# 2-Sided Altruism: Do Intergenerational Transfers Trigger Greater Childbearing In Developing Countries?

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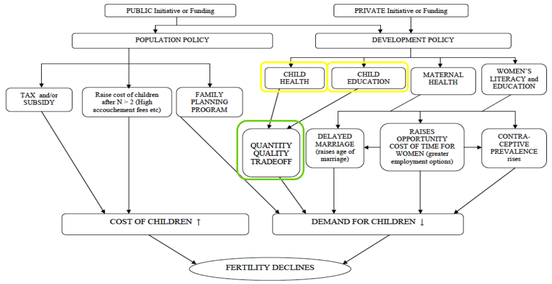
## INTRODUCTION

- Current world population = 7 billion → 2050 Projections = 9 billion
- **ΔP = B - D + NM**
- Population growth deceleration → Fertility Management

**Schematic Representation of Policy instruments that affect the Determinants of Fertility**




- Previous Literature: Barro & Becker (1988, 1989); Kimball (1987); Abel (1987); Singh, Veigas & Ratnam (1986); Gertler & Molyneaux(1994) etc.

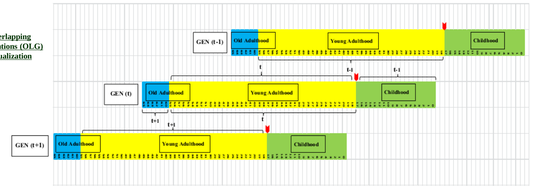
## RESEARCH QUESTION

*How can the* ***Quantity-Quality model of fertility*** *be used in presence of*
❖***child labor*** ❖***lack of old age security*** ❖***intergenerational transfers***
*to analyze the effects of* ***incentives for smaller family sizes?***

## METHODOLOGY

- Extension of QQ model → incorporate 3 generations + 3 time period.

**Overlapping Generations (OLG) Visualization**




- Demand for children made in presence of uncertainty
- Elderly may not have savings for old age security
- Parents choose *number of children (quantity)+education of child (quality)*
- Children may work + Young adults employed + Old adults retired

## THEORETICAL FRAMEWORK

- Additively separable *Buiter-Carmichael-Burbidge Utility function*
- Discount Rates and Degrees of Altruism: (θ) (ϕ) (α) (ε)

**Dynamic Model Optimisation Exercise**

$$\max_{C_{2t},n_t,g_t,l_t,k_t} U_t = V_t(C_{2t}) + \theta V_t(C_{t+1}) + \phi V_{t-1}(C_{3t}) + \alpha(n_t)^{1-\varepsilon} V_{t+1}(C_{2t+1})$$

$$= \frac{1}{\sigma}(C_{2t})^{\sigma} + \theta\frac{1}{\sigma}(n_t g_{t+1})^{\sigma} + \phi\frac{1}{\sigma}(n_{t-1} g_t)^{\sigma} + \alpha(n_t)^{1-\varepsilon}\frac{1}{\sigma}(C_{2t+1})^{\sigma}$$

subject to

$$C_{2t} + n_t\beta + g_t + n_t k_t = e + (1 + R_t)(1 - l_{t-1})^{\gamma} k_{t-1} + n_t w_t^e l_t$$

$$n_t[C_{2t+1} + n_{t+1}\beta + g_{t+1} + n_{t+1}k_{t+1}] = n_t[e + (1 + R_{t+1})(1 - l_t)^{\gamma} k_t + n_{t+1} w_{t+1}^e l_{t+1}]$$

- Analytical Solutions can be solved from First order Conditions for the 7 unknowns: $(C_{2t}, n_t, g_t, l_t, k_t, \lambda_t, \lambda_{t+1})$

## EMPIRICAL ANALYSIS

| | Period (t-2) | | | Period (t-1) | | | Period (t) | | | Period (t+1) | | | Period (t+2) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Start of pd (t-2) | | | Start of pd (t-1) | | | Start of pd (t) | | | Start of pd (t+1) | | | Start of pd (t+2) | | | Start of pd (t+3) |
| | x yr | x+7yr | x+7yr | x+20yr | x+22yr | x+27yr | x+40yr | x+42yr | x+47yr | x+60yr | x+62yr | x+67yr | x+80yr | x+82yr | x+87yr | x+100yr |
| | 1967 | | | 1987 | | | 2007 | | | 2027 | | | 2047 | | | 2067 |
| Gen (t-2) | Y-Ad = 38 | Y-Ad = 40 | Y-Ad = 45 | Y-Ad = 58 | O-Ad = 60 | Die = 65 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Gen (t-1) | Y-Ad = 18 | Y-Ad = 20 | Y-Ad = 25 | Y-Ad = 38 | Y-Ad = 40 | Y-Ad = 45 | Y-Ad = 58 | O-Ad = 60 | Die = 65 | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Gen (t) | N/A | Born = 0 | Child = 5 | Y-Ad = 18 | Y-Ad = 20 | Y-Ad = 25 | Y-Ad = 38 | Y-Ad = 40 | Y-Ad = 45 | Y-Ad = 58 | O-Ad = 60 | Die = 65 | N/A | N/A | N/A | N/A |
| Gen (t+1) | N/A | N/A | N/A | N/A | Born = 0 | Child = 5 | Y-Ad = 18 | Y-Ad = 20 | Y-Ad = 25 | Y-Ad = 38 | Y-Ad = 40 | Y-Ad = 45 | Y-Ad = 58 | O-Ad = 60 | Die = 65 | N/A |
| Gen (t+2) | N/A | N/A | N/A | N/A | N/A | N/A | Born = 0 | Child = 5 | Y-Ad = 18 | Y-Ad = 20 | Y-Ad = 25 | Y-Ad = 38 | Y-Ad = 40 | Y-Ad = 45 | Y-Ad = 58 | |
| Gen (t+3) | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | Born = 0 | Child = 5 | Y-Ad = 18 | Y-Ad = 20 | Y-Ad = 25 | Y-Ad = 38 | |
| Gen (t+4) | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | Born = 0 | Child = 5 | Y-Ad = 18 | |

- Representing generation length =20 years → (t-2)=1967; (t-1)=1987; (t)=2007.
- Data: NSSO's 43rd to 64th Round (1986-2008) , World Bank indicators.
- Cumulative values are discounted by 2007 real interest rate (6.87%).

**Derivation of Lagged Variables** *(from data)*

| | | | |
|---|---|---|---|
| ***Young Adult Consumption*** | $C_{2t-1}$ | | |
| | 36073.946 | | |
| ***Old Adult Consumption*** | $g_{t-1}$ | | |
| | 832.7792 | | |
| ***Fertility*** | $n_{t-1}$ | | |
| | 2.071 | | |
| ***Child Labor*** | $l_{t-2}$ | $l_{t-1}$ | |
| | 0.1406 | 0.1406 | |
| ***Child Expenses*** | $k_{t-2}$ | $k_{t-1}$ | β |
| | 878.6377 | 1144.133 | 11965.55 |
| ***Rate of Interest*** | $R_{t-1}$ | $R_t$ | $R_{t+1}$ |
| | 0.065601 | 0.068691 | 0.071926 |
| ***Wages*** | $w_{t-1}^e$ | $w_t^e$ | |
| | 143457.1406 | 31355.30667 | |

**Estimation of Lagged Variables from data**

**Model Parameterization Results**

| Parameters | Notation | Values |
|---|---|---|
| *Premium rate for own old age consumption* | θ | 0.8772 |
| *Rate of human capital accumulation* | γ | 0.5 |
| *Degree of altruism towards children* | α | 0.4881 |
| *Degree of altruism towards elderly parents* | ϕ | 0.124 |
| *Elasticity of number of children* | ε | 0.2419 |
| *Elasticity of consumption* | σ | 0.5 |

**Household Decision Results**

| Variables | Estimated Values | Observed Values |
|---|---|---|
| *Current Young Adult Consumption Expenditure* | 70337 | 70778.5 |
| *Contribution to Old Adult's Consumption Expenditure* | 2239.8 | 2279.6 |
| *Fraction of Time spent in Child Labor* | 0.2372 | 0.2094 |
| *Cumulative Investment in Child Education* | 4783.3 | 4674.7 |
| *Fertility Choice ($n_t$ = TFR/2)* | 1.3754 | 1.371 |

**Calibration Exercise via back calculation (plug t = 2007 values)**

**Numerical Results (Avg No of children per parent = 1.37 → TFR= 2.7>2.1)**

## POLICY EXPERIMENTS

Different policy scenarios would result in different levels of choice.

**FERTILITY REDUCTION SUBSIDY**

- Current $n_0$=1.37 => TFR=2.7 Vs. Target $n_t$=1.05 => TFR=2.1
- Effect on Budget Constraint: $C_{2t} + n_t\beta + g_t + n_t k_t = e + (1 + R_t)(1 - l_{t-1})^{\gamma} k_{t-1} + n_t w_t^e l_t + s(n_0 - n_t)$
- 2 stage game:- Step 1: Policy maker; Step 2: Household.
- Model yields monetary transfer of Rs. 39250 per person.
- Concerns: Timing of subsidy; Expensive payoff.

**CONDITIONAL CASH TRANSFER TO REDUCE CHILD LABOR**

- Aim: influx of money → reduce child lab → raise schooling → QQ
- Effect on Budget Constraint: $C_{2t} + n_t\beta + g_t + n_t k_t = e + (1 + R_t)(1 - l_{t-1})^{\gamma} k_{t-1} + n_t w_t^e l_t + c(l_0 - l_t) n_t$

**Setting c = 5% (Brazil); 10% (Mexico); 20% (Nicaragua) to replicate successful interventions**

$$C_{2t} + n_t\beta + g_t + n_t k_t - n_t loc = e + (1 + R_t)(1 - l_{t-1})^{\gamma} k_{t-1} + n_t w_t^e l_t - n_t loc$$

$$C_{2t} + n_t(\beta - loc) + g_t + n_t k_t = e + (1 + R_t)(1 - l_{t-1})^{\gamma} k_{t-1} + n_t(w_t^e - c) l_t$$

- Concerns: Timing of CCT

$$C_{2t} + n_t\overline{\beta} + g_t + n_t k_t = e + (1 + R_t)(1 - l_{t-1})^{\gamma} k_{t-1} + n_t \overline{w_t^e} l_t$$

**CCT calculation**

| Variable | $CCT_1$ *(5% of $w_t^e$)* | $CCT_2$ *(10% of $w_t^e$)* | $CCT_3$ *(20% of $w_t^e$)* |
|---|---|---|---|
| $c$ | 1567.7653 | 3135.5306 | 6271.0613 |
| $\overline{\beta}$ | 11613.4319 | 11261.3118 | 10557.0716 |
| $\overline{w_t^e}$ | 29787.5413 | 28219.7760 | 25084.2453 |

**Comparative Statics for Conditional Cash Transfers**

| | Child Labor ($l_t$) | Educational Investment ($k_t$) | Fertility Choice ($n_t$) |
|---|---|---|---|
| **BASELINE** | 0.2372 | 4783.3 | 1.3754 |
| **$CCT_1$** *(5% of $w_t^e$)* | 0.1862 | 4847.9 | 1.3203 |
| **$CCT_2$** *(10% of $w_t^e$)* | 0.1253 | 4936.7 | 1.2614 |
| **$CCT_3$** *(20% of $w_t^e$)* | 0.0930 | 5213.3 | 1.1313 |

** Note: $C_{2t}$ and $g_t$ remain unaffected by the transfers.*

**MIDDAY MEAL SCHEMES TO RAISE SCHOOL ATTENDANCE**

- Aim: school lunch program → raise enrollment + attendance → QQ
- Effect on Budget Constraint: $C_{2t} + n_t\beta + g_t + n_t k_t = e + (1 + R_t)(1 - l_{t-1})^{\gamma} k_{t-1} + n_t w_t^e l_t + n_t m$

**State sponsored public schools provide daily balanced meal of rice, lentils ,vegetables, eggs and fruits (Rs. 5 per child per day)**

$$C_{2t} + n_t(\beta - m) + g_t + n_t k_t = e + (1 + R_t)(1 - l_{t-1})^{\gamma} k_{t-1} + n_t w_t^e l_t$$

$$C_{2t} + n_t\overline{\beta} + g_t + n_t k_t = e + (1 + R_t)(1 - l_{t-1})^{\gamma} k_{t-1} + n_t w_t^e l_t$$

- Concerns: Difficult to sustain

**Comparative Statics for Mid-day Meal Scheme**

| | Child Labor ($l_t$) | Educational Investment ($k_t$) | Fertility Choice ($n_t$) |
|---|---|---|---|
| **BASELINE** | 0.2372 | 4783.3 | 1.3754 |
| **Mid-Day Meal** $m = 4306.9206$ $\overline{\beta} = 7652.6320$ | 0.1535 | 5308.2 | 1.2878 |

** Note: $C_{2t}$ and $g_t$ remain unaffected by the transfers.*

## CONTRIBUTION

- ✓ Considers both factors of ***old age dependence*** and ***child labor*** within ***fertility choice.***
- ✓ Extends the Quantity-Quality model to ***solve for household decision variables.***
- ✓ Traces effects of ***conditional cash transfers, midday meal programs*** and ***fertility reduction subsidies.***

## CONCLUSION

***Healthier well educated children are more valuable to parents*** → ***More quality so satisfied with less quantity***

- Dynamic intergenerational model integrates
  *Q-Q fertility tradeoff + child labor + old age security*
- Raising investments in quality allows a child to attain full potential → this individual then invests more in their own children → chain reaction to replacement rate fertility and stable population size
- Reliance on children for contributions to household income leads to high fertility → provision of appropriate social safety nets → parents have fewer children as rely less on economic gifts from offspring
- Policy implication: Need ***COMBINED POLICY PORTFOLIO***

## FUTURE EXTENSIONS

- Test impact of other policy instruments (social security benefits)
- Sensitivity analysis for different parameters

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