Spillover Effect, Current Account, and the Composition of Government Expenditure*

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This paper examines how changing the composition of government expenditure affects long-run levels of world interest rates, current accounts and welfare in a two-country overlapping generations model. We consider two types of government expenditure, one for production and the other for consumption. We show that if the complementarity between productive government expenditure and private capital is sufficiently small, increasing the composition of productive government expenditure in one country improves its current account. We also show that increasing the composition of productive government expenditure has a positive spillover effect on a country with a current account deficit but has an ambiguous effect on a country with a surplus. From dependence on the spillover effect, non-cooperative choices by two countries on the composition of government expenditure can be shown to differ from cooperative ones.

I. Introduction

The accelerating globalization of the world economy has dramatically changed the way in which the public policy needs to be conducted in both developed and developing countries. When dealing with the contributions to international public goods such as the global environment, it is recognized that international cooperation among countries is necessary to overcome free-riding problems.[1] The argument is even relected in the case of purely domestic policies such as public investment and expenditure ones. A reason for this is that public policy in a global economy sometimes involves spillover effects across countries via the international capital market.

This paper investigates how public investment and expenditure policies in one country affect the international capital market and hence the welfare of other countries. In particular, we examine how changing the composition of government expenditure in one country has an impact on long-run levels of international interest rates, current accounts and the welfare in a two-country overlapping generations model. To address the issue, we consider two types of government expenditure, one for production and the other for consumption.

First, we show that increasing the composition of productive government expenditure in one country increases its savings and hence lowers the international interest rate, provided that the

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complementarity between productive government expenditure and private capital is suffciently small. This will improve the country's current account and worsen that of the other country. Welfare effects depend on the golden rule effect and the interest payment effect as well as complementarity between productive government expenditure and private capital. We show that if the complementarity is suffciently small, increasing the composition of productive government expenditure involves positive golden rule and interest payment effects on a country with a current account deficit, and positive golden rule but negative interest payment effects on a country with a surplus.

We also examine whether non-cooperative choices by two countries on the composition of government expenditure result in too small or too large allocations of either type of expenditure relative to cooperative choices. It is shown that if the complementarity is suffciently small and if the golden rule effect is dominant, the non-cooperative choices will result in too small an allocation of productive government expenditure and too large an allocation of government consumption expenditure in both countries. If the interest payment effect is dominant, the non-cooperative choices will result in a situation in which the allocation of productive government expenditure is too small in a country with a current account surplus and too large in a country with a deficit.

There are studies that investigate the spillover effects and fiscal policy coordination in an international economy. Hamada (1986) examines the strategic aspects of international fiscal interdependence in a two-country overlapping generations model; showing that expanding government expenditure always has a negative spillover effect on the other country. Thus, non-cooperative behavior by two countries will result in excessive government expenditure in both countries. Ihori (1987) and Turnovsky (1988) address this issue in a two-good model of international trade. Biaconi and Turnovsky (1997) studied the spillover effect of government consumption expenditure financed by lump-sum, income and capital taxes. However, those studies do not consider government expenditure that contributes to production or expenditure that directly affects individual consumption-saving behaviors.

Studies such as Aschauer (1988), Barro (1990), and Turnovsky and Fisher (1995) have examined the effect of government productive and consumption expenditure on the economic variables in a dynamic general equilibrium model of a closed economy. Those studies not only assumed away international fiscal interdependence but also did not focus on the composition of the two types of government expenditure as our study does.

This paper is organized as follows. The next section develops a two-country overlapping generations model that will be used throughout the analysis. Section 3 examines the effect of changing the composition of government expenditure on long-run levels of international interest rates, current accounts and welfare. Section 4 studies the optimal policies chosen by two countries on the composition of government expenditure and compares non-cooperative choices with cooperative ones. The final section concludes the paper.

II. The Model

This section sets up an overlapping generations model of two countries that will be used throughout the analysis. The model is based on a framework developed by Buiter (1981).[2] Consider two countries producing one identical good, the "home" ountry (H) and the "foreign" country (F). Two countries are identical in every respect except in fiscal structures. Each country is represented by two overlapping generations, competitive output and factor markets, and constant returns to scale production structure. The population in each country is assumed to grow at rate n.

1. Individuals

Individuals live for two periods. In the first period, each individual in-elastically supplies one unit of labor and spends the labor income on consumption and saving. In the second period, the individual obtains saving income and spends it on consumption. In addition, in the second period, individuals obtain benefits from government expenditure, which we call the "government consumption expenditure".[3]

Individuals within the same generation share identical preferences. That is, an individual of generation t in country i ($i = H, F$) has the utility function

$$U^i = u(c^i_{1t},\ c^i_{2t+1},\ e^i_{t+1}) \tag{1}$$

where c^i_{1t} and c^i_{2t+1} are the first and the second period consumptions, respectively. e^i_{t+1} represents the amount of government consumption expenditure provided in the second period. Individuals derive positive and diminishing marginal utility from private and government consumptions. The utility function is assumed to be strictly concave in all arguments. An individual of generation t in country i chooses c^i_{1t} and c^i_{2t+1} so as to maximize (1) subject to the budget constraint

$$w^i_t - \tau^i_t = c^i_{1t} + s^i_t, \tag{2}$$

$$c^i_{2t+1} = (1+r_{t+1})s^i_t, \tag{3}$$

where w^i_t is the wage rate, τ^i_t is the lump-sum tax rate, s^i_t is the savings, and r_{t+1} is the world interest rate. The first order conditions for this optimization

problem are

$$u_1-\lambda^i=0, \tag{4}$$

$$u_2-\lambda^i/(1+r_{t+1})=0, \tag{5}$$

$$w_t^i-\tau_t^i=c_{1t}^i+c_{2t+1}^i/(1+r_{t+1}), \tag{6}$$

Where $u_1=\partial u/\partial c_1$, $u_2=\partial u/\partial c_2$, and λ^i represents the Lagrange multiplier associated with the utility maximization problem. From (4)-(6), we have

$$\begin{aligned} c_{1t}^i &= c_{1t}^i(w_t^i-\tau_t^i,\ r_{t+1},\ e_{t+1}^i),\\ c_{2t+1}^i &= c_{2t+1}^i(w_t^i-\tau_t^i,\ r_{t+1},\ e_{t+1}^i),\\ s_t^i &= s_t^i(w_t^i-\tau_t^i,\ r_{t+1},\ e_{t+1}^i) \end{aligned} \tag{7}$$

We assume that the private consumption is a normal good, that is, $0<\partial s/\partial w<1$. We also assume the following.

Assumption 1 : Government consumption expenditure is a substitute for private consumption, that is, $s_e^i=\partial s^i/\partial e^i<0$.

Assumption 1 states that the government consumption expenditure e is a substitute for private consumption in the sense that increasing e reduces the amount of savings.[4]

2. Production

The production side of the economy is described by a representative firm. In each period, the firm in country i combines capital K^i, labor L^i, and productive government expenditure G^i to produce a single output Y^i. Technology is represented by the production function $Y_t^i=F(K_t^i,\ G_t^i,\ L_t^i)$ It exhibits constant returns to scale, and positive and diminishing marginal productivity in all arguments. It is assumed that technology is identical across countries. No capital depreciation is assumed, and productive government expenditure is assumed to be current flows.[5] From the constant returns to scale assumption, the production function can be expressed in per capita term as

$$y_t^i=f(k_t^i,\ g_t^i), \tag{8}$$

where $y_t^i=Y_t^i/L_t^i$, $k_t^i=K_t^i/L_t^i$, and $g_t^i=G_t^i/L_t^i$.

Capital is assumed to be perfectly mobile across countries while labor is not. This, together with the competitive capital market, implies that the marginal product of capital is equalized across countries and coincides with the world interest rate. That is,

$$r_t=f_k(k_t^i,\ g_t^i), \tag{9}$$

If labor receives residual products as its rewards, the wage rate can be written as

$$w_t^i=f(k_t^i,\ g_t^i)-k_t^i f_k(k_t^i,\ g_t^i), \tag{10}$$

Equations (9) and (10) can be solved to find the capital-labor ratio and the wage rate in each country as functions of the world interest rate and productive government

expenditure. This can be expressed as

$$w_t^i = w_t^i(r_t, g_t^i), \tag{11}$$

$$k_t^i = k_t^i(r_t, g_t^i), \tag{12}$$

where

$$w_r = \frac{\partial w}{\partial r} = -k,\ w_g = \frac{\partial w}{\partial g} = f_g,$$

$$k_r = \frac{\partial r}{\partial r} = \frac{1}{f_{kk}},\ k_g = \frac{\partial k}{\partial g} = \frac{f_{kg}}{f_{kk}},$$

$f_{kk} = \partial^2 f/\partial k^2$ and $f_{kg} = \partial^2 f/\partial g \partial k$. From the properties of the production function, we have $f_{kk} < 0$. In addition, we assume the following.

Assumption 2 : Productive government expenditure can improve productivity, but less than one.
That is, $0 < w_g = f_g < 1$.[6)]

Assumption 3 : Productive government expenditure is a complement for private capital. That is, $k_g = f_{kg} > 0$.

3. Government

In each period, the government collects lump-sum taxes from individuals and allocates them to the productive expenditure at rate α^i and the consumption expenditure at rate $1-\alpha^i$. The composition coefficient α^i satisfies $0 < \alpha^i < 1$. Thus, country i's government budget constraint in period t can be written as

$$\alpha^i \tau_t^i L_t = g_t^i L_t, \tag{13}$$

$$(1-\alpha^i)\tau_t^i L_t = e_t^i L_{t-1}. \tag{14}$$

4. Market Clearing

This economy has three markets; goods, capital and labor markets. In section 2.1, we assumed that the labor supply is inelastic. This implies that the labor market is always in equilibrium. The equilibrium condition for the capital market is written as

$$s_t^H + s_t^F = (1+n)(k_{t+1}^H + k_{t+1}^F). \tag{15}$$

Using the budget constraint for individuals (2) and (3), the factor market equilibrium conditions (9) and (10), and the government budget constraint (13) and (14), we obtain the equilibrium condition for the goods market by the Walras' law.

$$\begin{aligned} &Y_t^H + Y_t^F + K_t^H + K_t^F \\ &= c_{1t}^H L_t + c_{2t}^H L_{t-1} + c_{1t}^F L_t + c_{2t}^F L_{t-1} + e_t^H L_{t-1} + \\ &\quad e_t^F L_{t-1} + g_t^H L_t + g_t^F L_t + K_{t+1}^H + K_{t+1}^F. \end{aligned} \tag{16}$$

This completes the description of the economy.

For comparative statics analysis, we derive the stability condition in the capital market. From (7) and (11)-(15), it can be expressed as

$$\left|\frac{dr_{t+1}}{dr_t}\right| = \left|\frac{s_w^H w_r^H + s_w^F w_r^F}{(1+n)(k_r^H + k_r^F) - s_r^H - s_r^F}\right| < 1, \tag{17}$$

where $s_w^i = \partial s^i / \partial (w^i - \tau^i)$, $w_r^i = \partial w^i / \partial r$, $s_r^i = \partial s^i / \partial r$, and $k_r^i = \partial k^i / \partial r$.

Ⅲ. Steady State Analysis

This section examines the effect of changes in the composition of government expenditure on steady state levels of the world interest rate, the current account, and the welfare. The steady state of the economy is described by the following set of equations.

$$\alpha^i\tau^i = g^i, \tag{18}$$

$$(1-\alpha^i)\tau^i = e^i/(1+n), \tag{19}$$

$$\begin{aligned} &s^H[w^H(r,\ g^H)-\tau^H,\ r,\ e^H]+ \\ &\quad s^F[w^F(r,\ g^F)-\tau^F,\ r,\ e^F] \\ &\quad = (1+n)[k^H(r,\ g^H)+k^F(r,\ g^F)]. \end{aligned} \tag{20}$$

Equations (18) and (19) represent country i's government budget constraint in the steady state and equation (20) represents the capital market equilibrium condition in the steady state.

1. Effect on World Interest Rate

First, we examine how a change in the composition of government expenditure affects the world interest rate. It is assumed that in changing the composition α governments maintain their tax revenue as a constant. Totally differentiating (18)-(20), we obtain

$$\frac{dr}{d\alpha^i} = -\frac{\tau^i}{\Delta}[s_w^i w_g^i - s_e^i - (1+n)k_g^i], \tag{21}$$

where

$$\Delta = s_w^H w_r^H + s_w^F w_r^F + s_r^H + s_r^F - (1+n)(k_r^H + k_r^F).$$

If increasing the world interest rate does not reduce savings,[7] then the stability condition (17) implies $\Delta > 0$. We assume this to be the case. The first term in the square bracket on the right-hand-side of (21) represents the effect of increasing the allocation of productive government expenditure on savings through its impact on the wage rate. If, as assumed above, private consumption is normal and if the productive government expenditure improves productivity, then the sign of this term is positive. That is, an increase in the allocation of productive government expenditure raises the wage rate and hence the amount of savings. This will lower the world interest rate.

The second term in the square bracket represents the effect of decreasing the allocation of government consumption expenditure on savings. If, as assumed above, private and government consumptions are substitutes for each other, then the sign of this term is positive. That is, decreasing the allocation of government consumption expenditure increases savings, which will lower the world interest rate. The third term in the square bracket represents the effect of increasing the allocation of productive government expenditure on the demand for capital. If, as assumed above, productive government expenditure is a complement for private capital, then the sign of this

term is negative. That is, an increase in the allocation of productive government expenditure stimulates the demand for private capital, which will raise the world interest rate.

Therefore, how a change in the composition of government expenditure α affects the world interest rate depends on the magnitude of the third term relative to the first and second ones. If the complementarity between productive government expenditure and private capital is sufficiently small, then allocating more resources to productive government expenditure will lower the world interest rate. Contrarily, if the complementarity is suffciently large, then it is possible that increasing the allocation of productive government expenditure raises the world interest rate. We summarize the results obtained in the following proposition.

Proposition 1 : If the complementarity between productive government expenditure and private capital is suffciently small (large), then increasing the composition of productive government expenditure will lower (raise) the world interest rate.

2. Effect on Current Account

Next we examine how a change in the composition of government expenditure affects the current account. A country's current account is represented by the difference between domestic savings and investment. Denoting A^i as country i's net current account surplus, the capital market equilibrium condition in a steady state can be written as

$$A^H+A^F=0,$$

where

$$A^i=s^i[w^i(r, g^i)-\tau^i, r, e^i]-(1+n)k^i(r, g^i),$$

for $i=H, F$. Differentiating above with respect to α^i and using (21), we obtain

$$\frac{dA^i}{d\alpha^i}=\tau^i\left[s^i_w w^i_g-s^i_e-(1+n)k^i_g\right]\left[1-\frac{s^i_w w^i_r+s^i_r-(1+n)k^i_r}{\Delta}\right]. \quad (22)$$

The stability condition (17) implies that the sign of the third component on the right-hand-side of (22) is positive. Thus, the sign of (22) depends on that of the second component. Obviously, the sign of the second component depends on the complementarity between productive government expenditure and private capital. Thus, the following proposition can be obtained.

Proposition 2 : If the complementarity between productive government expenditure and private capital is suffciently small (large), then increasing the composition of

productive government expenditure by one country improves (worsens) its own current account and worsens (improves) the other country's.

Proposition 2 states that if the complementarity between productive government expenditure and private capital is suffciently small (large), then increasing the composition of productive government expenditure increases savings (investments) and hence improves (worsens) the current account. It also indicates that if the complementarity is suffciently small (large), then the country with a relatively larger allocation of productive government expenditure becomes a net creditor (a net debtor) in the steady state as long as the lump-sum tax rates are identical across countries. Buiter (1981) shows that if two countries are identical in all respects except in time preference, the country with a relatively lower time preference becomes a net creditor in the steady state. Hamada (1986) shows that if two countries are identical in all respects except in the amount of government expenditure, the country with the relatively smaller amount of government expenditure becomes a net creditor in a steady state. Our result demonstrates that even though the time preference and the amount of government expenditure (i.e., the lump-sum tax rates) are identical across countries, the current account imbalance arises from the diffrence in the composition of government expenditure.

3. Welfare Effect

Now we examine the welfare effect of changing the composition of government expenditure. The welfare of country i is represented by its indirect utility function

$$V^i(w^i-\tau^i,\ r,\ e^i) = u[c_1^i(w^i-\tau^i,\ r,\ e^i),\ c_2^i(w^i-\tau^i,\ r,\ e^i),\ e^i]. \quad (23)$$

Differentiating V^i with respect to α^i, we obtain the "own effect" of changing the composition of government expenditure.

$$\frac{dV^j}{d\alpha^i} = \frac{\lambda^j}{1+r}\left[(n-r)+x^j\right]\frac{dr}{d\alpha^i} + \tau^i\lambda^i w_g - \tau^i V_e^i, \quad (24)$$

where $x^i = c_2^i/(1+r)-(1+n)k^i$ is the net current account surplus in country i in the steady state. Differentiating $V^j(j \neq i)$ with respect to α^i, we obtain the spillover effect of changing the composition of government expenditure.

$$\frac{dV^j}{d\alpha^i} = \frac{\lambda^j}{1+r}\left[(n-r)+x^j\right]\frac{dr}{d\alpha^i}, \quad (25)$$

where x^j is the net current account surplus in country j. Thus, by definition, $x^H+x^F=0$. Note that we use the relationship that $\partial V^i/\partial(w^i-\tau^i)=\lambda^i$ and

$\partial V^i/\partial r = c_2^i \lambda^i/(1+r)^2$ to obtain (24) and (25). To examine the welfare effect, we assume the following.

Assumption 4 : An accumulation path of an economy is always efficient. That is, $n-r<0$.

Following Batina and Ihori (1991), we decompose the welfare effect into the following.

1. Golden rule effect: This is represented by the first component in (24) and (25), $\frac{\lambda}{1+r}[n-r]\frac{dr}{d\alpha^i}$.[8] A change in α by one country affects the world interest rate and hence the capital accumulation in both countries. If $n-r<0$, accumulating more capital increases the welfare.
2. Interest payment effect: This is represented by the second component in (24) and (25), $\frac{\lambda}{1+r}x^i\frac{dr}{d\alpha^i}$.[9] If a change in α increases the world interest rate, this has a positive (negative) impact on welfare of a country with a current account surplus (deficit).
3. Wage effect: An increase in α^i raises the wage rate in country i. This is represented by the third component of (24), $\tau^i\lambda^i w_g$. By assumption 2, the sign of this term is positive for increasing α^i and negative for decreasing.
4. Direct effect: A change in α^i directly affects country i's welfare. This is represented by the fourth component of (24), $\tau^i V_e$. The sign of this term is negative for increasing α^i and positive for decreasing.

Consider the own effect (24). If increasing α lowers the world interest rate, the golden rule effect is always positive while the interest payment effect is negative (positive) for a country with a current account surplus (deficit). Contrarily, if increasing α raises the world interest rate, the golden rule effect is always negative while the interest payment effect is positive (negative) for a country with a current account surplus (deficit). The wage effect is positive and the direct effect is negative for increasing α. Total effect is ambiguous and depends on the relative magnitude ofthose four effects.

On the other hand, the sign of the spillover effect (25) can be determined by the relative magnitude of the golden rule and interest payment effects. This can be summarized by the following proposition.

Proposition 3 : If the complementarity between productive government expenditure and private capital is suffciently small (large), then increasing the composition of productive government expenditure will have a positive (negative) spillover effect on a country with a current account deficit but an

ambiguous effect on a country with a surplus.

The spillover effect depends on both the complementarity between productive government expenditure and private capital and the relative magnitude of the golden rule and interest payment effects. Suppose that the complementarity is suffciently small. Then, increasing α involves positive golden rule and interest payment effects on a country with a current account deficit and positive golden rule but negative interest payment effects on a country with a surplus. If the golden rule effect is dominant, increasing α in a surplus country improves the welfare of a deficit country. Also, increasing α in a deficit country improves the welfare of a surplus country. On the other hand, if the interest payment effect is dominant, increasing α in a surplus country improves the welfare of a deficit country, but increasing α in a deficit country reduces the welfare of a surplus country.

If the complementarity is suffciently large, increasing α involves negative golden rule and interest payment effects on a country with a current account deficit and negative golden rule but positive interest payment effects on a country with a surplus. If the golden rule effect is dominant, increasing α in a surplus country reduces the welfare of a deficit country. Also, increasing α in a deficit country reduces the welfare of a surplus country. On the other hand, if the interest payment effect is dominant, increasing α in a surplus country reduces the welfare of a deficit country, but increasing α in a deficit country improves the welfare of a surplus country. We summarize the results obtained in Table 1.

Ⅳ. Optimal Fiscal Policy

This section examines optimal policies chosen by two countries on the composition of government expenditure. The objective function of government in country i is the indirect utility function (23). The analysis in this section is based on the following two frameworks. The first is a non-cooperative choice. A government in country i takes its rival's choice $\alpha^j(j \neq i)$ as given in choosing α^i. Equilibrium in this framework is known as the Cournot-Nash equilibrium. The second is a cooperative choice. There, two governments cooperatively choose (α^i, α^j) to maximize the joint welfare.

1. Non-cooperative Choice

First, we consider a non-cooperative choice. As mentioned above, the government in country i chooses its composition of government expenditure α^i to maximize the objective function (23), taking its rival's choice $\alpha^j(j \neq i)$ as given. Thus, the first order condition for this problem can be written as

$$\frac{\partial V^H}{\partial \alpha^H} = 0, \tag{26}$$

$$\frac{\partial V^F}{\partial \alpha^F} = 0, \tag{27}$$

for the home and foreign governments, respectively. Equations (26) and (27) can be solved to obtain the optimal response function for the home government $\alpha^H = \alpha^H(\alpha^F)$ and that for the foreign government $\alpha^F = \alpha^F(\alpha^H)$. The intersection of the two functions in the $\alpha^H - \alpha^F$ surface represents the Cournot-Nash equilibrium. We assume that the equilibrium is unique and stable.

2. Cooperative Choice

Next, we consider a cooperative choice. In this framework, two governments cooperatively choose (α^H, α^F) to maximize the joint welfare, which is represented by the sum of V^H and V^F.

$$W = V^H + V^F.$$

The first order conditions for this problem can be written as

$$\frac{\partial W}{\partial \alpha^H} = \frac{\partial V^H}{\partial \alpha^H} + \frac{\partial V^F}{\partial \alpha^F} = 0, \tag{28}$$

$$\frac{\partial W}{\partial \alpha^F} = \frac{\partial V^H}{\partial \alpha^F} + \frac{\partial V^F}{\partial \alpha^F} = 0. \tag{29}$$

Evaluating the above at the non-cooperative equilibrium, we obtain

$$\left.\frac{\partial W}{\partial \alpha^H}\right|_N = \frac{\partial V^F}{\partial \alpha^H}, \tag{30}$$

$$\left.\frac{\partial W}{\partial \alpha^F}\right|_N = \frac{\partial V^H}{\partial \alpha^F}. \tag{31}$$

Thus, the relationship between non-cooperative and cooperative equilibria depends on the sign of the spillover effect. As discussed in the previous section, the sign of the spillover effect depends on both the degree of complementarity between productive government expenditure and private capital, and the relative magnitude of the golden rule and interest payment effects. The following proposition summarizes the results.

Proposition 4 : Suppose that the complementarity between productive government expenditure and private capital is suffciently small (large). If the golden rule effect is dominant, non-cooperative choices by two countries will result in a situation in which the allocation of productive government expenditure is too small in both countries. If the interest payment effect is dominant, the non-cooperative choices will result in a situation in which the allocation of productive government expenditure is too small (large) in a country with a current account surplus, but is too large (small) in a country with a deficit.

Possible interpretations of proposition

4 are as follows. If the complementarity between productive government expenditure and private capital is suffciently small, an increase in α lowers the world interest rate. If the golden rule effect is dominant, increasing α in one country has a positive spillover effect on the other country. Thus, non-cooperative choices lead to a situation in which the allocation of productive government expenditure is too small (or the allocation of government consumption expenditure is too large) in both countries. On the other hand, if the interest payment effect is dominant, increasing α in a country with a surplus (deficit) has a positive (negative) spillover effect on the other country. Thus, non-cooperative choices lead to a situation in which the allocation of productive government expenditure is too small in a country with a surplus but is too large in a country with a deficit.

On the other hand, if the complementarity is suffciently large, an increase in α raises the world interest rate. If the golden rule effect is dominant, non-cooperative choices lead to a situation in which the allocation of productive government expenditure is too large (or the allocation of government consumption expenditure is too small) in both countries. On the other hand, if the interest payment effect is dominant, non-cooperative choices lead to a situation in which the allocation of productive government expenditure is too large in a country with a surplus but is too small in a country with a deficit. We summarize the results obtained in Table 2.

Proposition 4 shows that the non-cooperative choices by two countries result in the allocation of government expenditure that is too small or too large depending on the degree of complementarity between productive government expenditure and private capital, and the relative magnitude of the golden rule and interest payment effects. That is, in some cases the allocation of a certain type of government expenditure becomes too high, while in other cases it becomes too low. Those results differ from Hamada (1986) and Turnovsky (1988) in several ways. Hamada (1986) shows that non-cooperative choices by two countries lead to a situation in which the government expenditure always becomes excessive in both countries. Turnovsky (1988) shows that non-cooperative choices result in a situation in which government expenditure on export goods becomes excessive while that on import goods less excessive. One reason why we could obtain the results that differ from the previous studies is that we introduce two types of government expenditure that affect both production and consumption choices and focus on changes in the composition of the expenditure.

V. Concluding Remarks

This paper investigates the effect of the composition of government expenditure on long-run levels of world interest rate, current account and the welfare in a two-country overlapping generations model. First, we show that increasing the composition of productive government expenditure by the government in one country lowers the world interest rate and improves that country's current account, if the complementarity between productive government expenditure and private capital is suffciently small. Welfare effects depend on the golden rule and the interest payment effects as well as the complementarity between productive government expenditure and private capital. We show that if the complementarity is suffciently small, increasing the composition of productive government expenditure involves positive golden rule and interest payment effects on a country with a current account deficit and positive golden rule but negative interest payment effects on a country with a surplus.

We also examine whether non-cooperative choices by two countries on the composition of government expenditure result in too small or too large allocations of either type of expenditure relative to cooperative choices. It is shown that if the complementarity is suffciently small and if the golden rule effect is dominant, non-cooperative choices will result in too small an allocation of productive government expenditure and too large an allocation of government consumption expenditure in both countries. If the interest payment effect is dominant, non-cooperative choices will result in a situation in which the allocation of productive government expenditure is too small in a country with a current account surplus and is too large in a country with a deficit.

This paper focused on productive government expenditure as a current flow rather than a stock. However, production-enhancing government expenditure sometimes affects the economy by accumulating over time. One possible extension would be to allow productive government expenditure to accumulate over time. We also focused on the long-run effect of changing the composition of government expenditure. As in studies such as Turnovsky and Fisher (1995), distinctions between permanent and temporal effects of policies are important. A further extension would be to examine transitional processes arising from changing the composition of government expenditure.

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Table 1 : Comparative Statics Results

	Country	$\frac{dr}{d\alpha^i}$	$\frac{dA^i}{d\alpha^i}$	$\frac{dV^j}{d\alpha^i}$	Conditions
Small Complementarity	Surplus	−	+	+	$GR > IP$
				+	$GR < IP$
	Deficit	−	+	+	$GR > IP$
				−	$GR < IP$
Large Complementarity	Surplus	+	−	−	$GR > IP$
				−	$GR < IP$
	Deficit	+	−	−	$GR > IP$
				+	$GR < IP$

GR : Golden Rule Effect　　IP : Interest Payment Effect

Table 2 : Allocation of Government Expenditure in the Non-cooperative Choices

Conditions	Surplus	Deficit
Small Complementarity and $GR > IP$	Too Small α	Too Small α
Small Complementarity and $GR < IP$	Too Small α	Too Large α
Large Complementarity and $GR > IP$	Too Large α	Too Large α
Large Complementarity and $GR < IP$	Too Large α	Too Small α

Notes

1) See, for example, OECD (1976) for an extensive survey on this issue.

2) Buiter (1981) extends a two-period overlapping generations model developed by Diamond (1965) to a two-country framework to examine welfare implications of international lending and borrowing.

3) We take this type of government expenditure as housing service or public pensions, both of which are substitutes for private consumption.

4) See Kormendi (1983) for an empirical study on the substitutability between government and private consumption

5) This speci.cation follows from Aschauer (1988), Barro (1990), and Turnovsky and Fisher (1995). Arrow and Kurtz (1970) allow government expenditure to accumulate over time.

6) This assumption follows from Aschauer (1988) and Kormendi (1983).

7) That is, $s_r^i \geq 0$.

8) This effect corresponds to the capital accumulation effects in Hamada (1986) and

Ihori (1987).

9) This effect corresponds to the intertemporal terms of trade effects in Hamada (1986) and Ihori (1987).

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