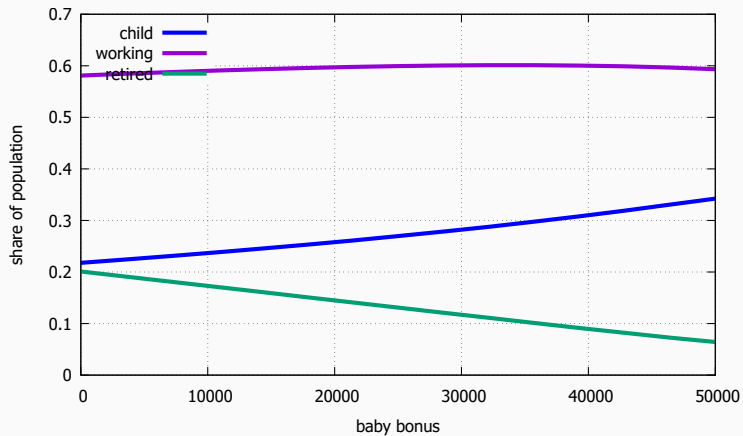


Evidence from Completed Fertility Rates



Source: CPS June Fertility Supplement, 4-Year Bins

Change in Demographic Structure



Highlights for Subsidized Childcare \mathcal{S}

Figure 11: Fertility

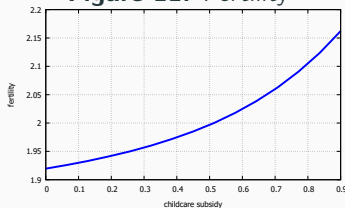


Figure 12: $\Delta \bar{h}$

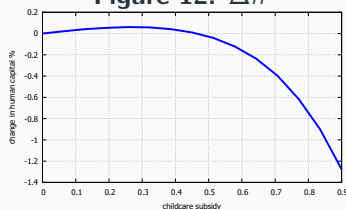


Figure 13: Per capita output

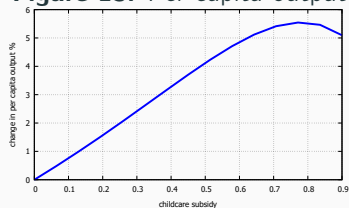


Figure 14: $\Delta \tau_c$

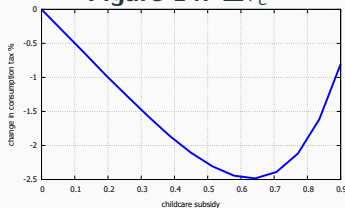


Figure 15: Mobility

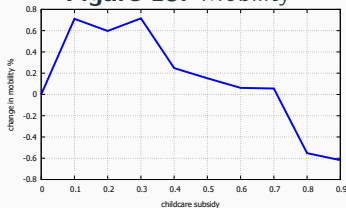
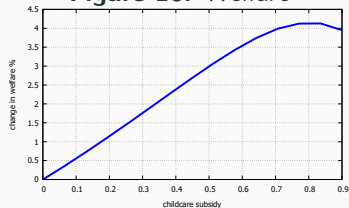


Figure 16: Welfare



- Need **80%** refund to reach 2.1 fertility, **50%** less cost-effective than baby bonus
- Impacts of subsidized childcare are qualitatively similar to baby bonus except that **it encourages work** (Guner, Kaygusuz and Ventura 2020) and **mobility effect is small**
- **Less progressive** because subsidy amount depends on childcare expenditures

Highlights for Public Education Expansion \mathcal{E}

Figure 17: Fertility

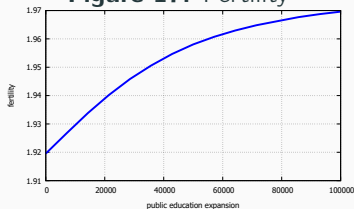


Figure 18: $\Delta \bar{h}$

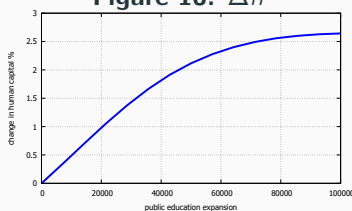


Figure 19: Per capita output

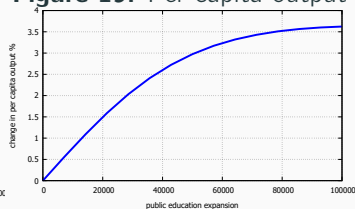


Figure 20: $\Delta \tau_c$

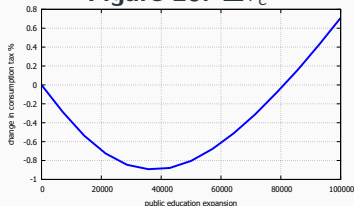


Figure 21: Mobility

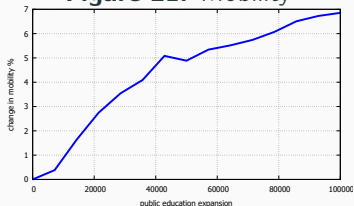
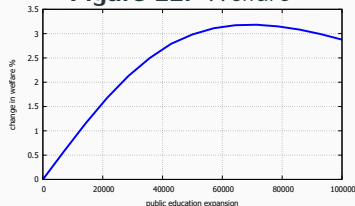
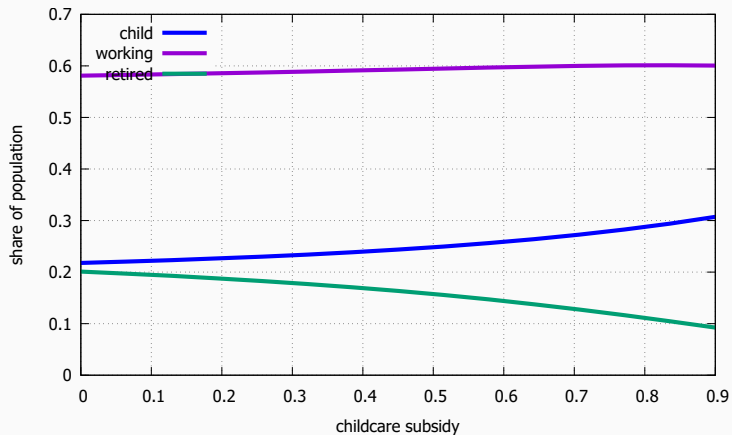


Figure 22: Welfare

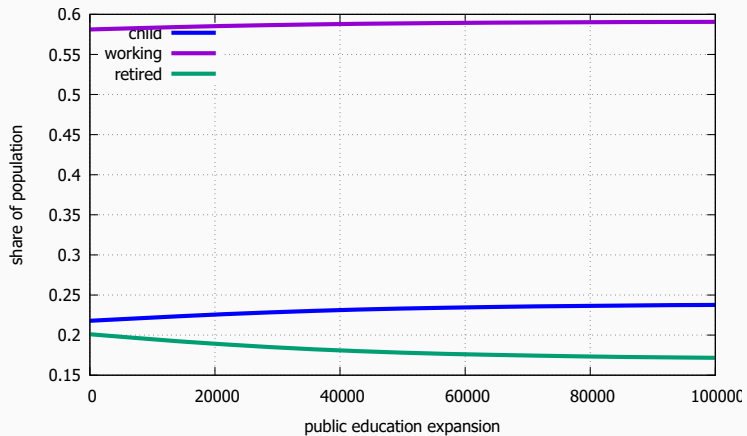


- **Mildest fertility effects** (0.035 boost vs 0.23 boost using \$40k baby bonus)
- **Most effective in improving mobility** (5.5% increase using \$65k)
- **Progressive** policy with large welfare improvement for low-income households

Change in Demographic Structure



Change in Demographic Structure



Transition path

- **Question:** How long do we need to wait for aggregate effects to take place? What are the distributional consequences for households in the original steady-state? Majority support for policy reform?
- **Conjecture:** Majority support may requires transfers **within cohorts**

Alternative ways of financing

- **Question:** How will things change if the policy could be funded via government deficits or labor/capital taxes?

Optimal policies

- **Question:** What is the optimal policy to maximize welfare however defined?