Capital income taxation and trade unions in an endogenous fertility model

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February 2023

Discussion Paper No. 2302

GRADUATE SCHOOL OF ECONOMICS

KOBE UNIVERSITY

ROKKO, KOBE, JAPAN

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Abstract

The current study aimed to develop a standard overlapping generations model incorporating involuntary unemployment caused by the union wage setting and fertility choice within an endogenous growth framework. Our study assumes that capital income tax finances in-work benefits, which is the income transfer conditioned on work. The results indicate that increasing capital income tax promotes employment, and hence, promotes economic growth. Further, we demonstrate that a rise in capital income tax improves fertility.

JEL Classification: H55, J13, J51

Keywords: Capital income tax, Involuntary unemployment, Fertility

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1. Introduction

Rising unemployment and slow economic growth have been observed in several developed countries (Daveri and Tabellini, 2000; Kunze and Schuppert, 2010). In addition, many developed countries are experiencing a decline in fertility (Fanti and Gori, 2010). These serious issues can be caused by high labor and child care costs. Fanti and Gori (2010) demonstrated that child tax improves both employment and fertility in an overlapping generations model, although their study does not include endogenous growth. Kunze and Schuppert (2010) stated that cutting labor income tax with a higher capital income tax[3] promotes not only employment but also economic growth in an overlapping generations model. However, Kunze and Schuppert (2010) did not consider fertility choices in their study.

Rising unemployment, slow economic growth, and lower fertility rates in developed countries are serious economic issues; however, previous studies that have incorporated involuntary unemployment and fertility choice in an overlapping generations model that includes endogenous growth are, to the best of our knowledge, scarce. To bridge this gap in existing literature, the present study develops a standard overlapping generations model to demonstrate that capital income tax is the solution to the above economic issues, referring to Fanti and Gori's (2010) and Kunze and Schuppert's (2010) studies. The results indicate that a higher capital income tax promotes not only employment and economic growth but also fertility.

The remainder of this paper is structured as follows: Section 2 describes our model, and Section 3 concludes the study.

2. Model

2.1. Households

In a standard overlapping generations economy, households are identical and experience two periods, young and old. We assume that households derive utility from the consumption in the two periods and the number of children. Following Fanti and Gori (2010), the lifetime utility for households is described as follows:

$$v_t = \log c_t + \beta \log d_{t+1} + \log n_t, \quad (1)$$

where c_t and d_{t+1} are the consumption in the young and old periods, respectively, n_t is the fertility rate, and $\beta < 1$ is the discount factor. If we denote N_t as the population born in t, the population growth is given by $N_{t+1} = n_t N_t$.

Households endow one unit of time and supply it to the labor market inelasticity

[3] Uhlig and Yanagawa's (1996) notable study theoretically indicates that a higher capital income tax can lead to faster economic growth in an overlapping generations model.

during the young period, while, during old periods, households retire. The present study introduces the issue of unemployment caused by young individuals joining trade unions, in line with Daveri and Tabellini (2000) and Ono (2010). The unemployment rate is defined as a fraction of time, following Fanti and Gori (2010) and Ono (2010). This assumption considers work-sharing as explained in Section 5.2 in Ono's (2010) study.

Following Kolm and Tonin (2011, 2015), the current study introduces in-work benefits, which comprise the income transfer conditioned on work. The two studies have theoretically demonstrated that in-work benefits reduce wage demands, and hence, reduce the equilibrium unemployment rate within a search model. Though Kolm and Tonin (2011, 2015) considered that wage tax finances in-work benefits, we assume that in-work benefits are financed by capital income tax in this study.

Households receive wage income and in-work benefits when they are employed, and unemployment benefits, financed by wage tax, when they are unemployed. Households split their disposable income between consumption, savings, and child-rearing costs when they are young. The budget constraint during the young period is indicated as follows:

$$c_t + s_t + qw_t(1-u_t)n_t = [(1-\tau_w)w_t + \theta_t](1-u_t) + b_t u_t, \tag{2}$$

where s_t is the savings, $qw_t(1-u_t)n_t$ is the purchase of goods for child care, w_t is the wage, u_t is the unemployment rate, $\tau_w \in (0,1)$ is the wage tax, θ_t is the in-work benefits, and b_t is the unemployment benefits. Since the unemployment rate is defined as unemployment time, $w_t(1-u_t)$ captures the working income. We assume that $q \in (0,1)$, and this assumption captures the child-rearing cost as a fraction of the working income, similar to Fanti and Gori (2014). Note that the right-hand side of equation (2) denotes the average income of young households.

Next, households retire and consume their savings when they are old. Thus, the budget constraint during the old period is given as follows:

$$d_{t+1} = [1 + (1-\tau_r)r_{t+1}]s_t, \tag{3}$$

where $\tau_r \in (0,1)$ is the capital income tax and r_{t+1} is the interest rate. From equations (1), (2), and (3), the optimal allocations are described as follows:

$$\frac{s_t}{n_t} = \beta q w_t(1-u_t), \tag{4}$$

$$n_t = \frac{[(1-\tau_w)w_t + \theta_t](1-u_t) + b_t u_t}{(2+\beta)qw_t(1-u_t)}. \tag{5}$$

Note that the right-hand side of equation (4) indicates the child-rearing cost.

2.2. Firms

Firms produce final goods with the help of capital and labor inputs under a competitive market. We introduce positive externality to ensure endogenous growth as in Romer (1986). The aggregate production function is described as follows:

$$Y_t = AK_t^{\alpha}(E_t L_t)^{1-\alpha},\ 0 < \alpha < 1, \tag{6}$$

where Y_t is the total outputs, $A > 0$ is the constant technology level, K_t and L_t are the aggregate capital and labor inputs, respectively, and E_t is the efficiency. The aggregate labor input is expressed as follows:

$$L_t = (1 - u_t)N_t. \tag{7}$$

We assume no capital depreciation. The factor demands are described as follows:

$$w_t = (1-\alpha)Ak_t^{\alpha}E_t^{1-\alpha}(1-u_t)^{-\alpha}, \tag{8}$$

$$r_t = \alpha A k_t^{\alpha-1}\big(E_t(1-u_t)\big)^{1-\alpha}, \tag{9}$$

where $k_t \equiv K_t/N_t$ is the per capita capital. From equation (8), labor input increases if wage shrinks. In equilibrium, efficiency is assumed as follows:

$$E_t = k_t, \tag{10}$$

where $y_t \equiv Y_t/N_t$ is the per capita output, and the per capita output is described as $y_t = Ak_t^{\alpha}\big(E_t(1-u_t)\big)^{1-\alpha}$ based on equation (6).

2.3. Trade Unions

Following Daveri and Tabellini (2000) and Ono (2010), trade unions set wages to maximize the average income of union members, taking policy variables as given. The objective function of trade unions is written as follows:

$$[(1-\tau_w)w_t + \theta_t](1-u_t) + b_t u_t. \tag{11}$$

Equation (8) can be rewritten as $1 - u_t = \left(\frac{1-\alpha}{w_t}\right)^{\frac{1}{\alpha}} A^{\frac{1}{\alpha}} k_t E_t^{\frac{1-\alpha}{\alpha}}$. Substituting this equation into (11), trade unions set wages as follows:

$$w_t = \frac{1}{(1-\alpha)(1-\tau_w)}(b_t - \theta_t). \tag{12}$$

In this equation, $1/(1-\alpha)(1-\tau_w)$ is the constant markup and $b_t - \theta_t$ is the net benefit from social security. An increase in in-work benefits reduces net benefits from social security and leads to a wage decline. Note that $b_t > \theta_t$ is obtained in equilibrium. See the Appendix for the proof of $b_t > \theta_t$.

2.4. Government

The government provides unemployment and in-work benefits financed by wage and capital income taxes, respectively, under a balanced budget. The budget constraints of the government are written as follows:

$$\tau_w w_t (1-u_t) N_t = b_t u_t N_t, \tag{13}$$

$$\tau_r r_t s_{t-1} N_{t-1} = \theta_t (1-u_t) N_t. \tag{14}$$

The left-hand side of equations (13) and (14) are the revenue from wage tax and capital income tax, respectively. The right-hand side of equations (13) and (14) indicate the government expenditure for unemployment and in-work benefits, respectively.

2.5. Equilibrium

The dynamics in this economy are denoted as follows:

$$k_{t+1} = s_t / n_t. \tag{15}$$

We recall that $y_t = A k_t^{\alpha} \left(E_t(1-u_t)\right)^{1-\alpha}$ holds; therefore, the following equations are derived, using equations (8) and (9):

$$w_t(1-u_t) = (1-\alpha) y_t, \tag{16}$$

$$r_t k_t = \alpha y_t. \tag{17}$$

From equations (13)–(17), we obtain the following equations:

$$b_t = \tau_w (1-\alpha) y_t / u_t, \tag{18}$$

$$\theta_t = \tau_r \alpha y_t / (1-u_t). \tag{19}$$

Substituting equations (16), (18), and (19) into (12), we obtain the following constant unemployment rate:

$$u = \frac{\tau_w}{1-\alpha+\alpha\tau_w+\frac{\alpha\tau_r}{1-\alpha}} < 1. \tag{20}$$

By differentiating equation (20) with respect to τ_r, we obtain:

$$\frac{du}{d\tau_r} = \frac{-\frac{\alpha\tau_w}{1-\alpha}}{\left(1-\alpha+\alpha\tau_w+\frac{\alpha\tau_r}{1-\alpha}\right)^2} < 0. \tag{21}$$

A rise in capital income tax increases the amount of in-work benefits and reduces the net benefits from social security, thus, reducing wages from equation (12). A decline in wages leads firms to increase labor input. Therefore, increasing capital income tax reduces unemployment. This finding is qualitatively consistent with that of Ono's (2010) study. However, Ono (2010) considered public pension benefits and not in-work benefits.

Next, this study examines how capital income tax affects the growth rate. Denote g_t as the per capita growth rate given by $g_t = y_{t+1}/y_t = k_{t+1}/k_t$. From equations (4), (8), (10), (15), and (20), the growth rate is described as follows:

$$g = \beta q (1-\alpha) A (1-u)^{1-\alpha} \tag{22}$$

$$= \beta q(1-\alpha)A\left(1-\frac{\tau_w}{1-\alpha+\alpha\tau_w+\frac{\alpha\tau_r}{1-\alpha}}\right)^{1-\alpha},$$

where the growth rate is constant. Recall that the right-hand side of equation (22) denotes child-rearing cost from equation (4). We assume a large enough A to ensure sustained growth. Differentiating equation (22) with respect to τ_r, we derive:

$$\frac{dg}{d\tau_r}=\frac{\beta q\alpha(1-\alpha)A\tau_w(1-u)^{-\alpha}}{\left(1-\alpha+\alpha\tau_w+\frac{\alpha\tau_r}{1-\alpha}\right)^2}>0. \tag{23}$$

A higher capital income tax increases both employment and working income described as $w_t(1-u_t)$, which simultaneously increases the child-rearing cost. Since a rise in child-rearing costs temporally reduces the fertility rate, per capita capital accumulation can be promoted (Fanti and Gori, 2010)[4]. Therefore, increasing capital income tax promotes economic growth. Though tax reform is an essential assumption in Kunze and Schuppert's (2010) study to indicate that increasing capital income tax promotes employment and economic growth, the present study does not utilize tax reforms to obtain the results.

This study investigates the impact of capital income tax on the fertility rate. Substituting equations (18) and (19) into (5), the equilibrium fertility rate is written as follows:

$$n=\frac{1-\alpha+\alpha\tau_r}{(2+\beta)q(1-\alpha)}. \tag{24}$$

From equation (24), the fertility rate is constant. Differentiating equation (24) with respect to τ_r, we obtain the following equation:

$$\frac{dn}{d\tau_r}=\frac{\alpha}{(2+\beta)q(1-\alpha)}>0. \tag{25}$$

Long-term fertility rate improves with a higher capital income tax. Increasing capital income tax enhances the amount of in-work benefits, which improves fertility. Furthermore, a rise in capital income tax increases working income, which leads to opposite effects on fertility. First, an increase in working income directly improves fertility. Second, an increase in working income also increases child-rearing costs, which reduces fertility. These opposite effects are canceled in equilibrium, and we obtain the following proposition:

[4] In Fanti and Gori (2010), the fertility rate temporarily declines with a higher child tax, which promotes per capita capital accumulation.

Proposition 1
A rise in capital income tax promotes not only employment and economic growth but also fertility.

Note that Fanti and Gori (2010) introduce wage subsidy, which is the income transfer conditioned on work, similar to in-work benefits. In their study, wage subsidy has positive impacts on the fertility rate. Similarly, in-work benefits contribute to an improvement in fertility as shown in the present study.

Table 1 presents a numerical example. The parameters are set as follows: $\tau_w = 0.1, \alpha = 0.33, \beta = 0.55, q = 0.2,$ and $A = 16.$

[Table 1]

3. Conclusion

Low fertility rates, rising unemployment, and slow economic growth are reported in several developed countries. This study employed an overlapping generations model with unemployment and endogenous fertility and found that capital income taxation is effective in promoting employment, economic growth, and fertility rates.

Appendix:

In this appendix, we demonstrate that $b_t > \theta_t$ holds. Using equations (18)–(20), we obtain:

$$\frac{b_t}{\theta_t} = \frac{\tau_w(1-\alpha)}{\tau_r\alpha}\frac{1-u}{u}. \tag{A.1}$$

Substituting equation (20) into equation (A.1), we obtain:

$$\begin{aligned}\frac{b_t}{\theta_t} &= \frac{\tau_w(1-\alpha)}{\tau_r\alpha}\frac{1-u}{u}, \\ &= \frac{(1-\tau_w)(1-\alpha)^2}{\tau_r\alpha} + 1.\end{aligned} \tag{A.2}$$

In this equation, $\frac{b_t}{\theta_t} > 1$ holds. Therefore, $b_t > \theta_t$ holds in equilibrium.

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Table 1

τ_r	0	0.1	0.2	0.3	0.4	0.5
u	0.142	0.133	0.125	0.118	0.111	0.105
g	1.064	1.072	1.078	1.084	1.090	1.094
n	1.961	2.057	2.154	2.251	2.347	2.444

$\tau_w = 0.1, \alpha = 0.33, \beta = 0.55, q = 0.2,$ and $A = 16.$