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Abstract

This paper evaluates the recent movement of Japanese fiscal reform. We first summarize fiscal policy in 1990s. Then, we investigate several relevant topics of fiscal policy such as the macroeconomic impact of government debt and the sustainability problem. We then consider dynamic properties of fiscal reconstruction process by analyzing the dynamic game among various interest groups. This paper points out that the long-run structural reform is more important than the short-run Keynesian policy in Japan.

Key words: fiscal structural reform, fiscal reconstruction, fiscal policy

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1. Japanese government's deficits

Japan’s fiscal situation in 2000 is the worst of any G7 country, having deteriorated rapidly with the collapse of the ‘bubble economy’ in 1991 and the deep and prolonged period of economic recession which ensued, and from which recovery has been slow and modest despite the implementation of counter-cyclical policy. In this section let us first summarize briefly the movement of fiscal deficits and fiscal reform in Japan.

Traditionally, the Japanese government has followed a balanced budget policy. The balanced budget was maintained until 1965, when national bonds were first issued in the postwar period. The gap between government expenditures and tax revenues, which corresponds roughly to fiscal deficits, began to expand rapidly at the outbreak of the first oil shock in 1973. Asako et. al. (1991) and Ishi and Ihori (1992) presented good description of the rise and fall of deficits in 1970s and 1980s in Japan. They interpreted that the increase of deficits in the second half of 1970s as a combination of several factors. The larger fiscal deficits resulted from the major burst of new spending on social welfare programs in the first half of 1970s and on public investment in the second half of 1970s and the lack of tax revenues reflecting the slowdown of economic growth.

Since the increase in the budget deficit in 1975, deficit reduction has become one of the most important objectives of economic policy. Eliminating fiscal deficits was officially called 'fiscal reconstruction'. MOF (The Ministry of Finance) constantly pressured each ministry of the government to hold down expenditures when drawing up the initial budget. Since 1982 the principle of zero growth requests (zero ceiling) has been imposed on budget requests. The ceiling was sharply tightened to negative increases in the late 1980s.

Furthermore, the important step was the establishment of the Ad Hoc Council on Administrative Reform (Rincho) in 1981. Rincho submitted five reports from July 1981 to March 1983 and recommended a number of important reforms to trim overly expanded portions of the government bureaucracy: privatization of three major public corporations, cuts in spending on public works and so on. As the result of such policies, the growth of government expenditure has indeed been restrained.

Along with severe spending constraints imposed by Rincho to promote the goal of reducing deficits, MOF began to fall back on various small measures to increase tax revenues. MOF did not however pursue major tax reforms which would have greatly altered the basic tax structure until late 1980s. The value added tax (VAT) was finally introduced in the tax structure in April 1989, after long-standing trial and error.

The substantial amount of natural tax increases has been produced from 1986 to 1991. The abnormal hike of stock and land prices generated a great amount of tax revenues in the form of the corporate tax, the security transaction tax, capital gains tax, etc. Such a large amount of natural tax increases was of great help in reducing accumulated deficits, which in turn achieved the target of fiscal reconstruction by 1991. The sharp rise of tax revenues, caused by a bubble phenomenon, looks like "windfall". "Windfall" tax increases have played a vital role in achieving the MOF's target in the second half of 1980s.

After a "bubble economy" was broken in 1991, natural tax decreases were incurred to generate revenue. At the same time the politico-economic pressures for larger expenditure budgets and counter-cyclical packages of fiscal measures intensified. Responding to them, MOF (The Ministry of Finance) employed some measures for stimulating the aggregate demand. However, these counter-cyclical measures were not so effective, resulting in an increase in the fiscal deficit. The planned bond-dependency rate rose from a low-point of

7.6% in FY 1991 (initial) to 18.7% in FY 1994 (initial). The reality was still worse. The implementation of counter-cyclical fiscal policy through Supplementary-Budgets in-year led to further borrowing still, and the actual bond-dependency rate was more than 22% in FY 1994.

The state of the national finances deteriorated rapidly throughout FY 1995 and FY 1996. MOF was forced to borrow 22.0 trillion to finance a deficit swollen by the large fiscal stimulus in September 1995, resulting in a bond-dependency ratio of 28.2%, its highest level since 1980. In FY 1996 the planned issue of 10.1 trillion of special deficit bonds exceeded all previous experience. Despite the gravity of the fiscal situation the initial budgets for FY 1996 and 1997 nevertheless provided for further increases of expenditure, of 5.8% and 3.0%. Not only were fixed costs for prior commitments rising: those for discretionary expenditures continued to rise as well. The servicing of that debt absorbed more than a fifth of the total General Account Budget. Limiting the latter to 1.5% ceiling in FY 1997 was claimed by the Government and MOF as a sign of new fiscal austerity.

FY 1998 initial budget was drawn up making utmost efforts to deal with the current economic and financial situation within the framework of the Fiscal Structural Reform Act. According to MOF, fiscal reconstruction was equivalent to the achievement of the three policy-objectives of

(I) the elimination of special balanced bonds

(ii) the reduction of the bond-dependency ratio to reduce fiscal deficits on the path to a balanced budget

(iii) the reduction of the size and service-costs of the accumulated debt

The initial budget for FY 1998 marked the beginning of a new realism in the control of public spending promised in PM Hashimoto's 'Vision' of fiscal structural reform. The Fiscal

Structural Reform Act, which was implemented in November 1997, had three targets to be achieved by FY 2003.

(i) the elimination of special balanced bonds

(ii) the reduction of general government debt-GDP ratio to 60%

(iii) the reduction of general government deficit-GDP ratio to 3%

General expenditures were down 1.3% over FY 1997 initial budget, the largest decline in history. However, in the light of severe economic and financial situation, The Fiscal Structural Reform Act was revised in May 1998, so that income tax reduction would be easily implemented. Furthermore, since the LDP lost the upper house election in July 1998, new PM Obuchi changed the target of fiscal policy. Namely, further tax reductions and increases in public works have been implemented to stimulate the aggregate demand, following the traditional Keynesian counter-cyclical policy. The Fiscal Structural Reform Act is not regarded as a legal constraint any more. In FY 1998 the issue of special deficit bonds was 21.7 trillion yen due to several fiscal policy measures. By the end of FY 1999 the accumulated debt was total 327 trillion, equal to 65% of GDP. The deficit on the general government financial balance in FY 1999 was 10.0% of GDP, with a gross debt of over 108%. The inclusion of the surplus on social security reduced that deficit to 7.8%, and even that figure was highest among G7.

In order to evaluate the recent movement of fiscal deficits and fiscal reform in Japan, the present paper investigates the following three points: debt neutrality, sustainability and fiscal reconstruction. Our main concern here is to evaluate the fiscal reconstruction process. The Japanese government among many governments has been attempting to return to the balanced budget by raising taxes and/or reducing public spending. However, since most of transfer payments and public works are actually controlled by interest groups, such attempts would not always be successful. After introducing the consumption tax Japan's government deficit has grown rapidly mainly due to increases in transfer payments and public works. It is important to investigate how raising taxes would affect fiscal reconstruction. The critical point of formulating fiscal reconstruction process is to clarify how the existing privileges of interest groups such as preferential treatments of public works, taxes, and/or subsidies are to be abandoned.

Alesina and Drazen (1991) presented a simple model of delayed stabilization due to a war of attrition among various interest groups and derived the expected time of stabilization as a function of characteristics of those groups. Instead of the war-of-attrition model, Ihori and Itaya (1998) have developed a dynamic game among various interest groups which would accept voluntarily increases in their net tax burden (or abandon some of group-specific privileges) in order to gain the benefits resulting from a reduction in government debts. Recently, Becker and Mulligan (1998) showed that "more efficient" tax system such as raising consumption taxes brings larger governments. Velasco (1997) investigated the endogenous path of government debt in the non-cooperative and cooperative dynamic game models and showed that the cooperative equilibrium tends to be violated when the level of debt is low. Based on Velasco (1997), we develop an analytical framework which explores the impact of raising taxes on fiscal reconstruction, and then empirically examine the impact.

The organization of the paper is as follows. Section 2 investigates the plausibility of debt neutrality in the Japanese economy. There are two types of debt neutrality, Ricardian neutrality and Barro (1974)'s neutrality. The weak version of Ricardian neutrality seems more plausible than the strong version of Barro's neutrality. Section 3 investigates whether Japan's fiscal policy has been sustainable in the sense of being consistent with an intertemporal budget constraint. Section 4 investigates the property of Japanese fiscal reconstruction based on a game-theoretic approach of interest groups. Finally, section 5 concludes the paper.

2. Debt neutrality

There have been many papers of investigating empirical evidence on the impact of government budget variables on private consumption and on the debt neutrality hypothesis. Homma et. al. (1984) and Ihori (1989) are empirical studies on debt neutrality in Japan. Following Ihori (1989), we estimate the private sector consumption function and investigate the degree of debt neutrality for the period 1970 I -1998 II.

We develop a finite-horizon model of identical individuals. Each agent throughout his life faces a constant probability of death, p. Under the assumption that instantaneous utility is logarithmic, aggregate consumption is given by

$$C = (p + \theta)\left(\frac{YW - G}{r + p} + \frac{p}{r + p} B + K + F\right) \tag{1}$$

where C is aggregate consumption, θ is the rate of time preference, YW is labor income, G is government expenditure, r is the rate of interest, B is government debt, K is real capital, and F is foreign assets.

The above consumption function has the following policy implication. An increase in taxes and debt ($dT = rdB > 0$) does not affect permanent income but leads agents feel wealthier by an amount $p/(p + r)dB$. This leads then to increase consumption and dissave and to decumulate foreign assets. $p/(p + r)$ may be regarded as the wealth effect of debt. If $p/(p + r)$ is zero, debt will not be regarded as net wealth. We have the extreme debt neutrality case. If $p/(p + r)$ is unity, debt will be regarded as being almost perfect substitutable with foreign assets. We have the extreme Keynesian case. Therefore it is natural to denote by 1-

$p/(p + r)$ the degree of debt neutrality.

We set the consumption function for the estimation as the following:

$$C_t = a_0 + a_1(Y_t - G_t) + a_2 B_t + a_3 F_t + u_t \tag{2}$$

where Y is NNP. The index of debt neutrality x is given by x= $1 - a_2 / a_3$.

Table 1 reports the estimates of the OLS in the first differences. The coefficient on B is positive but smaller than the coefficient on F. The degree of debt neutrality is calculated as 66% for the whole sample period. The debt neutrality is more valid in recent years (86%) but not perfectly valid.

We may derive the following implications for fiscal policy in Japan. First, the strong version of debt neutrality (Barro's neutrality) is not perfectly valid. Hence, the government debt has some real effects and debt burden could be transferred to future generations. Second, people are concerned with long-run effects of fiscal policy. The private sector would have enough information to know the structure of the government budget constraint. It is plausible to conjecture that behavior in the real world may fall between these extremes: the strong version of Barro's debt neutrality and the simple Keynesian hypothesis. In other words, the weak version of Ricardian neutrality is well valid.

3. Sustainability problem

In 1990s we have experienced a rapid increase in fiscal deficits. In 2000s it would be expected that an increase in transfer payments (a decrease in net tax revenues) due to aging will contribute to higher primary deficits. It is very important to restrain the increasing trend in transfer payments.

There have been a few analyses on the sustainability problem in the government debt in Japan. So long as we use the data until 1990, it seems that the government debt has been sustainable in Japan. However, as explained in section 1, fiscal deficits have increased rapidly since 1990. We are not sure if the present fiscal system in Japan may be sustainable in the long run. Bohn (1998) proposed a new method different from existing tests for sustainability of government debt, which is based on estimating a transversality condition and on cointegration methods. His test has better properties than the conventional tests. We apply Bohn (1998)'s method to the test on sustainability of Japanese government debt.

His test is the following. Fiscal policy satisfies the intertemporal budget constraint, i.e. the condition on sustainability of government debt, if the primary surplus to GDP (s_t) increases with the ratio of (start-of-period) debt to GDP (b_t). Suppose we express a relation between the two as

$$s_t = f(b_t) + m_t \qquad (3)$$

where other determinants, m_t, is bounded and the present value of future GDP is finite. Then, government debt satisfies a transversality condition if there is a debt-GDP ratio $\hat{b}$ such that $f'(b_t) \geq b > 0$ for all $b_t \geq \hat{b}$ (where b is a positive constant). Bohn found that an increase in the ratio of government debt to GDP raised the ratio of primary surplus to GDP for 1916-1995 in the U.S. It follows that U.S. fiscal policy satisfied an intertemporal budget constraint.

We focus on the (national) General Account in Japan. We set the sample period as FY 1956-1998 and FY 1965-1998; FY 1965 is the year that Japanese government begun to issue debt in the General Account after the WWII.

Let us set $f(b_t) = bb_t$ as a special case of equation (3), that is,

$$s_t = bb_t + a_0 + a_G \mathrm{GVAR}_t + a_Y \mathrm{YVAR}_t + e_t, \qquad (4)$$

where GVAR_t is a measure of temporary government expenditure, YVAR_t is a measure of cyclical variations in GDP. $\mathrm{GVAR}_t \equiv (G_t - G^*_t)/Y_t$, and $\mathrm{YVAR}_t \equiv (U_t - U^m)(G^*_t/Y_t)$, where G_t,

G^*_t, U_t, and U^m denote real government expenditure, the permanent component of G_t, the unemployment rate and the median of U_t for the sample period, respectively. We make data on G^*_t in Japan using Beveridge and Nelson (1981) decomposition of real government expenditure into temporary and permanent components. For FY 1955-1998, U^m is equal to 0.021.

We also assume $f(b_t) = bb_t + g(b_t - \bar{b})^2$ instead of (3). Then, in place of (4) we have

$$s_t = bb_t + g(b_t - \bar{b})^2 + a_0 + a_G \mathrm{GVAR}_t + a_Y \mathrm{YVAR}_t + e_t, \qquad (5)$$

where $\bar{b}$ denotes the average of b_t for the sample period. We estimate both equations (4) and (5).

In estimating these equations, there exists serial correlation in the error terms of these equations. Hence we use the maximum likelihood estimation. Estimates of equation (4) are reported in regressions (I), (II), (V), and (VI) in Table 2. Also estimates of equation (5) are reported in regressions (III), (IV), (VII), and (VIII) in Table 2. Regressions (I)-(IV) show results for the sample period FY 1956-1998, and regressions (V)-(VIII) show results for the period FY 1965-1998. r in Table 2 denotes the estimator of first order autocorrelation of the error term.

For the sample period FY 1956-1998, estimators of b, coefficient of b, in the linear equation (4) are not significant. Also estimators of the first-order and second-order terms in the quadratic equation (5) are insignificant. We cannot find a positive response of the primary surplus-GDP ratio to changes in the debt-GDP ratio in the Japanese (national) General Account for FY 1956-1998.

For FY 1965-1998, the estimator b is significantly positive in regression (V). As the estimator of GVAR is not significant in this regression, we exclude GVAR and reestimate the equation (4). Its result is reported in regression (VI). The estimator of b is insignificant in regression (VI). Similarly, estimators of the first-order and second-order terms are insignificant in regression (VIII). These results do not support that Japanese government debt satisfies a transversality condition for FY 1965-1998.

From the above analysis, we cannot reject that the Japanese national debt has not been sustainable at least for recent years. An intuitive explanation is as follows. We draw a scatter plot of the primary surplus-GDP ratio against the debt-GDP ratio in Figure 1. Until early 1990s, Japanese fiscal policy held the quadratic relation between the two. Recently, Japanese fiscal policy deviates from the relation excessively. This is one of the reasons we obtain the above result in this section. Hence, it is important to reduce the government deficit in the near future.

4. Fiscal reconstruction and raising taxes

4.1 Model

Velasco (1997) investigated the endogenous path of government debt in the non-cooperative and cooperative dynamic game models and showed that the cooperative equilibrium tends to be violated when the level of debt is low. Based on Velasco (1997), we develop an analytical framework which explores the impact of raising taxes on fiscal reconstruction. Suppose that the economy is divided into n regions and indexed by $i = 1, 2, \ldots, n$. Regional governments are regarded as interest groups, seeking for public works from the central government. For simplicity, we assume that each region is endowed with a unit of population.

The representative individual in each region solves the following optimization problem:

$$\text{MAX} \qquad U = \sum_{t=0}^{\infty} \left(\frac{1}{1+\rho} \right)^t \ln(C_t^i *) , \tag{6}$$

$$\text{s.t.} \qquad A_{t+1}^i = (1+r)A_t^i + y - T - C_t^i , \qquad \lim_{t \to \infty} \left(\frac{1}{1+r} \right)^t A_t^i = 0 , \tag{7}$$

$$\text{given} \qquad A_0^i \quad .$$

where we specify the instantanenous utility function as a logarithmic form. In the objective function (6), $C_t^i *$ denotes the level of "effective" consumption in region i in period t. The effective consumption $C_t^i *$ is taken to be a function of private consumption expenditure C_t^i, and the benefit of the public capital G_{t-1}^i which is accumulated in the preceding period:

$$C_t^i * = C_t^i + m(G_{t-1}^i) , \qquad m' > 0,\ m'' < 0 . \tag{8}$$

It is assumed that public capital does not have any interregional spillover effect. In the budget constraint (7), A_t^i, y and T are assets, labor income and lump-sum taxes per capita in region i respectively. The labor income y and the lump-sum tax T are equal among regions and constant over time.

For simplicity, we assume that the interest rate r is equal to the discount rate r. In the case, it is optimal to keep the level of effective consumption $C_t^i *$ constant over time. This is due to the consumption smoothing mechanism.

$$C^i * = rA_t^i + y - T + \left(\frac{r}{1+r} \right) \sum_{t=0}^{\infty} \left(\frac{1}{1+r} \right)^t \mu(G_{t-1}^i) . \tag{9}$$

The central government levies tax, issues debt and allocates public investment among regions. The central government's budget constraint is written as

$$B_{t+1} = (1+r)B_t + \sum_{i=1}^{n} G_t^i - nT \ \ , \ \ \lim_{t\to\infty}\left(\frac{1}{1+r}\right)^t B_t = 0 , \tag{10}$$

where B_t is the (start-of-period) government debt. Regional governments recognize the central government's budget constraint (10). Therefore, the level of the effective consumption C_t^i* must satisfy both (9) and (10). Combining these equations, we have

$$C^i* = r\left\{A_t^i - \frac{B_t}{n}\right\} + y + \left(\frac{r}{1+r}\right)\sum_{t=0}^{\infty}\left(\frac{1}{1+r}\right)^t\left\{\mu(G_{t-1}^i) - \frac{1}{n}\sum_{i=1}^{n}G_t^i\right\}. \tag{11}$$

The level of the effective consumption C_t^i* and the economic welfare depend on the initial net asset $A_t^i - B_t/n$, the labor income y and the sequence of the public investment $\{G_t^i\}_{t=0}^{\infty}$ $(i = 1,2,\ldots,n)$. Thus, the crucial point is how the sequence of public investment $\{G_t^i\}_{t=0}^{\infty}$ $(i = 1,2,\ldots,n)$ is determined[1].

The optimal size of public investment $G*$ that maximizes the joint welfare of all regions is given by

$$1 + r = m'(G*) . \tag{12}$$

In the following policy-making process the optimal size of public investment $G*$ is not necessarily attained. Each region determines the sequence $\{G_t^i\}_{t=0}^{\infty}$ that maximizes (9) for given T, claims it to the central government and brings it to his region. From now on, we assume three constraints on the region's optimization problem. First, no region can claim the public investment that exceeds the optimal level $G*$. Second, each region must preserve

[1] The change in the lump-sum tax never affects the level of consumption as long as the sequence of the public investment $\{G_t^i\}_{t=0}^{\infty}$ is not changed. However, if a change in the lump-sum tax affects the sequence of the public investment, it could affect the level of the effective consumption and the economic welfare.

the intertemporal budget constraint of the central government, namely the transversality condition. Third, the lump-sum tax T is pre-determined by the central government, and hence is taken as given by regions. Under these assumptions we can describe the optimization problem that the regions face as[2]:

$$\text{MAX} \qquad \sum_{t=0}^{\infty}\left(\frac{1}{1+r}\right)^{t}\mu(G_t^i)$$

$$\text{s.t.} \quad (9)\ , \quad G_t \leq G^*,$$

$$\text{given} \qquad B_0 \ . \tag{13}$$

We analyze the equilibrium dynamic process in the following two cases. First, all regions act in a coordinated fashion to maximize the joint welfare. In this case all interest groups agree with fiscal reconstruction. Furthermore, if the central government could set the constant lump-sum tax T in the proper level, the first best level of public investment would be attained. Second, all region behave non-cooperatively. In this case fiscal reconstruction is not effectively conducted by the central government.

In the first cooperative case, the equilibrium level of public investment per region is given as:

$$G = MIN\left[-r\frac{B_t}{n}+T, G^*\right]. \tag{14}$$

From (10) and (14), we can see that the level of the government debt remains constant over time[3]. Since the rate of time preference is equal to the rate of interest and the marginal benefit

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[2] The sequence is equal to the one that maximize (11) subject to (10) since (11) is obtained by substituting (10) into (9).

[3] The transversality condition in (13) will be violated (negatively) if the lump-sum tax exceeds G^*+rB_t/n. We assume that the central government never levies such a heavy tax.

of public capital decreases with G, it is desirable to keep public investment as well as private consumption constant over time at the cooperative solution.

We now consider how an unexpected permanent increase in the lump-sum tax levied by the central government affects public investment per region and private consumption. Differentiating (10) and (14) with respect to T yields

$$\frac{dG}{dT} = 1. \tag{15}$$

$$\frac{dB_t}{dT} = 0 \;, \quad t = 1,2,\Lambda \;. \tag{16}$$

That is, the increase in public investment is just equal to the increase in the central government's permanent tax revenue. It does not affect the dynamics of public debt.

Next, let us turn to the case of non-cooperative dynamic game among regions. Since maximization problem is identical for all regions, optimal policy for each region should be identical too. The optimal policy is the function of state variable B_t, but it is bounded by $G*$:

$$G_t = MIN\left[h(B_t), G*\right]. \tag{17}$$

Each region expects that all other regions make decisions according to the policy function (17). Hence, it faces the following budget constraint obtained by substituting (17) into (10):

$$G_t = B_{t+1} - (1+r)B_t - (n-1)h(B_t) + nT \quad \text{if} \quad h(B_t) \le G*,$$

$$G_t = B_{t+1} - (1+r)B_t - (n-1)G* + nT \quad \text{if} \quad h(B_t) \ge G*. \tag{18}$$

We now consider the behavior of public investment and government debt. As shown in Appendix, if the following condition is not satisfied, the level of the public investment per region is $G*$;

$$B_t \ge \frac{nT}{r} + \frac{G*}{f(1+r)}. \tag{19}$$

Then, from (18) the debt evolves as the following:

$$B_{t+1} = (1+r)B_t + n(G^* - T). \tag{20}$$

If condition (19) is satisfied, the level of the public investment per region is given as $h(B_t)$.

We have then

$$B_{t+1} = (1+r)(1+nf)B_t + nT\left\{\frac{1-(1+r)(1+nf)}{r}\right\}, \tag{21}$$

$$0 < \frac{G_{\tau+1}}{G_\tau} = \left[1+(n-1)\phi\right]^{1/1-\alpha} < 1. \tag{22}$$

The public investment falls as the government debt rises, and in the limit they converge to zero and a finite level respectively. Intuition is as follows. When public debt is high, each regional government believes that other regional governments would reduce public investment (h'<0), reducing the effective rate of interest of financing public debt, (1+r)+(n-1)h'. This stimulates the free-riding behavior. Namely, since the effective rate of interest declines with public debt, each regional government desires a high level of public investment at the early stage of the game. Each region perceives that other regions will pay some parts of the government debt redemption by reducing their public investment in the future. The steady state government bond is given by

$$B = \frac{nT}{r}. \tag{23}$$

Figure 2 shows the dynamic behavior of the government debt. Line BB and B'B' correspond to (20) and (21) respectively. Since public investment fluctuates due to the free-riding behavior, welfare in the non-cooperative game is less than in the cooperative game.

We now consider how an unexpected permanent increase in lump-sum tax affects the dynamic behavior of public investment per region and government debt. The public investment per region in each period from now on changes by

$$\frac{dG_t}{dT} = -\{(1+r)(1+nf)\}^t\left\{\frac{f(1+r)n}{r}\right\}, \tag{24}$$

compared with its original level. The steady state government debt changes by

$$\frac{dB}{dT} = \frac{n}{r} \quad . \tag{25}$$

Note that (24) is positive since ϕ is negative. Therefore, both public investment and steady state government debt rise as the lump-sum tax rises. The dynamics is shown in Figure 3. It is also seen that an increase in taxes may reduce net issuance of public debt in the non-cooperative game, while it does not affect net issuance of public debt in the cooperative game.

When the regions act in a coordinated fashion, the permanent increase in the lump-sum tax stimulates pubic investment from now on by the same size, and it does not change the level of central government debt. On the contrary, under the situation of the non-cooperative game, the permanent increase in the lump-sum tax stimulates public investment only in the short run, and it causes an expansion of the government debt. To apply this model to the fiscal reconstruction process, some applicable implications are obtained. Namely, the impact of a tax increase on public debt can tell whether fiscal reconstruction may be regarded as a cooperative one or not.

According to (15) and (16), in the case where all interest groups act in a coordinated fashion, an increase in the tax revenues leads to an increase in public investment or privileges by the same amount, and not to a change in the public debt. On the other hand, according to (24) and (25) (see Figure 3), in the case where each interest group acts non-cooperatively, an increase in the revenues leads to an increase in the public debt as well as an increase in public investment. By investigating whether (16) or (25) is held in the real economy, we may explore the dynamic nature of fiscal reconstruction process.

Before doing some empirical studies, it would be useful to investigate how the central government could induce regions to agree with a switch from the non-cooperative game equilibrium to the cooperative one. Analytically this problem may be considered as whether the cooperative equilibrium is stable or not. We examine it by introducing trigger strategies.

Suppose in period 0 the cooperative equilibrium is attained. If the cooperative equilibrium has been maintained in all *t-1* preceding periods, regions cooperate in the period *t* too; otherwise, they switch to the non-cooperative game equilibrium.

A region that defects from the cooperation solves

$$W^d(B_0) = \quad \text{MAX} \;\; \mu(G_0^i) + \left(\frac{1}{1+r}\right) W(B_1) \tag{26}$$

$$\text{s.t.} \qquad B_1 = (1+r)B_0 + G_0^i + (n-1)G_0 - nT \;\; , \;\; G_t \le G^* ,$$

where G_0 is given by (14), and $W(B_t)$ is the maximized objective function (13) in the case of non-cooperative dynamic game. We define $W^*(B_0)$ as the maximized objective function (14) in the cooperative situation. If $W^d(B_0)$ exceeds $W^*(B_0)$, the cooperative equilibrium is unstable at the government debt level B_0.

Figure 4 shows the possibility of this defection. Under the non-cooperative game, the later the consensus of fiscal reconstruction is attained, the more difficult to confirm it. This is a different result from Velasco (1997). Intuition is as follows. A switch from the cooperative game to the non-cooperative game produces a gain in the early stage and a loss in the late stage. When public debt is high, the stationary level of public spending becomes low and hence the gain in the early stage would outweigh the loss in the late stage of the game.

4.2 Estimation

We analyze the General Account (excluding grants of local allocation tax) in FY

1955-1997. In the General Account, expenditures by purpose are divided into the following categories; national agencies, local government finance, national defense, disposition of external affairs, national land conservation and development (public works), industrial development, education and culture, social security, pensions, government bonds, and other. Based on the above model, we can divide these variables as follows. The first group is expenditures for provision of pure public goods, including national agencies, national defense, disposition of external affairs, and education and culture, denoted by *Z*. The second is interest payment, equal to government bonds minus bond redemption, denoted by rB. The last one is public investment and privileges to regions, including the remaining expenditures (excluding grants of local allocation tax), denoted by $\sum_{i=1}^{n} G_t^i$.

On the revenue side, we divide the total revenue into tax and other revenues (T) and net issue of debt (equal to public debt minus bond redemption: $DB \equiv B_t - B_{t-1}$), excluding revenues for grants of local allocation tax. We use these variables deflated by the GDP deflator.

We can apply literature on the revenue-expenditure nexus to our investigation. There exist many previous studies on the relationship between revenues and expenditures in the U.S.; e.g. von Fustenberg, Green and Jeong (1985, 1986), Manage and Marlow (1986), Holtz-Eakin, Newey and Rosen (1989), and Owoye (1995).

In previous works, the Granger causality tests using the conventional VAR analysis and ECMs have been used. One of these shortcomings is the tests cannot be implemented when the orders of integration of revenues and expenditures are different, or when either order of integration is more than two. To avoid it, we employ the method of Toda and Yamamoto (1995)[4]. An advantage of this method is that we can implement the Granger causality tests

[4] An example that employs this method on the revenue-expenditure nexus is Doi (1998).

when the order of integration of revenues is not equal to that of expenditures and when either order of integration is more than two. The method is as follows.

We consider the following VAR of an N-vector time series $\{\mathbf{X}_t\}_{t=-k+1}^{\infty}$ $(k \geq 1)$:

$$\mathbf{X}_t = \mathbf{b}_0 + \mathbf{b}_1\mathbf{t} + \Phi_1\mathbf{X}_{t-1} + \Lambda + \Phi_k\mathbf{X}_{t-k} + \Lambda + \Phi_l\mathbf{X}_{t-l} + \mathbf{å}_t, \tag{27}$$

$$\text{where } \mathbf{X}_t \equiv \begin{bmatrix} X_{1t} \\ X_{2t} \\ \text{M} \\ X_{nt} \end{bmatrix}, \quad \Phi_i \equiv \begin{bmatrix} j_{11}^{i} & j_{12}^{i} & \Lambda & j_{1N}^{i} \\ j_{21}^{i} & j_{22}^{i} & & \\ \text{M} & & \text{O} & \text{M} \\ j_{N1}^{i} & & \Lambda & j_{NN}^{i} \end{bmatrix},$$

Φ_i (i = 1,2, …, k, …, l) denotes an N×N matrix of coefficients, **t** denotes a vector of a time trend, and e_t denotes an N-vector of the innovation. We assume that the order of integration of $\mathbf{X}_t$ is at most $d_{\max}$ around a linear trend. $d_{\max}$ denotes the maximal order of integration of variables in $\mathbf{X}_t$.

First, we select the lag length in (27). According to Toda and Yamamoto (1995), under the following null hypothesis:

H'_0: Φ_{m+1} = …= Φ_l = **0**, where $k \leq m \leq l$-1

the usual Wald statistic obtained from the OLS estimators of coefficients in (27), has an asymptotic χ^2 distribution with $N^2(l–m)$ degrees of freedom if $m \geq d_{\max}$. After this test, we select the lag length as the null hypothesis can be rejected. l denotes the selected lag length.

For implementing the Granger causality tests, we estimate the following VAR:

$$\mathbf{X}_t = \mathbf{b}_0 + \mathbf{b}_1\mathbf{t} + \Phi_1\mathbf{X}_{t-1} + \Lambda + \Phi_k\mathbf{X}_{t-k} + \Lambda + \Phi_l\mathbf{X}_{t-l} + \mathbf{å}_t, \tag{28}$$

In this regression, the i-th variable, X_{it}, does not Granger-cause the j-th variable, X_{jt}, if we cannot reject the following null hypothesis:

H_0: j^{1}_{ji} = …= j^{l}_{ji} = 0.

Toda and Yamamoto (1995) proved that under the above null hypothesis, the usual Wald statistic obtained from the OLS estimators of coefficients in (28), has an asymptotic χ^2 distribution with l degrees of freedom if $l \geq k + d_{max}$. Note that the conditions, $l \geq k + d_{max}$ and $k \geq 1$, must be satisfied.

We analyze a VAR model with the following five endogenous variables: $\frac{Z}{Y}$, $\frac{\sum_{i=1}^{n} G_t^i}{Y}$, $\frac{T}{Y}$, and $\frac{DB}{Y}$ (or $\frac{B}{Y}$), where Y denotes GDP.

Before the Granger causality tests, we implement the unit root tests. We employ the augmented Dickey-Fuller tests because the number of observation of these variables is not enough large in order to implement the Phillips-Perron tests. We use the criteria advocated by Pantula, Gonzalez-Farias and Fuller (1994), and based on the principle of parsimony in deciding the lag length.

We found the order of integration of each variable by the augmented Dickey-Fuller tests. We set the 5% significance level in testing the null hypothesis that the variable has a unit root. The order of integration of each variable is identified by the tests. From these results, we set d_{max}=2 as the larger of the order of integration of the five variables; $\frac{Z}{Y}$, $\frac{\sum_{i=1}^{n} G_t^i}{Y}$, $\frac{T}{Y}$, and $\frac{\Delta B}{Y}$ (or $\frac{B}{Y}$).

In the next step, we select the lag length of VAR. As mentioned above, we decide the lag length, l, using the Wald statistic. We note that the conditions, $l \geq k + d_{max}$ and $k \geq 1$, must be satisfied. As a result, we set l =3.

We estimate the VAR equations (28), which lag length is equal to 3. The results are reported in Table 3. We then implement the Granger causality tests based on the Wald statistics from the OLS estimators. The Wald statistics are reported in Table 4. Figure 5 summarizes the results of the Granger causality tests.

According to the Granger causality tests, we confirm that the causality from $\frac{T}{Y}$ to $\frac{\sum_{i=1}^{n} G_t^i}{Y}$ as well as from $\frac{T}{Y}$ to $\frac{DB}{Y}$ (or $\frac{B}{Y}$) is strong. It suggests that an increase in the tax revenues leads to an increase in privileges as well as a decrease in the net issuance of public debt in the Japanese fiscal reconstruction, which is consistent with the analytical result of non-cooperative game in section 4.3. Also, an increase in taxes leads to an increase in the level of public debt outstanding, which is consistent with the result of non-cooperative game too. In other words, the Japanese government was not strong enough to persuade interest groups to cooperate with fiscal reconstruction in the above sample period. We could not exclude free-riding behavior of interesting groups.

5. Conclusion

We have shown that Barro's neutrality does not hold perfectly in Japan and there exists serious concern with the sustainability of fiscal policy in 1990s. Hence, it would be important to reduce government deficits in the long run. The long run structural fiscal reform is more important than the short run Keynesian policy in Japan. We have also shown that the free riding problem in the fiscal reconstruction process is aggravated when players' choices are conditional on the observable collective variables. Therefore, it would be much difficult to induce all interest groups to cooperate when the government debt becomes large and the fiscal crisis becomes serious. In words, the sooner the fiscal reconstruction movement begins, the more likely we would have successful fiscal reconstruction outcome.

The most important policy's lesson from these analyses is that if the program of fiscal reconstruction is too flexible in the sense that it allows each interest group to reconsider the predetermined policies such as tax increases or subsidy cuts at each point in time when the outcome of fiscal reconstruction is revealed, it is highly likely that fiscal reconstruction ends finally in much failure. Allowing such possibility would straighten an incentive of each group to free ride. In order to realize successful fiscal reconstruction, therefore, we have to stick to the long-term program for fiscal reconstruction that has been agreed at the beginning of planning period. In practice, one of effective means is to enact legislation for fiscal reconstruction which does not permit much room for reconsidering or revising the fiscal reconstruction plan. In the real economy both the Gramm-Rudman-Hottings Act in the United States and the Fiscal Structural Reform Act in Japan have weakness in that they allow for much room for reconsidering the fiscal reform.

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Appendix

We investigate the characteristics of the function $h(B_t)$. Here we specify the function μ as

$$\mu(G) = G^{\alpha} \quad , \; 0 < \alpha < 1. \tag{A1}$$

Substituting (18) and (A1) into (13) and differentiating it with respect to $\{B_t\}_{t=1}^{\infty}$, we obtain the following first order condition:

$$G_{t+1} = G_t \left[1 + \frac{n-1}{1+r} h'(B_{t+1})\right]^{1/1-a} . \tag{A2}$$

Since the policy function of this region is also given as (17), (18) and (A2) can be rewritten as

$$B_{t+1} = (1+r)B_t + nh(B_t) - nT , \quad (18)'$$

$$h(B_{t+1}) = h(B_t)\left[1 + \frac{n-1}{1+r} h'(B_{t+1})\right]^{1/1-a} . \quad (A2)'$$

Substituting (18)' into (A2)', we obtain:

$$h((1+r)B + nh(B) - nT) = h(B)\left[1 + \frac{n-1}{1+r} h'((1+r)B + nh(B) - nT)\right]^{1/1-\alpha} . \tag{A3}$$

We guess that the function $h(B_t)$ takes the following liner form:

$$h(B_t) = \phi(1+r)B_t + \theta . \tag{A4}$$

Substituting (A4) into (A3), we obtain the conditions that the parameters ϕ, θ must satisfy:

$$(1+r)(1+n\phi) = \{1 + (n-1)\phi\}^{1/1-\alpha} , \tag{A5}$$

$$\{1 + \phi(1+r)n\}\theta = \theta\{1 + (n-1)\phi\}^{1/1-\alpha} + \phi(1+r)nT . \tag{A6}$$

The parameter ϕ satisfies

$$-1/(n-1) < \phi < 0 . \tag{A7}$$

From (A5) and (A6), the parameter q is given by

$$\theta = -\frac{\phi(1+r)nT}{r} . \tag{A8}$$

Remember that the function $h(B_t)$ is the optimal reaction function if it is smaller than G^*. From (A4) and (A8), we can see that $h(B_t)$ is the reaction function if

$$B_t \geq \frac{nT}{r} + \frac{G^*}{f(1+r)} .$$

If the above condition is satisfied, the level of the public investment per region is given as $h(B_t)$. Using (18)(A2)(A4)(A7) and (A8), we have then (21) and (22).

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Table 1

The estimates of a consumption function

	1970 Ⅰ -1998 Ⅱ	1970 Ⅰ -1983Ⅳ	1984 Ⅰ -1998 Ⅱ
constant	-0.004	-0.009	-0.03*
	(-0.52)	(-1.02)	(-1.74)
Y-G	0.62***	0.70***	0.59***
	(62.74)	(38.36)	(59.11)
D	0.04***	0.12***	0.03***
	(3.46)	(4.22)	(2.62)
F	0.11***	0.13*	0.18***
	(2.68)	(1.70)	(2.70)
Adj.R^2	0.98	0.98	0.99
DW	2.11	2.04	1.81
η	65.8%	6.49%	86.0%

Note:

*** denotes rejection at the 1% significance level, ** at the 5 % and * at the 10%.

Table 2

Test for sustainability

Dependent variable: s_t
Maximum likelihood estimation with annual data

Sample	1956-1998				1965-1998			
	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)
Intercept	0.0039	0.0042	0.0034	0.0039	-0.0238	-0.0254	-0.0279	-0.0292
	(0.228)	(0.256)	(0.197)	(0.231)	(-2.025)	(-1.887)	(-2.140)	(-2.090)
b_t	0.0056	0.0037	-0.0020	-0.0036	0.0820	0.0815	0.0898	0.0847
	(0.110)	(0.075)	(-0.036)	(-0.067)	(2.019)	(1.787)	(2.247)	(1.886)
GVAR	-0.0231		-0.0288		0.6458		0.6499	
	(-0.226)		(-0.276)		(1.659)		(1.603)	
YVAR	-17.6178	-17.2851	-19.0126	-18.4708	-23.4328	-24.1307	-26.6392	-27.3682
	(-2.832)	(-2.893)	(-2.633)	(-2.688)	(-3.531)	(-3.570)	(-2.989)	(-3.182)
$(b_t - \bar{b})^2$			0.0544	0.0490			0.0587	0.0738
			(0.392)	(0.361)			(0.473)	(0.555)
ρ	0.9232	0.9223	0.9245	0.9234	0.7594	0.8302	0.7254	0.8155
	(17.927)	(17.964)	(18.057)	(18.054)	(7.003)	(9.435)	(6.148)	(8.725)
log L	149.232	149.204	149.319	149.276	119.178	117.915	119.279	118.078
Adj. R^2	0.802	0.808	0.801	0.806	0.812	0.798	0.807	0.794
Std. error	0.0082	0.0081	0.0082	0.0081	0.0076	0.0078	0.0078	0.0079
D.W.	1.457	1.466	1.478	1.487	1.808	1.686	1.816	1.706

Note:

a. The above parentheses indicate the t-values using White's consistent covariance.

b. D.W. denotes Durbin-Watson statistic.

Table 3

Estimation of the VAR

	Dependent variable:				Dependent variable:			
	$(G/Y)_t$	$(T/Y)_t$	$(Z/Y)_t$	$(B/Y)_t$	$(G/Y)_t$	$(T/Y)_t$	$(Z/Y)_t$	$(\Delta B/Y)_t$
intercept	0.006 (0.808)	0.075 (4.030)	0.002 (0.129)	-0.062 (-1.852)	0.033 (2.587)	0.056 (3.484)	-0.008 (-1.553)	-0.030 (-1.719)
Time-trend $X10^3$	0.366 (3.471)	-0.912 (-3.517)	0.526 (2.262)	1.706 (3.668)	-0.029 (-0.326)	-0.094 (-0.830)	0.003 (0.101)	0.065 (0.524)
$(G/Y)_{t-1}$	-0.153 (-1.463)	0.216 (0.840)	0.840 (3.642)	-1.676 (-3.629)	21.847 (1.980)	12.274 (0.886)	6.325 (1.518)	15.764 (1.038)
$(G/Y)_{t-2}$	-0.130 (-0.864)	0.525 (1.421)	0.144 (0.435)	1.610 (2.433)	24.844 (2.604)	-13.399 (-1.119)	4.822 (1.339)	43.078 (3.283)
$(G/Y)_{t-3}$	0.201 (1.989)	-0.105 (-0.423)	0.160 (0.718)	-0.551 (-1.234)	-6.491 (-0.645)	-4.301 (-0.341)	-3.471 (-0.914)	-5.485 (-0.396)
$(T/Y)_{t-1}$	0.169 (2.760)	0.172 (0.778)	0.062 (0.312)	1.527 (3.857)	-21.138 (-1.907)	-11.873 (-0.853)	-6.179 (-1.477)	-15.302 (-1.004)
$(T/Y)_{t-2}$	0.100 (0.945)	-0.593 (-2.277)	-0.079 (-0.339)	-0.607 (-1.300)	-24.842 (-2.602)	13.491 (1.125)	-4.736 (-1.314)	-43.092 (-3.281)
$(T/Y)_{t-3}$	-0.064 (-1.088)	-0.142 (-0.979)	-0.156 (-1.203)	0.423 (1.634)	6.258 (0.626)	3.760 (0.299)	3.482 (0.922)	5.807 (0.422)
$(Z/Y)_{t-1}$	0.314 (1.558)	0.667 (1.345)	-0.063 (-0.141)	-1.313 (-1.476)	21.936 (1.954)	12.821 (0.909)	6.972 (1.645)	15.918 (1.030)
$(Z/Y)_{t-2}$	-0.317 (-1.447)	1.180 (2.191)	0.452 (0.937)	-1.621 (-1.678)	24.296 (2.492)	-14.040 (-1.147)	4.551 (1.236)	42.941 (3.201)
$(Z/Y)_{t-2}$	-0.067 (-0.500)	-0.768 (-2.344)	-0.444 (-1.513)	1.773 (3.015)	-6.611 (-0.667)	-3.260 (-0.262)	-3.264 (-0.872)	-6.447 (-0.472)
$(B/Y)_{t-1}$	0.162 (2.540)	-0.086 (-0.551)	0.137 (0.977)	2.708 (9.650)				
$(B/Y)_{t-2}$	-0.116 (-0.939)	-0.477 (-1.573)	-0.341 (-1.254)	-1.905 (-3.503)				
$(B/Y)_{t-3}$	-0.081 (-0.963)	0.643 (3.122)	0.153 (0.832)	0.070 (0.189)				
$(\Delta B/Y)_{t-1}$					-20.939 (-1.894)	-12.348 (-0.890)	-6.174 (-1.479)	-14.623 (-0.961)
$(\Delta B/Y)_{t-2}$					-24.952 (-2.620)	13.522 (1.131)	-4.761 (-1.324)	-43.257 (-3.302)
$(\Delta B/Y)_{t-3}$					6.435 (0.643)	4.110 (0.327)	3.489 (0.924)	5.643 (0.410)
	log of likelihood function			722.274	log of likelihood function			908.027
std. error	0.001	0.003	0.003	0.006	0.003	0.004	0.001	0.004
Adj. R^2	0.806	0.873	0.978	0.999	0.931	0.819	0.989	0.941
D.W.	2.190	2.401	2.032	1.877	2.075	2.113	2.061	2.029

Note:

a. sample: 1955-1997.

b. The above parentheses indicate the t-values.

Table 4

Granger causality tests Wald statistics

Dependent Variable	Independent variables ΣG/Y	T/Y	Z/Y	B/Y
ΣG/Y	--	6.626 (0.036)	7.334 (0.026)	10.801 (0.005)
T/Y	9.922 (0.007)	--	6.927 (0.031)	13.479 (0.001)
Z/Y	0.918 (0.632)	0.156 (0.925)	--	1.585 (0.453)
B/Y	7.698 (0.021)	14.890 (0.001)	13.216 (0.001)	--

Dependent Variable	Independent variables ΣG/Y	T/Y	Z/Y	B/Y
ΣG/Y	--	11.580 (0.003)	11.631 (0.003)	11.597 (0.003)
T/Y	1.861 (0.394)	--	1.886 (0.390)	1.884 (0.390)
Z/Y	4.534 (0.104)	4.363 (0.113)	--	4.391 (0.111)
B/Y	12.634 (0.002)	12.063 (0.002)	12.490 (0.002)	--

Note:

a. Sample: 1955-1997.

b. The above parentheses indicate the p-values of the hypothesis: The independent variable does not Granger-cause the dependent variable.

Figure 1

Primary Surplus and Government Debt 1955-1998

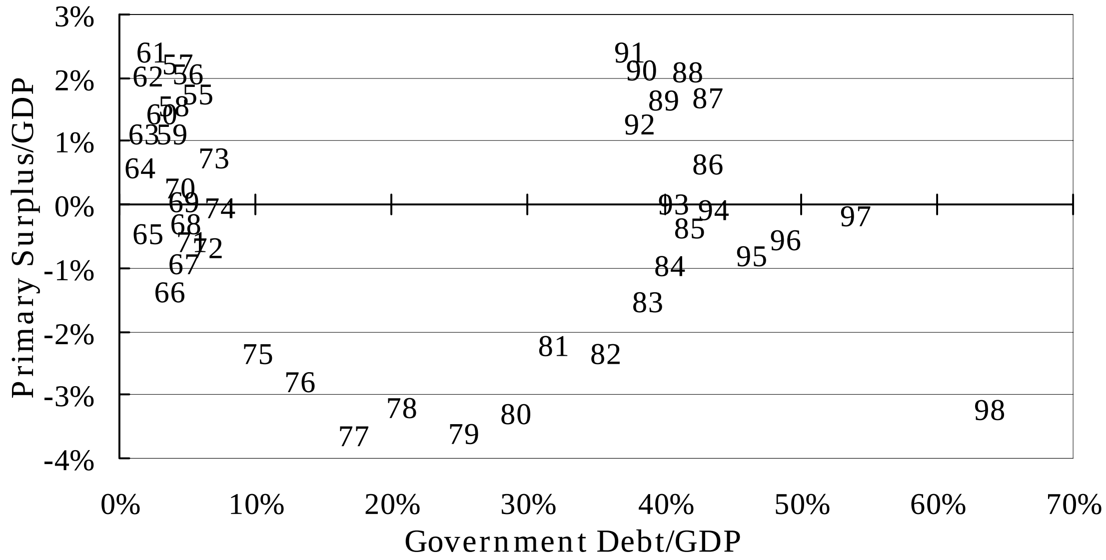


Figure 2
Dynamics of government debt

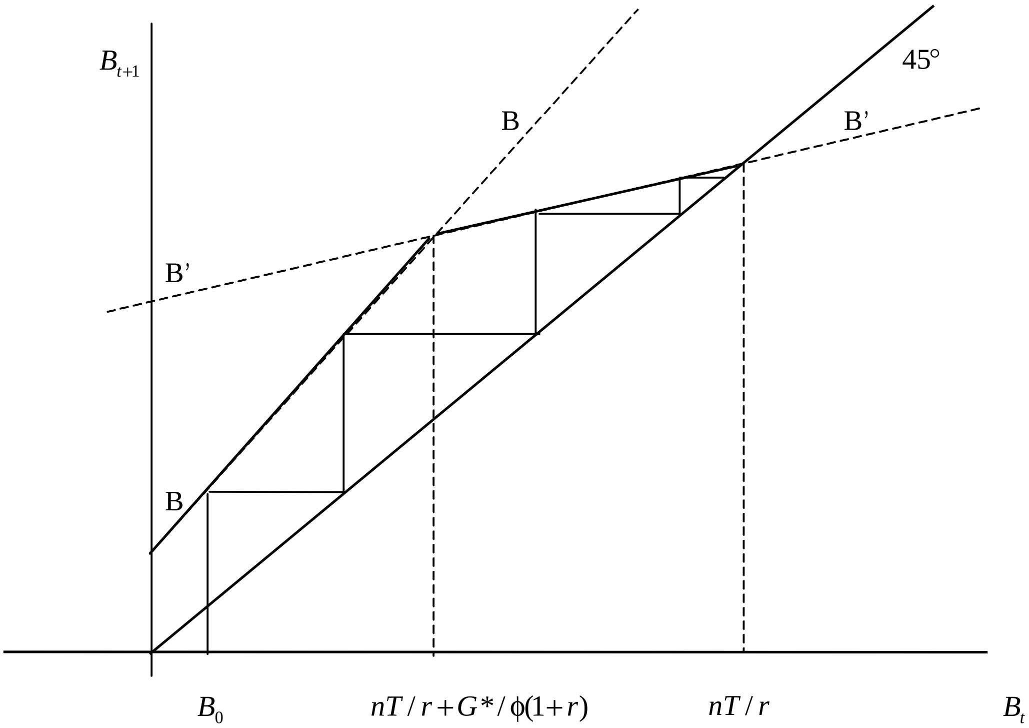
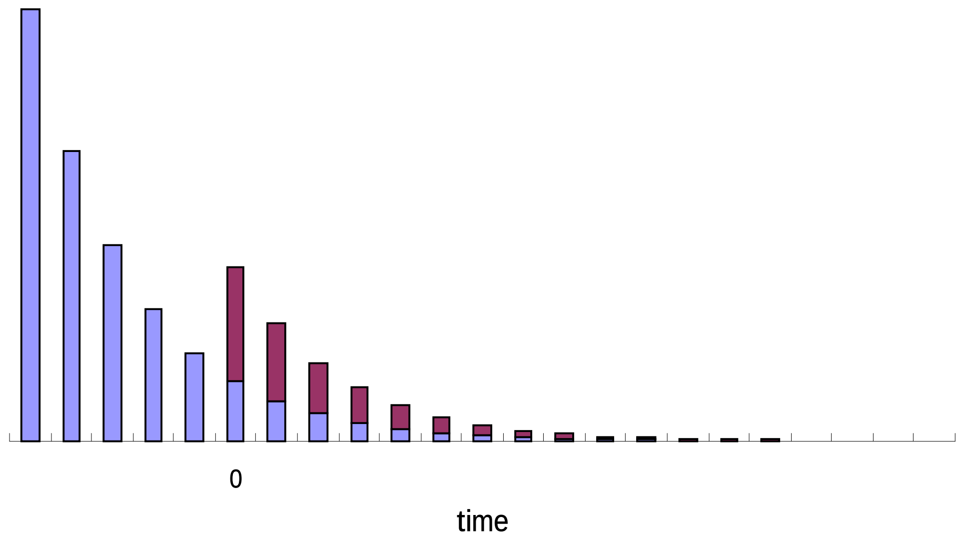


Figure 3
Dynamics of public investment and public debt



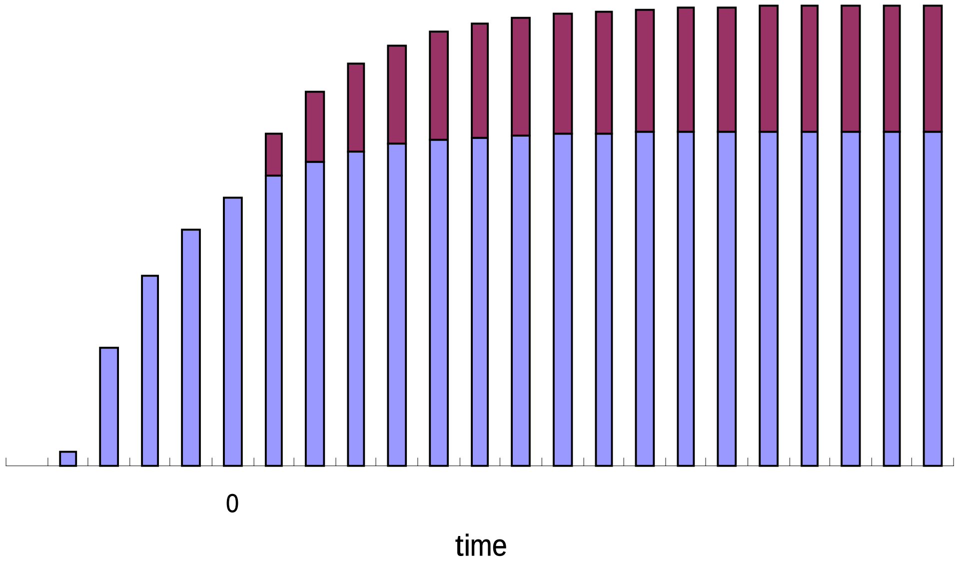


Figure 4
Economic welfare

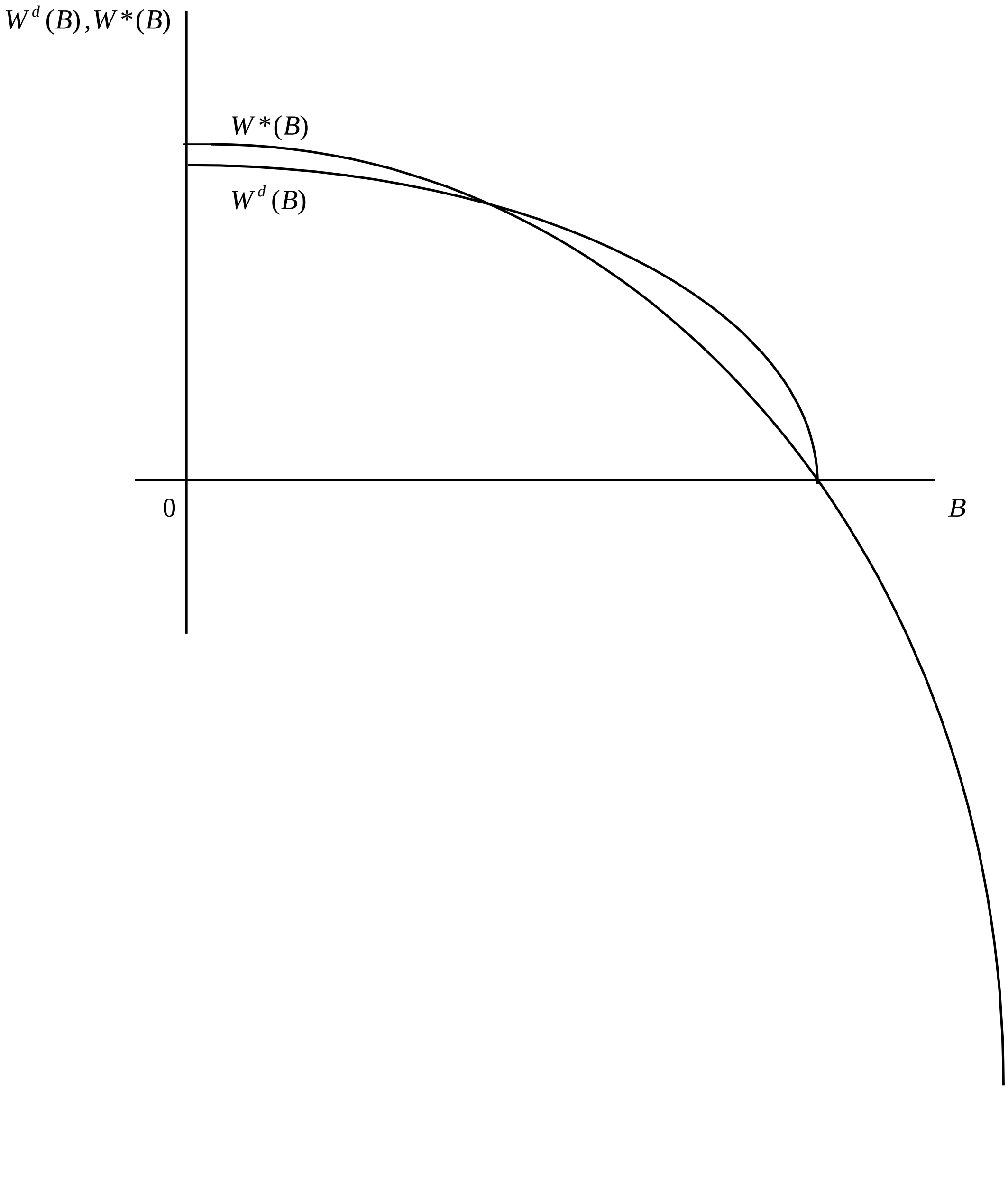


Figure 5

Granger causality tests