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Tuan Khai Vu

(Meisei University)

Hodokubo 2-1-1, Hino, Tokyo 191-8506

School of Economics, Meisei University

Phone: 042-591-6047 Fax: 042-591-5863

URL: http://keizai.meisei-u.ac.jp/econgs/

Fiscal Policy News Shocks and the Japanese Macroeconomy*

Tuan Khai Vu†

School of Economics, Meisei University

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Abstract

Recently it has been increasingly recognized that, when identifying fiscal policy shocks, we should take into account the fact that they are often well anticipated before they actually materialize. Extending the structural VAR of Mountford and Uhlig (2009), this paper uses a new method that is able to identify fiscal policy shocks as both unanticipated and anticipated (or news) shocks. The method is also able to identify multiple news shocks. The method is applied to the data of Japan. We find that there is a clear difference between the effects of an unanticipated government spending shock and those of an anticipated one: in the whole sample period (1968Q1-2010Q1), the former significantly increases GDP, consumption, and employment, while the latter does not. We also find that the effectiveness of government spending policy is very different between the pre- and post-bubble periods: an anticipated government spending policy can stimulate the economy in terms of GDP and consumption in the former period, while in the latter period it cannot do so or it even aggravates the business cycle fluctuations at some horizons.

Keywords: Government spending, Japanese economy, News shock, VAR, Sign restriction.

JEL codes: C32, E32, E62.

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† E-mail: vu.tuankhai@meisei-u.ac.jp.

1. Introduction

Fiscal policy has actively been used by governments in modern capitalist countries as one of the main tools to stabilize economic fluctuations. The use of large scale fiscal stimulus packages in the U.S., Europe, Japan, China, and many other countries in the recent worldwide financial and economic crises presents a good example of this. Given this importance of fiscal policy, economists have long been interested in understanding its effects on the macroeconomy both empirically and theoretically.[1]

In the empirical literature on the effects of fiscal policy, recently it has been increasingly recognized that, when identifying fiscal policy shocks, we should take into account their property of news shocks,[2] i.e. they are often well anticipated by the time they actually materialize. Take the case of government spending policy, which is also the focus of this paper. In its process of decision making, this policy must follow a series of procedure such as debates inside the ruling party and debates and approval in the Diet. And even after being approved and announced, there usually is administrative procedure that is required before the policy is implemented, and as a result, this gives rise to the time lag between the announcement and the implementation of the policy. This is especially true for the case of government investment because it requires coordination among central and local governments and possibly private firms, and it has to go through along process of planning, bidding, contracting, construction, and evaluation (Leeper et al., 2010). During these processes, the private agents can anticipate the policy and incorporate that information into their decision making. Given this news-shock property of government spending shocks, it can be argued that if one fails to identify them, one might come up with misleading results. In a recent study using the U.S. data, Ramey (2011) shows that the estimated effect of government spending on consumption indeed depends crucially on the timing of shocks to be identified. Mountford and Uhlig (2009) develop a structural vector auto-regression (SVAR) method which is able to identify news shocks to government spending, and they apply the method to the case of the U.S.

The purpose of the present paper is to use a new method that is able to deal with the problem of news-shock property of government spending to study its effects on the Japanese macroeconomy. The method is developed by extending the framework of Mountford and Uhlig (2009) in two important directions. First, instead of identifying only one government spending shock which is *either* unanticipated government spending shock *or* government spending news shock as in Mountford and Uhlig (2009), I identify these two types of shocks *simultaneously*. The second extension is that, rather than assuming only one news shock as in Mountford and Uhlig (2009), I introduce a richer structure of multiple news shocks with different forecast horizons. I believe that

[1] This can be seen in the large literature on fiscal policy. See Blanchard and Perotti (2002), Perotti (2005), and Gali et al. (2007), Edelberg et al. (1999), Burnside et al. (2004), Leeper et al. (2010), Ramey and Shapiro (1998), Ravn et al. (2012), among others.

[2] Recently understanding the role news shocks in explaining business cycle fluctuations has gained much attention from macroeconomists. See the original contribution of Beaudry and Portier (2006).

these extensions would make the analysis more realistic because unanticipated and anticipated government spending shocks would coexist, and news about government spending might be learnt at different time horizons. Thus we could expect that the method used here would help us identify government spending shocks more precisely, and it would also enable us to make a comparison between different types of government spending shocks.

Applying this new method to the data of Japan, I wish to provide new evidence and shed some new light on the role of fiscal policy in Japan over the last few decades. During the so called 'lost decade' which started from the collapse of the asset bubble at the beginning of the 1990s, the Japanese government actively used fiscal policy to stimulate the economy. This active fiscal policy notwithstanding, the economy was stuck in stagnation for a long period, and thus fiscal policy has been criticized for this. Although there has been a large literature examining the effectiveness of fiscal policy in Japan,[3] little attention has been paid to the news-shock property of government spending shocks. The only exceptions are myself previous work (Vu, 2011), Morita (2012), and Miyazawa and Nutahara (2013). The main difference between the present paper and these papers is that here I extend the framework in Vu (2011) to introduce a richer structure of fiscal news shocks with different forecast horizons, as described above.

The remainder of the paper is organized as follows. Section 2 explains the empirical strategy. Section 3 describes the data and estimation. Section 4 provides the results and analysis. Section 5 concludes the paper.

2. Empirical Strategy

This section describes the strategy to identify government spending shocks, which is an extension of the sign-restricted SVAR in Mountford and Uhlig (2009) and Vu (2011).

A government spending shock is defined as an exogenous change in government spending. Because in reality some part of the change in government spending is endogenous in the sense that it responds to fluctuations of the business cycles, so we need to control for that part. To do that we introduce one more shock, namely a business cycle shock. We place this shock before a government spending shock, and require the government spending shock to be orthogonal to it. By this all of the endogenous response of government spending to the fluctuations of the economy will be attributed to the business cycle shock.

We identify two types of government spending shocks, namely, a government spending surprise (or unanticipated) shock and government spending news shocks. The latter shocks are

[3] See Bayoumi (2001), Watanabe et al. (2001), Ihori et al. (2003), and Ihori and Nakamoto (2005), Fukuda (2002), Fukuda and Kei (2002), Nakazato (2002), Kobayashi and Komaki (2003), Miyazaki (2009, 2010), Takeuchi (2011), and Fujii et al. (2013). See also a series of papers on fiscal policy in Japan summarized in the book edited by Ihori and published by ESRI (2010).

further classified into four types of news shocks: those that are learnt at one through four quarters ahead. Thus we will identify a total of six types of shocks: a business cycle shock, four government spending news shocks, and a government spending surprise shock.

Note that the method used here is different from the conventional SVAR in that we do not need to identify all shocks (whose number equals the number of endogenous variables in the VAR), but instead we are able to identify only a subset of them. This is an important advantage because identifying all shocks requires a lot more restrictions, many of which might hardly be justified as economically reasonable.

The six types of shocks are identified by imposing sign restrictions on the impulse response functions (IRFs) of macroeconomic variables to them. The sign restrictions are described in Table 1.

A business cycle shock is defined as a shock that raises tax revenue, output, consumption, investment, and tax revenue of the government for the first four quarters after the shock. Theoretically, we can think of this shock as a TFP shock, a monetary shock, or a demand shock that increases both consumption and investment. On the other hand, a government spending shock is defined as a shock that is orthogonal to the business cycle shock and that raises government spending for some period. To allow the government spending shock to be a news shock, we impose the restriction that government spending remains unchanged for the first *s* quarters and then increases for the next four quarters. If *s*=0, the shock is an unanticipated one which is similar to those identified in the conventional SVAR framework. If instead *s*>0, the shock is an anticipated one (or a news shock) and we have a new identification scheme. Thus this is a crucial point to distinguish the new approach here with the ones used so far in the literature. In our estimation we introduce one through four quarter ahead government spending news shocks which correspond respectively to the cases of *s*=1,...,4. We order the shocks such that the one on the left in Table 1 will come first, and we require all of them to be orthogonal to one another.

Details of the methodology are described in the following steps.

Step 1: Estimate the reduced-form VAR as in (1).

$$x_t = B_0 + B_1 x_{t-1} + B_2 x_{t-2} + ... + B_p x_{t-p} + u_t \qquad (1)$$

Here x_t is a vector of endogenous variables of size $n \times 1$, t denotes quarter t, B_0 is an $n \times 1$ vector of coefficients in the constant terms, B_j ($j = 1,..., p$) are coefficient matrices of size $n \times n$, p is the lag length, and u_t is a $n \times 1$ vector of residuals. Let Σ of size $n \times n$ be the residual variance-covariance matrix, and A of size $n \times n$ be the matrix such that $u_t = A\varepsilon_t$ where ε_t is a vector of the structural shocks which include the six shocks we wish to identify and other unidentified shocks. The six shocks we wish to identify are the first six elements of ε with the ordering as noted above. To identify these shocks we need to identify the first six columns of A.

Step 2: Based on the estimated matrices $\hat{\Sigma}$ and $\hat{B}$ obtained in step 1, randomly generate Σ and

B from the inverse Wishart and Normal distributions, respectively.

Step 3: For each pair (B,Σ), randomly generate a vector q_1 of size $n\times 1$ with length equal to unity, and calculate the impulse response vector to the first shock at some horizion *k* as follows,

$$r_1(k)=\sum_{j=1}^{n} q_{1,j}c_j(k),$$

where $q_{1,j}$ is the *j*-th element of q_1, and $c_j(k)$ is the *j*-th impulse response vector obtained using Cholesky decomposition at horizon *k*. The impulse response vectors to the next four four shocks, which are news shocks to government spending, are calculated similarly except that now we add two types of restrictions regarding the orthogonality to shocks ordered before them and that they do not affect government spending at the first few quarters. Take for example the case of the second shock, which is the four quarter ahead government spending news shock. In this case, the restrictions on the vector q_2 are: (i) q_2 must be orthogonal to q_1; and (ii) $Cq_2=0$ (the news shock restriction) where *C* is a matrix of size $(n-4-1)\times n$ and

$$C=\begin{bmatrix} c_{i,1}(0) & \dots & c_{i,n}(0) \\ \vdots & \dots & \vdots \\ c_{i,1}(3) & \dots & c_{i,n}(3) \\ q_{1,1} & \cdots & q_{1,n} \end{bmatrix} \qquad (2),$$

where *s* is number of horizons required for the shock to materialize since its news is revealed, and $c_{i,j}(k)$ is the response of the *i*-th variable (which is government spending) to the *j*-th impulse response vector obtained using Cholesky decomposition at horizon *k* (*k*=0,...,3).[4] The impulse response vector to the last shock, which is the government spending surprise shock, is also calculated similarly except that we exclude the news shock restriction (ii) noted above.

Step 4: Check if the signs of the elements of $r_j(k)$ (*j*=1,...,6) satisfy the sign restrictions described in Table 1 or not. If they are, call this a valid case and store $r_j(k)$, otherwise discard the set $(q_1,...,q_6)$. Perform this task for a certain number of times (say 300).

Step 5: Repeat steps 2 through 4 until obtaining a certain number of valid cases (say 300). Finally, use the set $\{r_1(k),...,r_6(k)\}$ obtained to calculate the impulse response functions (IRFs) and perform other calculation exercises.

3. Data and Estimation

We utilize the data used in Vu (2011). Our dataset contains quarterly data of the following ten macroeconomics variables: GDP, private consumption, private investment, government spending, tax revenue, employment, work hours per worker, the unemployment rate, CPI, and stock prices. The sample period is 1968Q1-2010Q1, which later will be divided into two subsamples of the lost decade

[4] We define 0 as the first quarter when the shock occurs, so there are four quarters from quarter 0 to quarter 3.

and the period prior to that.

The first five series are in real terms and are created by merging 68SNA and 93SNA data. Private investment is the sum of residential and nonresidential investment. Government spending is either government consumption or government investment. We distinguish between these two types of government spending because the news-shock property might be more relevant to the latter than to the former. Tax revenue is the sum of nominal direct and indirect tax revenue and then is divided by the GDP deflator (also available from the SNA database) to transform to the real series. Data on the labor market variables, namely employment, work hours per worker, and the unemployment rate, are taken from the Labor Force Survey available from the homepage of the Ministry of Health, Labor, and Welfare. The last two series, CPI, and stock prices, are from the OECD database with stock prices being the Nikkei average index. The inclusion of stock prices is to allow for the possibility that the news on government spending might be reflected in this forward-looking variable.

All of the ten series are seasonal adjusted, and are in logarithms, except the unemployment rate which is in percentage. In addition, the first six series are divided by the population to transform to per capita terms before taking logarithms. The data on population is obtained from the homepage of the Statistics Bureau, Ministry of Internal Affairs and Communications.

The primary reason to include a rather large number of variables as noted above (ten instead of four or five) first is of course that all of them are variables of interest. Another reason, which is technical, is that in order to introduce a rich structure of news shocks we need a sufficiently large number of endogenous variables in the VAR.[5]

The reduced-form VAR model noted in (1) is estimated with all variables in *levels* rather than first order differences. This point is suggested by Hamilton (1994) to take into account the possibility that there might be some cointegration relationships between the variables. The lag length is chosen to be four, but a robustness check reveals that the results obtained when the lag lengths are five and six are very similar to those reported below.

4. Results and Analysis

Using the IRFs obtained from the estimated SVAR we can analyze the effects of shocks on the macroeconomic variables in the VAR. The results and analysis reported below are done for the two cases in which government spending is government consumption (gC) and government investment (gI), respectively. We also conduct the analysis using the whole sample (1968Q1-2010Q1) and two subsamples with the sample periods 1968Q1-1992Q4 and 1993Q1-2010Q1, respectively. Moreover, in each of these cases there are IRFs to six types of shocks. Thus we have a total of 36 cases, and a

[5] It can be seen from (2) that to introduce four news shocks, as we do here, we need at least six variables.

rather large number of IRFs. So to save space, below we will pick up a few cases and show their results in Figures 1-10, and the results for all cases (including those that are not shown in the figures) are summarized in Tables 2-6.

Figures 1-8 show the effects of the six types of structural shocks. In each box of a figure, the numbers in the horizontal axis are quarters after the shock, and those in the vertical axis are the changes in logs of the corresponding variables. Dashed lines are 16th and 84th quantiles, while solid lines are 50th quantiles. The shaded areas indicate the time intervals in which sign restrictions are imposed. Looking at the shaded areas one can see graphically how the sign restrictions in Table 1 are imposed in the SVAR. We will examine the results shown in each of these figures with a focus on the IRFs that are left agnostic, i.e. those without any restrictions imposed. See also the first column on Table 1 for the abbreviations and description of the variables.

4.1. Effects of a business cycle shock

Figure 1 displays the effects of a business cycle shock identified in the case in which a government spending is government investment and the whole sample (1968Q1-2010Q1) is used. We observed that the shock increases the stock price and employment, while reducing the unemployment rate at a few quarters after it occurs. On the other hand, the effects on government investment, the price level and work hours are not significantly different from zero. The effect on the price level can be either negative or positive because the business cycle shocks here are a mixture of supply and demand shocks which have opposite effects on the price level. For the case of government consumption shocks, the IRFs are not shown but the results are summarized in Table 2. We can see that qualitatively the effects of a business cycle shock remain almost the same as the case of a government investment shock, except that the effect on employment now turns insignificant.

4.2. Effects of an unanticipated government spending shock

Next we move to our main interest in this paper: the effects of fiscal policy shocks. Figure 2 shows the effects of an unanticipated government spending shock identified in the case in which government spending is government investment and the whole sample (1968Q1-2010Q1) is used. We observe that the shock raises GDP, consumption, and investment. The results on the first two variables are similar to that of many existing studies using recursive SVAR, and are consistent with traditional Keynesian models (e.g. the IS-LM model) and some versions of New Keynesian models (e.g. the model in Gali et al., 2007), while the result on investment is consistent with a standard neoclassical model (such as a standard RBC model).[6] The shock reduces the price level rather than

[6] The mechanism in the IS-LM model is that the increase in government spending raises aggregate demand and therefore increases GDP and consumption, and it also raises the interest rate thus reduces investment. On the other hand, the mechanism in a standard RBC model which assumes forward-looking households is that the increase in government spending must be accompanied with an increase in taxes now or in the future, which in turn reduces

raises it. This is puzzling given that government spending shock is a demand shock, but it is similar to the finding of Mountford and Uhlig (2009) using data of the U.S. The effect on the stock price is insignificant, which is consistent with the finding of Fukuda (2002). Regarding the IRFs of labor market variables, the shock raises employment and reduces work hours, but does not have a significant effect on the unemployment rate. Table 2 shows that the qualitative effects noted above are almost unchanged when the estimation is done with government consumption.

4.3. Effects of government spending news shocks

Figures 3-6 display the effects of news shocks to government investment estimated using the whole sample 1968Q1-2010Q1. We can see what is meant by a "news shock" from the IRFs of government investment (*gI*). For example, in Figure 6, *gI* remains unchanged for the first four quarters and only starts rising in quarter three, but this change is anticipated by the agents in the economy at quarter 0 and thus other variables respond before *gI* actually rises. Turning to the effects of the news shocks, we observe that when the government spending shock is identified as news shocks, the responses of almost all variables, including GDP and consumption, turn insignificant (the only exception is the case of the price level). This is totally different from the case of an unanticipated shock analyzed above, and it implies that government spending is not effective in stimulating the economy in Japan.[7]

For the case of government consumption news shocks shown in Table 2, the results on GDP and consumption are the same as above. The differences are that some news shocks reduce investment, hours worked, and employment, and raise the unemployment rate. This means that government consumption policy might even do more harm than good to the Japanese economy in terms of labor market variables. The results also indicate that the timing of government spending shocks is crucial to understand their effects, as argued by Ramey (2011).

4.4. Is there a structural change in the effects of government spending around the bubble period?

It has been argued in the literature that fiscal policy in Japan has become less effective over the last few decades. One explanation for this is that there might have been some structural change in the economy in around the asset bubble period (roughly the period 1985-1991). Another possible explanation is that the accumulated government debt could have played some role in affecting the effects of fiscal policy.[8]

Taking into account the possibility of this structural change, some authors divide the

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households permanent income, decreasing their consumption and increasing their labor supply and thus GDP (the so called *wealth effect*). The increase in labor supply raises the marginal product of capital and thus increases investment of firms.

[7] Since theoretical implications regarding a news shock to government spending are not yet well established (at least to the best knowledge of the author), we cannot say much about the likely underlying mechanism here. Building a theoretical model to explain the effects of a news shock to government spending would be an interesting future task.

[8] According to the data of the Ministry of Finance, the public debt-nominal GDP ratio in Japan was about 0.51 in 1980, 0.67 in 1990, 1.35 in 2000, 1.75 in 2005, and in 2012 it is 2.19.

sample into subsamples with the timing of structural change being around the year 1987. Using a Bayesian approach, Takeuchi (2011) endogenously estimates this timing of structural change and finds that it is around the year 1992. Following her finding, we divide the sample into two subsamples with the sample periods 1968Q1-1992Q4 (call this the pre-bubble period) and 1993Q1-2010Q1 (call this the post-bubble period), respectively, and reestimate the SVAR model to see if there is any difference in the effects of government spending between the two. The results using the two subsamples are shown in Figures 7-8 and summarized in Tables 3-4.

Regarding the effects of an unanticipated government investment shock, we can see from Figure 7 that the qualitative effects on GDP and consumption are robust across the two subsamples: both variables increase in response to an increase in government investment. This is also observed for the case of government consumption, as shown in Table 3. These results are the same as those obtained when the whole sample is used, and they are consistent with traditional Keynesian models and some New Keynesian models as well, as noted above. The effect on investment, however, is different between the two subsamples: investment increases in the pre-bubble subsample and decreases or shows somewhat complicated fluctuations in the post-bubble subsample. Moreover, in the pre-bubble subsample an increase in government spending can create employment and reduce the unemployment rate, but in the post-bubble subsample the results are mixed. The puzzling negative effect on the price level remains in the two subsamples.

Turning to the effects of news shocks, we observe a more contrast picture between the two subsamples. In the pre-bubble subsample, government investment news shocks with short forecast horizons (e.g. one quarter ahead) raise GDP and consumption as shown in the upper panel of Figure 8 and Table 4. But these effects turn insignificant when the news shocks are with longer forecast horizons (e.g. two to four quarters ahead). In the post-bubble subsample, a three-quarter ahead government investment news shock reduces GDP, consumption, investment, and employment, and raises the unemployment rate as shown in the lower panel of Figure 8 and Table 4. These results are quite striking, and they imply that, given the fact that government spending shocks are more likely anticipated shocks than unanticipated ones, in the post-bubble period, active government spending policy not only could not stimulate the Japanese economy but even worsened it.

5. Concluding Remarks

In this paper we adopt a new method that is able to identify government spending shocks as both unanticipated and anticipated (i.e. news) shocks, and in addition, the method also allows for a structure of multiple news shocks with different forecast horizons. We use the method to study the macroeconomic effects of government spending in Japan. Our main findings are as follows. First, an unanticipated increase in government spending raises both GDP and consumptions; this finding is in

line with many previous studies, and it lends support to traditional Keynesian models and some New Keynesian models. Second, there is a clear difference between an unanticipated government spending shock and an anticipated one: in the whole sample period (1968Q1-2010Q1), the former significantly increases GDP, consumption, and employment, while the latter does not. We also find that the effectiveness of government spending policy is very different between the pre-bubble period (1968Q1-1992Q4) and the post-bubble period (1993Q1-2010Q1): an anticipated increase in government spending can stimulate the economy in terms of GDP and consumption in the former period, while in the latter period it cannot do so but it even aggravates the business cycle fluctuations at some horizons.

There are several more tasks that are worth doing. So far we have focused on the qualitative effects, but it is also important to analyze the quantitative effects of government spending shocks (i.e. the government spending multiplier), and to conduct variance decomposition to compare the roles played by different types of government spending shocks. We have not yet analyzed the effects of tax policy. Given that tax policy has also been actively used in Japan, examining the effects of tax policy is also important. In addition, it might be interesting to build a theoretical model to explain the effects of government spending news shocks and to justify the findings in this paper. A related topic that emerges from the analysis results of the paper is why fiscal policy has become less effective in Japan in the post-bubble period. I plan to investigate further along these lines.

References

Bayoumi, T. (2001), "The morning after: explaining the slowdown in Japanese growth in the 1990s, " Journal of International Economics 53 (2), 241–259.

Beaudry, P. and Portier, F. (2006), "Stock prices, news and economic fluctuations," American Economic Review, 96, 1293-1307.

Blanchard, O. and R. Perotti (2002), "An empirical characterization of the dynamic effects of changes in government spending and taxes on output," Quarterly Journal of Economics 117 (4), 1329–1368.

Burnside, C., M. Eichenbaum, and J. D.M. Fisher (2004) , "Fiscal shocks and their consequences," Journal of Economic Theory 115, pp. 89-117.

Edelberg, W., M. Eichenbaum, and J. D.M. Fisher (1999), "Understanding the effects of a shock to government purchases," Review of Economic Dynamics, 2, 166-206.

ESRI (The Economic and Social Research Institute, Cabinet Office, Government of Japan) (2010), Zaisei-seisaku to shakai-hosho (Fiscal policy and Social security in Japan), edited by T. Ihori, Keio University Press Inc. An electronic version available from: http://www.esri.go.jp/jp/others/kanko_sbubble/analysis_05.html.

Fujii, T., K. Hiraga, and M. Kozuka (2013), “Effects of Public Investment on Sectoral Private Investment : A Factor Augmented VAR Approach,” Journal of the Japanese and International Economies 27, 35-47

Fukuda, S. (2002), “Naze nihon no zaisei akaji ha zoudai shitaka? 90-nendai no ‘‘news’’ no kanten kara,” Financial Review 63, 83–106.

Fukuda, S. and S. Kei (2002), “Nihon ni okeru zaisei seisaku no impact: 1990 nendai no event study,” Kinyu Kenkyu 21 (3), 55–101.

Galí, Jordi, J. D. López-Salido, and J. Vallés (2007), “Understanding the effects of government spending on consumption,” Journal of the European Economic Association, 5, 227-270.

Hamilton, J. D. (1994) , “Time series analysis,” Princeton: Princeton University Press.

Ihori, T., Nakazato, T., and Kawade, M. (2003), “Japan’s fiscal policies in the 1990s,” The World Economy 26 (3), 325–338.

Ihori, T. and Nakamoto, A. (2005), “Japan’s fiscal policy and fiscal reconstruction,” International Economics and Economic Policy 2 (2–3), 153–172.

Kobayashi, S. and Komaki, Y. (2003), “Zaisei no hi-Keynes kouka ni tsuite,” Kokumin-Keizai 166, 127–147.

Leeper, E. M., T. B. Walker, and S. S.Yang (2010), “Government investment and fiscal stimulus,” Journal of Monetary Economics, 57, 1000–1012.

Mountford, A. and H. Uhlig (2009), “What are the effects of fiscal policy shocks?,” Journal of Applied Econometrics, 24, 960-992.

Miyazaki, T. (2009), “Public investment and business cycles: The case of Japan,” Journal of Asian Economics 20, 419–426.

Miyazaki, T. (2010), “The effects of fiscal policy in the 1990s in Japan: A VAR analysis with event studies,” Japan and the World Economy 22, 80–87.

Miyazawa, K. and K. Nutahara (2013), “Dynamic Effects of Fiscal Policy in Japan: Evidence from a Structural VAR with Sign Restrictions,” The Canon Institute for Global Studies (CIGS) Working Paper Series No. 13-006(E). Available from: http://www.canon-igs.org/research_papers/131112_nutahara_WP006E.pdf

Morita, H. (2012), “Expansionary Effect of an Anticipated Fiscal Policy on Consumption in Japan,” Global COE Hi-Stat Discussion Paper Series 219.

Nakazato, T. (2002), “Zaisei seisaku no hi-Keynese kouka wo meguru ronten seiri ,” Keizai Bunseki 163, 71–90.

Perotti, R., (2005), “Estimating the effects of fiscal policy in OECD countries,” CEPR Discussion Paper 4842.

Perotti, R. (2008), “In Search of the transmission mechanism of fiscal policy,” in NBER Macroeconomics Annual 2007, Volume 22 (2008), University of Chicago Press.

Ramey, V. A. (2011), “Identifying government spending shocks: It’s all in the timing,” Quarterly Journal of Economics, 126, 1-50.

Ramey, V. A. and M. Shapiro (1998), “Costly capital reallocation and the effects of government spending,” Carnegie Rochester Conference on Public Policy.

Takeuchi, H. (2011), “Kokyo toshi wa henka shita ka?: Bayes suitei wo mochiita Markov-henkan VAR model ni yoru kensho,” mimeo. Previous version presented at a seminar in Hitotsubashi University, 2009.

Ravn, M., S. Schmitt-Grohe, and M. Uribe (2012), “Consumption, government spending, and the real exchange rate,” Journal of Monetary Economics, 59, 215–234.

Uhlig, H. (2005), “What are the effects of monetary policy on output? Results from an agnostic identification procedure,” Journal of Monetary Economies, 52, 381-419.

Vu, T. K. (2011), “Macroeconomic effects of government spending in Japan,” The Journal of the Faculty of Economics, Seikei University, 42-2, 117-133.

Watanabe, K.,Watanabe, T., Watanabe, T. (2001), “Tax policy and consumer spending: Evidence from Japanese fiscal experiments,” Journal of International Economics, 53 (2), 261–281.

Table 1: The list of variables in the VAR and sign restrictions imposed

Endogenous variables in the VAR	Business cycle shock	Gov. spending news shocks				Gov. spending surprise shock
		4-quarter-ahead news	3-quarter-ahead news	2-quarter-ahead news	1-quarter-ahead news	
Gov. spending (*gC* or *gI*)		0 0≤t≤3 + 4≤t≤7	0 0≤t≤2 + 3≤t≤6	0 t=0,1 + 2≤t≤5	0 t=0 + 1≤t≤4	+ 0≤t≤3
Tax revenue (*T*)	+ 0≤t≤3					
GDP (*Y*)	+ 0≤t≤3					
Consumption (*C*)	+ 0≤t≤3					
Investment (*I*)	+ 0≤t≤3					
Stock price (*SP*)						
Price level (*P*)						
Employment (*Emp*)						
Work hours (*Hours*)						
Unemployment rate (*U rate*)						

Notes: A "+" means that the variable increases and 0 means that the variable does not change in period *t* (*t*=0 is the quarter in which the shock occurs). A blanked cell indicates that no sign restriction is imposed and the corresponding IRF is leaved agnostic.

Table 2: A summary of effects of shocks (gov. spending: *gC*, sample period: 1968Q1-2010Q1)

Endogenous variables in the VAR	Business cycle shock	Gov. consumption news shocks				Gov. cons. surprise shock
		4-quarter-ahead news	3- quarter-ahead news	2-quarter-ahead news	1-quarter-ahead news	
Gov. cons. (*gC*)		0 $0\le t\le 3$ + $4\le t\le 7$	0 $0\le t\le 2$ + $3\le t\le 6$	0 $t=0,1$ + $2\le t\le 5$	0 $t=0$ + $1\le t\le 4$	+ $0\le t\le 3$
Tax revenue (*T*)	+ $0\le t\le 3$					−
GDP (*Y*)	+ $0\le t\le 3$					+
Consumption (*C*)	+ $0\le t\le 3$					+
Investment (*I*)	+ $0\le t\le 3$			−		+
Stock price (*SP*)	+					
Price level (*P*)		+			−	−
Employment (*Emp*)		−				+
Work hours (*Hours*)			−			−
Unemployment rate (*U rate*)	−	+	+		+	

Notes: A shaded cell indicates that sign restrictions are imposed on the IRF (see the notes in Table 1. for more details). A non-shaded cell which are blanked indicates that the IRF are not significantly different from zero..

Table 3: A summary of effects of gov. consumption shocks in the pre- and post-bubble periods

Sample period: 1968Q1-1992Q4

Endogenous variables in the VAR	Business cycle shock	Gov. consumption news shocks				Gov. con. surprise shock
		4-quarter-ahead news	3- quarter-ahead news	2-quarter-ahead news	1-quarter-ahead news	
Gov. cons. (*gC*)	+	0 0≤t≤3 + 4≤t≤7	0 0≤t≤2 + 3≤t≤6	0 t=0,1 + 2≤t≤5	0 t=0 + 1≤t≤4	+ 0≤t≤3
Tax revenue (*T*)	+ 0≤t≤3			+	+	−/+
GDP (*Y*)	+ 0≤t≤3			+	+	+
Consumption (*C*)	+ 0≤t≤3			+	+	+
Investment (*I*)	+ 0≤t≤3			+	+	+
Stock price (*SP*)					+	+
Price level (*P*)	−	+		−	−	−
Employment (*Emp*)	+				+	+
Work hours (*Hours*)	−				+	−/+/−
Unemployment rate (*U rate*)	−				−	−

Sample period: 1993Q1-2010Q1

Gov. cons. (*gC*)	−	0 0≤t≤3 + 4≤t≤7	0 0≤t≤2 + 3≤t≤6	0 t=0,1 + 2≤t≤5	0 t=0 + 1≤t≤4	+ 0≤t≤3
Tax revenue (*T*)	+ 0≤t≤3		−			+/−
GDP (*Y*)	+ 0≤t≤3			−		+
Consumption (*C*)	+ 0≤t≤3	−	−	−		+
Investment (*I*)	+ 0≤t≤3		−		−	−
Stock price (*SP*)	+		−			+/−
Price level (*P*)	−/+	−	−	−		−
Employment (*Emp*)	+	−	−	−	−	+/−
Work hours (*Hours*)					−	−
Unemployment rate (*U rate*)	−	−				−/+

Notes: See the notes in Table 2.

Table 4: A summary of effects of gov. investment shocks in the pre- and post-bubble periods

Sample period: 1968Q1-1992Q4

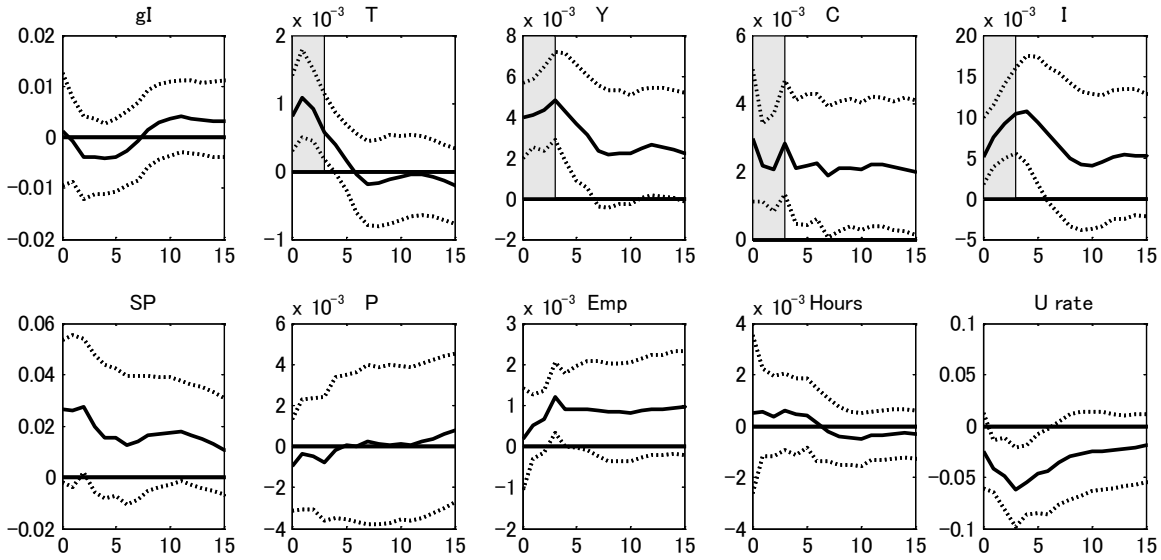
Endogenous variables in the VAR	Business cycle shock	Gov. investment news shocks				Gov. inv. surprise shock
		4-quarter-ahead news	3- quarter-ahead news	2-quarter-ahead news	1-quarter-ahead news	
Gov. investment (*gI*)		0 0≤t≤3 + 4≤t≤7	0 0≤t≤2 + 3≤t≤6	0 t=0,1 + 2≤t≤5	0 t=0 + 1≤t≤4	+ 0≤t≤3
Tax revenue (*T*)	+ 0≤t≤3				+	+
GDP (*Y*)	+ 0≤t≤3				+	+
Consumption (*C*)	+ 0≤t≤3				+	+
Investment (*I*)	+ 0≤t≤3	+				+
Stock price (*SP*)	+				+	−
Price level (*P*)	−	−			−	−/+
Employment (*Emp*)	+					+
Work hours (*Hours*)	+					−
Unemployment rate (*U rate*)	−	−				−

Sample period: 1993Q1-2010Q1

Gov. investment (*gI*)	−	0 0≤t≤3 + 4≤t≤7	0 0≤t≤2 + 3≤t≤6	0 t=0,1 + 2≤t≤5	0 t=0 + 1≤t≤4	+ 0≤t≤3
Tax revenue (*T*)	+ 0≤t≤3					+
GDP (*Y*)	+ 0≤t≤3	−	−	−		+
Consumption (*C*)	+ 0≤t≤3	−				+
Investment (*I*)	+ 0≤t≤3	−/+	−	−		−/+/−
Stock price (*SP*)	+	−	−	−		+
Price level (*P*)	−/+		−			−/+/−/+
Employment (*Emp*)	+			−		+
Work hours (*Hours*)	−		+	+		+
Unemployment rate (*U rate*)	−		−	+		−/+

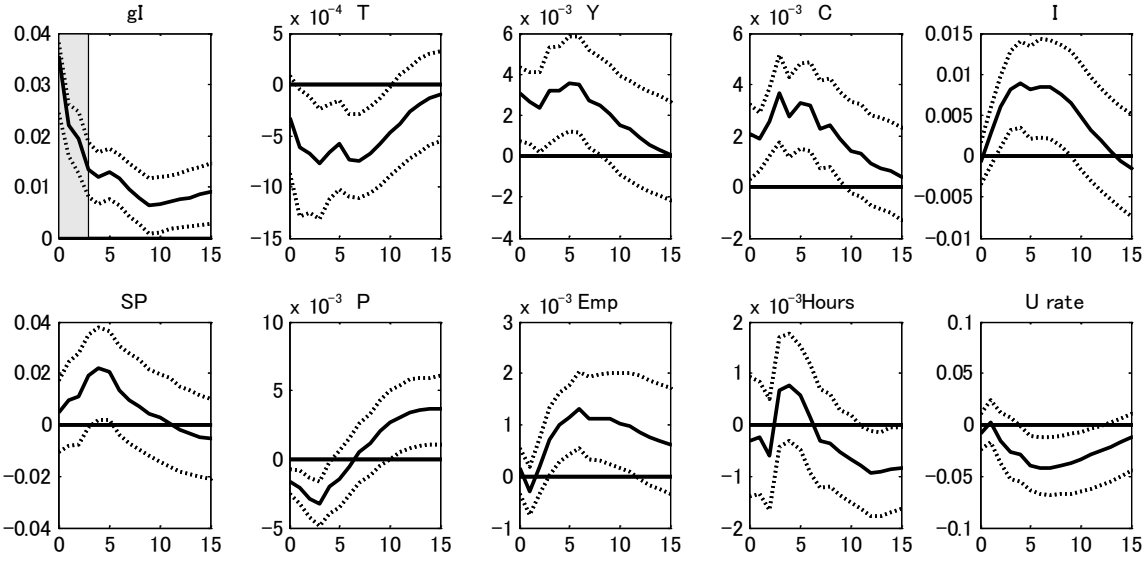
Notes: See the notes in Table 2.

Figure 1: Effects of a business cycle shock (gov. spending: *gI*, sample period: 1968Q1-2010Q1)



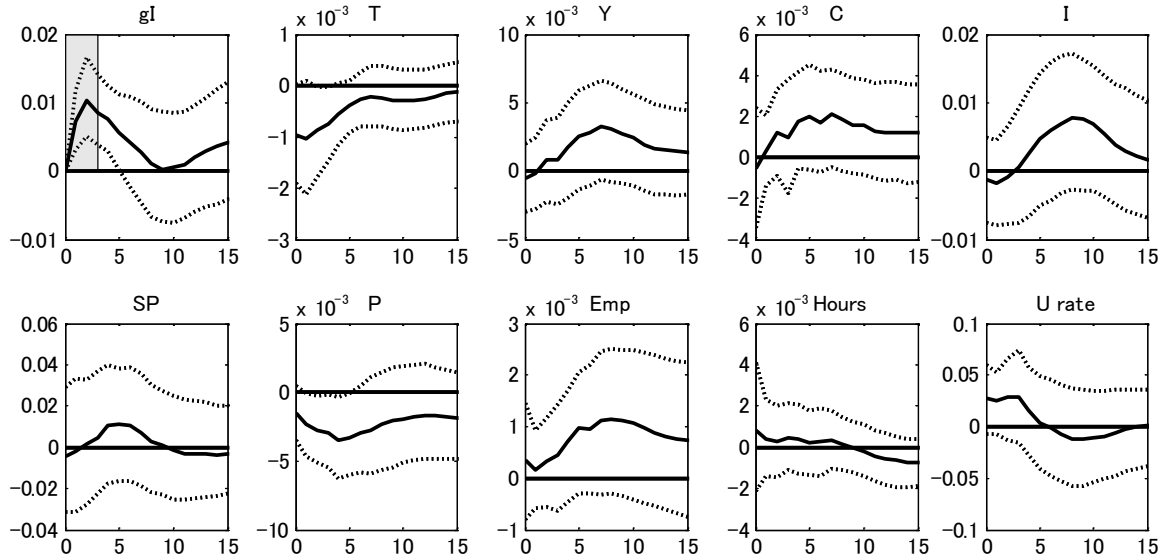
Notes: Numbers in the horizontal axis are quarters after the shock, while those in the vertical axis are percentage changes in the corresponding variables. Dashed lines are 16th and 84th quantiles, while solid lines are 50th quantiles. Shaded areas indicate the time intervals in which sign restrictions are imposed. Variable notations of are the same as those in the first column of Table 1.

Figure 2: Effects of an unanticipated gov. investment shock (sample period: 1968Q1-2010Q1)



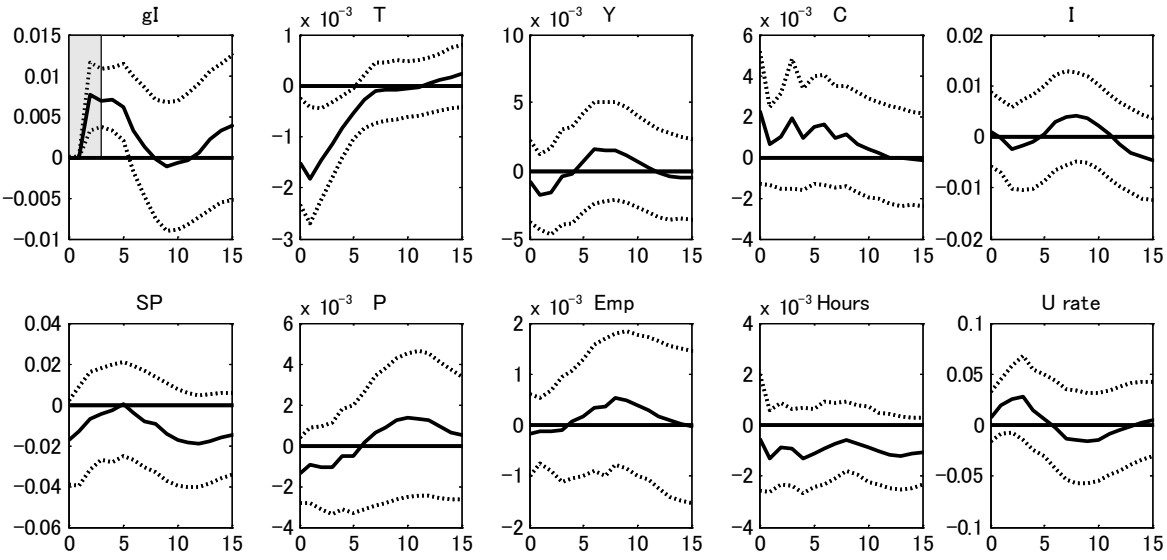
Notes: See the notes in Figure 1.

Figure 3: Effects of 1-quarter ahead gov. investment news shock (sample period: 1968Q1-2010Q1)



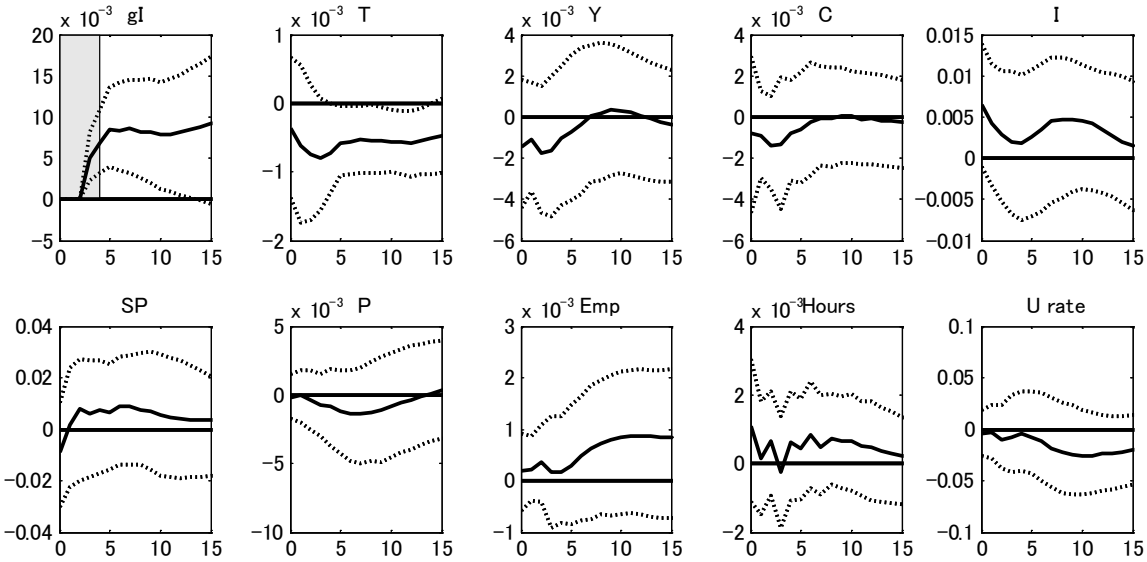
Notes: See the notes in Figure 1.

Figure 4: Effects of 2-quarter ahead gov. investment news shock (sample period: 1968Q1-2010Q1)



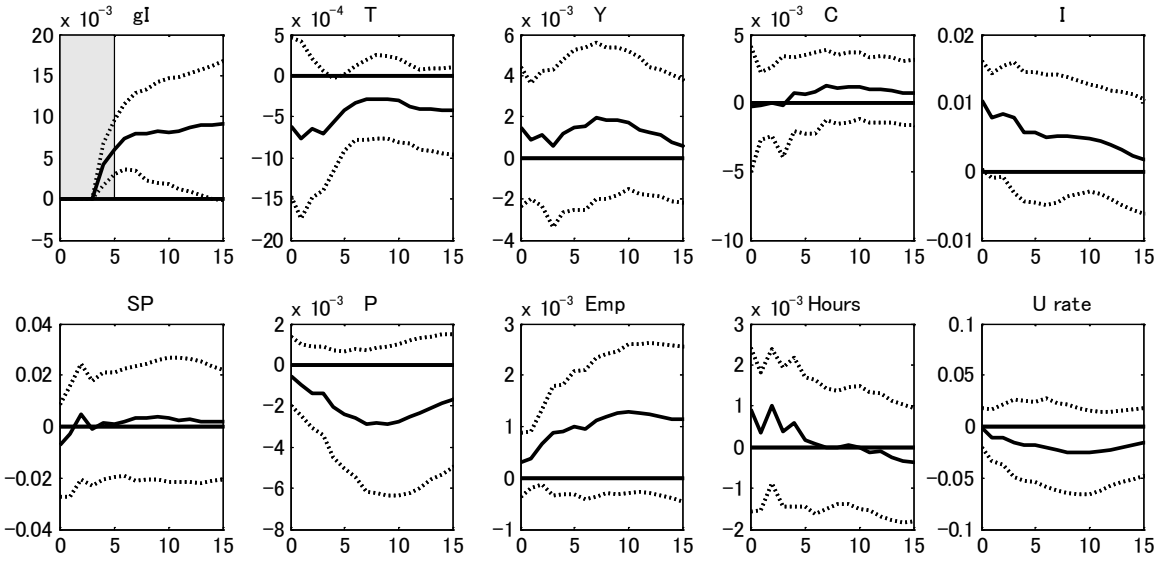
Notes: See the notes in Figure 1.

Figure 5: Effects of 3-quarter ahead gov. investment news shock (sample period: 1968Q1-2010Q1)



Notes: See the notes in Figure 1.

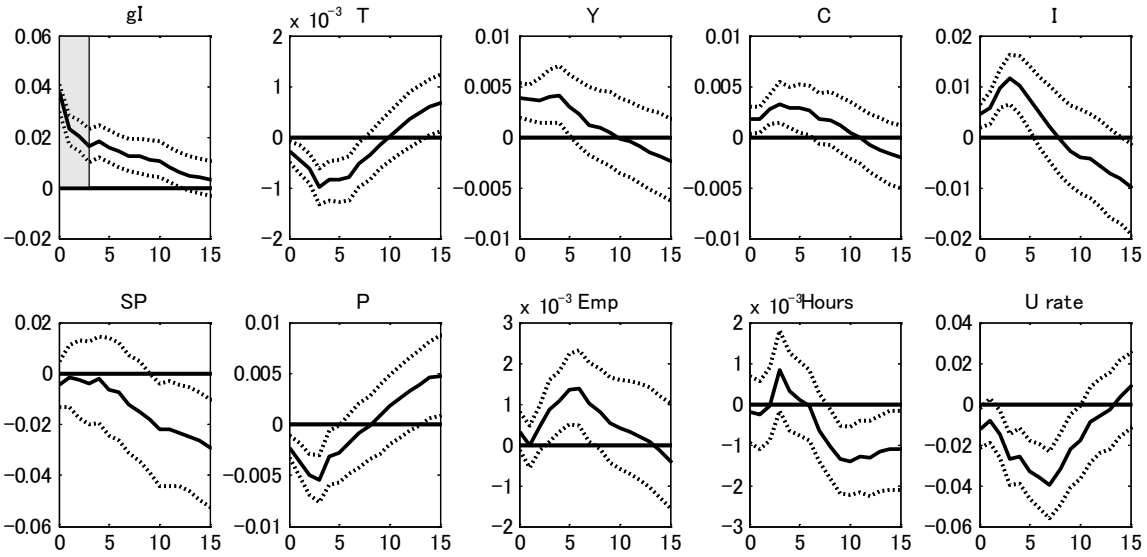
Figure 6: Effects of 4-quarter ahead gov. investment news shock (sample period: 1968Q1-2010Q1)



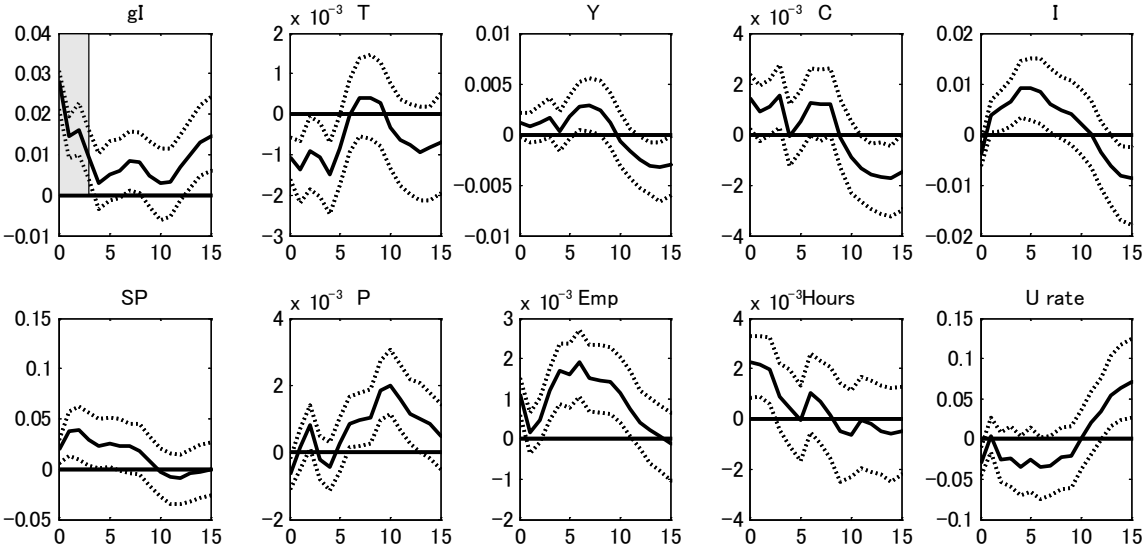
Notes: See the notes in Figure 1.

Figure 7: Effects of an unanticipated gov. investment shock in the pre- and post-bubble periods

Sample period: 1968Q1-1992Q4



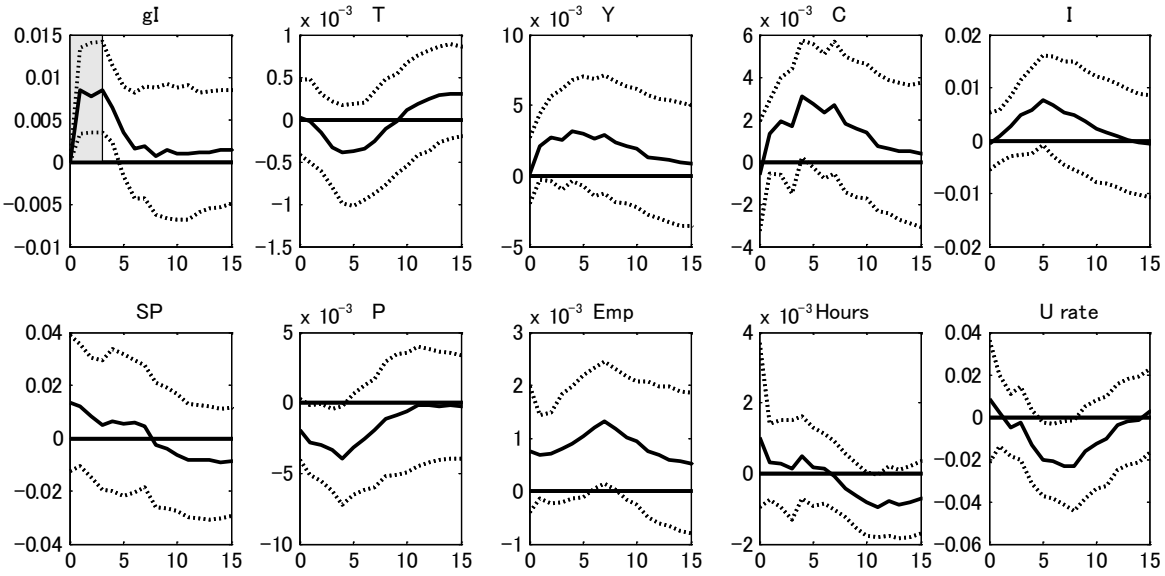
Sample period: 1993Q1-2010Q1



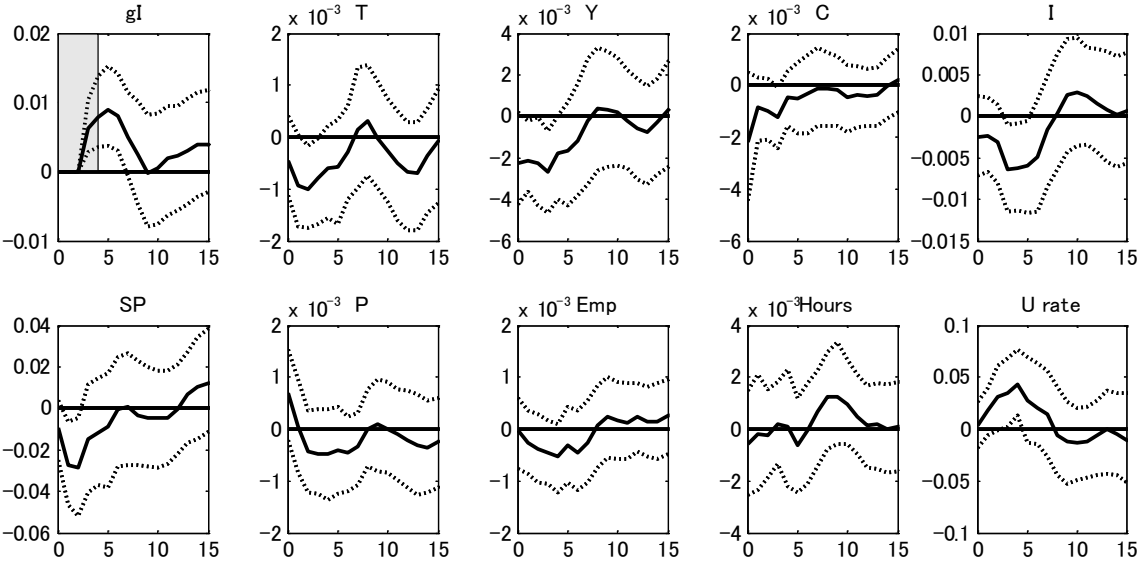
Notes: See the notes in Figure 1.

Figure 8: Effects of gov. investment news shock in the pre- and post-bubble periods

Sample period: 1968Q1-1992Q4. News shock: one quarter ahead.



Sample period: 1993Q1-2010Q1. News shock: three quarter ahead.



Notes: See the notes in Figure 1.