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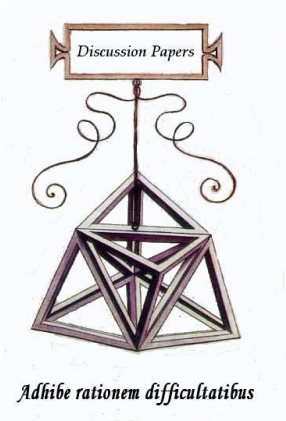

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Child policy ineffectiveness in an OLG small open economy with human capital accumulation and public education

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Child policy ineffectiveness in an OLG small open economy with human capital accumulation and public education

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Abstract Motivated by the recent decrease in the number of children experienced in many developed countries, in this paper we consider an OLG small open economy with endogenous fertility and human capital formation through public education and look at the role the government can play in affecting fertility rates through the widely used child allowance policy. Contrary to the conventional wisdom, we show that child allowances do not affect fertility. The policy implication is that the public provision of child allowances is not effective as a pro-natalist policy, while also reducing human capital accumulation. In contrast, enhancing the public provision of education is beneficial for both fertility and human capital.

Keywords Child allowance; Fertility; Public education; Small open economy

JEL Classification I28; J13

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1. Introduction

In the recent decades the literature on economic development highlighted the prominent roles played by the human capital formation as well as by the endogenous demographic behaviours of individuals in the economic system, focusing in particular on the interaction of them (e.g. Becker et al., 1990; Galor and Weil, 1996).

Human capital accumulation is widely considered as the major engine of development, and may occur through different channels: for instance, educational attainment and learning by doing with the former being mainly reached through formal schooling.[1] In this paper we focus on the formation of human capital through formal schooling, in particular through public schooling, motivated by the fact that, historically, the state has been the main provider of schooling especially in European countries, but even in North-American countries.[2]

The effects of public provision of education[3] on growth have been explored by Glomm and Ravikumar (1992), Eckstein and Zilcha (1994), Benabou (1996), Fernandez and Rogerson (1996) and many others. However these literature ignores the effects of public education on (endogenous)

[1] For instance Mankiw et al. (1992) found that school enrolment is positively correlated with GDP per worker age person.

[2] Indeed, for instance, Glomm and Ravikumar (2001, p. 808) argue that during the last century the fraction of students at the elementary and secondary level who attend public schools has been above 95 per cent in Canada and 86 per cent in the U.S.

[3] For the sake of completeness, we note that recent economic literature argued that in the formation of human capital the public education input may be complemented by a private input, for instance effective parental time. As noted by Glomm and Ravikumar (2008, p. 1012) "It is believed that private parental inputs at a pre-school stage as well as parent's time spent helping the child in school related activities such as homework, reading and field trips play a fundamental role in the formation of human capital." The relationship of parental inputs to public education inputs has been explored by Glomm and Kaganovich (2003), Viaene and Zilcha (2003) and Houtenville and Smith Conway (2003).

fertility. The widely recognised prominent role of the human capital formation in the economic development has important implications for the economy, and can therefore significantly affect the results of analyses concerning for instance fertility rates and family policies.

The recent demographic behaviour in several developed economies is characterised by a huge decrease in the number of children as well as by an increasing longevity. As regards the first aspect, since a lower rate of fertility seems to be the result of a rational choice that individuals make, it is prominent in the political agendas the use of adequate family policies for affecting fertility rates. A widespread instrument used is the provision of child allowances to the parents (e.g. Neyer, 2003): the reduction of the cost of child rearing due to the perception of a per child subsidy is expected to positively affect the choice of how many children to have.

This paper analyses the effects of a child subsidy policy in an economy with endogenous fertility, and looks at the role the government can play in affecting fertility rates. Following, for instance, van Groezen et al. (2003) and Fenge and Meier (2005),[4] we consider a small open economy where individuals derive utility from material consumption and the number of children raised in the context of the standard OLG growth model (Diamond, 1965). We show that the human capital accumulation is reduced by child allowances while their overall effect on the choice of the number of children depends crucially on the relative strength of the substitution effect due to the reduced cost of children and of the income effect due to the negative change in the endowment of human capital. Therefore we argue, rather unexpectedly, that a child allowance policy is fertility-neutral. Indeed individual fertility depends ultimately only – and in a positive way – on the educational contribution rate.

Our findings suggest that the public provision of child allowances misses the pro-natalist purposes while also dampening the formation of human capital. In contrast, an enlargement of the public provision of education increases monotonically both human capital and fertility.

[4] Different from our paper, these authors abstract from human capital formation and focus on the interaction of family policies with pensions policies.

The remainder of the paper is organised as follows. Section 2 develops the model and analyses both the child allowance and the public education policies. Section 3 concludes.

2. The model

2.1. Firms

Consider a small open economy with perfect capital mobility that faces an exogenously given (constant) interest rate r. Production takes place according to a standard neoclassical constant-returns-to-scale technology $f(k_t, h_t)$, where k_t and h_t represent the per capita stock of physical capital and the endowment of human capital of each individual (i.e. labour in efficiency units), respectively. Since capital is perfectly mobile, both the capital-labour ratio and the wage rate w are fixed and constant.

2.2. Government

At time t the government runs two distinct balanced budget policies: (*i*) a public education plan such that the per capita schooling expenditure at time t, g_t, is entirely financed with a constant wage income tax at the rate $0 < \theta < 1$, that is

$$g_t = \theta w h_t, \tag{1}$$

where w is the working income of each member of the young adult (child bearing) generation and h_t represents the endowment of human capital of each individual, and (*ii*) a per child allowance policy:

$$\phi n_t = \tau_t w h_t, \tag{2}$$

where the left-hand side represents the per capita child benefit expenditure and the right-hand side the per capita tax receipts, where $\phi > 0$ is the benefit per child, n_t is the number of children at time t and $0 < \tau_t < 1$ is a wage tax adjusted from period to period to balance out the budget.

2.3. Individuals

The representative individual entering the working period at time t is endowed with a homothetic and separable utility function U_t and faces the following problem (e.g., Eckstein and Wolpin, 1985, Galor and Weil, 1996):

$$\max_{\{c_t, c_{2,t+1}, n_t\}} U_t = \ln(c_{1,t}) + \pi\,\beta \ln(c_{2,t+1}) + \gamma \ln(n_t), \tag{3}$$

subject to

$$\begin{aligned} c_{1,t} + s_t + (p - \phi) n_t &= w h_t (1 - \tau_t - \theta) \\ c_{2,t+1} &= \frac{1+r}{\pi} s_t \end{aligned}, \tag{4}$$

where $c_{1,t}$ $c_{2,t+1}$, n_t and s_t represent working period consumption, retirement period consumption, the number of children and the saving rate, respectively, $p > 0$ is the (fixed) cost of child rearing, $0 < \beta < 1$ is the individual subjective discount factor, $\gamma > 0$ captures the relative taste for children, and $0 < \pi < 1$ is the constant probability of surviving at the end of the working period.

The first order conditions for an interior solution are:

$$\frac{c_{2,t+1}}{c_{1,t}} \cdot \frac{1}{\beta} = 1 + r\,, \tag{5}$$

$$\frac{c_{1,t}}{n_t} \cdot \gamma = p - \phi\,. \tag{6}$$

Eq. (6) implies that $\phi < p$ must hold to ensure the existence of a positive number of children.

Combining Eqs. (5) and (6) with Eqs. (2) and (4), the demand for children is determined as

$$n_t = \frac{\gamma w h_t (1-\theta)}{(1+\pi\beta)(p-\phi)+\gamma p}. \tag{7}$$

2.4. Human capital formation

We assume that human capital evolves according to the following Cobb-Douglas learning technology:[5]

$$H_{t+1} = BH_t^{\mu} G_t^{1-\mu}, \tag{8}$$

where H and G represent the aggregate level of human capital and the aggregate public schooling expenditure, respectively, $B > 0$ is a scale parameter and $0 < \mu < 1$.[6] Therefore, the accumulation of human capital in per capita terms is the following:

$$h_{t+1} = \frac{B h_t^{\mu} g_t^{1-\mu}}{n_t}, \tag{9}$$

Exploiting Eqs. (1), (7) and (9) human capital in equilibrium is:

$$h = \frac{B\theta^{1-\mu}\left[(1+\pi\beta)(p-\phi)+\gamma p\right]}{\gamma(1-\theta)w^{\mu}}. \tag{10}$$

From a simple inspection of Eq. (10) the following remark holds:

Remark 1. *The steady state human capital is: (i) a negative monotonic function of the child allowance; (ii) a positive monotonic function of the educational contribution rate.*

[5] See, for instance, Glomm and Ravikumar, 1997, and Zhang et al., 2003, which however assume a stationary population normalised to one and therefore in their models aggregate and per capita human capital coincide.

[6] We assume that the human capital is completely depreciated when individuals are retired.

While the latter claim trivially derives from the fact that the human capital is formed through a public schooling financed by an educational contribution rate, the former is explained by the fact that, since the impact effect of child allowances tends to increase the individual demand for children, then, loosely speaking, there exists a "congestion" effect that affects in a negative way the acquisition of human capital per child.

Below we analyse the effects of child allowances on the individual demand for children in the long run. The rate of fertility as a generic function of the child allowance can be written as follows:

$$n^* = n^*\left\{\phi, h^*(\phi)\right\}. \tag{11}$$

Totally differentiating Eq. (12) with respect to ϕ yields:

$$\frac{dn^*}{d\phi} = \frac{\partial n^*}{\partial \phi} + \frac{\partial n^*}{\partial h^*} \cdot \frac{\partial h^*}{\partial \phi}. \tag{12}$$

It is easy to see that, in the absence of human capital, the conventional wisdom (e.g. van Groezen et al. 2003, Fenge and Meier, 2005) according to which a child allowance policy stimulates fertility rates, holds. However, in line with the recent theoretical and empirical literature, when the realistic role of the human capital accumulation is taken into account, things are indeed different. In particular, Eq. (12) reveals that the final effect of a child allowance policy depends crucially on the relative strength of the substitution effect due to the reduced cost of children, and the income effect due to a change in the endowment of human capital.

Combination of (7) with (10) gives the equilibrium rate of fertility, that is:

$$n = B(w\theta)^{1-\mu}. \tag{13}$$

From Eq. (11) the following propositions hold:

Proposition 1. *The child policy is fertility-neutral.*

Proof. The proof is straightforward since $\partial n / \partial \phi = 0$. **Q.E.D.**

Proposition 2. *An enlargement of the public education system always increases the rate of fertility.*

Proof. The proof uses the following derivative:

$$\frac{\partial n}{\partial \theta} = (1-\mu) B w^{1-\mu} \theta^{-\mu} > 0. \tag{14}$$

Q.E.D.

Proposition 3. *The rate of fertility is independent of both the parents' taste for children and the rate of longevity.*

Proof. The proof is obvious since $\partial n / \partial \gamma = 0$ and $\partial n / \partial \pi = 0$.

Therefore, from Eq. (13) and Propositions 1–3, we may derive the interesting conclusion that the long-run rate of fertility depends positively only on the human capital formation, while it is kept unaltered by a change in the child allowance.

3. Conclusions

This paper contributes to highlight the link between child allowance policy, public education policy and the individual demand for children in a small open economy with overlapping generations.

It is shown that the child allowance policy dampens the formation of human capital and its final effect on fertility depends crucially on the relative strength of the substitution effect due to the reduced cost of children and of the income effect due to the induced reduction in the endowment of human capital.

Contrary to the conventional views, child allowance policies have no effect on the individual choice of fertility. Moreover the analysis has shown that the rate of fertility is independent of both the parents' taste for children and the rate of longevity.

In conclusion the interesting message is that the fertility rate in the long run depends positively only on human capital and, hence, an enlargement of the supply of public education always promotes the individual demand for children. The policy implication is that child allowances are not effective as a pro-natalist policy while also reducing the accumulation of human capital. In contrast, the provision of public education can be used as an instrument to increase both human capital and fertility.

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