Fiscal Policy Effectiveness in Japan : Experiences from Recent Policies

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Abstract

This paper examines the effects of Japanese fiscal policy after the 2008 global financial crisis so called Lehman's fall. A mixed vector autoregression (VAR)/event study approach is used for this purpose. We especially focus on the effects of stimulus packages related to environmental-related policy. The empirical results show that the program of eco-car tax break and eco-car subsidy was useful to stimulate the production of automobile industries.

1. Introduction

In the wake of the 2008 global financial crisis, governments in many developed countries conducted economic stimulus packages. Some countries like the U.S. included environmental-related policies in the package. Such "green" initiatives play a significant role in powering economic recovery as well as environmental protection.

On the other hand, the Japanese government also implemented environmental-related

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stimulus packages after the crisis. For example, the subsidies for the purchase of energy conserving home appliances (the so-called Eco-point) was implemented from May 2009 to March 2010. This is the subsidy plan allowing refundable points when purchasing energy efficient electronic appliances. Further, the program of eco-car tax break and eco-car subsidy were done for the periods of April 2009 to February 2011.[1] Under these programs, if a consumer buys a new car that emits less CO2 or has low-fuel consumption such as gas-electric hybrid car, the car tax will be lowered and subsidized a money.[2]

However, to the author's knowledge, there has been no research which examines the size and persistence of fiscal policy in Japan after the global financial crisis by drawing attention on these environmental-related stimulus packages. Morita (2012), Rafiq (2012), and Vu (2012) examine the size and persistence of the Japanese fiscal policy by including the periods of the global financial crisis through Vector Autoregression (VAR) model. However, these paper do not focus on the environmental-related policies. On the other hand, a recent paper Alhulail and Takeuchi (2014) by examines the effects of

[1] The effective periods of eco-car tax break and eco-car subsidy program were extended after February 2011. However, since this extension was decided by the coalition government of the Democratic Party of Japan and People's New Party, it seems to be different from the policy implementation as one of the stimulus packages mentioned above. Therefore, we do not include the extended periods of these policies when we construct a dummy variable to implement estimations by using a narrative approach.
[2] For the fiscal policy response after the global financial crisis in Japan, please see Iwaisako (2010) and Asako (2012). Moreover, for the details of the program of eco-car tax break and eco-car subsidy, please see Alhulail and Takeuchi (2014).

eco-car tax break and eco-car subsidy on the sales of ten eco-friendly vehicles in Japan. However, Alhulail and Takeuchi (2014) do not examine the size and persistency of the policy effects.

The purpose of this research is to examine the effects of fiscal policy after the 2008 global financial crisis in Japan. Especially, we give an eye on two environmental-related stimulus packages such as the subsidies for the purchase of energy conserving home appliances (hereafter the eco-point) and the program of eco-car tax break and eco-car subsidy. Here we would like to use the "narrative approach." This approach enables us to examine the effects of policy using a time series method in conjunction with an event study. To capture policy changes, the dummy variables are constructed based on the announcement or implementation of the monetary and fiscal policy. The advantage of this approach is to consider not only the size and persistence of each policy change but also the effects of different fiscal policies in different periods after the devastating financial crisis.

Our empirical results show that the program of eco-car tax break and eco-car subsidy had positive and significant effects on the production of automobile industries. On the other hand, however, the effect of eco-point on electric appliance production is estimated to be insignificant. Section 2 explains how dummy variables are used for the

identification of fiscal shocks when we implement a narrative approach. Section 3 provides the empirical results. Section 4 concludes the paper.

2. The Dummy Variables for Fiscal Shocks

We discuss the dummy variables used to identify fiscal policy shocks on the basis of official documents.

Incidentally, note that we face an identification problem in selecting the dummy variables. If we allow the dummy associated with each major tax and spending shock to have its own distributed lag effect, we cannot identify the effects of each individual fiscal policy because they are too close to each other in terms of the time periods in which they were announced and/or implemented. Therefore, the value of the dummy variable for a policy is changed from 0 to 1 either in the month in which the policy was implemented, and it continues to take a value of 1 for the time periods in which the policy was in effect, as in the case of Blanchard and Perotti (2002) and Miyazaki (2010).

Considering these, we make the dummy variables that capture the effects of environmental-related policies. To do so, we clarify the initial and final period of the implementation of the environmental-related policies. The first dummy variable is “Eco

Point" that specifies the implementation periods of the eco-point. The other one is "Eco Car" that show the periods that program of eco-car tax break and eco-car subsidy is effective. "Eco -Point" equal to 1 from May 2009 to March 2010 and "Eco-Car" equal to 1 from April 2009 to February 2011.

3. Empirical Results

3.1. Data Sets

Throughout the paper, monthly data are used. Since the sample periods after the 2008 global financial crisis are very short, it is difficult to set a certain level of lag length when we use quarterly data. Therefore, we use the monthly data for estimation as in the case of Miyazaki (2009) and Kozuka et al.(2012).

The variables that captures the production are y_t^{El}, which denotes indicator of electric appliance production (minsei-yo denki kikai, in Japanese), and y_t^{Auto}, which indicates the one of automobile production (jou-you sha, in Japanese) (2010=100).[3] y_t^{El} covers the production of air conditioner and refrigerator, which were targeted by the eco-point.[4]

[3] To capture the effects of each policy, it is also assumed that we focus on the production of the items which are directly affected by the policy such as gas-electric hybrid car, air conditioner, and refrigerator, etc. However, the data provided by METI cannot be divided into detailed items.

[4] Incidentally, the eco-point also targeted the consumption of the liquid crystal television. This is captured by the production of electric machine for home use (minsei-yo denshi kikai, in Japanese).

These data are downloaded from the homepage of the Ministry of Economy, Trade and Industry (METI) at http://www.meti.go.jp/statistics/. Here we focus on the individual industries that are assumed to be directly related to each policy. This is why as long as these subsidies or tax breaks are assumed to intend the increase in production of each industries, it would be favorable to examine the effects on each industries.[5] Therefore, as we see later, we run a VAR model by the combination of each policy dummy and the index of production of each industries.[6]

Both y_t^{El} and y_t^{Auto} are seasonally adjusted using the X12-ARIMA method. The sample period is from January 1980 to December 2012. We take the logarithm for y_t^{El} and y_t^{Auto} .

3.2. Outline of VAR Estimation

The variables grouped under "Case 1" are Eco point and $\log y_t^{El}$. "Case 2" is the case that consists of Eco Car and $\log y_t^{Auto}$. In order to estimate the effects on individual industries, we estimate two VAR groups.

Throughout the analysis, we follow the recent convention seen in the VAR literature

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However, the item targeted by the eco-point of this data is limited to television. Since y_t^{El} covers the broader items targeted by the policy compared to the production of electric machine for home use, we use y_t^{El} .

[5] Harada and Kageyama (2011) and Hayo and Ohno (2011) also examine the effects on the production of each industry by using VAR model.

[6] We estimate our VAR model by using the index of industrial productions instead of y_t^{El} or y_t^{Auto} . However, the impulse response functions are not estimated to be significant.

and use levels, rather than the first or second differences, for all series. As Hamilton (1994) argues, a levels specification yields consistent estimates regardless of whether or not cointegration exists, whereas a difference specification is inconsistent if some variables are cointegrated. The lag length is set as twelve in all cases, according to the likelihood ratio test in Sims (1980).

Now we can set up the structural VAR model $B(L)\Delta X_t = \varepsilon_t$, where $\Delta X_t = \left(D_i, \log y_t^j\right)'$, $B(L) = B_0 - B_1 L - \ldots - B_p L^p$ is a pth-order lag polynomial of two-by-two coefficient matrix $B_k\left(k = 0,1,\ldots, p\right)$, and $\varepsilon_t = \left(\varepsilon_{D_i}, \varepsilon_{y_t^j}\right)$ is vector of serially uncorrelated structural disturbances with a mean zero and a covariance matrix Σ_ε. Here D_i is a dummy variable that specify the policy change ("Eco Point" or "Eco Car") and $\log y_t^j$ is the logarithm of index of productions ($\log y_t^{El}$ or $\log y_t^{Auto}$).

Structural disturbances are assumed to be orthogonalized, and the recursive identification procedure implies that B_0 in the structural form becomes lower triangular and the ordering in the VAR determines the degree of exogeneity of the variables. Here we treat the policy dummy as most exogenous. It takes policy makers and the legislature more than a month to learn about shocks to economic activity, and it is very difficult to make discretionary adjustments to fiscal policy within a month. Therefore, there may be no feedback from the current economic variables to fiscal

expansion.[7] The treatment may be justified from this argument.

3.3. Estimation Results

Figures 1 and 2 shows the results of Case1 and Case 2, respectively. The solid line indicates the estimated response and the dotted lines represent the 95% confidence intervals.

Figure 1 tells us that the effect of the eco-point is not estimated to be statistically significant. On the other hand, the response of the program of eco-car tax break and eco-car subsidy on automobile industries is estimated to be positive and significant. This implies that at least the program of eco-car tax break and eco-car subsidy was effective to stimulate the production of automobile industries. However, the magnitude of the effect is very small, and this positive effect becomes insignificant after four months from its implementation.[8]

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[7] This is followed by the argument shown in Blanchard and Perotti (2002) and Miyazaki (2009).

[8] To check the robustness of the results, we conduct some another exercise by adding some policy variables or changing the specifications. First, we reestimate the model by changing the ordering such as $\Delta X_t = \left(\log\ y_t^j, D_i\right)'$. Second, we add the real effective exchange rate (e_t) to the system. This is why the foreign factor strongly affect the production of these two industries. In this specification, the ordering in the VAR is $\Delta X_t = \left(D_i, \log\ y_t^j, \log\ e_t\right)'$. Third, we reestimate the model by adding two variables that capture the monetary policy: the call rate (r_t) and money stock (M_t). In this case, we limit the sample periods after January 1986 because the call rate can be obtained after this month. The ordering in the VAR is $\Delta X_t = \left(D_i, r_t, \log\ M_t, \log\ y_t^j\right)'$. Finally, we limit the sample periods after January 1990 because we confirm a structural change after this month by following Christiano (1986) and Cecchetti and Karras (1994). In spite of these additional test, the results are basically the same shown in Figure 1 and 2. Detailed results can be obtained from the author upon the request.

4. Conclusion

This paper examine the effects of fiscal policy after the 2008 global financial crisis in Japan. Especially, we focus on two environmental-related stimulus packages: the eco-point and the program of eco-car tax break and eco-car subsidy. The estimation results of impulse response functions show that while the eco-point did not positive and significant effects, the program of eco-car tax break and eco-car subsidy has a positive impact on the production of automobile industries. Incidentally, both packages were implemented by announcing the termination. Thanks to this, the automobile production might be stimulated by reflecting the consumer's incentive to spend before the end of the eco-car tax break and eco-car subsidy. However, the same phenomenon might not be applicable to the electric appliance production.

The program of eco-car tax break or eco-car subsidy is planned to attain both economic stimulus and the reduction of carbon-dioxide from a car. This policy may be surely effective for carbon-dioxide reduce in that the number of gas-electric hybrid automobiles increased after the implementation of the program as shown in Figure 3. This also sustains that the production of gas-electric hybrid automobiles surely increased thanks

to the program, and the production of the automobile industries might also increase in accordance with this increase. However, according to our estimation results, the effect was not so large, and soon becomes insignificant. Please pay attention that in terms of the evaluation of Japanese discretionary fiscal policy up after the global financial crisis, even a policy with a positive effect has generated limited benefits for the economy.

Incidentally, we do not examine the effects on the consumption or investment. To examine the effects precisely, we should also pay attention pay attention to the individual items of private demand. Further, more developed techniques such as Factor-Augmented VAR model as in Fujii et al. (2013) could be employed for investigation. These points should be done in future research.

References

Alhulail, I., Takeuchi, K., 2014. Effects of tax incentives of eco-friendly vehicles: Evidence from Japan. Discussion Paper No. 1412, Graduate School of Economics, Kobe University.

Asako, K., 2012. Studies on the Japanese business cycle. Maruzen Publishing, Tokyo, Japan.

Blanchard, O., Perotti, R., 2002. An empirical characterization of the dynamic effects of changes in government spending and taxes on output. Quarterly Journal of Economics117 (4), 1329-1368.

Cecchetti, S. G., & Karras, G. (1994). Sources of output fluctuations during the interwar period: Further evidence on the causes of great depression. *Review of Economics and Statistics* 76, 80-102.

Christiano, L. J. (1986). Money and the U.S. economy in the 1980s: A break from the past? *Federal Reserve Bank of Minneapolis Quarterly Review* Summer, 2-13.

Fujii, T., M. Kozuka, K. Hiraga., 2013. Effects of public investment on sectoral private investment: A factor augmented VAR approach. Journal of the Japanese and International Economies 27, pp. 35-47.

Hamilton, J. D., 1994. Time series analysis. Princeton University Press, Princeton.

Harada, N., Kageyama, N., 2011. Bankruptcy dynamics in Japan. Japan and the World Economy 23 (2), pp. 119-128.

Hayo, B., Ohno, H., 2011. Industry effects of monetary policy demand shocks in Japan in the period of quantitative easing. Working Paper, Faculty of Economics, Toyo University.

Iwaisako, T., 2010. Japanese macroeconomic policy management after the global financial crisis. Public Policy Review Vol.6 (5), pp. 795-806.

Kozuka, M., Hiraga, K., Fujii, T., 2012. Zaisei seisaku no koka ni tsuite: Getsuji data to Data-Rich na hensu wo mochiita kensho (On the effects of fiscal policy: The examination by using monthly data and data-rich variables). Paper presented at the 69th congress of the Japan Institute of Public Finance.

Miyazaki, T., 2009. Public investment and business cycles: The case of Japan. Journal of Asian Economics 20 (4), pp.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 (2), pp.80-87.

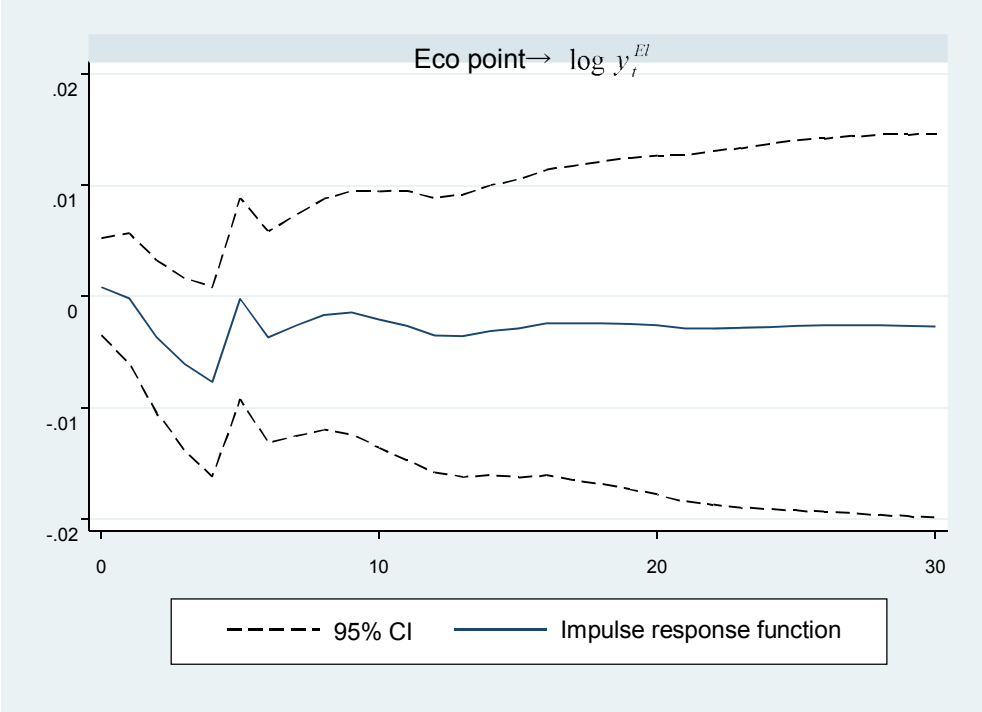
Morita, Y., 2012. Expansionary effect of an anticipated fiscal policy on consumption in Japan. Global COE Hi-Stat Discussion Paper Series 219.

Rafiq, S., 2012. Is discretionary fiscal policy in Japan effective? B.E. Journal of Macreconomics 12 (1).

Sims, A. C., 1980. Macroeconomics and reality. Econometrica 48 (1), 1-48.

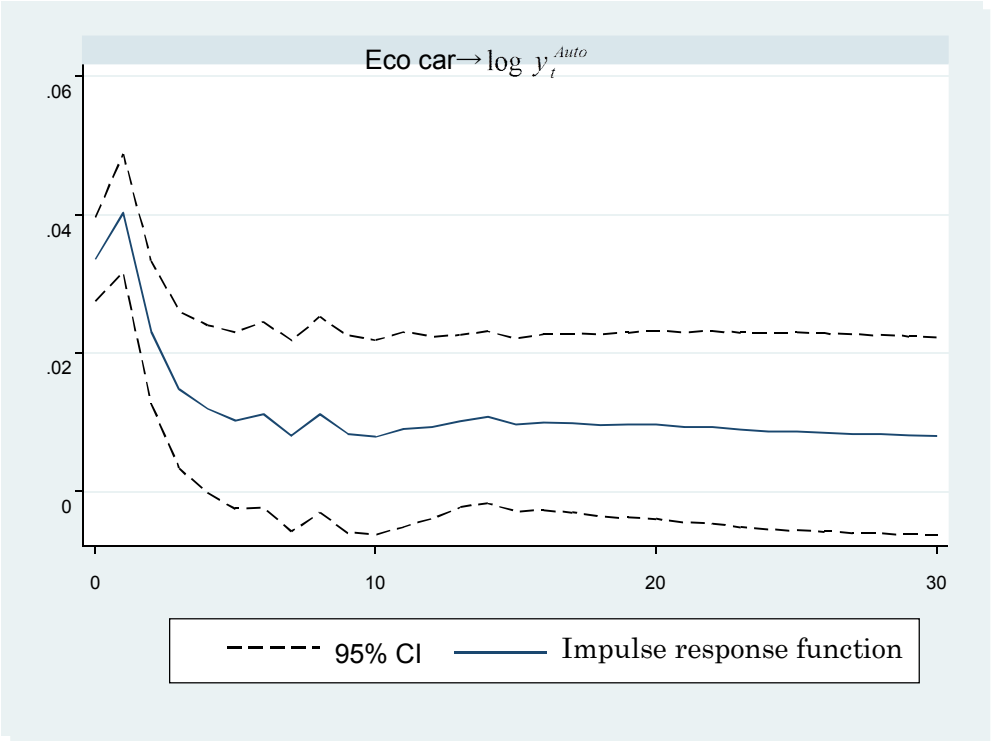
Vu, T. K., 2012. News shocks to government spending and the Japanese macroeconomy. Paper presented at the Eighth Annual Conference of Asia Pacific Economic Association.

Figure 1. Impulse response function of the index of electric appliance production, y_t^{El}



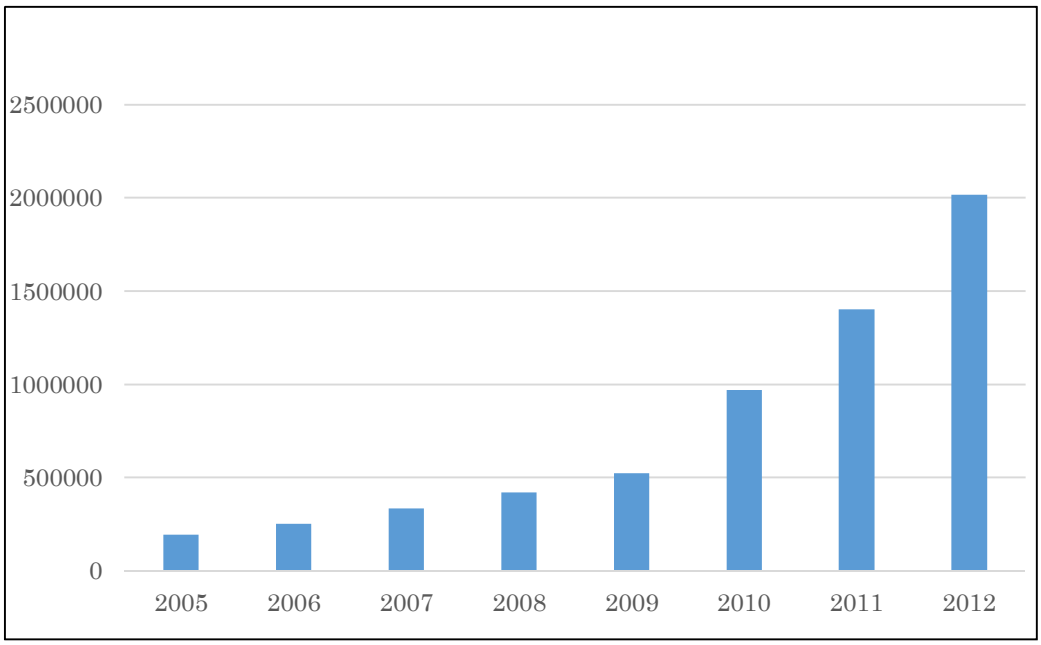
Note: The solid line indicates the estimated response, and the dotted lines represent the 95% confidence intervals.

Figure 2. Impulse response function of the index of automobile production, y_t^{Auto}



Note: The solid line indicates the estimated response, and the dotted lines represent the 95% confidence intervals.

Figure3. The number of gas-electric hybrid automobiles (2005-2012)



Source: The homepage of Automobile Information Center

URL: http://www.autoinfoc.com/hoyu/kokunaihoyu/hy-kokunaiihoyu-15.html