E C O N O M I C S B U L L E T I N

Child quality choice and fertility disincentives

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Abstract

This paper analyses the effects of the introduction of child-subsidy support policies extending recent overlapping generations (OLG) models to account for endogenous fertility decisions of individuals and publicly provided pensions in a small open economy with preferences for both child quantity and child quality. It is shown that if the preference for the quality of children is higher than the preference for the quantity of children, as casual observations seem to reveal in developed countries, then child subsidies always reduce the fertility rate. This way, the article provides an explanation for possible failures of pro-natalist policies based on child subsidisation implemented in many western countries, which may therefore result as fertility disincentives instead of fertility incentives.

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1 Introduction

An issue of major policy concern is the problem of supporting social security systems, such as pay-as-you-go (PAYG) pension schemes, in the face of the recent and widespread decrease in fertility rates occurred in advanced countries. For such a reason, policymakers would like to increase the rate of population growth by resorting in many cases to child-subsidy support policies.

Although many recent papers (e.g., Kolmar, 1997; Wigger, 1999; van Groezen et al. 2003; Abio et al., 2004; Fenge and Meier, 2005) dealing with endogenous fertility and public pensions neglected the child quality issue, we argue that the introduction of child quality preferences may be an important element for the analysis of some inter-generational effects, in particular for the effects of child benefits on fertility behaviour.

Therefore, this paper aims to fill this gap by addressing the question of whether and how a child-subsidy, implemented as a pro-natalist policy instrument, influences fertility rates in a context in which parents choose both the number and the quality of children.

This model is related to that one developed by van Groezen et al. (2003) and Fenge and Meier (2005) as regards the overlapping generations (OLG) structure with endogenous fertility, child-subsidy support policies and publicly provided pensions in a small open economy context. However, while in these papers the authors did not take into account child quality problems, in this contribution we assume that, following standard models of endogenous fertility (starting from Becker, 1960 until to, among many others, Strulik, 2004a), parents choose both the number and the quality of their children.

In particular, van Groezen et al. (2003) investigated the issue of child subsidies and PAYG pensions, while Fenge and Meier (2005) extended the previous work by allowing for a pension system with benefits partially or fully linked with the number of children raised. Both focused on optimality issues, starting from the conviction that child subsidies always increase the individuals' desired number of children. This belief is correct in their models since parents are interested exclusively in the quantity of children they have. In this paper we show that if the preference for child quality is higher than the preference for child quantity, as casual observations seem to reveal in developed countries, then child subsidies always reduce instead of increase the fertility rate. Therefore, the policy implications of our result are straightforward: governments with a pro-natalist objective should not use child-subsidy policies when the individuals' preference for the quality of children is sufficiently high, as the final result is to strengthen the drop in population growth. Moreover, both van Groezen et al. (2003) and Fenge and Meier (2005) argued that, when the government redistributes from young-aged to old-aged individuals with PAYG pension benefits, children entail a positive externality and a system of child allowances makes the achievement of the first-best outcome possible. Therefore, we argue that when parents care about the quality of their children, child allowances invoked by the previous papers might lead to a social "pessimum" rather than to a social optimum.[1]

The remainder of the paper is organised as follows: in Section 2 we develop the model and the main results are analysed and discussed; Section 3 bears the conclusions.

2 The model

2.1 Firms

As regards the production side, we consider a small open economy with perfect capital mobility that faces an exogenously given interest rate r, which is assumed to be constant over time. Production takes place according to a standard neoclassical constant-returns-to-scale production function, $f(k)$, where k is the amount of capital per young individual in period t. Because capital is perfectly mobile, both the capital-labour ratio and the wage rate (w) are fixed and constant.

[1] The discussion of the welfare implications (which are the focus of the articles above mentioned) is beyond of the scope of the present paper, but a lot of works made in this direction reveals that the consideration of child quality preferences largely modifies the welfare conclusions of such papers.

2.2 Government

Following van Groezen et al. (2003), we suppose the government runs two distinct balanced budget policies in every period for both childcare expenditure and social security.
The child subsidy is supposed to be entirely financed by levying and adjusting over time lump-sum taxes on the young-adult generation. Therefore, the system of child allowances is balanced in every period according to:

$$\beta n_t = \tau_t , \tag{B1}$$

where the left-hand side represents the total childcare expenditure and the right-hand side the tax receipts, with $\beta > 0$ being the (constant) subsidy per child and $\tau_t > 0$ is a lump-sum tax. Notice that agents act in an atomistic way and do not take the government budget (B1) into account when deciding on the desired number of children, the savings path and the fraction of income voluntarily spent on child quality.
As regards the social security system, the time-t government budget constraint is the following:

$$p_t = \theta w \cdot \left[(1-\omega)\bar{n}_{t-1} + \omega n_{t-1}\right], \tag{B2}$$

where the left-hand side represents the social security expenditure and the right-hand side the tax receipts, with $0 < \theta < 1$ being a constant proportional-to-wage contribution rate paid by young-aged individuals, $0 \le \omega \le 1$ is a parameter measuring the relative importance of the (individual's) household's number of children on pension payments (if $\omega = 0$ we have a pure PAYG system; if, on the contrary, $\omega = 1$ we have a pension system fully linked with the number of children (CPAYG), see, for instance, Kolmar, 1997; Abio et al., 2004; Fenge and Meier, 2005).[2] Eq. (B2) shows that pension benefits depend, with a share ω of the contribution, on the individual's desired number of children and, with a share $1-\omega$, on the aggregate growth factor of the population. Following Fenge and Meier (2005, p. 34), we will call the policy variable ω the child factor. Notice that $\bar{n}$ represents the average fertility rate of the economy while n is the private number of children freely chosen by the agents.

2.3 Individuals

Identical agents (N_t) are supposed to have a finite lifetime and overlap over three periods: childhood, young adulthood and old-age. During childhood individuals do not make economic decisions and thus they consume a fixed fraction of the time endowment from their parents. Adult individuals belonging to generation t have a homothetic and separable utility function defined over young-aged consumption ($c_{1,t}$), old-aged consumption ($c_{2,t+1}$), the number of children they have (n_t), as in Galor and Weil (1996), and the total expenditure per child (defined to be the sum of the fixed nourishment expenditure, e, plus the fraction of income voluntarily spent to increase child quality, q_t). The way in which child expenditure enters the individual's utility function is rather usual; in particular, we strictly follow Strulik (2003, 2004a, 2004b). For instance, one may think that rearing a child up to school age requires a given cost of $e > 0$ units of income (including expenditure on nutrition and health) and "assume that parents can additionally decide to spend a fraction $q \ge 0$ of their income on each child that reaches school-age. According to Becker (1960) the total expenditure per child $Q = (e+q)w$ is called child quality and provides utility to the parent." (see Strulik, 2004a, p. 551).[3] However, differently from Strulik (2004a), we assume a fixed (rather than an income-indexed) value of Q, since our model does not show endogenous growth, while Strulik (2004a) analysed an endogenous

[2] We assume agents to have perfect foresight with respect to the level of the future public pension benefit.
[3] It is enough to refer to luxury branded clothes for babies which increase parents' utility, but they may certainly not be considered as necessary goods required by children.

growth model where the presence of endogenous income growth required child costs growing with income.[4]

Only young-adult individuals join the workforce, and the labour supply is supposed to be constant and normalised to unity. During adulthood, each individual receives a working income at the rate w which is used to consume, to pay taxes, to raise children and to save. Moreover, we suppose parents are entitled to a direct monetary transfer for each child ($\beta > 0$) – provided by the government at balanced budget – to support child-rearing activities.

During old-age agents are retired and live on the proceeds of their savings (s_t) plus the accrued interest at the rate r. Furthermore, each old-age individual receives a publicly provided pension benefit (p_{t+1}) financed at balanced budget by the government.

Therefore, the representative individual born at time t is faced with the following program:

$$\max_{\{c_{1,t},c_{2,t+1},n_t,q_t\}} U_t\left(c_{1,t}, c_{2,t+1}, n_t, q_t\right) = \ln\left(c_{1,t}\right) + \chi \ln\left(c_{2,t+1}\right) + \phi \ln\left(n_t\right) + h \ln\left(e + q_t\right), \tag{P}$$

subject to

$$c_{1,t} + s_t = w\left(1-\theta\right) - \tau_t - \left(e + q_t - \beta\right)n_t, \tag{C1}$$

$$c_{2,t+1} = \left(1+r\right)s_t + \theta w \cdot \left[\left(1-\omega\right)\overline{n}_t + \omega n_t\right], \tag{C2}$$

$$q_t \geq 0, \tag{C3}$$

where $0 < \chi < 1$ is the subjective discount factor and $\phi, h \in \left(0,1\right)$ capture the importance in the welfare function of consuming while young relative to the quantity and the quality of children, respectively.[5]

Therefore, the first order conditions for an interior solution are given by:

$$\frac{c_{2,t+1}}{c_{1,t}} \cdot \frac{1}{\chi} = 1 + r_{t+1}, \tag{FOC1}$$

$$\frac{\phi}{n_t} = \frac{1}{c_{1,t}} \cdot \left(e + q_t - \beta - \omega\theta \frac{w}{1+r}\right), \tag{FOC2}$$

$$\frac{h}{e+q_t} = \frac{n_t}{c_{1,t}}. \tag{FOC3}$$

Eq. (FOC1) equates the marginal rate of substitution between working period and retirement period consumption to their relative prices, whereas Eqs. (FOC2) and (FOC3) equates the marginal utility of having a child with the involved marginal costs in terms of forgone utility of consumption, and the marginal utility of an additional increase in the expenditure per child quality relative to the utility of children, respectively.

Exploiting (B1)-(B2), (C1)-(C3) and (FOC1)-(FOC3) gives the fraction of income spent on child quality, the demand for children and the savings path chosen optimally by individuals.

Case $h - \phi < 0$ *(no child quality expenditure)*

If the preference for the quality of children is lower than the preference for the quantity of children, the constraint (C3) is binding with equality and individuals do not invest in child quality. Therefore, we have:

$$q = 0, \tag{1a}$$

[4] In any case, it is easy to show that the qualitative results of this paper hold even under the hypothesis of income-indexed child costs.

[5] In this article we abstract from possible impacts of the child expenditure both on future human capital, and thus on the enhanced labour productivity (e.g., in the case of education expenditure), and on future health, and thus on the increased longevity (e.g., in the case of health care expenditure), since we focus exclusively on the effects of child subsidies on individuals' fertility behaviour rather than on economic growth. Although, for simplicity, we ignore the case where the child quality expenditure is a source of externality, we acknowledge that this is a further promising direction of research.

$$n = \frac{\phi w(1-\theta)}{(1+\chi)(e-\beta)+\phi e-[(1+\chi)\omega+\phi]\theta\dfrac{w}{1+r}}, \tag{2a}$$

$$s = \frac{w(1-\theta)\left[\chi(e-\beta)-(\chi\omega+\phi)\theta\dfrac{w}{1+r}\right]}{(1+\chi)(e-\beta)+\phi e-[(1+\chi)\omega+\phi]\theta\dfrac{w}{1+r}}. \tag{3a}$$

Now, let $\theta_1 \equiv \dfrac{\chi(e-\beta)}{\chi\omega+\phi}\cdot\dfrac{1+r}{w}$. Then from Eqs. (2a) and (3a) it can easily be seen that a necessary and sufficient condition for ensuring a finite positive solution for n and s is $0<\theta<\theta_1$.
From Eq. (2a) the following proposition holds:

Proposition 1. *Let* $h-\phi<0$ *hold. Then, introducing and/or rising a child subsidy does always increase the fertility rate independently of the pension system adopted.*

Proof. The proof is obvious by differentiating Eq. (2a) with respect to β, that is:

$$\frac{\partial n}{\partial\beta} = \frac{(1+\chi)\phi w(1-\theta)}{\left\{(1+\chi)(e-\beta)+\phi e-[(1+\chi)\omega+\phi]\theta\dfrac{w}{1+r}\right\}^2} > 0,$$

for any $0\le\omega\le 1$. **Q.E.D.**

Case $h-\phi>0$ *(positive child quality expenditure)*

If the preference for the quality of children is higher than the preference for the quantity of children, the constraint (C3) is not binding and voluntarily invest a positive fraction of their income to increase the quality expenditure for their children. Therefore, we have:

$$q = \frac{h}{h-\phi}\left(\beta+\omega\theta\frac{w}{1+r}\right)-e, \tag{1b}$$

$$n = \frac{(h-\phi)w(1-\theta)}{(1+\chi+h)\beta+[(1+\chi+h)\omega-(h-\phi)]\theta\dfrac{w}{1+r}}, \tag{2b}$$

$$s = \frac{w(1-\theta)\left[\chi\beta+(\chi\omega+\phi-h)\theta\dfrac{w}{1+r}\right]}{(1+\chi+h)\beta+[(1+\chi+h)\omega-(h-\phi)]\theta\dfrac{w}{1+r}}. \tag{3b}$$

From Eq. (1b) it is easy to see that the higher both the child subsidy and the contribution rate and the lower the fixed nourishment expenditure (e) the higher q.

Let $\theta_2 \equiv \dfrac{\chi\beta}{h-\phi-\chi\omega}\cdot\dfrac{1+r}{w}$ and $\overline{\omega}\equiv\dfrac{h-\phi}{\chi}$. If $\chi>h-\phi$ and $\omega>\overline{\omega}$, then $n,s>0$ for any $0<\theta<1$; if $\omega<\overline{\omega}$, then from Eqs. (2b) and (3b) it can be shown that a necessary and sufficient condition for ensuring a finite positive solution for n and s is $0<\theta<\theta_2$.
From Eq. (2b) the following proposition holds:

Proposition 2. *Let* $h-\phi>0$ *hold. Then, introducing and/or rising a child subsidy does always reduce the fertility rate independently of the pension system adopted.*

Proof. The proof is obvious by differentiating Eq. (2b) with respect to β, that is:

$$\frac{\partial n}{\partial \beta} = \frac{-(1+\chi+h)(h-\phi)w(1-\theta)}{\left\{(1+\chi+h)\beta+[(1+\chi+h)\omega-(h-\phi)]\theta\frac{w}{1+r}\right\}^2} < 0,$$

for any $0 \le \omega \le 1$. **Q.E.D.**

The essential message which emerges from Proposition 2 is that a publicly provided system of child support introduced as a pro-natalist policy instrument in a context in which parents care about the quality as well as the quantity of their children obtains – in contrast with the prevailing literature – the unconventional result to strengthen the drop in population growth, as an increase in the child grant increases the child quality expenditure but reduces the fertility rate.

3 Conclusions

This paper addresses the question of whether and how a child subsidy, implemented as a pro-natalist policy, influence fertility rates when parents choose both the number and the quality of children. In contrast with many recent papers which neglected the child quality issue, we argue that the latter variable introduces paradoxical effects of child benefits on individuals' fertility behaviour, that is, the conventional wisdom that a child subsidy always increases the number of children may be correct only when people are interested exclusively on the quantity of children they have. Indeed we show that if the preference for child quality is higher than the preference for child quantity, as casual observations seem to reveal in developed countries, then child-subsidy support policies strengthen the drop in population growth. This way, the article provides: 1) the policy implication that policymakers with a pro-natalist objective should be cautious to use child subsidy policies when the individuals' preference for the quality of children is sufficiently high, and 2) an explanation for possible failures of pro-natalist policies based on child subsidisation implemented in many western countries.

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