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GTAP Annual Conference on Global Economic Analysis
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The Impacts of the Fiscal-Consolidation Policies in Developed Economies under the Free Trade Agreements

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May, 2001

Abstract

The purpose of this study is to clarify the impacts of the fiscal-consolidation policies in developed economies when the economies are involved in an FTA, using a perfect-foresight dynamic AGE model of global trade. The model used in this paper assumes endogenous growth with public capital along with private capital, and can be used to answer questions when the response of intertemporal variables such as savings and investment are important, but also the structure of the global economy is relevant. The parameters and exogenous variables are calibrated assuming that the benchmark data is obtained from an economy in the stationary state.

Simulations with the model revealed that the policies that decrease public capital, such as cutting in the public expenditures or abolition of taxes, may have a strong impacts on the global economy through trade, and would finally decelerate the economic growth. On the other hand, the countries that performed the policies might be better off if we focus on the welfare level that is defined by the private consumption.

Keywords: applied general equilibrium model; endogenous growth model; public capital; fiscal-consolidation; global trade; free trade agreement.

JEL Classification Numbers: C68, D58, E62, F15, F41.

1 Introduction

Over the past decade, the global economy is becoming increasingly interdependent and intensifying international linkages with the launch of the World Trade Organization (WTO). Most of the members of WTO are also involved in regional economic arrangement such as the Asia-Pacific Economic Co-operation (APEC), the European Union (EU), and the North American Free Trade Agreement (NAFTA). The integration of individual economies into the global economy has progressed, forming new links between developed and developing economies.

On the other hand, it is an important subject for policy makers to achieve balanced fiscal budget, since excess accumulation of fiscal deficit may lead low growth of the economy. At the integrated global economy, where capital and goods are mobile across the national boundary, fiscal-consolidation policies in developed economies may have crucial influence on the global economy through trade.

In this point of view, the author tried to clarify the impacts of the fiscal-consolidation policies in developed economies when the economies are involved in a Free Trade Agreement (FTA), using a perfect-foresight dynamic Applied General Equilibrium (AGE) model of global trade[1]. The main finding from the study is that there would be no negative effects of the fiscal-consolidation in developed countries on lower income economies, if we focus on the welfare level that is defined by private consumption. An additional implementation of tariff liberalization on the fiscal-consolidation, may raise the growth rate of both middle- and low-income countries.

On the other hand, the author's previous study does not incorporate public investment that may play an important role in economic growth. Especially, expansion of public capital such as infrastructure may function as an externality in production. The fiscal-consolidation may also have a crucial impact on economic growth through this channel.

Barro (1990) develops a simple model of endogenous growth in which the government uses tax revenue to finance public service and this service enters into the production function as a productive input. In this study, Barro proved that maximizing the national growth rate is equivalent to maximizing social welfare. On the other hand, economy is always at a position of steady growth in Barro's model. Futagami, Morita and Shibata (1993) expanded the Barro's model to incorporates public capital stock that enables us to examine transitional dynamics. Using this model, Futagami, Morita and Shibata reexamined Barro's result, and found that the tax rate, which maximizes the growth rate of the economy, is not equal to the rate that maximizes national welfare. Turnovsky (1997) performed a comprehensive

[1]See Oyamada (1999). The model is based on a Ramsey-Cass-Koopmans type exogenous growth model.

analysis highlighting the differences between considering productive government expenditure in the form of capital, with the more standard practice of introducing it as a flow.

To handle the highly complicated economic system, AGE models are often utilized. The Global Trade Analysis Project (GTAP, Hertel ed. (1997)) carries out a comprehensive analysis on trade related subjects. While some studies analyze the dynamic impacts of policy changes assuming static expectations, however, there are few satisfactory extensions of the model to incorporates rational expectations. Devarajan and Go (1998) point out the contradiction of the assumption that the same agent behaves rationally for one set of decisions but irrationally for another. Since their purpose is to present the simplest possible model, they do not analyze the sectoral and regional effects. Diao, Elbasha, Roe and Yeldan (1996) developed an AGE model that incorporates Research and Development based endogenous growth, and examined the behavior of the model.

Along with the author's previous study, the purpose of this study is to answer the following questions, using a perfect-foresight dynamic AGE model of global trade that incorporates productive public capital:

1. How do the fiscal-consolidation policies in developed economies affect the global economy?

2. How does the Free Trade Agreement (FTA) change the impacts of the fiscal-consolidation policies in developed economies.

Since some macroeconomic policies are essentially intertemporal, we look at the differential impact of policies that cannot be captured in a static framework. The model in this paper solves for the set of inter- and intratemporally consistent prices. Both savings and investment are the result of dynamic optimization based on future prices that are consistent with the realized levels of savings and investment. The same as Futagami, Morita, and Shibata (1993), transitional dynamic impacts may also be examined, since the model includes stock of public capital.

In the following section, we present the major assumptions in the analysis. In section 3, the basic structure of the model is outlined. In section 4, we perform three simulations with the model and interpret the results. Section 5 concludes the paper.

2 Nature of the Model

In this section, we present the major assumptions in this study.

Multi-Regional Growth Model The framework is that of a dynamic multi-regional endogenous growth model. The global economy is divided

into three regions, high-, middle-, and low-income countries. Industries are aggregated into one sector. Economic growth is led by the exogenous growth of labor input and an endogenous per capita growth. The model is based on an endogenous growth model that incorporates public capital along with private capital. The public capital is provided to the producers without user charges and is not subject to congestion effects[2].

Dynamic Consistency The agents' intertemporal behavior is assumed to be rational, so that the entire system of prices across sectors and over time is internally consistent. This is because the model calculates variables of all the periods at the same time. Consumption and investment are determined, not based on what happened in the past, but based on the assumed future conditions of technology and preference. Changes in the future exogenous variables can affect present endogenous variables.

Discrete Time Formulation For the purpose of numerical implementation, the intertemporal problem is formulated in discrete time. Discounting in discrete time requires a dating convention. In order to keep the derivation and calibration simple, all transactions are assumed to take place at the end of the period (while decisions are made or planned at the beginning of the period).

Terminal Conditions To solve a growth model that has an infinite horizon, we follow the usual procedure of imposing stationary state conditions at some future terminal period. As long as the transversality conditions are satisfied, the sums of various infinite series pertaining to the consumption function and the investment equation will be finite and well defined.

3 Structure of the Model

In this section, we outline the basic structure of the model used in this study.

Enterprise There is one competitive enterprise in each sector for every region, which produces one kind of product. Production and factor inputs are all determined endogenously so that resources are optimally used from the viewpoint of a maximization of net income. Factor substitutability is assumed between labor, capital, and intermediate inputs.

The dynamic decision problem of the enterprise is to choose a time path of investment that maximizes the value of the firm, defined as the present value of net income. As a long-term model, inventory investment is included in investment.

[2]Turnovsky (1997) handles the case that public service has congestion effects.

An enterprise's optimization problem can be expressed as follows.

$$\text{Max} \qquad VF_r = \sum_{t=1}^{T} \left(\prod_{v=1}^{t} \frac{1}{1+RI_v} \right) R(Z_{rt}, QH_{rt}, L_{rt}, QF_{rt})$$

$$\text{s.t.} \qquad K_{rt} \leq QF_{rt-1} + (1-\delta_r^K)K_{rt-1} \qquad \perp PK_{rt} \tag{1}$$

$$\{N_r + (1+N_r)\gamma_r + \delta_r^K\}K_{rT} \leq QF_{rT} \qquad \perp PKT_r \tag{2}$$

$$Y_{rt} \leq L_{rt}\text{CD}(K_{rt}, J_{rt}) \qquad \perp PY_{rt} \tag{3}$$

$$Z_{rt} \leq \text{CES}(Y_{rt}, QH_{rt}) \qquad \perp PZ_{rt} \tag{4}$$

where VF_r, Z_{rt}, Y_{rt}, K_{rt}, J_{rt}, L_{rt}, QH_{rt}, and QF_{rt} are the value of the firm, gross output, value-added, private capital stock which depreciates at constant rate δ_r^K, public capital stock, labor input, composite intermediate input, and composite raw capital to be equipped as the private capital, respectively for region r. t denotes time period, and $\text{CD}(\cdot)$ and $\text{CES}(\cdot)$ show that the aggregators are assumed to be of Cobb-Douglas type and Constant Elasticity of Substitution (CES) function, respectively. PK_{rt}, PKT_r, PY_{rt}, PZ_{rt}, and RI_t denote prices and market interest rate. Perpendicular index "$\perp$" shows the counterpart relation between an inequality and a positive variable. Current net income $R(\cdot)$ is obtained by the subtraction of costs from sales, and, as a result, it is a function of output and inputs.

Note that the public capital $J_{rt} = \sum_{v=2}^{t}\{(1-\delta_r^J)^{t-v}QG_{rv-1}\} + (1-\delta_r^J)^{t-1}\overline{J_{r1}}$, which depreciates at constant rate δ_r^J, is provided to the producer without user charges. In this equation, QG_{rt} denotes composite raw capital to be equipped as the public capital. The economic growth is defined by exogenously given labor growth rate N_r and per capita growth rate γ_r which is determined endogenously.

The dual relations for the optimum are:

$$PL_{rt} - (1-\alpha_r^Y)PY_{rt}\frac{Y_{rt}}{L_{rt}} \geq 0 \qquad \perp L_{rt} \tag{5}$$

$$\begin{aligned} -\frac{1}{1+RI_{t+1}}PK_{rt+1}(1-\delta_r^K) + PK_{rt} \\ - (1-\tau_r^V)PY_{rt}\frac{\partial Y_{rt}}{\partial K_{rt}} \geq 0 \qquad \perp K_{rt} \end{aligned} \tag{6}$$

$$(1-\tau_r^X)PQF_{rt} - \frac{1}{1+RI_{t+1}}PK_{rt+1} \geq 0 \qquad \perp QF_{rt} \tag{7}$$

$$PQH_{rt} - \frac{1}{1+\tau_r^Z}PZ_{rt}\frac{\partial Z_{rt}}{\partial QH_{rt}} \geq 0 \qquad \perp QH_{rt} \tag{8}$$

$$PY_{rt} - \frac{1}{1+\tau_r^Z} PZ_{rt} \frac{\partial Z_{rt}}{\partial Y_{rt}} \geq 0 \qquad \perp Y_{rt} \tag{9}$$

$$PZ_{rt} - PW_{rt} \geq 0 \qquad \perp Z_{rt} \tag{10}$$

where τs are taxes/subsidies which function as price distortions. α_r^Y is share of private capital input in the Cobb-Douglas type production aggregator, and PW_{rt} is average output price of products.

Household The representative consumer in each region maximizes her/his discounted utility of the temporal sequence of aggregated consumption. The utility function is homogenous and additively separable with constant elasticity of marginal utility. The utility is discounted by the consumer's positive and constant rate of time preference.

Since the financial claims are perfect substitutes ex-ante, we cannot uniquely determine the individual consumer's optimal portfolio shares. However, since the traded goods are imperfect substitutes, interregional security market equilibrium condition defines the foreign saving for each region endogenously[3]. Without uncertainty and with efficient financial markets, financial assets among sectors and regions earn the same anticipated rate of return.

A household's optimization problem can be expressed as follows:

$$\begin{aligned} \text{Max} \qquad & U_r = \sum_{t=1}^{T} \overline{L_{rt}} \left(\frac{1}{1+\rho_r} \right)^t \frac{1}{1-\sigma_r} \left(\frac{QC_{rt}}{\overline{L_{rt}}} \right)^{1-\sigma_r} \\ \text{s.t.} \qquad & \sum_{t=1}^{T} \left(\prod_{v=1}^{t} \frac{1}{1+RI_v} \right) PQC_{rt} QC_{rt} \leq W_r \qquad \perp \lambda_r^H \end{aligned} \tag{11}$$

where U_r, QC_{rt}, and PQC_{rt} are utility, composite consumption, and price of composite good, respectively. ρ_r, σ_r, and λ_r^H are subjective discounted rate, inverse of the elasticity of intertemporal substitution, and the marginal utility of wealth. W_r is regional wealth which is defined by the discounted sum of current net factor income.

The dual relation for the optimum is:

$$\lambda_r^H \left(\prod_{v=1}^{t} \frac{1}{1+RI_v} \right) PQC_{rt} - \left(\frac{1}{1+\rho_r} \right)^t \left(\frac{QC_{rt}}{\overline{L_{rt}}} \right)^{-\sigma_r} \geq 0 \qquad \perp QC_{rt} \tag{12}$$

[3]The model treats capital flows as equal to the balance of trade, adjusted for net foreign transfers/remittances and debt service payments.

Government Government revenue comes from import tariffs, export duties, domestic indirect taxes, and direct taxes. Government current expenditure includes government consumption and public investment. On the other hand, official transfers and foreign lending has not yet been included in this study. The difference between government revenue and expenditure equals government saving (if negative, fiscal deficit).

Assuming fixed share of the fiscal budget is accounted for by the public expenditure, and public investment, the following optimization problems characterize the government's behavior:

$$\begin{aligned} \text{Max} \quad & QS_{rt} \\ \text{s.t.} \quad & PQS_{rt} QS_{rt} \leq (1-\theta_r^G)(1+\theta_r^D)\, TAX_{rt} \qquad \perp \lambda_{rt}^S \end{aligned} \tag{13}$$

and

$$\begin{aligned} \text{Max} \quad & QG_{rt} \\ \text{s.t.} \quad & PQG_{rt} QG_{rt} \leq \theta_r^G(1+\theta_r^D)\, TAX_{rt} \qquad \perp \lambda_{rt}^G \end{aligned} \tag{14}$$

where QS_{rt}, QG_{rt}, PQS_{rt}, and PQG_{rt} are government consumption, public investment, and prices of composite good, respectively. The fiscal budget is equal to the current tax revenue TAX_{rt} inflated by the exogenously given fixed fiscal deficit rate θ_r^D. θ_r^G is fixed share of public investment in the public expenditure. λ_{rt}^S and λ_{rt}^G are marginal values of fiscal budget in each period.

The dual relations for the optimum are:

$$\lambda_{rt}^S PQS_{rt} - 1 \geq 0 \qquad \perp QS_{rt} \tag{15}$$

$$\lambda_{rt}^G PQG_{rt} - 1 \geq 0 \qquad \perp QG_{rt} \tag{16}$$

Interregional Trade Imperfect substitution characterizes the competition between foreign and domestic goods. This is reflected in the Armington aggregators between domestic goods and imports. Here, product is transformed by a Constant Elasticity of Transformation (CET) function between sales to the domestic market and the interregional market.

The Arminton aggregators and the dual relations are:

$$QH_{rt} \leq \text{CES}(DH_{rt}, MH_{rt}) \qquad \perp PQH_{rt} \tag{17}$$

$$(1+\tau^{DH_r})PD_{rt} - PQH_{rt}\frac{\partial QH_{rt}}{\partial DH_{rt}} \geq 0 \qquad \perp DH_{rt} \tag{18}$$

$$(1+\tau_r^{MH})PM_{rt} - PQH_{rt}\frac{\partial QH_{rt}}{\partial MH_{rt}} \geq 0 \qquad \perp MH_{rt} \tag{19}$$

$$QC_{rt} \leq \mathrm{CES}(DC_{rt}, MC_{rt}) \qquad \perp PQC_{rt} \tag{20}$$

$$(1+\tau_r^{DC})PD_{rt} - PQC_{rt}\frac{\partial QC_{rt}}{\partial DC_{rt}} \geq 0 \qquad \perp DC_{rt} \tag{21}$$

$$(1+\tau_r^{MC})PM_{rt} - PQC_{rt}\frac{\partial QC_{rt}}{\partial MC_{rt}} \geq 0 \qquad \perp MC_{rt} \tag{22}$$

$$QS_{rt} \leq \mathrm{CES}(DS_{rt}, MS_{rt}) \qquad \perp PQS_{rt} \tag{23}$$

$$(1+\tau_r^{DS})PD_{rt} - PQS_{rt}\frac{\partial QS_{rt}}{\partial DS_{rt}} \geq 0 \qquad \perp DS_{rt} \tag{24}$$

$$(1+\tau_r^{MS})PM_{rt} - PQS_{rt}\frac{\partial QS_{rt}}{\partial MS_{rt}} \geq 0 \qquad \perp MS_{rt} \tag{25}$$

$$QF_{rt} \leq \mathrm{CES}(DF_{rt}, MF_{rt}) \qquad \perp PQF_{rt} \tag{26}$$

$$(1+\tau_r^{DF})PD_{rt} - PQF_{rt}\frac{\partial QF_{rt}}{\partial DF_{rt}} \geq 0 \qquad \perp DF_{rt} \tag{27}$$

$$(1+\tau_r^{MF})PM_{rt} - PQF_{rt}\frac{\partial QF_{rt}}{\partial MF_{rt}} \geq 0 \qquad \perp MF_{rt} \tag{28}$$

$$QG_{rt} \leq \mathrm{CES}(DG_{rt}, MG_{rt}) \qquad \perp PQG_{rt} \tag{29}$$

$$(1+\tau_r^{DG})PD_{rt} - PQG_{rt}\frac{\partial QG_{rt}}{\partial DG_{rt}} \geq 0 \qquad \perp DG_{rt} \tag{30}$$

$$(1+\tau_r^{MG})PM_{rt} - PQG_{rt}\frac{\partial QG_{rt}}{\partial MG_{rt}} \geq 0 \qquad \perp MG_{rt} \tag{31}$$

where the indices D and M show whether the commodity is domestically made or imported.

The transformation of output and the dual relations are:

$$\mathrm{CET}(TF_{srt}, D_{rt}) \leq Z_{rt} \qquad \perp PW_{rt} \tag{32}$$

$$PW_{rt}\frac{\partial Z_{rt}}{\partial D_{rt}} - PD_{rt} \geq 0 \qquad \perp D_{rt} \tag{33}$$

$$\begin{aligned}(1+\tau_{rs}^{M})(1+\tau_{rs}^{S})(1+\tau_{rs}^{E})PW_{st}\frac{\partial Z_{st}}{\partial TF_{rst}} \\ - PM_{rt}\frac{\partial M_{rt}}{\partial TF_{rst}} \geq 0 \qquad \perp TF_{rst}\end{aligned} \tag{34}$$

where TF_{srt}, D_{rt}, and PW_{rt} are interregional trade flow of good from r-th region to s-th region, domestically used good, and average output price of products, respectively.

Equilibrium Conditions To arrive at a solution, both the intertemporal and general equilibrium conditions have to be satisfied simultaneously. At every point in time, the usual general equilibrium conditions require that: (i) material balance in the demand and supply of all goods in the economy holds; (ii) the demand for total labor equals its supply; (iii) government revenue is allocated between public expenditure (government consumption and public investment) and saving; and (iv) global-wide total of saving equals total investment[4]. The intertemporal conditions ensure that future prices and quantities are fully anticipated and factored into the behavior of consumption and investment. They also guarantee that the path towards a new stationary state is unique.

These equilibrium conditions are:

$$L_{rt} \leq \overline{L_{rt}} \qquad \perp PL_{rt} \tag{35}$$

$$DH_{rt} + DC_{rt} + DS_{rt} + DF_{rt} + DG_{rt} \leq D_{rt} \qquad \perp PD_{rt} \tag{36}$$

$$MH_{rt} + MC_{rt} + MS_{rt} + MF_{rt} + MG_{rt} \leq \mathrm{CES}(TF_{rst}) \qquad \perp PM_{rt} \tag{37}$$

$$\sum_r PQF_{rt} QF_{rt} \leq \sum_r SAV_{rt} \qquad \perp RI_t \tag{38}$$

The inequalities (35), (36) and (37), and (38) respectively represent (ii), (i), and (iv) mentioned above, and (iii) has been already included in the former government's problems.

Nominal Variables based on Dual Although the model does not have nominal variables, dual variables can be interpreted to indicate relative prices. Thus one can calculate future nominal variables, given an assumption on an overall rate of inflation.

Choice of Terminal Period As variables of different time-periods are inter-dependent, the computation burden is much larger than models that calculate solutions period by period. Moreover, extension of calculation horizon increases calculation difficulty more than proportionally, and expansion of models with respect to the number of sectors or regions is more difficult. Because of these difficulties, we set the terminal period to 50 with the limited amount of computational resources[5].

[4]This condition can be dropped because of the Walras' law. We include an inequality that reflects the condition (iv) in order to indicate interregional rate of return as its counterpart variable.

[5]The qualitative changes are not affected by the choice of terminal period. See Devarajan and Go (1998).

Data Source and Parameterization The main data source of the model is the GTAP data. Regions and industries are aggregated into three and one, respectively. A fixed fraction of output is supplied for interregional shipping services. In addition, a tentative proportion is assumed by the author for the division of the fixed capital formation into private and public investment. Using these basic components, the data set is readjusted to achieve a global stationary state in which every economy grows at the same rate, since the endogenous per capita growth rate of each economy is determined by the system of the model. After that, parameters and exogenous variables are calibrated from the benchmark data assuming that the global economy is in a stationary state. Some of the parameters are assumed by the author.

Software The model is formulated as a Mixed Complementarity Problem (MCP) and solved by "PATH" of the General Algebraic Modeling System (GAMS)[6]. MCP is a set of Kuhn-Tucker conditions derived from certain optimization problems.

4 Simulations

We now report on the results of three simulations in this dynamic framework with public capital. The first experiment handles an FTA between high- and middle-income countries. Since so many numbers of AGE analysis with static framework have been made to measure the impacts of several FTAs, we focus on the qualitative dynamic impacts of tariff liberalization.

The second simulates the fiscal-consolidation policies in high-income countries. In spite of the fact that the model includes neither official transfer nor foreign lending such as Official Development Assistance (ODA) flows, a fiscal-consolidation in high-income countries may have crucial impact on the global economy.

The third is the simultaneous implementation of the tariff liberalization and the fiscal-consolidation policy appearing in the first and the second experiments. Since these two policy measures are major issues in the recent economy, there is a possibility that these two are implemented in the same time periods. In addition, a fiscal-consolidation policy, as usual, accompanies other policy measures such as increase in the rate of certain taxes. We demonstrate this kind of policy set as an example.

In the table and figures, R1 to R3 denote high-, middle-, and low-income countries, respectively.

[6]Brook, Kendrick, and Meeraus (1992).

4.1 Case 1 - Tariff Liberalization

We begin with a permanent abolition of the import tariffs on the interregional trade between high- and middle-income countries. The simulation results are shown in Figures 1 to 8.

In a static model such as used in much literature, one would expect that the levels of private consumption and investment to rise. By contrast, in this dynamic framework with public capital, the levels of the regional private investment surge in the first year before settling in at the new steady-state levels lower than in the reference run. The reason is that the decrease in the government revenue from import tariff gradually leads the decrease of production through the decrease of public capital, and smaller production decelerates the private investment and lessens tax revenue. This negative impact is stronger on middle-income countries than on high-income ones. While production volume become smaller, the private consumption in middle-income countries become larger as much volume which was crowded-out in the reference run. Imports from high-income countries would fill up this consumption demand. So that, if we focus on the welfare level that is defined by the levels of private consumption, there is no negative effects of the trade liberalization.

Then, let us turn our eyes to low-income countries. The volume of the economy also becomes small. This is caused by the diversion effects of trade that high- and middle-income countries expands trade with each other, and decrease trade with low-income countries. As a result, the private consumption becomes small, and, from a certain point of view, one can be say that the trade liberalization between high- and middle- income countries causes a serious problem on the low-income economies.

4.2 Case 2 - Fiscal-Consolidation Policy

Next, we handle the issue of the fiscal-consolidation policies in high-income countries. In the experiment, the government fiscal deficit rate of high-income countries is reduced by half. In the reference run, the fiscal deficit rates of each regional government are: 2.72 for high-income countries, 1.95 for middle-income ones, and 1.60 for low-income ones. These values are derived directly from the differences between initial regional tax revenue and government expenditure. The results are shown in Figures 9 to 16.

A cutting in government spending is expected to enlarge private consumption as much as the volume that was crowded-out in the reference run. The increase of consumption demand in high-income countries enlarges exports from middle- and low-income countries to high-income ones. So that the trade balances do not become so large compared with the first simulation. Middle- and low-income countries start expanding the volume of production to be exported.

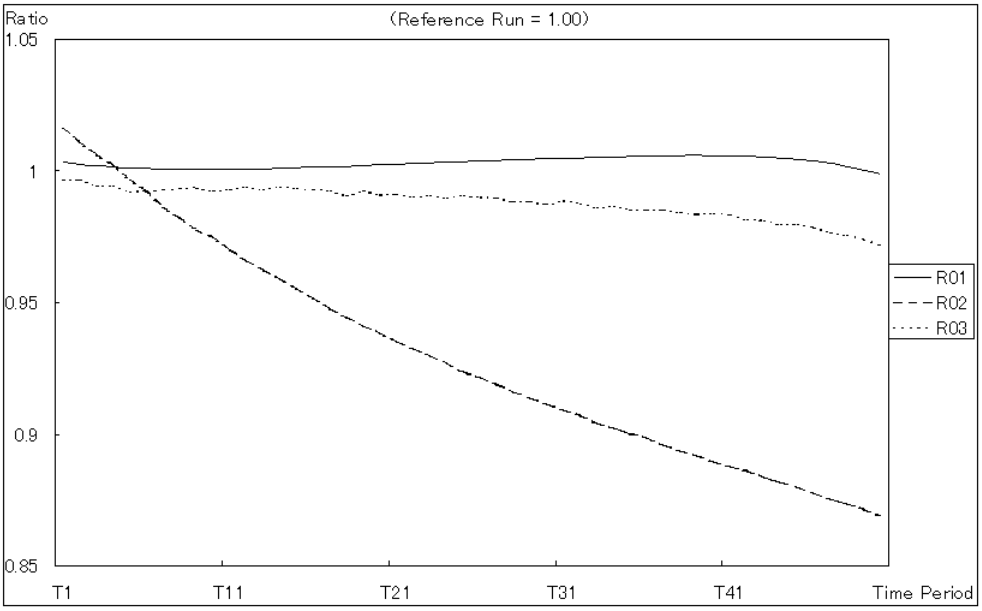

Figure 1: Effects on Output (Case 1)

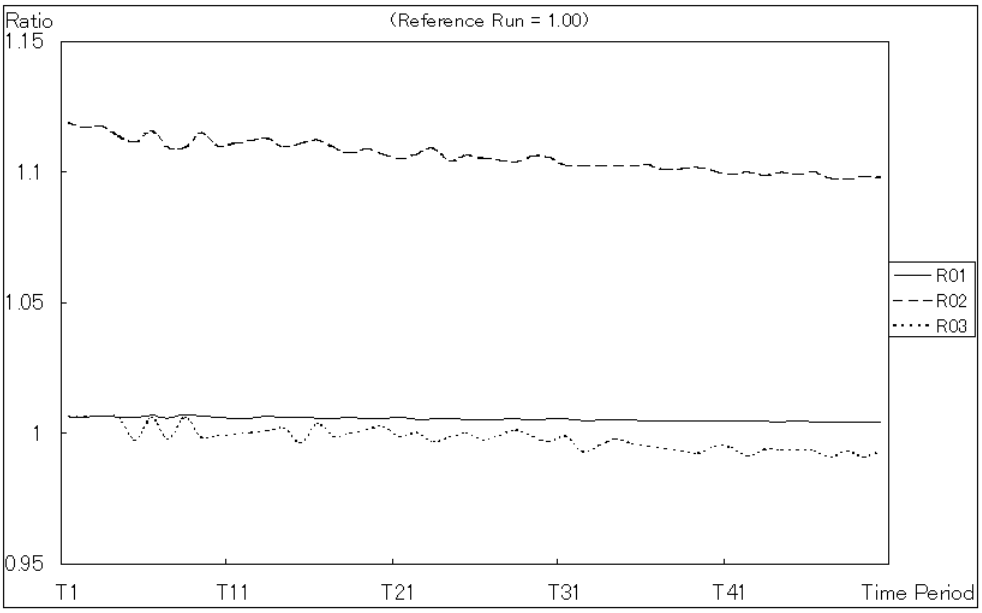

Figure 2: Effects on Private Consumption (Case 1)

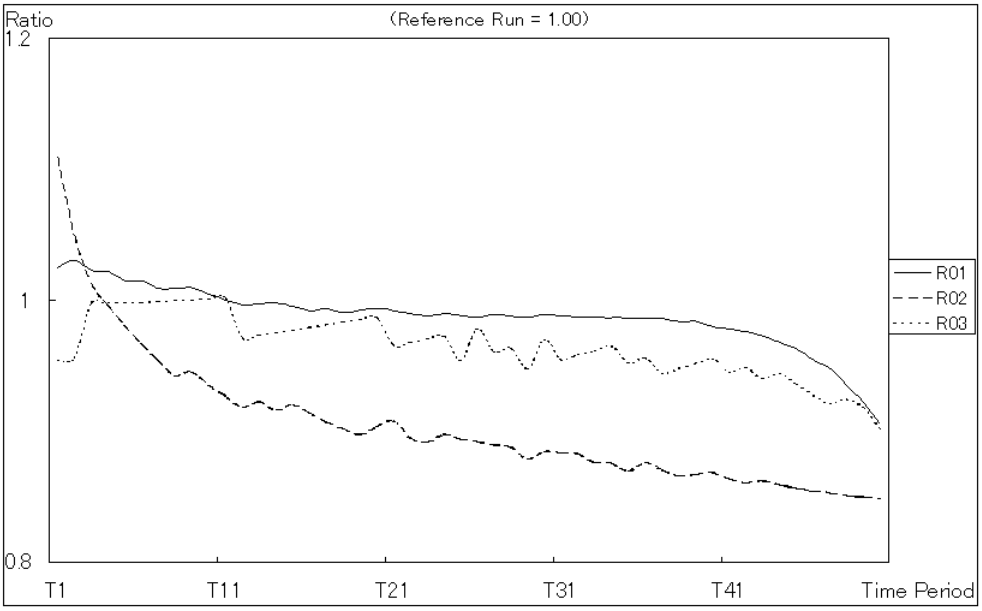

Figure 3: Effects on Private Investment (Case 1)

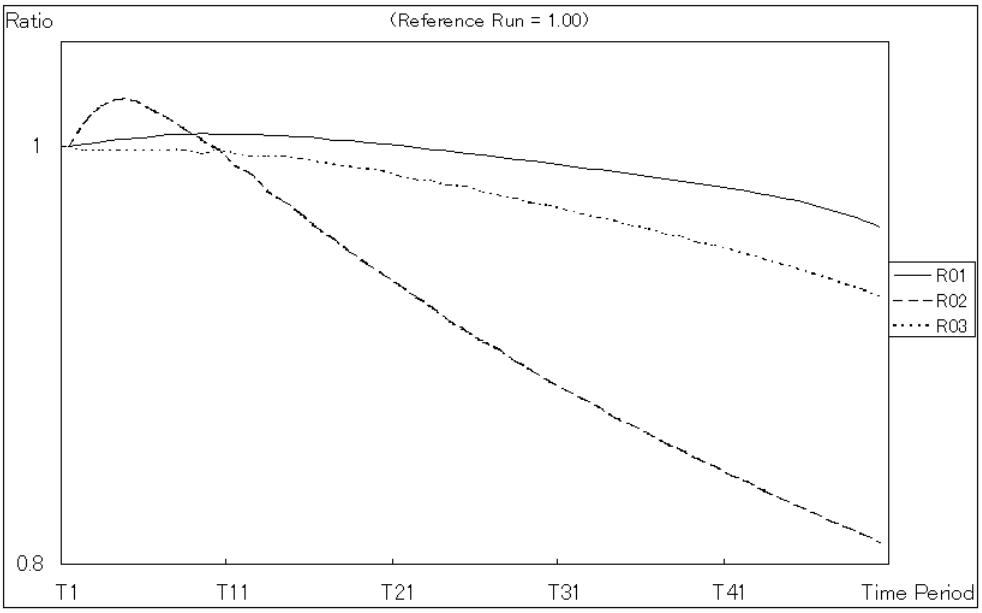

Figure 4: Effects on Private Capital (Case 1)

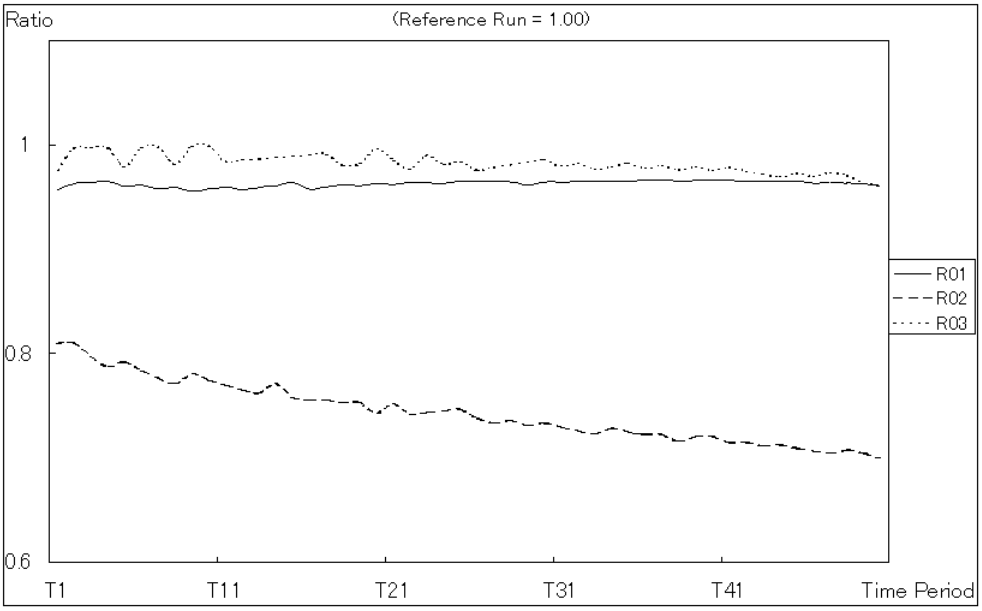

Figure 5: Effects on Public Investment (Case 1)

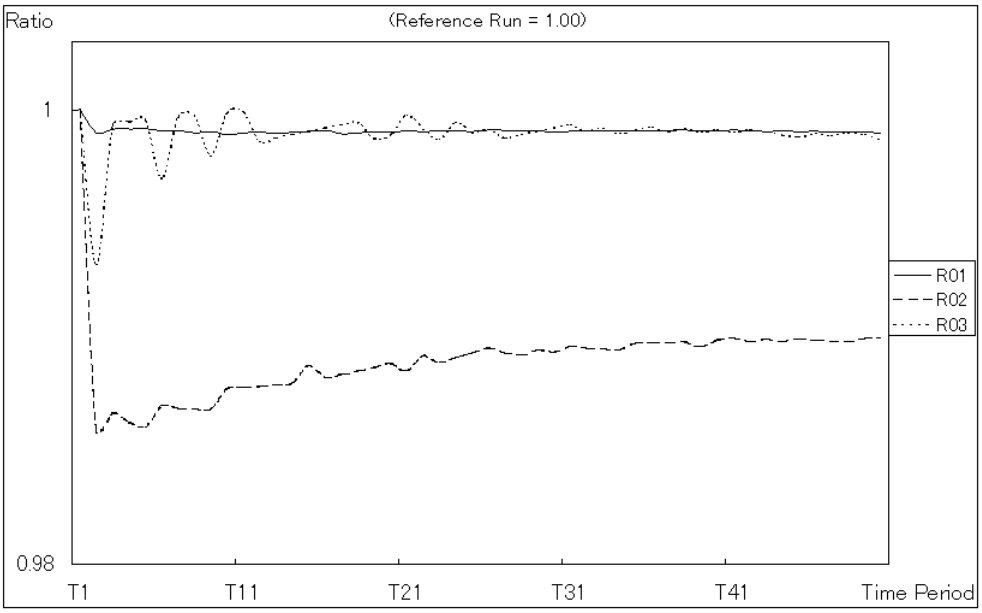

Figure 6: Effects on Public Capital (Case 1)

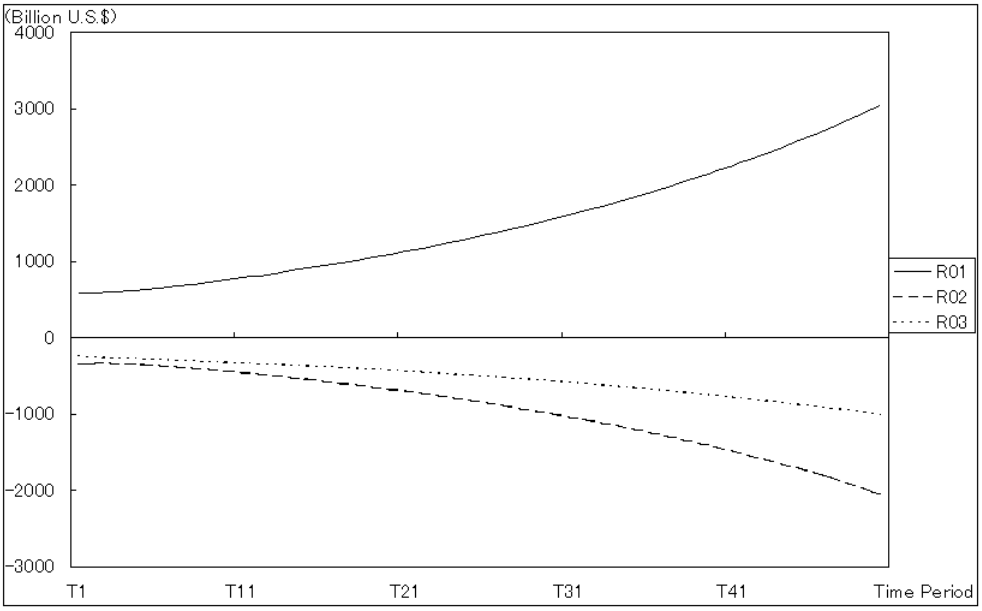

Figure 7: Effects on Net Exports (Case 1)

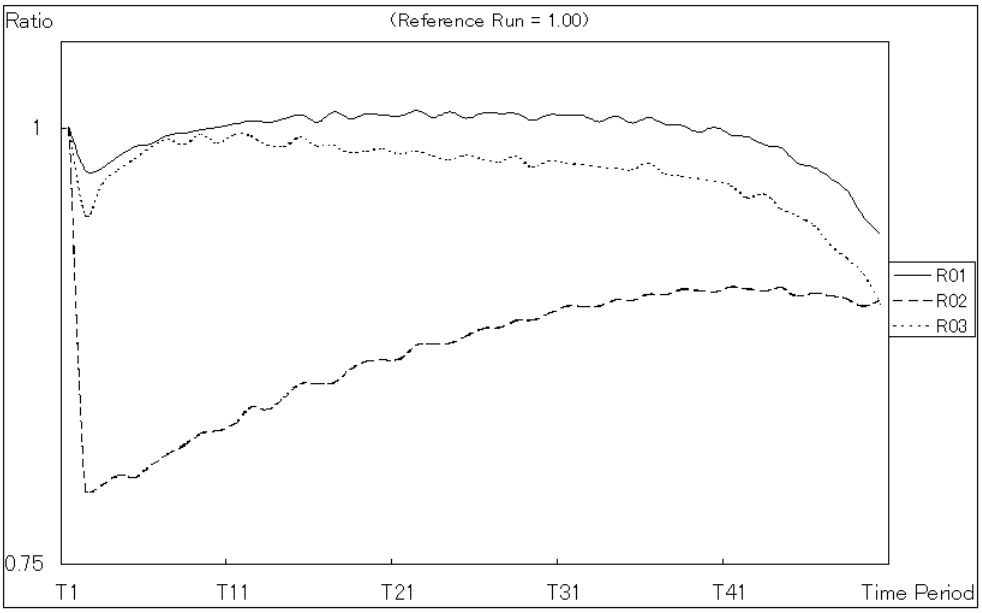

Figure 8: Effects on GDP Growth Rate (Case 1)

On the other hand, the decrease of public investment in high-income countries gradually lessens the levels of private investment and production. The deceleration would be finally reaches a tragic level, and affects lower-income economies. As a result, global economy would stop growing. This shows that the economic conditions of high-income countries have a crucial influence on the global economy.

4.3 Case 3 - Simultaneous Implementation of Tariff Liberalization and Fiscal-Consolidation Policy

In this experiment, we combine the setting of parameters in cases 1 and 2. The results appear in Figures 17 to 24.

The results show that the impacts of the tariff liberalization and the fiscal-consolidation policies are just mixed in this simulation. The first simulation results revealed that the decrease of tariff revenue in middle-income countries decelerates the growth of the region, and, in the second, the cutting in the public investment in high-income countries drive the global economy into a stagnation. On the other hand, the levels of the private consumption would be high because the government becomes small. In all of the cases, low-income countries suffer the negative impacts of the policies in the neighbor countries through trade.

5 Concluding Remarks

The purpose of this study is to clarify the impacts of the fiscal-consolidation policies in developed economies when the economies are involved in an FTA, using a perfect-foresight dynamic AGE model of global trade that incorporates productive public capital. The model can be used to analyze questions where the response of intertemporal variables such as savings and investment are important, but also the public capital plays an important role in the economy.

Simulations with the model revealed that the policies that decrease public capital, such as cutting in public expenditures or abolition of taxes, may have a strong impacts on the global economy through trade, and would finally decelerate the economic growth. On the other hand, the countries that performed the policies might be better off if we focus on the welfare level that is defined by the private consumption.

Finally, we would like to consider the direction of future research. Since the simulation results might be implicitly showing that the policies examined in this study caused a divergence from the optimal tax rate which is examined by the previous studies, such as Barro (1990), Futagami, Morita and Shibata (1993), and Turnovsky (1997). In this regard, we should certify the existence of the optimal tax rate, and how much extent the tax rate should be to achieve highest economic growth or welfare level in the model.

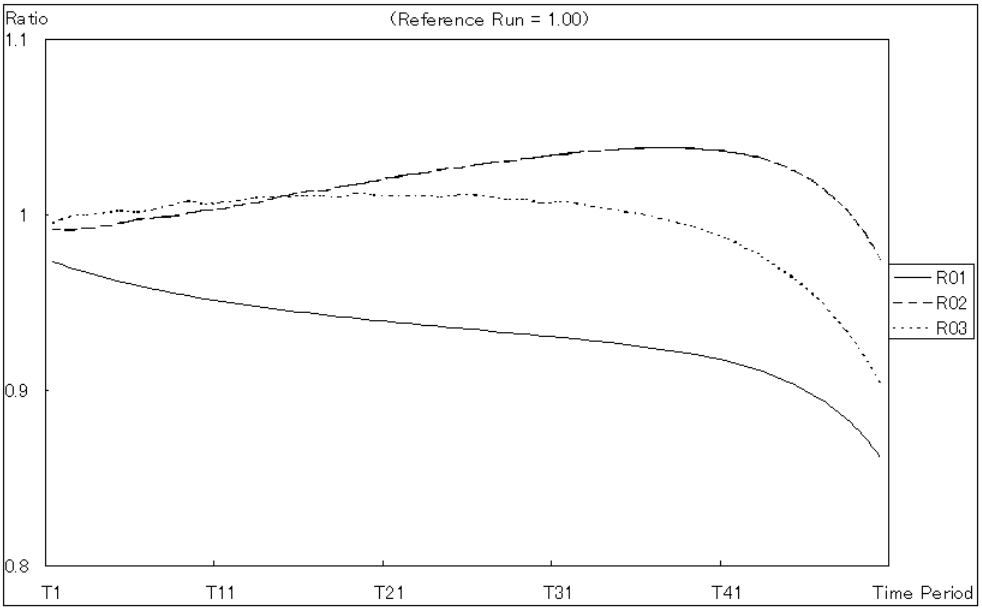

Figure 9: Effects on Output (Case 2)

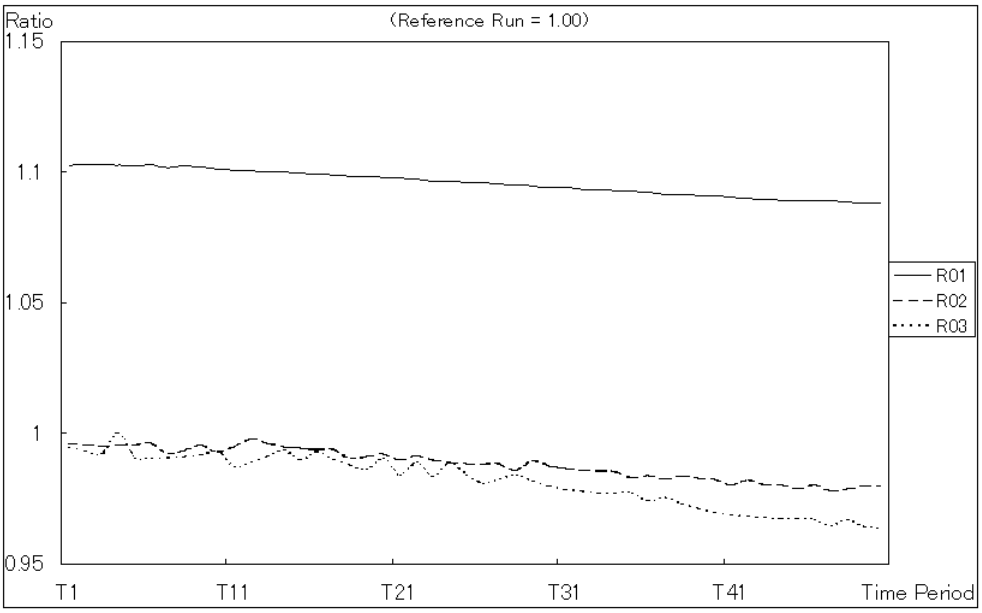

Figure 10: Effects on Private Consumption (Case 2)

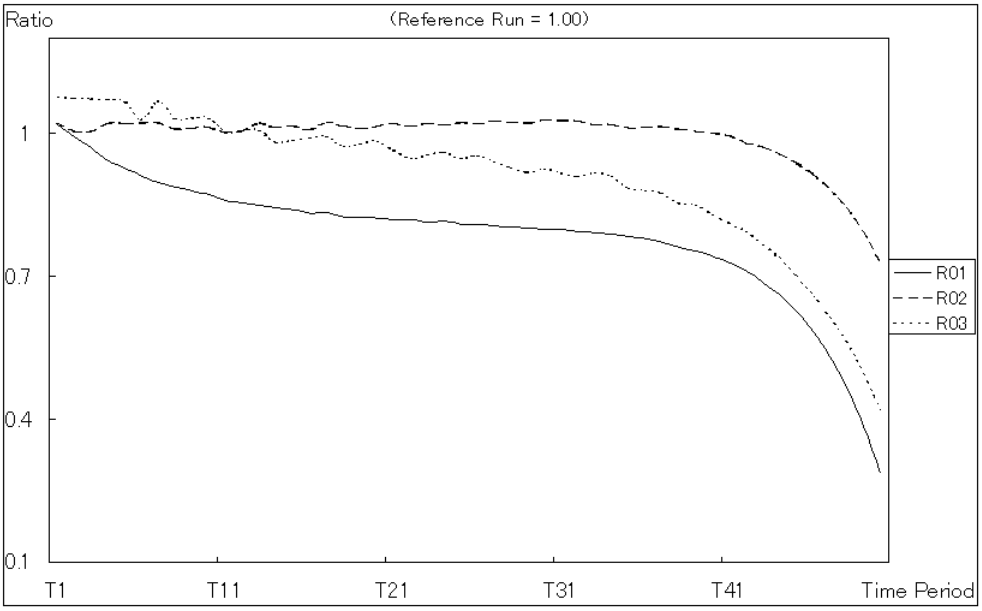

Figure 11: Effects on Private Investment (Case 2)

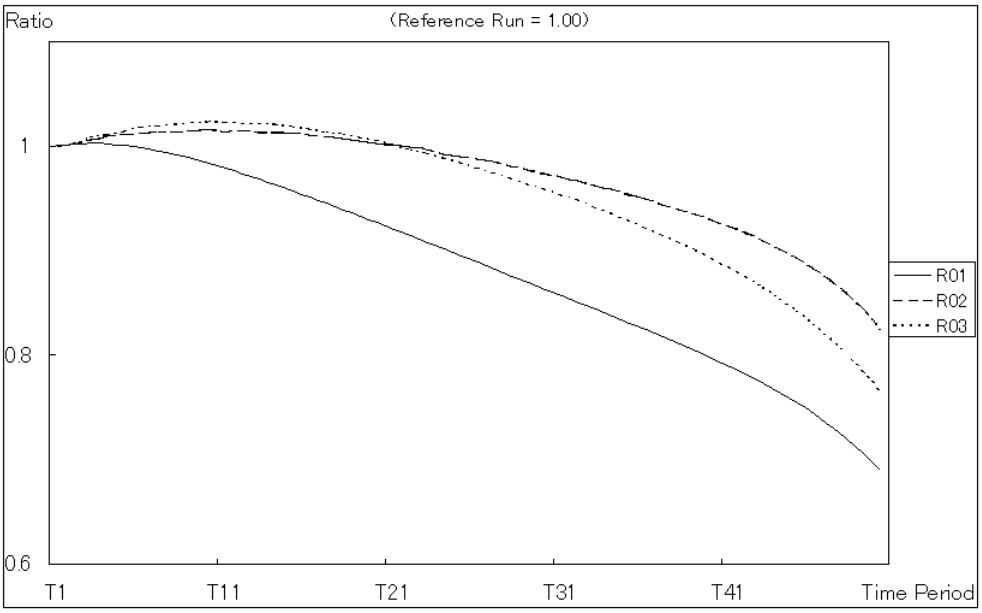

Figure 12: Effects on Private Capital (Case 2)

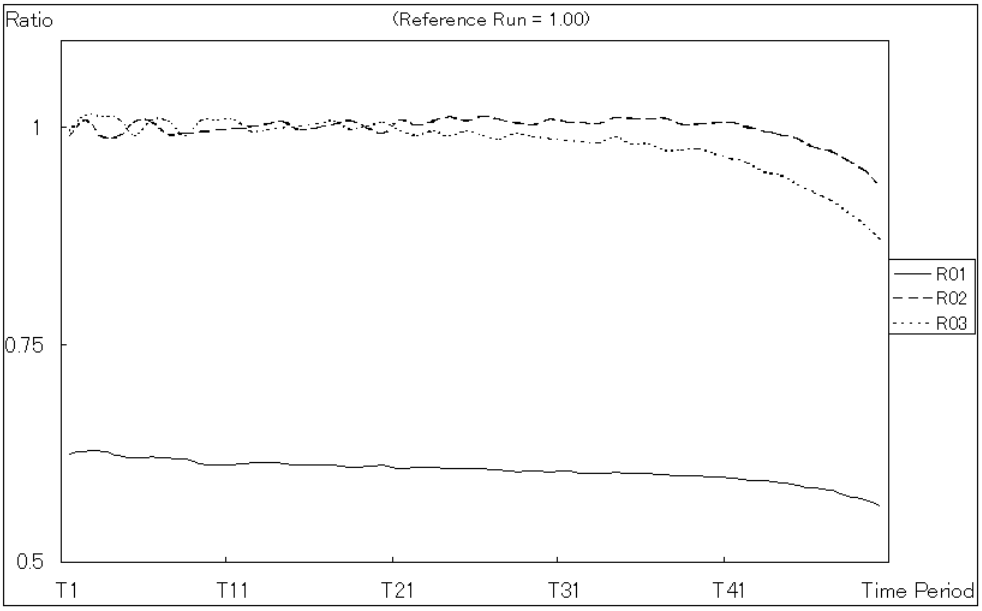

Figure 13: Effects on Public Investment (Case 2)

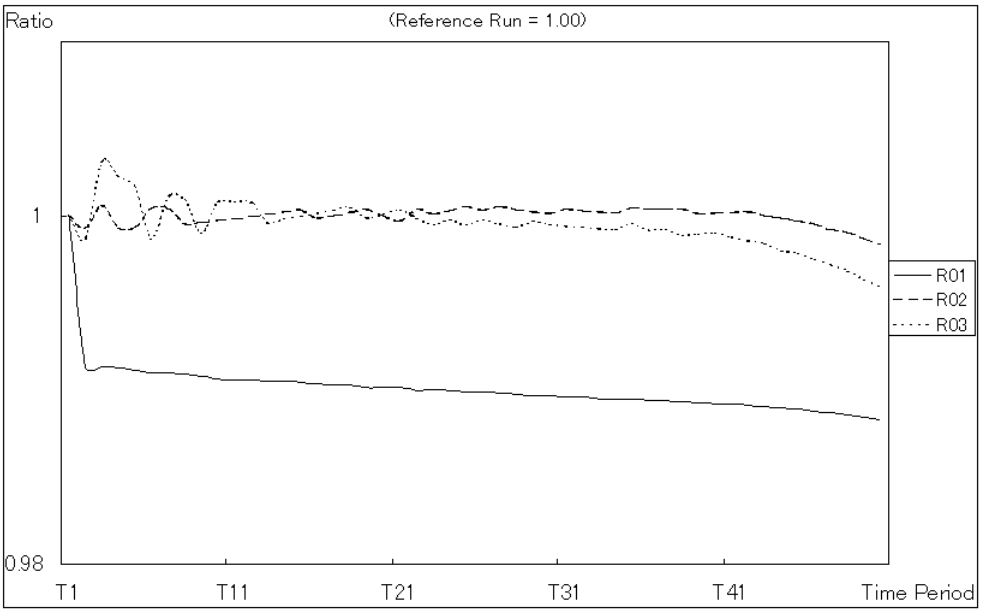

Figure 14: Effects on Public Capital (Case 2)

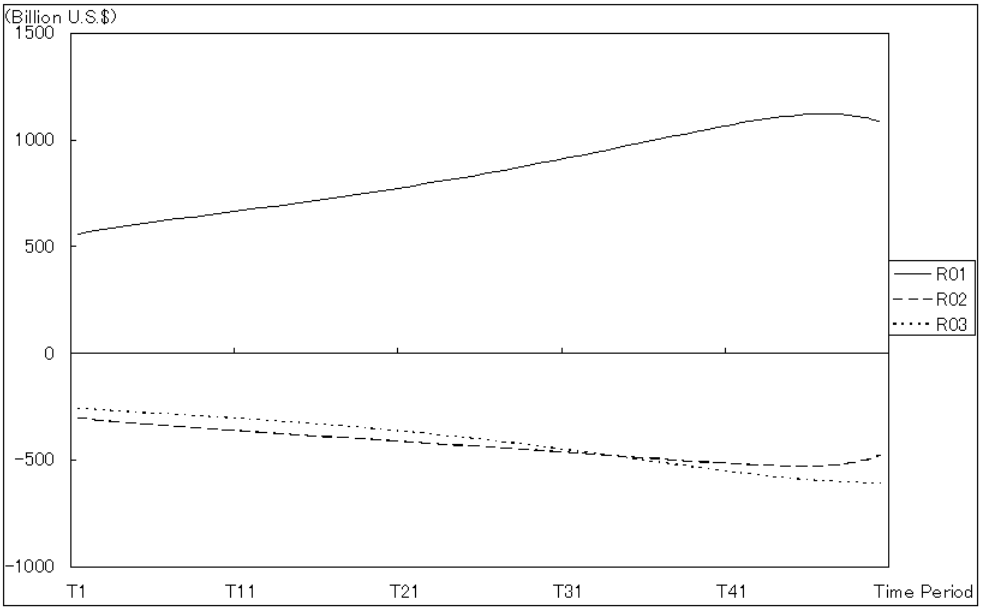

Figure 15: Effects on Net Exports (Case 2)

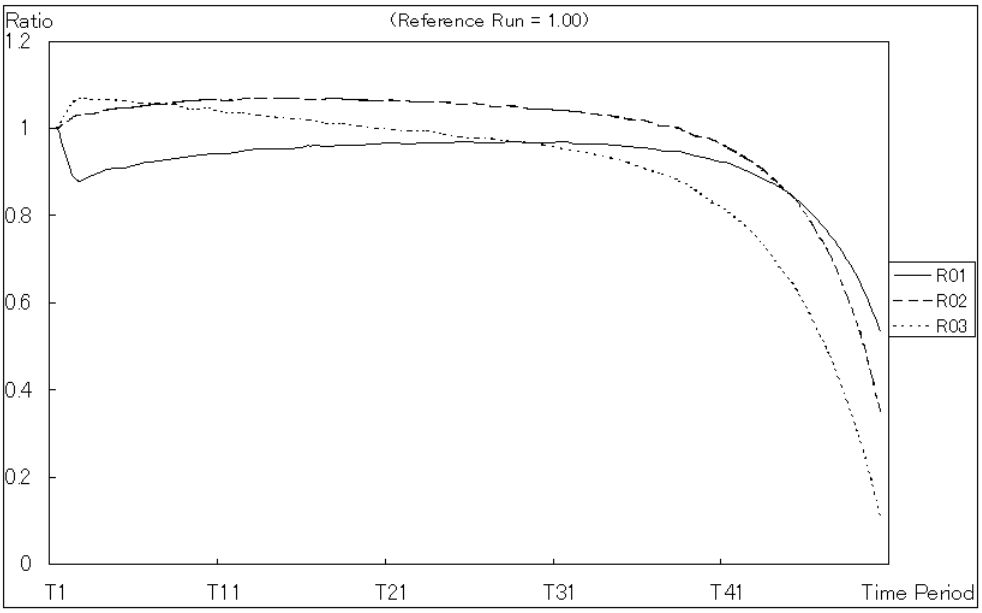

Figure 16: Effects on GDP Growth Rate (Case 2)

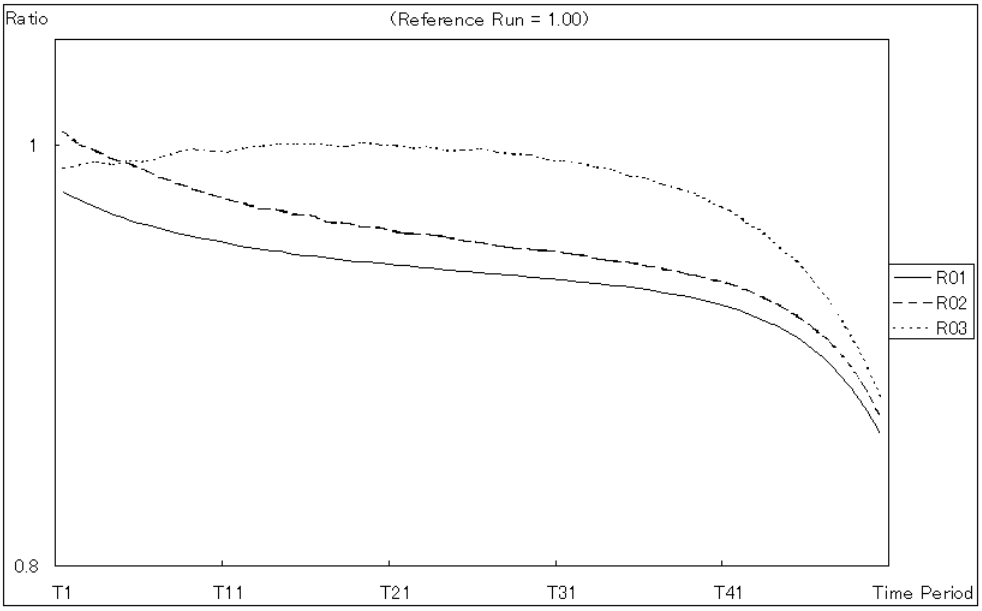

Figure 17: Effects on Output (Case 3)

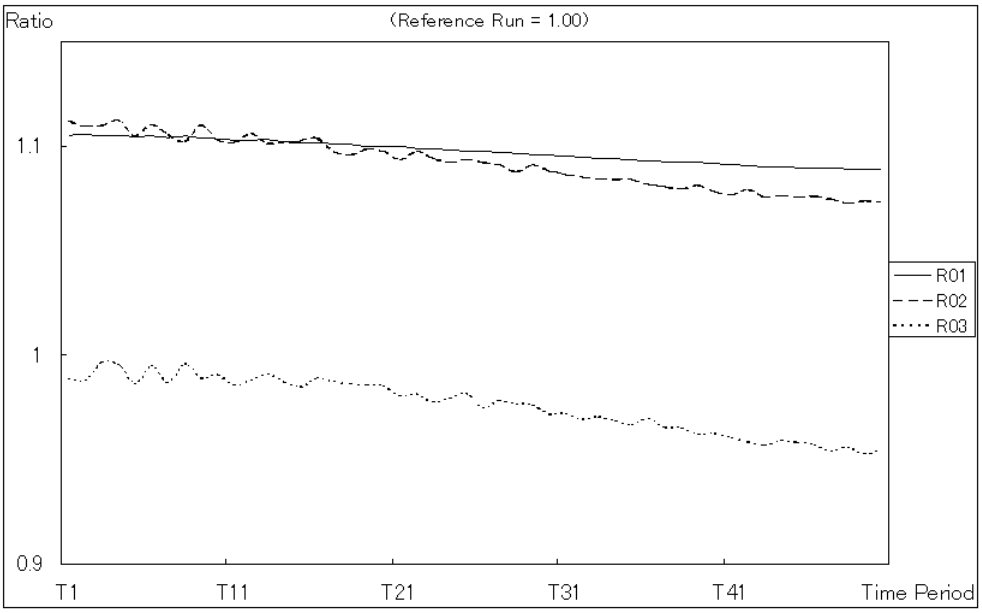

Figure 18: Effects on Private Consumption (Case 3)

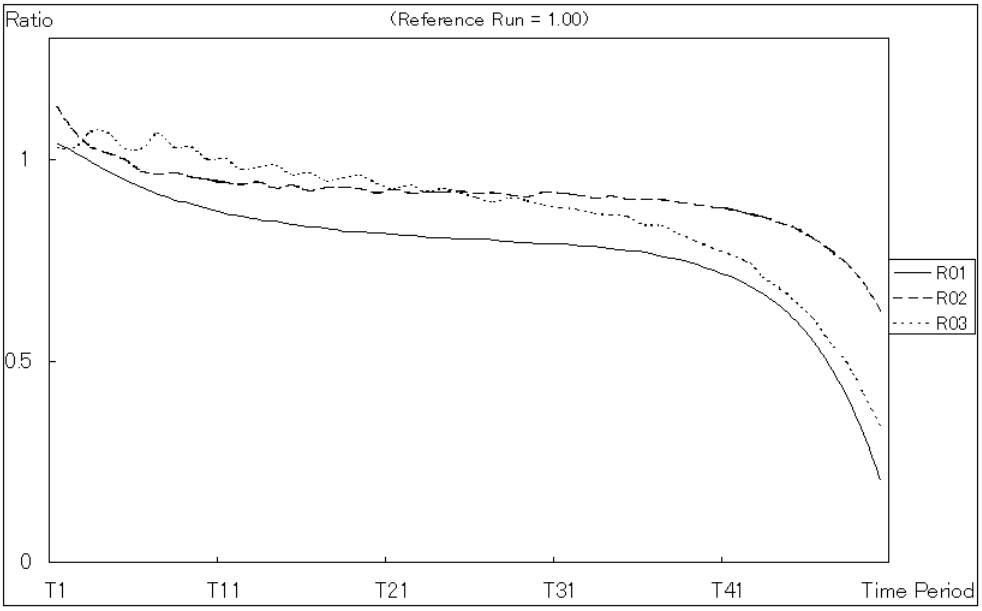

Figure 19: Effects on Private Investment (Case 3)

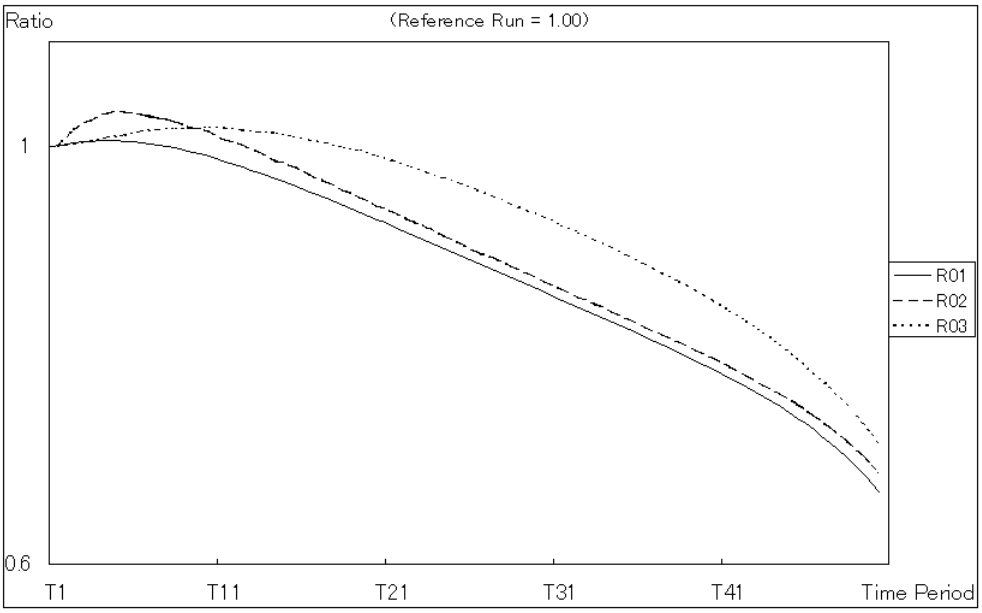

Figure 20: Effects on Private Capital (Case 3)

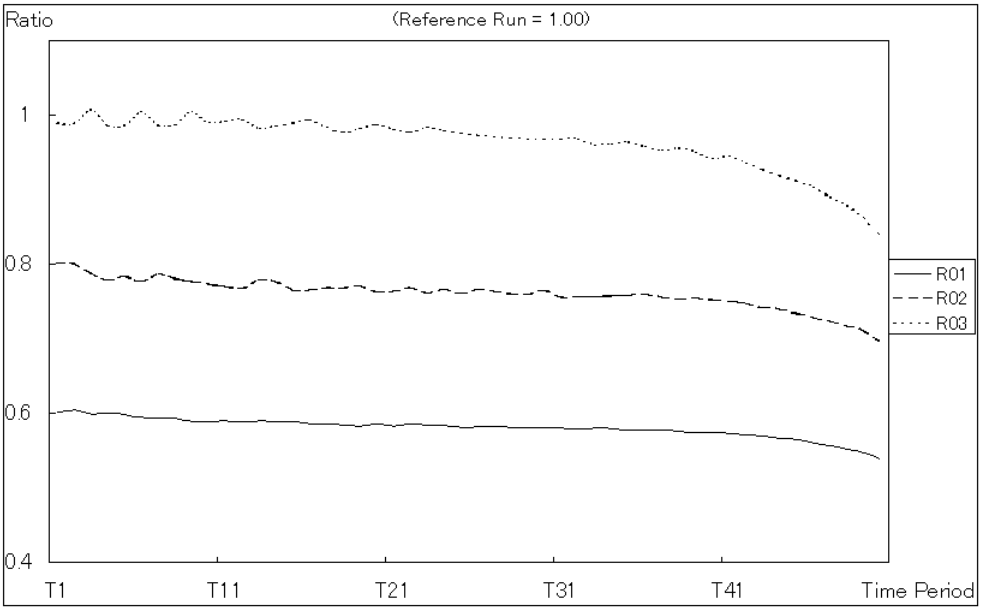

Figure 21: Effects on Public Investment (Case 3)

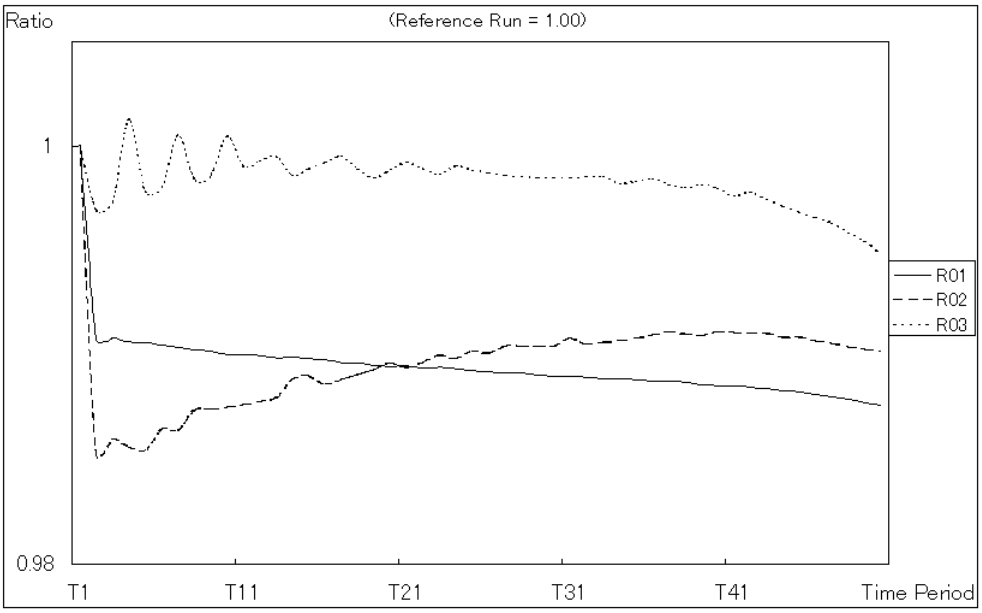

Figure 22: Effects on Public Capital (Case 3)

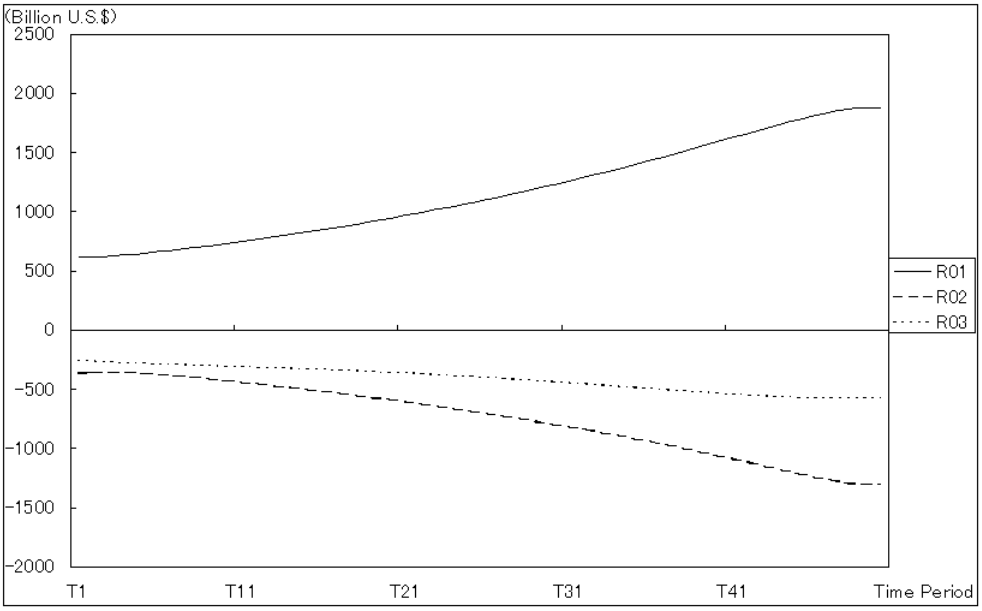

Figure 23: Effects on Net Exports (Case 3)

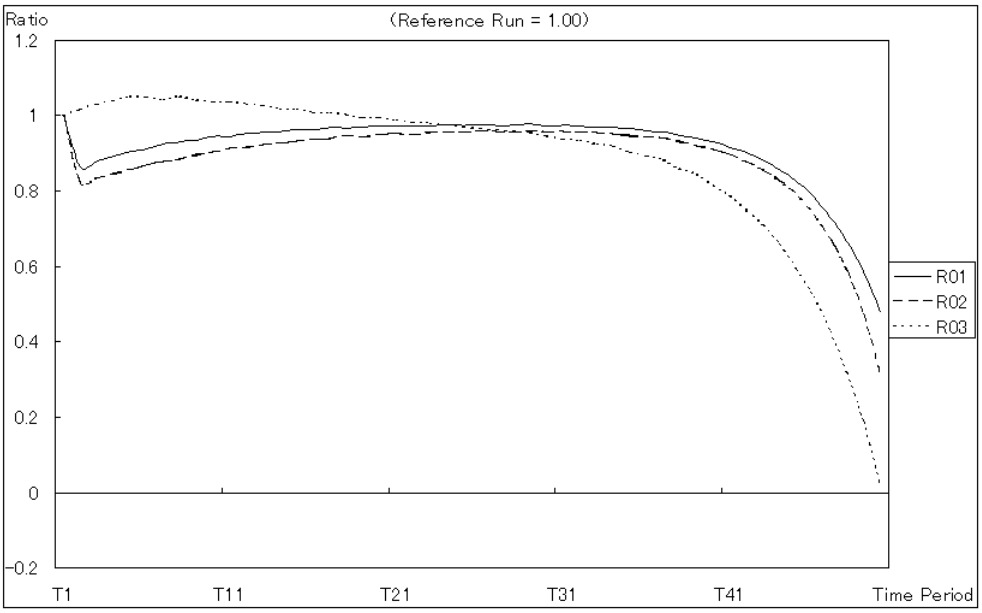

Figure 24: Effects on GDP Growth Rate (Case 3)

In addition, the model still has not included the official transfers and foreign lendings from high-income countries to low-income ones. Since a standard policy to reduce government expenditure often accompanies cuts in bi- and multi-lateral Official Development Assistance (ODA) flows, the model should include the official transfers from high-income countries to low-income ones.

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