Child policy solutions for the unemployment problem

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Abstract Using a simple overlapping generations model with endogenous fertility, minimum wages and involuntary unemployment, it is shown that the child tax can be used as an instrument to promote population growth and restore full employment.

Keywords Child Tax; Fertility; OLG model; Unemployment

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1. Introduction

The present analysis is motivated by two important issues in contemporary developed economies, namely population ageing and the persistently high rates of unemployment. The former is mainly caused by both the reduced birth rates and increased longevity. The latter, instead, has several origins but many economists ascribe it to the high wage rates determined in non-competitive labour markets (e.g. minimum wage legislation).[1]

As regards population ageing, several remedies have been proposed by politicians and economists (e.g. child subsidies). As regards unemployment, although a vast literature argued for several recipes and remedies, nobody has, to the best of our knowledge, so far considered the effects of child policies on unemployment in a general equilibrium context.

The present paper contributes to the efforts to remedy the plagues of high unemployment and low fertility by offering a model that incorporates some important institutional features. Thereby it provides an analytical framework in which relevant policy issues are addressed.

In the theoretical literature, unemployment and child policies have traditionally been studied separately. Two recent valuable works focusing on the unemployment issue in an overlapping generations (OLG) model are Corneo and Marquardt (2000) and Irmen and Wigger (2002), while other papers have recently tackled out the role of child policies either in static contexts (Apps and

[1] For instance, "The observed increase in unemployment and the slowdown in economic growth in Europe are related, both stem from a common cause, an excessively rapid growth of the cost of labour… If labor markets are non-competitive, an *exogenous* and *lasting* increase in labor costs has two effects. On the one hand, it reduces labor demand, and thus creates unemployment. On the other hand, as firms substitute capital for labor, the marginal product of capital falls. Over long periods of time, this in turn diminishes the incentive to invest and thus to grow." (Daveri and Tabellini, 2000, p. 50).

Rees, 2004) or in dynamic OLG models (Momota, 2000; van Groezen et al., 2003; van Groezen and Meijdam, 2008) under *laissez-faire*.[2]

Different from the previous literature, we develop a general equilibrium OLG model à la Diamond (1965) with endogenous fertility and minimum wages to study the interaction between child policy, saving, fertility and unemployment in the same breath. A number of clear-cut results can be established. In particular, we show that the child tax, rather than the more traditional child subsidy, can actually be used to promote population growth, reduce unemployment and restore the full employment equilibrium.

The remainder of the paper is organised as follows. In Section 2 we present the model. In Section 3 (Section 4) we investigate the long-run relationship between child taxes and unemployment (fertility). Section 5 concludes.

2. The model

2.1. Government

The government collects a fixed per child tax ($\beta > 0$) to finance a wage subsidy ($\tau_t > 0$) at a balanced budget. Therefore, the per young budget constraint at t reads as:

$$\tau_t \underline{w}(1-u_t) = \beta n_t, \tag{1}$$

[2] In addition to the fundamental differences given by the use of both the child-tax (instead of the child-subsidy) and the minimum wage in the same breath, many other differences can distinguish this paper from the current literature. For instance, Momota (2000) assumed two kinds of individuals, a gender wage gap, a time-opportunity cost of children and a rather special form of subsidy policy, while van Groezen et al. (2003) and van Groezen and Meijdam (2008) investigated the interactions between the childcare and the social security systems in an OLG small open and closed economy, respectively.

where $\underline{w}$ is the unitary constant minimum wage legally set by the government over the steady state competitive wage, w^*_c, u_t is the unemployment rate[3] and n_t represents the number of children in the whole economy at t.

2.2. Individuals

Consider an OLG closed economy populated by three-period lived identical individuals. As a child, each individual does not make economic decisions. As an adult, an individual works when young (the labour supply is constant and normalised to unity), and she is retired when old.

The budget constraint faced by a young person started working at t is

$$c_{1,t} + s_t + (m + \beta)n_t = \underline{w}(1 - u_t)(1 + \tau_t), \tag{2.a}$$

where the positive variables $c_{1,t}$, s_t m denote young-aged consumption, savings and the fixed cost of raising a child, respectively.

The budget constraint of an old retired person is

$$c_{2,t+1} = (1 + r_{t+1})s_t, \tag{2.b}$$

where $c_{2,t+1}$ and r_{t+1} represent old-aged consumption and the interest rate from t to $t+1$, respectively.

Individuals of generation t (N_t) have preferences towards material consumption over the life cycle and the number of children they have (see, e.g., Eckstein and Wolpin, 1985, Galor and Weil, 1996), i.e., we assume the so-called weak form of altruism (see Zhang and Zhang, 1998). They choose the saving rate and the fertility rate to maximise the lifetime utility function $U_t = (1 - \phi)\ln(c_{1,t}) + \gamma \ln(c_{2,t+1}) + \phi \ln(n_t)$ subject to Eqs. (2), taking factor prices and the government

[3] The rate of unemployment is defined as a fraction of units of time not worked, i.e. $u_t = (N_t - L_t)/N_t$, where L_t is the labour demand and N_t the number of young individuals at time t.

budget constraint Eq. (1) as given, where $0 < \gamma < 1$ is the subjective discount factor and $0 < \phi < 1$ the relative taste for children.

Combination of the first order conditions with Eq. (1) gives the demand for children and the saving rate, respectively:

$$n_t = \frac{\phi \underline{w}(1-u_t)}{(1+\gamma)m + (1+\gamma-\phi)\beta}, \tag{3.a}$$

$$s_t = \frac{\gamma(m+\beta)\underline{w}(1-u_t)}{(1+\gamma)m + (1+\gamma-\phi)\beta}. \tag{3.b}$$

2.3. Firms

Identical firms act competitively on the market. Aggregate production at time t (Y_t) takes place by combining capital (K_t) and labour (L_t) according to the Cobb-Douglas technology $Y_t = K_t^{\alpha} L_t^{1-\alpha}$, where $0 < \alpha < 1$. The intensive form production function, therefore, is:

$$y_t = k_t^{\alpha}(1-u_t)^{1-\alpha}, \tag{4}$$

where $k_t := K_t / N_t$ and $y_t := Y_t / N_t$. Profit maximisation yields:[4]

$$r_t = \alpha\left(\frac{k_t}{1-u_t}\right)^{\alpha-1} - 1, \tag{5}$$

$$\underline{w} = (1-\alpha)\left(\frac{k_t}{1-u_t}\right)^{\alpha}. \tag{6}$$

From Eq. (6) the unemployment rate is

$$u_t = 1 - \left(\frac{1-\alpha}{\underline{w}}\right)^{\frac{1}{\alpha}} \cdot k_t. \tag{7}$$

[4] We assume that capital totally depreciates at the end of each period and the price of final output is normalised to one.

2.4. Equilibrium

Given Eq. (5) and knowing that $N_{t+1} = n_t N_t$, equilibrium implies $n_t k_{t+1} = s_t$. Using Eqs. (3.a) and (3.b) we get:

$$k_{t+1} = k^*(\beta) = \frac{\gamma}{\phi}(m + \beta). \tag{8}$$

From Eq. (8) we find that $\partial k^*(\beta)/\partial\beta = \gamma/\phi > 0$. This holds for two reasons. First, the saving rate increases because the child tax revenue is rebated as a wage subsidy. Second, in the short run the fertility rate shrinks because the total cost of children raises.

In the next section we look at the long-run effects of child taxes on unemployment (Section 3) and fertility (Section 4).

3. Unemployment

From Eqs. (7) and (8), the following proposition holds:

Proposition 1. *For any given value of the minimum wage, (i) a rise in the child tax reduces the unemployment rate in the long run, and (ii) a threshold value of the child tax exists such that full employment is restored.*

Proof. Combining Eqs. (7) and (8), the long-run unemployment rate is:

$$u^*(\beta) = 1 - \left(\frac{1-\alpha}{\underline{w}}\right)^{\frac{1}{\alpha}} \cdot \frac{\gamma}{\phi}(m + \beta). \tag{9}$$

Therefore, $\frac{\partial u^*(\beta)}{\partial \beta} = -\left(\frac{1-\alpha}{\underline{w}}\right)^{\frac{1}{\alpha}} \cdot \frac{\gamma}{\phi} < 0$ for any $\underline{w} > w_c^*$. Since $\lim_{\underline{w}\to+\infty} u^*(\beta) = 1$, then for any $\underline{w} > w_c^*$, $u^*(\beta) = 0$ if and only if $\beta = \beta_u := \frac{\phi}{\gamma} \cdot \left(\frac{\underline{w}}{1-\alpha}\right)^{\frac{1}{\alpha}} - m$. **Q.E.D.**

Proposition 1 directly follows from the effect played by child taxes on capital accumulation. In particular, the higher the child tax, the higher the total cost of children and, hence, the higher the capital stock for any $\underline{w} > w_c^*$. A rise in the minimum wage increases the unemployment rate. However, a large enough value of the child tax exists to raise the stock of capital to completely eliminate unemployment in the long run.

4. Fertility

Analysis of individual fertility gives another interesting and unconventional result which may be carefully examined.

Define the long-run fertility rate as a generic function of the child tax as

$$n^* = n^*\left\{\beta, u^*\left[k^*(\beta)\right]\right\}. \tag{10}$$

The total derivative of Eq. (10) with respect to β implies:[5]

$$\frac{dn^*}{d\beta} = \overbrace{\frac{\partial n^*}{\partial \beta}}^{-} + \overbrace{\frac{\partial n^*}{\partial u^*}}^{-} \cdot \overbrace{\frac{\partial u^*}{\partial k^*}}^{-} \cdot \overbrace{\frac{\partial k^*}{\partial \beta}}^{+}. \tag{11}$$

Eq. (11) reveals that the final effect of a rise in the child tax on fertility depends on two counterbalancing forces: (*i*) a negative (direct) effect due to the increased cost of children, and (*ii*) a positive (indirect) general equilibrium feedback effect due to the reduced unemployment. In particular, for any given value of the minimum wage, a rise in the child tax increases both the

[5] The sign of each derivative can easily be ascertained from Eqs. (3.a), (7) and (8).

saving rate and the capital stock, while reducing the unemployment rate. Given the negative relationship between unemployment and fertility, the lower unemployment, the higher the demand for children.

Combining now Eqs. (3.a) and (9) the long-run fertility rate is obtained as

$$n^*(\beta) = \frac{\gamma(m+\beta)(1-\alpha)^{\frac{1}{\alpha}}}{\left[(1+\gamma)m + (1+\gamma-\phi)\beta\right]\underline{w}^{\frac{1-\alpha}{\alpha}}}. \tag{12}$$

Therefore, the following proposition holds.

Proposition 2. *A rise in the child tax increases the long-run fertility rate irrespective of the size of the minimum wage.*

Proof. Differentiating Eq. (12) with respect to β gives:

$$\frac{\partial n^*(\beta)}{\partial \beta} = \frac{n^*(\beta)m\phi}{(m+\beta)\left[(1+\gamma)m + (1+\gamma-\phi)\beta\right]} > 0, \tag{13}$$

for any $\underline{w} > w_c^*$ and $0 < \beta \leq \beta_u$. **Q.E.D.**

Proposition 2 reveals that the fertility rate in the long run is always higher than whether the child tax is absent. This result holds because the reduction in the unemployment rate due to a rise in the child tax is high enough to overcompensate the negative effect of fertility due to increased cost of children.

The essential message of the paper therefore is the following: countries with imperfect labour markets and low birth rates (e.g., several European Union countries) should consider the possibility to introduce a child tax as a single instrument to decrease unemployment and promote population growth.

5. Conclusions

Since reforming labour markets is high on the political agenda in several developed countries, a theoretical knowledge of the possible long-run interaction between unemployment and child policy may be highly valuable. In this paper we achieve some clear cut results by examining the effects of child taxes in a simple overlapping generations model with endogenous fertility, minimum wages and involuntary unemployment. It is shown that a child tax can effectively be used to raise fertility and restore full employment.

The present paper offers a manageable framework of analysis by incorporating a number of simplifying assumptions. For instance, time (opportunity) cost of children, childcare facilities, home production technologies and unemployment benefit systems may be further considered.

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