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Transfers within a three generations family: When the rotten kids turn into altruistic parents[☆]

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HIGHLIGHTS

- We study exchanges between three overlapping generations with non-dynastic altruism.
- The middleaged provide care to their parents and invest in their child's education.
- The three generations play a game inspired by Becker's rotten kids framework.
- Care is set according to an efficient rule but education is distorted upwards.
- In the stationary equilibrium the levels of both transfers are inefficient.

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ABSTRACT

We study exchanges between three overlapping generations with non-dynastic altruism. The middleaged choose informal care provided to their parents and education expenditures for their children. The young enjoy their education, while the old may leave a bequest to their children. Within each period the three generations play a "game" inspired by Becker's (1974, 1991) rotten kids framework, with the added features that the rotten kids turn into the altruistic parent in the next period and that parents invest in the education of their children. We show that Becker's rotten kids theorem holds for the single period game in that informal aid is set according to an efficient *rule*. However, education is distorted upwards. In the stationary equilibrium the *levels* of both transfers are inefficient: education is too large and informal aid is too low.

1. Introduction

Understanding intergenerational transfers within the family is a crucial ingredient for the design of various policies like education and long-term care. This paper studies intergenerational exchanges in an overlapping generation (OLG) framework with three generations: the young, the middleaged (parents) and the old (grandparents). The parents choose two transfers: (i) informal care provided to their parents, and (ii) education expenditures for their children. The young enjoy their education while the old may leave a bequest to their children. Individuals are altruistic but in a non-dynastic way; altruism is limited to the following generation. Within each period the three generations play a "game" inspired by Becker's (1974, 1991) rotten kids framework, with the added features that the rotten kids turn into the altruistic parent in the next period and that parents invest in the education of their children. We study the subgame perfect equilibrium of the single-period game and then determine the stationary equilibrium of the multi-period setting.

Our results corroborate Becker's "rotten kids theorem" but only to a rather limited extent. First, his efficiency result is obtained only in the single-period game and only for caregiving services but not for education. Specifically, aid is set according to an efficient

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tradeoff, while there is an upward distortion in education spending. Second, the stationary equilibrium *levels* of both aid and education are inefficient. Investments in education are too high and this "spills over" to aid, the *level* of which is too low. This is because excessive education, by boosting the wage rate, increases the opportunity cost of aid.[2]

There exists an extensive literature which studies education in an OLG model, but these papers concentrate on very different issues like inequality, growth or the role of public education.[3] The predecessors to our paper who also focus on intergenerational transfers to the young *and* old, on the other hand, do not consider altruism. For instance Cremer et al. (1992) show that selfish parents *underinvest* in the education of their children (even when they can commit to a strategic bequest rule). In their model the parent's incentives to invest in their offspring's education are solely driven by the surplus they can extract from an attention-for-bequest game. In a similar vein Rangel (2003) and Boldrin and Montes (2005) consider voluntary exchanges between selfish generations. They show that providing education to the young is generally not sustainable unless it is bundled with sufficiently large transfers (like a PAYGO pension scheme) to the old.

2. The model

Consider an OLG framework with three generations. In every period t a new generation is born and lives for three periods. The agent is a child (superscript 'c') in the first period, a parent (superscript 'p') in the second period and a grandparent (superscript 'g') in the third period. Each generation consists of a single individual and is perfectly altruistic towards the next generation. We assume that altruism is non-dynastic: parents are altruistic only towards their own children but not towards their grandchildren. In every period the parent decides how much to save s_t, how much care a_t to provide to the old generation and how much education e_t to invest in the young generation. We assume that the price for education is one and that care costs time of which the total amount is again normalized to one. Grandparents are retired and have a monetary value $h(a_t)$ (with $h' > 0$ and $h'' < 0$) of the care they receive from their children. The residual time $1-a_t$ is spend on the labor market for which the parent receives a wage rate $w(e_{t-1})$. Their wage rate increases in the education they got from their parents (the current grandparents) implying $w' > 0$. The current old choose the bequest $b_t \geq 0$ to leave to their children (the current parents). The young simply enjoy their education and have no other decision to make. The utility functions of the three generations in period t are given by

$$\begin{aligned} U_t^g &= u(s_{t-1} + h(a_t) - b_t) + u((1-a_t)w(e_{t-1}) - e_t + b_t - s_t) \\ &\quad + u(s_t + h(a_{t+1}) - b_{t+1}), \qquad (1) \\ U_t^p &= u((1-a_t)w(e_{t-1}) - e_t + b_t - s_t) \\ &\quad + u(s_t + h(a_{t+1}) - b_{t+1}) + u(e_t) \\ &\quad + u((1-a_{t+1})w(e_t) - e_{t+1} + b_{t+1} - s_{t+1}) \\ &\quad + u(s_{t+1} + h(a_{t+2}) - b_{t+2}), \qquad (2) \\ U_t^c &= u(e_t) + u((1-a_{t+1})w(e_t) - e_{t+1} + b_{t+1} - s_{t+1}) \\ &\quad + u(s_{t+1} + h(a_{t+2}) - b_{t+2}) + u(e_{t+1}) \\ &\quad + u((1-a_{t+2})w(e_{t+1}) - e_{t+2} + b_{t+2} - s_{t+2}) \\ &\quad + u(s_{t+2} + h(a_{t+3}) - b_{t+3}), \qquad (3) \end{aligned}$$

with $u' > 0$ and $u'' < 0$. In the following we denote consumption levels in period t for a parent as d_t and for a grandparent as m_t.

3. Optimal allocation

As often in a dynamic setting, we define the optimum as the allocation that maximizes the lifetime utility of an individual who treats his children and his parents as he would have liked to be treated himself when a child or when a parent (see, e.g. Cremer et al., 1992). Note that the individual successively takes the role of c, p, and then g. We count only the own utility, laundering out the altruistic terms. This yields the following optimization problem:

$$\begin{aligned} \max_{s,b,a,e} W &= u(e) + u((1-a)w(e) - e + b - s) \\ &\quad + u(s + h(a) - b). \qquad (4) \end{aligned}$$

To ensure an interior solution we assume that W is concave. The first order conditions (FOCs) are given by

$$\frac{\partial W}{\partial s} = -u'(d) + u'(m) = 0, \qquad (5)$$

$$\frac{\partial W}{\partial b} = -u'(m) + u'(d) = 0, \qquad (6)$$

$$\frac{\partial W}{\partial a} = u'(m)h'(a) - u'(d)w(e) = 0 \quad \Rightarrow \quad h'(a) = w(e), \qquad (7)$$

$$\frac{\partial W}{\partial e} = -u'(d) + u'(e) + u'(d)(1-a)w'(e) = 0. \qquad (8)$$

Note that only $b - s$ (the net transfer) is determined. Let a^*, e^*, d^* and m^* denote the solution to Eqs. (5)–(8).

4. Equilibrium

In each period t, the parent and the grandparent play the following three stage game. First, the parent chooses a_t, the time devoted to aid their parent and the amount of money to spend on the education of their child, e_t. Second, the grandparent decides how much to leave as a bequest, b_t. Finally, the parent chooses how much to save for old age, s_t. Children receive education but do not make any decision. However, their utility affects p and g's decisions through the altruistic terms in their utility. While playing this game, p and g consider all past and future decisions made by other players as given (see, e.g. Veall, 1986). In each period t, the variables (a_t, e_t, b_t, s_t) are determined by the subgame perfect equilibrium of this game. Observe that the timing of this game along with the requirement for subgame perfection implies that grandparents cannot commit to some bequest rule which "rewards" or pays the caregivers. This rules out a strategic bequest type solution. A stationary equilibrium denoted by $(\bar{a}, \bar{e}, \bar{b}, \bar{s})$ is achieved when the solution remains constant over time. We determine the subgame perfect equilibrium in period t and then characterize the stationary equilibrium.

4.1. Period t

As usual the game is solved by backward induction.

4.1.1. Stage 3: savings

When deciding how much to save parents solve the following problem:

$$\begin{aligned} \max_{s_t} U_t^p &= u((1-a_t)w(e_{t-1}) - e_t + b_t - s_t) \\ &\quad + u(s_t + h(a_{t+1}) - b_{t+1}) + u(e_t) \\ &\quad + u((1-a_{t+1})w(e_t) - e_{t+1} + b_{t+1} - s_{t+1}) \\ &\quad + u(s_{t+1} + h(a_{t+2}) - b_{t+2}). \qquad (9) \end{aligned}$$

[2] It is by now well known that Becker's theorem applies only under rather stringent conditions; see Bergstrom (1989). However, these conditions hold in the one period version of our model; the failures we identify are of a completely different nature and due to the OLG framework.

[3] See Glomm et al. (2011) and Oded (2011) for recent overviews of this literature.