The Role of Public Works in the Political Business Cycle and the Instability of the Budget Deficits in Japan*

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Abstract
This paper discusses the Liberal Democratic Party’s (LDP) ability to maintain a majority of seats in the Diet after WWII by focusing on the role of public investment. The paper discusses three periods, namely, (i) the high-growth period (1950 to 1985), (ii) the asset bubble period (1986 to 1990), and (iii) the period of economic downturn after the bubble (post 1990). During the high-growth period, government investment had a strong positive output effect and it increased the tax revenue in the medium and long run. The high rate of private capital formation boosted growth and tax revenue even further: During the asset bubble period of the late 1980s, Japanese tax revenue increased due to high asset and property prices, and growth stayed high because of strong aggregate demand. The Japanese economy experienced slower growth after the asset bubble burst. The LDP continued its high-spending policy by issuing Japanese government bonds (JGB) to finance the deficits but has not been able to revive growth to previous levels. Accumulated government debt now amounts to 180 percent of GDP and it will be difficult to issue any more JGB. Fiscal policy in post-bubble Japan no longer fulfilled the stability conditions that were identified by Blinder and Solow (1974).

I. Introduction

A political earthquake happened in Japan in September 2009 with the defeat of the Liberal Democratic Party (LDP) by the Democratic Party of Japan (DPJ). The LDP was founded in 1955 and it had ruled Japan up until its defeat by the DPJ except for an 11-month break in 1993–94. The

* We acknowledge helpful comments from participants at the seminar of Konstanz University and at the Asian Economic
The political business cycle theory (Nordhaus 1975; Hibbs 1977, 1987; Ito 1990; Alesia, Roubini, and Cohen 1997; Heckelman and Berument 1998) showed that the ruling party has an incentive to try to manipulate the economy before the election to increase its likelihood of winning. Ito and Park (1988) documented that the government tended to call general elections in Japan when the economy was in a good condition. Ito and Park tested the hypothesis that the ruling LDP used monetary and fiscal policies to win elections but they found no such evidence to support it. However, in Kohno and Nishizawa’s (1990) analysis of the electoral business cycle in Japan, they found that public construction increased the popularity of the government.

This paper argues that the adroit use of fiscal policy was an important reason why LDP had such a long political life. However, the effectiveness of fiscal policy in boosting growth had declined over time, which was why the LDP has experienced declining support since 1990. There have been three phases in Japanese economic growth, and the effectiveness of government spending in inducing growth was different in each phase. In the period before 1986, which we call the phase of high growth, the public works implemented just before each election increased economic growth. The LDP financed the increased government expenditure by issuing Japanese government bonds (JGB), which were readily bought by the banks, postal savings, insurance, and pension funds. The deficit was under control because the increased output raised tax receipts. The satisfactory income growth and the state of public finance meant people were satisfied with LDP policies and, accordingly, voted for them.

The second phase of Japanese economic growth was the bubble economy in the 1986–90 period. The large increase in stock and land prices created a positive wealth effect that resulted in strong aggregate demand. The overall outcome was a high
growth rate despite a strong movement of manufacturing activities to Southeast Asia because of the high appreciation of the Japanese yen.

The third phase was the period after the asset bubble burst in the early 1990s. Growth slowed down because of the aging population and the earlier manufacturing drain. The LDP responded to the slowdown with public works spending and welfare expenditure in the belief that a Keynesian stimulus policy would boost the Japanese economy quickly. However, the GDP growth rate could not rise to the previous level because both the marginal productivity of public infrastructure and the marginal productivity of private capital had fallen. Table 3 reports the estimates by Yoshino and Nakahigashi (2000, 2004) of the marginal productivity of the public capital stock and the marginal productivity of the private capital stock in the 1956–93 period. The marginal productivity of the public capital stock fell from 0.80 in

Table 1. The number of seats and percentage of vote acquired by LDP in the lower house election in Japan

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of seats (LDP)</th>
<th>Percentage of vote (LDP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960</td>
<td>296</td>
<td>57.56</td>
</tr>
<tr>
<td>1963</td>
<td>283</td>
<td>54.67</td>
</tr>
<tr>
<td>1967</td>
<td>277</td>
<td>48.80</td>
</tr>
<tr>
<td>1969</td>
<td>288</td>
<td>47.63</td>
</tr>
<tr>
<td>1972</td>
<td>271</td>
<td>46.85</td>
</tr>
<tr>
<td>1976</td>
<td>249</td>
<td>41.78</td>
</tr>
<tr>
<td>1979</td>
<td>248</td>
<td>44.59</td>
</tr>
<tr>
<td>1980</td>
<td>284</td>
<td>47.88</td>
</tr>
<tr>
<td>1983</td>
<td>250</td>
<td>45.76</td>
</tr>
<tr>
<td>1986</td>
<td>300</td>
<td>49.42</td>
</tr>
<tr>
<td>1990</td>
<td>275</td>
<td>46.11</td>
</tr>
<tr>
<td>1993</td>
<td>223</td>
<td>36.62</td>
</tr>
<tr>
<td>1996</td>
<td>239</td>
<td>32.76</td>
</tr>
<tr>
<td>2000</td>
<td>233</td>
<td>28.31</td>
</tr>
<tr>
<td>2003</td>
<td>237</td>
<td>34.96</td>
</tr>
<tr>
<td>2005</td>
<td>296</td>
<td>38.18</td>
</tr>
<tr>
<td>2009</td>
<td>239</td>
<td>26.70</td>
</tr>
</tbody>
</table>

Source: Ministry of Internal Affairs and Communications.

Table 2. The number of seats and percentage of vote acquired by DP in the lower house election in Japan

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of seats (DP)</th>
<th>Percentage of vote (DP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>127</td>
<td>25.18</td>
</tr>
<tr>
<td>2003</td>
<td>177</td>
<td>37.77</td>
</tr>
<tr>
<td>2005</td>
<td>113</td>
<td>31.02</td>
</tr>
<tr>
<td>2009</td>
<td>308</td>
<td>42.40</td>
</tr>
</tbody>
</table>

Source: Ministry of Internal Affairs and Communications.

4 Table 3 reports the estimates by Yoshino and Nakahigashi (2000, 2004) of the marginal productivity of the public capital stock and the marginal productivity of the private capital stock during the 1956–93 period. The marginal productivity of the public capital stock fell
1960–64 to 0.22 in 1990–93, and the marginal productivity of the private capital stock fell from 0.73 to 0.20.

Because the fiscal stimulus after 1990 could not produce large output growth, tax revenue did rise substantially and reduce the budget deficits. The annual growth rate of tax revenue was 16.2 percent in 1955–70, 8.4 percent in 1981–90, and 0.2 percent in 2001–07 (Table 4). The result of the slowdown in the growth in tax revenue in the face of continued high government spending was a soaring amount of outstanding JGBs in respect to the level of government expenditure and the level of output.

In our opinion, in the third phase of Japanese economic growth, Japan did not fulfill the stability conditions that Blinder and Solow (1973) identified for the effectiveness of fiscal stimulus.5

These positive government expenditures were, however, able to give LDP sufficient popularity to stay in power even though GDP growth had slowed down. However, the U.S. sub-prime loan crisis of 2008 exacerbated the Japanese economic downturn beyond the ability of the government to overcome with its fiscal stimulus. Accumulated government debt amounts to more than 180 percent of GDP and it will be difficult to issue JGBs any further. In August 2009, the DPJ won the majority in the lower house of Parliament, ending the rule of the LDP.

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5 Related literature can be found in Christ (1968) and Ihori (1979, 1980).

### Table 3. Changes in the productivity effect of social capital stock

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Private Capital Stock</td>
<td>0.7558</td>
<td>0.7304</td>
<td>0.6463</td>
<td>0.4131</td>
</tr>
<tr>
<td>Public Capital Stock</td>
<td>0.6487</td>
<td>0.8016</td>
<td>0.8168</td>
<td>0.0842</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Private Capital Stock</td>
<td>0.3124</td>
<td>0.2578</td>
<td>0.2280</td>
<td>0.1995</td>
</tr>
<tr>
<td>Public Capital Stock</td>
<td>0.0397</td>
<td>0.0590</td>
<td>0.2525</td>
<td>0.2246</td>
</tr>
</tbody>
</table>

Source: Estimation by Yoshino and Nakajima (2001), chapter 2.

### Table 4. The average growth rate of tax revenue in Japan

<table>
<thead>
<tr>
<th>Year</th>
<th>Average growth rate of tax revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>1955–70</td>
<td>16.23</td>
</tr>
<tr>
<td>1971–80</td>
<td>14.52</td>
</tr>
<tr>
<td>1981–90</td>
<td>8.40</td>
</tr>
<tr>
<td>1991–2000</td>
<td>~1.56</td>
</tr>
<tr>
<td>2001–07</td>
<td>0.23</td>
</tr>
</tbody>
</table>

Source: Nikkei Needs.

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from 0.80 (1960–64) to 0.22 (1990–93), and the marginal productivity of the private capital stock fell from 0.73 to 0.20.
This paper is organized as follows. In section 2, we investigate the effectiveness of fiscal stimulus in a short run macroeconomic situation without considering budget constraints. In section 3, we show the long-run effectiveness of fiscal policy in macroeconomic situation that included the government budget constraint, and the supply-side of the economy. In section 4, we summarize the paper and discuss implications of the behavior of political parties in Japan.

2. A short-run demand-side macroeconomic model without imposing the government budget constraint

We assume that the number of seats won by the LDP is a function of the level of output, and that the maximum level of actual output is the full-employment level of output. So the loss function of the LDP is given by the quadratic gap between the actual level of GDP \( Y_t \) and the full employment GDP \( Y_f \), where the former is always less than the latter.

\[
L = N_R \left[ (Y_t - Y_f)^2 \right],
\]

where \( N_R \) is a constant.

The short-run macro model is a Keynesian type of macroeconomic model because it is often said that the Japanese economy is strongly influenced by government policy intervention and implementation. The output consists of four components, namely,

(1) Consumption spending \( (C_t) \);
(2) Investment \( (I_t) \);
(3) Government purchases \( (G_t) \);
(4) Net export \( (NX_t) \);

\[
Y_t = C_t + I_t + G_t + NX_t,
\]

where \( C_t = c_0 + c_t(1 - t)Y_t \) and \( c_0 > 0 \) is the autonomous consumption. \( t \) is the income tax rate, and \( c, 0 < c < 1 \) is the marginal propensity of consumption.

The short-run macro model does not take the government budget constraint into account. The ruling party solves the short-run macro model before the election. We call the model “the LDP ruling scheme.”

\[
\min_{C_t} L = N_R \left[ (Y_t - Y_f)^2 \right] \tag{1}
\]

such that \( Y_t = C_t + I_t + G_t + NX_t \) \tag{2}
\[ \begin{align*}
C_t &= c_0 + c_1(1 - t)Y_t \\
I_t &= \bar{I} \\
NX_t &= \overline{NX},
\end{align*} \]

where \( Y_t \) is expressed as the function of \( G_t \) and \( B_t \), that is, \( Y_t = Y_t(G_t, B_t; t, \bar{I}, \overline{NX}) \).

The first order condition for “the LDP ruling scheme” is as follows:

\[ \frac{\partial L}{\partial G_t} = 2N_k \left[ (Y_t - Y'_t)^2 \right] (Y_t - Y'_t) \frac{\partial Y_t}{\partial G_t} = 0 \]

At the optimal level, \( Y_t = Y'_t \) will be satisfied, and therefore the optimal level of government spending is given as

\[ G^*_t = Y'_t (1 - c_1(1 - t)) - c_0 - I_t(r_t) - \overline{NX} \]

Investment is assumed to depend on the interest rate \( r_t \), namely, \( I_t = I_t(r_t) \), \( r_t = r(B_t, G_t, t, \overline{NX}) \).

Under government bond financing, the government flow budget constraint in the short run can be written as:

\[ \Delta B_t = G^*_t + r_t B_{t-1} - I_t \]

where \( G^*_t \) is given by equation (7) and \( \Delta B_t \) is the new issue of the government bonds.

We will examine whether the Blinder-Solow condition\(^7\) of government bond financing is satisfied or not. First, the Blinder-Solow condition is tested whether \( \frac{\partial \Delta B_t}{\partial B_t} < 0 \) is satisfied or not.

Total differentiation of the government budget constraint (equation (8)) yields

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\(^6\) In our model, the timing of a bond interest payment is at the end of period \( t \).

\(^7\) Originally, Blinder and Solow (1974) consider the following two cases: (i) the case in which the government prints new money to finance additional government expenditures, and (ii) the case in which the government issues additional bonds to balance the budget. In our model, because we look into the effectiveness of fiscal policy in Japan, we focus on the effect of bond financing only.
higher rate of interest \((r_t)\) and pushes down private investment \((l_t)\). Therefore, the LDP’s short-run-oriented policy will lead to an unstable government budget.

However, the Blinder-Solow condition shown in equation (9) differentiates \(\Delta B_i\) with respect to \(B_i\) instead of \(G_i\). The stability condition should be evaluated by the level of public expenditure since \(G_i\) is the policy instrument. Therefore, it would be better to check the stability condition of the government budget constraint based on \(\frac{\partial \Delta B_i}{\partial G_i}\).

We obtain the following equation:

\[
\frac{\partial \Delta B_i}{\partial G_i} = r_t \left( \frac{\partial B_i}{\partial B_i} \cdot \frac{\partial B_i}{\partial G_i} + B_t \cdot \frac{\partial B_i}{\partial G_i} \cdot \frac{\partial B_i}{\partial G_i} \right) - \left( \frac{\partial l_t}{\partial r_t} \cdot \frac{\partial l_t}{\partial G_i} \right) > 0
\]

where

\[
\frac{\partial B_i}{\partial G_i} = r_t \left( \frac{\partial l_t}{\partial B_i} \cdot \frac{\partial l_t}{\partial G_i} \right) - \left( \frac{\partial l_t}{\partial B_i} \cdot \frac{\partial l_t}{\partial G_i} \right)
\]

Equation (10) is positive when an increase of the government expenditure leads to a higher rate of interest \((r_t)\) and it reduces private investment \((l_t)\) drastically.

During the high-growth period between 1950 and the 1970s, equation (10) was not explosive. Public works brought higher economic growth, higher income, and an increase in tax revenue, which stabilized the government budget constraint. However, the situation had drastically changed after the 1990 bubble burst. The LDP kept on spending for government investment (infrastructure investment) hoping the Japanese economy would recover. The LDP believed (especially Prime Minister Miyazawa at that time) that the public works would have strong supply-side effects. However, as shown in Table 1, the effectiveness of public investment had declined. The bubble burst created excess capacity and the marginal effectiveness of private investment declined sharply. Government infrastructure investment could not induce private investment into the region. Fiscal stimulus could not resuscitate the
Japanese economy. Instead, the government budget deficit increased. The ratio of bond issue to total government expenditure was quite low until the 1980s and it declined sharply during the bubble period of the late 1980s and started to increase drastically in the 1990s (see Figures 1 and 2).

3. Long-run macro model and the stability of the government budget

Next, we examine the long-run macroeconomic model where the government budget constraint, aggregate supply curve, and so forth, are introduced. The long-run model is summarized as follows:
\[
\min_{G_t} L = \sum_{t=1}^{T} \rho_t N_t \left[ (Y_t - Y_t^*)^2 \right] \quad \text{Loss Function} \quad (11)
\]

\[
Y_t^S = F \left[ N \left( \ln \frac{W_t}{P_t} \right), K_t^p, K_t^G \right] \quad \text{Aggregate Supply Function (Production Function)} \quad (12)
\]

\[
K_t^p = I(r_t) + K_{t-1}^p \quad \text{Real Private Capital Stock} \quad (13)
\]

\[
K_t^G = G_t + K_{t-1}^G \quad \text{Real Government Infrastructure Investment} \quad (14)
\]

\[
G_t = G_C + G_t \quad \text{where } G_C = \theta G_t, G_t = (1 - \theta)G_t \quad \text{Total Government Expenditure} \quad (15)
\]

\[
A_t = D_t + B_t = K_t^p + K_t^G \quad \text{Nominal Private Financial Assets} \quad (16)
\]

\[
(1 - t)Y_t - C_t = S_t - I(r_t) + G_t \quad \text{where } S_t = \Delta D_t + \Delta B_t \quad \text{IS Balance} \quad (17)
\]

\[
Y_t^D = c_0 + c_1(Y_t - tY_t) + c_2(A_t - p_t) + I(r_t) + G_t \quad \text{Aggregate Demand Curve} \quad (18)
\]

\[
\Delta B_t^S = G_t + r_t B_{t-1} - tY_t \quad \text{Supply of the Government Bond (Government Budget Constraint)} \quad (19)
\]

\[
\Delta B_t^D = \Delta A_t - \Delta D_t = S_t - \Gamma_t = (1 - t)Y_t - C_t - \Gamma_t \quad \text{Demand for the Government Bond} \quad (20)
\]

where \(A_t = \text{asset}, D_t = \text{deposit}, p_t^* = \text{expected price level (wage rate)}, K_t^p = \text{private capital}, K_t^G = \text{public capital}, \theta, 0 \leq \theta \leq 1 = \text{the distribution ratio for government expenditure}, G_C = \text{Government Consumption}, \text{and } G_t = \text{Government Investment}.

Equation (13) determines the level of private capital stock. Equation (14) determines the level of the government capital stock. The aggregate supply function (AS, equation (12)) and aggregate demand function (AD, equation (18)) determine GDP \((Y_t)\) and price level \((p_t)\). The new supply of the government bond (equation (19)) and the demand for government bond (equation (20)) determine the level of the new issued bond and the interest rate.

The ruling party minimizes its loss function (11) subject to the long-run macroeconomic model described by equations (12)–(20).

The aggregate supply (AS) curve (12) can be rewritten as follows:

\[
Y_t^S = a_1(p_t - p_t^*) + a_2 K_t^p + a_3 K_t^G \quad \text{where } \ln W_t = p_t^* \quad \ln P_t = p_t \quad \text{(AS curve)} \quad (21)
\]

Substituting equations (13) and (14) into the AS curve (21), we obtain
\[ Y_t^s = a_1(p_t - p_t') + a_2(I(r_t) + K^p_{t-1}) + a_3(G_t + K^G_{t-1}) \ (AS) \]  

Equation (23) is the aggregate demand curve \( (AD) \) where the wealth effect \( (A - P) \) for the consumption function is explicitly introduced.

\[ Y_t^D = c_0 + c_1(Y_t + G_c - tY_t) + c_2(A_t - p_t) + I(r_t) + G_t \ (AD) \]  

The optimal government expenditure for LDP party can be obtained as follows:

\[ \frac{\partial L}{\partial G_t} = 2\rho^I N_p \left[ (Y_t - Y_t) (Y_t - Y_t) \right] \frac{\partial Y_t(G_t)}{\partial G_t} = 0 \]  

From equation (11), the target level of GDP is the full employment level, namely \( Y_t = Y_f \).

Substituting the AS curve (equation (21)) into the AD curve ((23)) and eliminating \( p_t \), the reduced form for GDP (\( Y_t \)) is obtained as follows:

\[ Y_t = -b_1p_t' + b_2c_0 + b_3I(r_t) + b_4G_t + b_5D_t + b_6B_t + b_7K^G_{t-1} + b_8K^P_{t-1} \]  

where

\[ b_1 = \frac{a_1c_2}{(a_1 + c_2) - a_1c_1(1 - t)} \quad b_2 = \frac{a_1}{(a_1 + c_2) - a_1c_1(1 - t)} \quad b_3 = \frac{a_1 + a_2c_2}{(a_1 + c_2) - a_1c_1(1 - t)} \]

\[ b_4 = \frac{a_4(1 + \theta c_1) + (1 - \theta)a_4c_2}{(a_1 + c_2) - a_1c_1(1 - t)} \quad b_5 = \frac{a_4c_2}{(a_1 + c_2) - a_1c_1(1 - t)} \quad b_6 = \frac{a_4c_2}{(a_1 + c_2) - a_1c_1(1 - t)} \]

\[ b_7 = \frac{a_3c_2}{(a_1 + c_2) - a_1c_1(1 - t)} \quad b_8 = \frac{a_3c_2}{(a_1 + c_2) - a_1c_1(1 - t)} \]

The reduced form of the price level \( (p_t) \) can be obtained from both the AS (equation (22)) and the AD (equation (23)) curves as follows:

\[ p_t = g_1p_t' + g_2c_0 + g_3I(r_t) + g_4G_t + g_5D_t + g_6B_t + g_7K^G_{t-1} + g_8K^P_{t-1} \]  

where

\[ g_1 = \frac{a_1[1 - (1 - t)c_1]}{(a_1 + c_2) - a_1c_1(1 - t)} \quad g_2 = \frac{1}{(a_1 + c_2) - a_1c_1(1 - t)} \quad g_3 = \frac{1 - a_2[1 - (1 - t)c_1]}{(a_1 + c_2) - a_1c_1(1 - t)} \]

\[ g_4 = \frac{1 - a_3[1 - (1 - t)c_1]}{(a_1 + c_2) - a_1c_1(1 - t)} \quad g_5 = \frac{c_2}{(a_1 + c_2) - a_1c_1(1 - t)} \]

\[ g_6 = \frac{c_2}{(a_1 + c_2) - a_1c_1(1 - t)} \quad g_7 = \frac{a_3[1 - (1 - t)c_1] - 1}{(a_1 + c_2) - a_1c_1(1 - t)} \quad g_8 = \frac{a_3[1 - (1 - t)c_1] - 1}{(a_1 + c_2) - a_1c_1(1 - t)} \]
The effect of an increase in government expenditure on GDP can be obtained by differentiating equation (25) with respect to $G_t$ as follows:

$$
\frac{\partial Y_t}{\partial G_t} = \frac{1}{\Delta} \left( (a_1 + a_2 c_2) \frac{\partial I_t}{\partial r_t} \frac{\partial r_t}{\partial B_t} - a_1 c_2 \frac{\partial p_t^e}{\partial G_t} + a_1 (1 + c_1 \theta) + (1 - \theta) a_3 c_2 \right) \leq 0
$$

where

$$
\Delta = \frac{1}{(a_1 + c_2) - a_1 c_2 (1 - t)} = \frac{1}{a_1 [1 - c_1 (1 - t)] + c_2} > 0
$$

(27)

The sign of the effect of additional government expenditure on GDP (equation (27)) depends on coefficients and elasticity in equation (27).

If the total effect of $\frac{\partial I_t}{\partial r_t} \frac{\partial r_t}{\partial B_t}$ (an increase in government bond crowds out private investment) is large and the effect of $a_1 (1 + c_1 \theta) + (1 - \theta) a_3 c_2$ (where $a_1$ is the effect of price on GDP and $a_3 c_2$ is the effect of government capital stock on GDP multiplied by the wealth effect on consumption) is small, then the additional increase of the government expenditure on GDP will become negative.

Namely, when the crowding-out effect of government debt on private investment becomes larger ($\frac{\partial I_t}{\partial r_t} \frac{\partial r_t}{\partial B_t} = -1$), the effects of the additional government expenditure on GDP will be smaller (or even negative).

To prevent this development, equation (27) must turn out to be small (or negative),

$$
a_1 (1 + c_1 \theta) + (1 - \theta) a_3 c_2 > 0
$$

It means that the effectiveness of public capital on output must be high, the price elasticity on output must be high, and the wealth effect on consumption is great.

However, during the high-growth period from 1960 to 1980, the crowding-out effect $\left( \frac{\partial I_t}{\partial r_t} \frac{\partial r_t}{\partial B_t} \right)$ was small and the coefficient of $K_t^c$, $a_3$, was large. The public infrastructure

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8 In our model, at the optimal, the optimal $\theta^*$ can be derived as $\theta^* = -\frac{(a_1 + a_3 c_2)}{a_1 c_1 - a_3 c_2}$.

9 In the effect of $\frac{\partial p_t^e}{\partial G_t}$ is very small, it can be ignored. If we assume that the crowding out effect is large so that $\left( \frac{\partial I_t}{\partial r_t} \frac{\partial r_t}{\partial B_t} \right)$ is $-1$, then equation (27) becomes $(0a_1 c_1 - a_2 c_2) + (1 - \theta) a_3 c_2$ which is positive.
investment created both a high direct and indirect effect. Therefore, the effect of the additional government expenditure on GDP was positive during the high-growth period (Figure 3).

However, if the government shifts the aggregate supply curve to the right (up to point E) as is shown in Figure 4, it will create a positive effect on real GDP. If the
technological progress shifts the AS curve further to the right, the long-run effect of $G_t$ will be even larger.

The optimal government spending in the long run can be obtained as follows by setting $Y_t = Y^f$

$$G_t^* = \frac{1}{b_4} (Y^f + b_1 p_t^* - b_2 c_0 - b_3 I(r_t) - b_4 D_t - b_6 B_t - b_7 K^C_{t-1} - b_8 K_t^p)$$  \hspace{1cm} (28)

If we substitute $G_t^*$ into $\Delta B_t = G_t + r_t B_{t-1} - t Y_t$ then the supply of the government bonds issued will become

$$\Delta B_t = G_t^* + r_t B_{t-1} - t Y_t$$

Under bond finance, the government flow budget constraint in the long run can be written as

$$\Delta B_t = G_t^* + r_t B_{t-1} - t Y_t$$  \hspace{1cm} (29)

where $G_t^* = \frac{1}{b_4} (Y^f + b_1 p_t^* - b_2 c_0 - b_3 I(r_t) - b_4 D_t - b_6 B_t - b_7 K^C_{t-1} - b_8 K_t^p)$

$$\frac{\partial \Delta B_t}{\partial B_t} = \frac{\partial G_t^*}{\partial B_t} + \frac{\partial r_t B_{t-1}}{\partial B_t} + r_t - t \frac{\partial Y_t}{\partial B_t} > 0$$  \hspace{1cm} (30)

The first component of the right hand side of equation (30) is positive.

$$\frac{\partial G_t^*}{\partial B_t} = b_1 \frac{\partial p_t^*}{\partial B_t} - b_2 \frac{\partial I_t}{\partial r_t} \frac{\partial r_t}{\partial B_t} > 0$$

Next, we introduce the demand for government bonds.

$$\Delta B_t^D = (1 - t)p_t Y_t - p_t c_t - \Delta D_t$$  \hspace{1cm} (31)

The supply of government bond can be rewritten as:

$$\Delta B_t^S = p_t G_t + r_t B_{t-1} - t(p_t Y_t)$$  \hspace{1cm} (32)

The next step is to compare the effect of the change in new issue of government bonds with respect to $G_t$ and $B_t$. Because the government bond is not the policy instrument, $G_t$ is better to use to check the stability of new issue of government bonds.

$$\frac{\partial \Delta B_t}{\partial G_t}, \text{ and } \frac{\partial \Delta B_t}{\partial B_t}.$$
From both equations (31) and (32), the following simultaneous equations system will be obtained.

The effects of changes in $\Delta B_t, G_t$, $\frac{\partial \Delta B_t}{\partial G_t}$, and $\frac{\partial \Delta B_t}{\partial B_t}$ will be obtained from the following simultaneous equations.

$$
\begin{bmatrix}
1 - t \left( \frac{\partial p_t}{\partial r_t} Y_t - \frac{\partial p_t}{\partial r_t} Y_t - p_t \frac{\partial C_t}{\partial r_t} - \frac{\partial \Delta D_t}{\partial r_t} \right) \\
B_{t-1} - t \left( \frac{\partial p_t}{\partial r_t} Y_t - \frac{\partial Y_t}{\partial r_t} - \frac{\partial p_t}{\partial r_t} G_t \right)
\end{bmatrix}
\begin{bmatrix}
\Delta B_t \\
\Delta Y_t \\
\Delta C_t \\
\Delta D_t
\end{bmatrix}
= 
\begin{bmatrix}
H_c dt + H_c dG_t + H_c dB_t + \ldots \\
J_c dt + J_c dG_t + J_c dB_t + \ldots
\end{bmatrix}
$$

where

$$
H_c = (1 - t) \left[ g_s \frac{\partial p_t}{\partial G_t} Y_t + \left( \frac{\partial p_t}{\partial G_t} Y_t + \frac{\partial r_t}{\partial G_t} B_{t-1} - t \left( \frac{\partial p_t}{\partial G_t} Y_t - \frac{\partial Y_t}{\partial r_t} - \frac{\partial p_t}{\partial G_t} G_t \right) \right) - \frac{\partial p_t}{\partial B_t} g_s Y_t - \frac{\partial Y_t}{\partial B_t} G_t - \frac{\partial C_t}{\partial B_t} - \frac{\partial \Delta D_t}{\partial B_t} \right] > 0: \text{High growth period}
$$

$$
J_c = \frac{\partial p_t}{\partial B_t} g_s Y_t + \frac{\partial r_t}{\partial B_t} B_{t-1} - t \left( \frac{\partial p_t}{\partial G_t} Y_t - \frac{\partial Y_t}{\partial r_t} - \frac{\partial p_t}{\partial G_t} G_t \right) < 0: \text{High growth period}
$$

$$
J_b = g_s \frac{\partial p_t}{\partial B_t} G_t + \frac{\partial C_t}{\partial B_t} + \frac{\partial r_t}{\partial B_t} B_{t-1} + r_t - t \left( \frac{\partial p_t}{\partial B_t} Y_t + \frac{\partial Y_t}{\partial B_t} G_t \right)
$$

By using Cramer’s rule, we obtain the effect $\frac{\partial \Delta B_t}{\partial G_t}$ and $\frac{\partial \Delta B_t}{\partial B_t}$.

$$
\frac{\partial \Delta B_t}{\partial G_t} = \frac{H_c \left( B_{t-1} - t \left( \frac{\partial p_t}{\partial r_t} Y_t - \frac{\partial Y_t}{\partial r_t} - \frac{\partial p_t}{\partial r_t} G_t \right) - J_c \left( (1 - t) \frac{\partial p_t}{\partial r_t} Y_t - \frac{\partial p_t}{\partial r_t} C_t + (1 - t) p_t \frac{\partial Y_t}{\partial r_t} - p_t \frac{\partial C_t}{\partial r_t} - \frac{\partial \Delta D_t}{\partial r_t} \right) \right)}{B_{t-1} - t \left( \frac{\partial p_t}{\partial r_t} Y_t - \frac{\partial Y_t}{\partial r_t} - \frac{\partial p_t}{\partial r_t} G_t \right) - (1 - t) \frac{\partial p_t}{\partial r_t} Y_t - \frac{\partial Y_t}{\partial r_t} - \frac{\partial p_t}{\partial r_t} C_t + (1 - t) p_t \frac{\partial Y_t}{\partial r_t} - p_t \frac{\partial C_t}{\partial r_t} - \frac{\partial \Delta D_t}{\partial r_t}}
$$

$$
\frac{\partial \Delta B_t}{\partial B_t} = \frac{H_b \left( B_{t-1} - t \left( \frac{\partial p_t}{\partial r_t} Y_t - \frac{\partial Y_t}{\partial r_t} - \frac{\partial p_t}{\partial r_t} G_t \right) - J_b \left( (1 - t) \frac{\partial p_t}{\partial r_t} Y_t - \frac{\partial p_t}{\partial r_t} C_t + (1 - t) p_t \frac{\partial Y_t}{\partial r_t} - p_t \frac{\partial C_t}{\partial r_t} - \frac{\partial \Delta D_t}{\partial r_t} \right) \right)}{B_{t-1} - t \left( \frac{\partial p_t}{\partial r_t} Y_t - \frac{\partial Y_t}{\partial r_t} - \frac{\partial p_t}{\partial r_t} G_t \right) - (1 - t) \frac{\partial p_t}{\partial r_t} Y_t - \frac{\partial Y_t}{\partial r_t} - \frac{\partial p_t}{\partial r_t} C_t + (1 - t) p_t \frac{\partial Y_t}{\partial r_t} - p_t \frac{\partial C_t}{\partial r_t} - \frac{\partial \Delta D_t}{\partial r_t}}
$$

All of the results are summarized in Table 5.

From equation (34), we interpret our comparative statics results applying to the Japanese historical economic situations:
The Role of Public Works in the Political Business Cycle and the Instability of the Budget Deficits in Japan

Table 5. The signs of \( H_G, J_G, \frac{\partial \Delta B_t}{\partial G_t} \) (both the high-growth period and recent period)

<table>
<thead>
<tr>
<th>High-growth period</th>
<th>Recent period</th>
</tr>
</thead>
<tbody>
<tr>
<td>( H_G )</td>
<td>( (1 - \theta) p_t \frac{\partial Y_t}{\partial G_t} &gt; 0 )</td>
</tr>
<tr>
<td>Large positive effect of ( G ) on ( Y )</td>
<td>( (1 - \theta) p_t \frac{\partial Y_t}{\partial G_t} - \frac{\partial \Delta D_t}{\partial r_t} &gt; 0 )</td>
</tr>
<tr>
<td>( J_G )</td>
<td>( \left(-lp_t b_{t+1} \frac{\partial Y_t}{\partial G_t}\right) &lt;&lt; 0 )</td>
</tr>
<tr>
<td>Large positive effect of ( G ) on ( Y )</td>
<td>( -lp_t b_{t+1} \frac{\partial Y_t}{\partial G_t} \geq 0 )</td>
</tr>
<tr>
<td>Nominator ( \frac{\partial \Delta B_t}{\partial G_t} )</td>
<td>( H_c \left(1 - \theta p_t \frac{\partial Y_t}{\partial r_t} - \frac{\partial \Delta D_t}{\partial r_t}\right) )</td>
</tr>
<tr>
<td>( \left(\frac{\theta p_t b_{t+1}}{\partial G_t}\right) )</td>
<td>( tp_t b_{t+1} \frac{\partial Y_t}{\partial G_t}, \frac{\partial \Delta D_t}{\partial r_t} &gt; 0 )</td>
</tr>
<tr>
<td>Denominator ( \frac{\partial \Delta B_t}{\partial G_t} )</td>
<td>( \frac{\partial \Delta B_t}{\partial G_t}, \frac{\partial \Delta D_t}{\partial r_t} \geq 0 )</td>
</tr>
<tr>
<td>( \left(-lp_t b_{t+1} \frac{\partial Y_t}{\partial G_t}\right) )</td>
<td>( B_{t-1} - \theta p_t \frac{\partial Y_t}{\partial r_t} &gt; 0 )</td>
</tr>
<tr>
<td>Final sign ( \frac{\partial \Delta B_t}{\partial G_t} )</td>
<td>( \frac{\partial \Delta B_t}{\partial G_t} &lt; 0 )</td>
</tr>
<tr>
<td>Stability</td>
<td>( \frac{\partial \Delta B_t}{\partial G_t} &gt; 0 )</td>
</tr>
<tr>
<td>Instability</td>
<td></td>
</tr>
</tbody>
</table>

(i) \( H_G > 0, J_G << 0 \) correspond to the high-growth periods in Japan,
(ii) \( H_G > 0, J_G \equiv 0 \) correspond to the recent Japanese economy.

The following components are major factors that contribute to determining the stability of a balanced budget:

(1) Effectiveness of government expenditures on GDP
(2) Incentives to buy government bonds (i.e., encourage demand for government bonds by reducing demand for deposits in this model)
(3) Interest rate sensitivity on private investment
(4) Effectiveness of private capital stock on real GDP
(5) Sensitivity of tax revenue both on private capital and public capital
(6) Multiplier effect of \( G \) (government investment) on real GDP

**High-growth period** Figure 5 shows both the supply and demand for bonds during Japan’s high-growth period. The ruling LDP determined to expand public investment \((p_t G_t)\) before the election. Because the effectiveness of public infrastruc-
ture was large during the high-growth period, it leads to higher real GDP, which increased tax revenue. Infrastructure investment also induced private investment, which created a long-run productivity effect on real GDP during the high-growth period. Higher growth of real GDP contributed to the higher demand for government bonds, as is shown in Figure 5.

Figure 5. The bond supply and demand in the high-growth periods

Figure 6 corresponds to the bond supply and demand in the bubble period. As stock and land prices continued to rise, the Japanese economy enjoyed high wealth and tax revenues increased dramatically, which brought down...
the budget deficits as is shown in Figure 2. A higher demand for government bonds was observed due to a strong positive wealth effect.

**Post-bubble period** Finally, Figure 7 shows the government bond supply and the demand during the slow-growth period after the bubble. To cope with slower growth in the early 1990s, the LDP implemented huge public investments by issuing government bonds. Due to excess capacity after the bubble, private firms relied less on bank borrowing and banks invested much more of their money in government bonds. Therefore, the government could afford to issue new bonds to domestic financial institutions, as shown in Figure 7.

### 4. Conclusion

This paper tries to answer why the LDP was able to hold on to power so long after WWII by focusing on the role of public investment. In the high-growth period of 1955–85, government investment had a strong output effect and it increased the tax revenue in the medium and long run, therefore the total issues of government bonds were reduced.

$$G_t \uparrow \left( = \Delta B_t^s \uparrow \right) \rightarrow Y_t \uparrow \rightarrow tY_t \uparrow \left( = \Delta B_t^s \downarrow \right)$$

Furthermore, the high economic growth increased the supply of deposits by households and firms, which lowered the interest rate and pushed private investment.
This increase in private capital stock had a high positive output effect, which raised tax revenue further.

During the asset bubble period of the late 1980s, Japanese tax revenues increased due to high asset and property prices. In the post-bubble period, the continued high level of government spending caused the amount of JGBs to soar out of control because the stability conditions for fiscal stimulus no longer held true in Japan.

The strong sustained recovery of the Japanese economy will require positive developments on several fronts, for example, an increase in the effectiveness of both public and private investment, an increase in the price elasticity of the aggregate supply curve, and an increase in wage flexibility.

References


