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External Information and Fiscal Multipliers*

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To quantify the effects of government spending accurately, exogenous changes in government spending must be identified. In this study, we estimate a proxy VAR, which was developed by Stock and Watson (2012) and Mertens and Ravn (2013), using a revised supplementary budget from the government as the instrumental variable to derive fiscal multipliers in Korea. Through this methodology, we identify government spending shocks that have purged effects, such as automated stabilizers, without assuming the timing restriction that is widely employed to estimate multipliers. The empirical analysis shows that exogenous increases in government consumption and investment, as well as government transfers, all increase GDP and private demand statistically significantly. To be precise, the one-year cumulative multipliers are 1.02 and 0.54 for government consumption plus investment and transfers, respectively.

JEL Classification: C54, D80, E62, H30, H50
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I. Introduction

Since the aftermath of the Great Recession, fiscal policy has taken the primary role in mitigating business cycle fluctuations. This trend is continuing to strengthen in many countries, including Korea, to address the huge recession caused by the COVID-19 pandemic. While most academic economists and policymakers agree that fiscal stimulus packages are necessary to support an economy, several disputes have emerged regarding the proper size of the stimulus. One of the reasons why

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disagreements arise can be attributed to uncertainty regarding the stimulus effects of government fiscal policy.

To measure the true effects of fiscal policy, a large body of research has focused on estimating government spending multipliers.[1] While clear consensus has yet to be reached, the methodologies for deriving fiscal multipliers have been developed substantially over the past decade. Identifying fiscal policy shocks lies at the center of this literature. To quantify the government spending multipliers accurately, we must identify any exogenous changes in government spending. Imposing contemporaneous relationships among variables, e.g., the Cholesky decomposition or Blanchard and Perotti (2002) method, has been the most widely employed method to identify fiscal shocks. In Korea, many studies have estimated the impact of fiscal policy on the aggregate economy on the basis of such an approach (K. K. Lee and Hur, 2017; Son and Lee, 2014; Choi and Son, 2017; S. Kim, 2012; Beak and Seo, 2010; Hur, 2007; S.-S. Kim, 2007; B.-G. Kim, 2011).

However, this approach has two disadvantages. First, it relies on a timing assumption that is difficult to justify fully. In particular, government spending is often assumed to be more exogenous than output (or GDP), as an implementation lag exists in the fiscal policy. However, whether fiscal policy is truly incapable of responding to the business cycle within a given period, such as a quarter, requires further examination. Second, as Ramey (2011a) argues, this method is unable to deal with advance information regarding government spending, which is an important determinant of private reactions to fiscal policy.[2] That is, real activity may react to future fiscal policy news even if actual spending has not yet been realized.

Ramey (2011a) suggests a narrative approach that can resolve these problems by accounting for fiscal news information. In particular, the present discounted values of military spending, which are exogenous to economic developments, announced in news articles are used to represent the government spending shock. After Ramey's seminal work, researchers have searched for additional variables that may be able to capture fiscal information and have incorporated these variables into structural econometric models (Mertens and Ravn, 2010; Ricco, 2014; Caggiano et al., 2015; Ellahie and Ricco, 2017).[3]

However, few studies have analyzed the impact of fiscal policy in Korea by introducing a new research trend that emphasizes enlarging the information sets used in empirical analyses to identify fiscal shocks accurately. In particular,

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[1] See Ramey (2011b, 2016) for a survey of this literature.

[2] See Leeper et al. (2013) for a theoretical exposition on the role of information flow in fiscal analysis.

[3] Some studies have employed different approaches. For instance, Ben Zeev and Pappa (2017) impose a medium-run restriction to identify the government spending news shock. Meanwhile, Ramey and Zubairy (2018) employs the local projection method by using externally identified government spending shocks.

imposing contemporaneous restrictions among variables within a stylized VAR model is the prevailing identification method. As Ellahie and Ricco (2017) argue, using a large set of information in a fiscal VAR model is important, as it helps to identify structural fiscal policy shocks accurately regardless of identification assumptions. Hence, these results call for implementing added information that can help identify fiscal shocks compared with the usual small-scale SVAR models.

Two notable exceptions are W. Kim (2019), who uses a factor augmented vector autoregressive model (FAVAR) that introduces factors that summarize 167 macroeconomic variables, and W. Kim (2021), who implements a local projection model and a proxy-VAR that measures the impacts of government transfers using the number of natural disaster victims as the instrument for transfer payments. On the other hand, E. K. Lee and Park (2021) introduce an external fiscal news variable constructed by external information regarding the stock prices of military contractors to identify government spending shocks. Although pioneering studies that explicitly focus on external information sources to identify fiscal shocks have emerged recently, additional research is required to obtain any meaningful consensus as to the effects of fiscal policy and the importance of identification restrictions in fiscal studies in Korea. This article attempts to shed some light on this issue with a different approach by implementing a new method that reflects advances in fiscal policy literature as it pertains to the Korean economy and unveils its usefulness, if any.

In particular, we employ a proxy-VAR model as proposed by Stock and Watson (2012) and by Mertens and Ravn (2013) to identify government outlay shocks and to evaluate fiscal multipliers. To this end, the revised supplementary budget is introduced as the external instrument. To the best of our knowledge, this study is the first to examine the effects of fiscal policy by implementing a proxy-VAR model while using a revised supplementary budget as the external instrument.

We believe that three advantages support the use of the revised supplementary budget as the external instrument. First, the approval of a supplementary budget is an outcome of political debate that bears an autonomous nature and is also usually accompanied by natural disasters or severe economic shocks, which are exogenous to the normal business cycle fluctuations.[4] Hence, the supplementary budget can satisfy the criteria requiring exogeneity.

Second, any supplementary budget is related to government spending activities. As the supplementary budget is a part of autonomous government spending, it should be highly correlated with fiscal spending shocks. Therefore, it can also satisfy the relevance condition.

[4] Even if a supplementary budget is related to the business cycle, it can still capture the evolution of fiscal shocks because, by construction, it is not related to automatic stabilizers that are the main hurdles to identify fiscal shocks.

Third, the supplementary budget is not vulnerable to subjectiveness while accounting for advanced information regarding future government spending. One of the shortcomings of the narrative method suggested by Ramey (2011a), is that the several assumptions required to build the fiscal news shocks seem arbitrary. For example, when computing the military spending news shock in Ramey (2011a), the entire budget must be distributed over time, as the announced bill only reveals the time horizon and the budget size for specific projects. Furthermore, it requires that future spending be discounted to build a present value of historical news series. In contrast, the supplementary budget contains information regarding near-future government spending, as it must be spent within a two- or three-quarter period in Korea. At the same time, this instrument is not vulnerable to the timing and discount problems that arise in other narrative methods mentioned above.

The benchmark result shows that government spending shocks significantly increase the GDP. To be precise, the one-year cumulative government spending multiplier associated with government consumption plus investment is computed to be 1.02. The impact of this shock on private investment also shows significant increases, which are possibly supported by the increases in real wages and working hours. The multiplier related to government transfers is somewhat smaller at approximately 0.54. We provide a comparison with the previous literature and detailed discussions regarding the importance of the identification strategy.

This paper is organized as follows. Section 2 introduces the empirical framework and data used in the analysis. Then, sections 3 and 4 provide the empirical results, including multipliers computed for different spending categories. Next, section 5 discusses the role of fiscal information and its implications for the identification of fiscal shocks. Finally, section 6 provides the conclusion.

II. Empirical Framework

In this section, we provide the empirical model employed to examine the impacts of government spending policies in the subsequent sections. Our empirical methodology is a proxy vector autoregression model that identifies fiscal shocks using external instruments. Our use of external instruments in a VAR is a variation of the methodology developed by Stock and Watson (2012), Mertens and Ravn (2013), and Gertler and Karadi (2015). We describe the empirical strategy below in detail.

2.1. Econometric Model

First, we introduce the reduced form of the VAR model that we use in the analysis. A period in the model corresponds to a quarter. The model that we are

considering is given as

$$Y_t = \alpha X_t + \sum_{j=1}^{p} A_j Y_{t-j} + e_t, \tag{1}$$

where Y_t and e_t are macro variables of interest used in VAR and the reduced form error. We also include a deterministic linear time trend, X_t, following Ramey (2016). For the VAR lag, $p = 2$ is selected on the basis of Schwarz and Hannan-Quinn information criteria. Assuming that $e_t = S\varepsilon_t$ holds when ε_t is the structural shock with a unit variance, the variance-covariance matrix of the reduced form error Σ can be expressed as

$$E[ee'] = E[SS'] = \Sigma. \tag{2}$$

$y_t^p \in Y_t$ is the fiscal policy indicator variable with the associated policy shock ε_t^p. In this study, we use three different fiscal policy indicators: final government expenditure, which consists of government consumption and investment, transfers, and total government spending, which is nothing but the sum of those two indicators.[5] Using one of these three indicators at a time, we separately analyze the impact of total government spending, final government expenditure, and transfers. Details of the three indicators will be explained below.

s indicates the column in matrix S associated with the impact on the reduced form residual e_t of fiscal policy shock ε_t^p. Hence, we need to estimate the following model to derive the impulse responses to the fiscal policy shock:

$$Y_t = A(L)Y_t + s\varepsilon_t^p. \tag{3}$$

Deriving the impulse responses to the other shocks is beyond the scope of this body of research. Thus, we avoid identifying all the coefficients of S.

We explain how external instruments are incorporated into this study. After estimating the reduced-form VAR model, we introduce external instruments for the fiscal policy shock to identify vector s. W_t is a vector containing instrumental variables, and ε_t^q is a structural shock other than the fiscal policy shock. To obtain the estimate of vector s, we apply the two-stage least squares (2SLS) method.

First, we compute the estimates of the reduced-form VAR residuals e_t on the

[5] The use of total government spending is oriented by policy interests as policymakers sometimes look for a single measure that can summarize the effects of all government activities, as dissecting a government budget into separate expenditure categories is not easy. For this reason, we analyze the effects of all government expenditures that consist of government consumption, investment, and transfers. See section 4.

basis of a regression of the reduced-form VAR. Then, e_t^p is the reduced form residual associated with the equation for the fiscal policy indicator, and e_t^q is the reduced form residual for the remaining equations. In addition, s^q and s^p denote the responses of e_t^q and e_t^p to a unit increase in fiscal policy shock ε_t^p. Then, we can derive an estimate of the ratio s^q / s^p from the 2SLS regressions of e_t^q on e_t^p using the instrumental variable W_t.

$$e_t^q = \frac{s^q}{s^p}\hat{e}_t^p + \xi_t, \tag{4}$$

where $\hat{e}_t^p$ is defined as the fitted variable from the first stage that regresses e_t^p on the instrument W_t. An estimate for s^p can be derived from the estimated reduced form of the variance-covariance matrix using Equation 2 and Equation 4. Then, we can automatically derive s^q. Given the estimates of s and autoregressive polynomials $A(L)$, we can obtain the impulse responses to the fiscal policy shock.

2.2. Data

This subsection describes the sources and preprocessing methods for the data used in the analysis. The data are largely divided into the supplementary budget data used as the instrumental variables and the data on the aggregates, such as government expenditure and other macroeconomic variables used, as endogenous variables.

In particular, the supplementary budget is used as the instrument for the fiscal policy shock. This instrument can incorporate the news effects of a government spending policy caused by advance information because the supplementary budget series is constructed on the basis of the announcement of the policy and not the actual spending. Given that at least a quarter is needed to begin actual spending due to legislation and implementation lags, an increase in the instrumental variable precedes an actual increase in government spending.

The advantages of using the supplementary budget as the instrument are as follows. First, the supplementary budget is organized to cope with economic conditions caused by exogenous factors, such as typhoons, health crises, and financial crises, which are orthogonal to normal business cycles; thus, it is likely to satisfy the exogeneity condition.[6] Second, it is also highly correlated with the structural shock of government spending in that it is a part of fiscal expenditures.

[6] We statistically test exogeneity by regressing the supplementary budget onto the current and lagged (up to four quarters) GDP growth rates. The P-values of the F-statistics exceed 0.10 for all types of supplementary budget series that we use in the article. Hence, we may assume the exogeneity of the supplementary budget.

Formally, we check the significance of the first-stage regression. Figure 1 shows the F-statistics for each government spending category. In particular, the F-statistics reported here are based on the regression of the sum of government spending from t (denoted 1) to t+3 (denoted 4) on the shock at t following Ramey (2016). Specifically, we are more interested in the F-statistics from t to t+1 given the usual spending schedules for supplementary budgets. The figure shows mixed results for different spending categories. To be precise, the F-values are quite high in terms of total outlays and transfers, while that for the sum of government consumption and investment is not very high. During the time horizon in which we are particularly interested, the F-values exceed 10 for the total outlays and transfers, which indicates that the IV estimates are reliable. The F-value is approximately 3 on average for government consumption and investment. However, we believe that this specification is not more vulnerable to the weak instrument problem than in the previous literature. For instance, Ramey (2016) reports that the F-statistics from Ramey (2011a), Fisher and Peters (2010), and Ben Zeev and Pappa (2017), which exclude the Korean War period from the sample, are very low. In particular, the F value obtained from the government consumption and investment case is higher than the F-values from those studies. Hence, we believe that all supplementary budget series can be treated as relevant instruments in this research.[7]

To obtain the entire supplementary budget time series, we rely on the "Press Release for the Supplementary Budget" released by the Ministry of Economy and Finance. However, the government's announcements concerning the compilation of the supplementary budget often include internal transactions, such as settlements of local government subsidies and the repayment of interest on government bonds. Therefore, we extract the supplementary budget time series data based on the expenditures side and exclude the internal transactions.[8]

In addition, the supplementary budget data are divided into subsections such as "Government Consumption and Investment Expenditure" and "Transfer Expenditure." We distinguish between government consumption/investment expenditures and transfer expenditures for the following two reasons.[9] First, as Zubairy (2014) and others point out, transfer spending affects household disposable income, whereas government consumption/investment spending directly affects the GDP, which may have a different impact on the aggregate economy. Second, the

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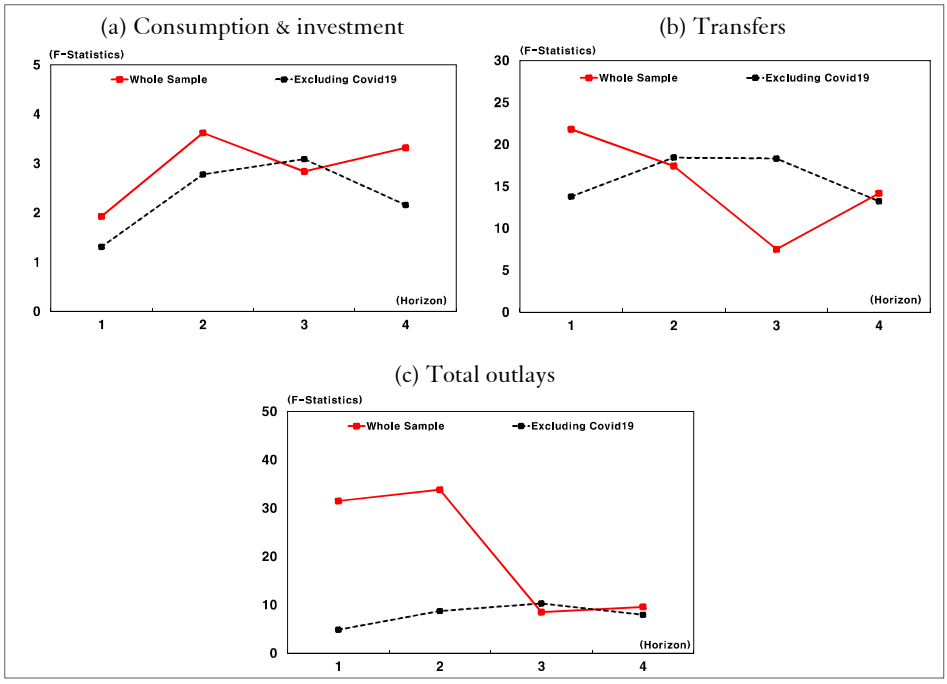
[7] We also compute the F-statistics excluding the COVID-19 period to test whether the relevance is entirely driven by that episode due to the extremely large supplementary budget during that period. Figure 1 clearly shows that the relevance does not disappear even if we remove the COVID-19 period from the sample.

[8] See Appendix A for the history of the supplementary budget compilation, etc. during the sample period.

[9] Even if the entire supplementary budget, which is not divided into detailed items, is used as an instrumental variable, the results do not change significantly. For more information, refer to subsection B.1.

proportion and importance of transfer expenditures have increased recently to enhance the welfare of low-income segments and to cope with an aging population.[10] We refer to government press releases and to the Open Fiscal Database to divide the supplementary budget into each subsection.[11] All the government expenditure and subcategory data are converted into real variables using the Consumer Price Index (CPI).

[Figure 1] F-statistics from the first-stage regression



Note: The red solid and black dotted lines show the F-statistics from the whole sample and the sample excluding the COVID-19 period.

The time series of the supplementary budget and its subsections are presented in Appendix A. Since 2000, supplementary budgets have been passed almost every year, except for 2007, 2010, 2011, 2012, and 2014. We find several items of interest. First, the amount of expenditure has steadily increased. In particular, the size of the

[10] Accordingly, studies, such as those of S. Kim and Kim (2020), T. B. Kim and Hur (2017), and Kwark (2014), have separately estimated government consumption, investment, and transfer expenditure multipliers.

[11] From 2016 to 2020, we also refer to the "Economic effects of the supplementary budget bill" section in the National Assembly Budget Office's "Evaluation of the Supplementary Budget Plan." The National Assembly Budget Office presents classifications of detailed items such as "Goods and services expenditure," "Capital expenditure," "Subsidies and ordinary transfer expenditure," and other categories (Loans and interest expenditure).

supplementary budgets during the 2009 Global Financial Crisis and the 2020 COVID-19 pandemic appear to have been the largest. Second, the relative proportion of transfer expenditures to overall expenditures has also tended to increase.

In the case of the government consumption and investment expenditure data, we use the "Final Consumption Expenditures" and "Total Fixed Capital Formation" items from the government sector (2.1.2.2.2 in the Bank of Korea's Economic Statistics System) contained in the National Account data.[12] In the case of transfer expenditures, quarterly data that accurately measure government transfers are not available in the National Account database. Hence, the transfers to households and to nonprofit institutions item in the Consolidated Fiscal Balance are used instead, as in Kwark (2014).

In addition, three series reflecting government consumption, investment, and transfers are aggregated to measure the impact of total government outlays. To this end, we label this aggregate as total government expenditures throughout this article. In addition, we use government consumption/investment expenditures and transfer expenditures as alternative government spending measures to gauge the impact of government spending across different categories. The government consumption/investment data can be retrieved in seasonally adjusted real datasets from the National Account. For the transfer expenditures, no such data are available. Therefore, we converted them to real variables using the CPI and seasonally adjusted them through the X-12 procedure.

Finally, we explain the endogenous variables included in the VAR model. We introduce the employment rate, real wages, and working hours (per month, quarterly averaged) into the model to study the impact of government spending on the labor market. Specifically, we use total wage data from the employment and labor statistics of the Ministry of Employment and Labor. Tax revenue converted to a quarterly frequency is obtained from the "National Tax Revenue" item of the Consolidated Fiscal Balance. The interest rate used as the endogenous variable is the yield on the 91-day commercial paper (CP) gathered from the Bank of Korea's Economic Statistics System.

All variables except the interest rate, employment rate, and working hours are converted to real variables using the CPI and seasonally adjusted through the X-12 procedure. In addition, all variables except the interest rate, employment rate, and working hours are log-transformed. We use the log levels specification following

[12] Many studies, such as those of E. K. Lee and Park (2021) and K. K. Lee and Hur (2017), have also used the Consolidated Fiscal Balance published by the Ministry of Economy and Finance. However, this study uses the National Account data instead because government expenditure data in the National Account have wider coverage in terms of expenditure items. For instance, the National Account data contain spending information about general government spending, including local governments, while the Consolidated Fiscal Balance only includes spending by the central government.

Ramey (2016). The sample period ranges from 2000Q1 to 2021Q1. The description of the data is summarized in Table 1.

[Table 1] Data Description

Variable Name	Sample Period	Source
Real Government Consumption	2000q1–2021q1	BOK National Account
Real Government Investment	2000q1–2021q1	BOK National Account
Real Government Transfer	2000q1–2021q1	Consolidate Fiscal Balance
Real Tax Revenue	2000q1–2021q1	Consolidate Fiscal Balance
Real GDP	2000q1–2021q1	BOK National Account
Real Private Consumption	2000q1–2021q1	BOK National Account
Real Private Investment	2000q1–2021q1	BOK National Account
Employment Rate	2000q1–2021q1	BOK ECOS
Real Wage	2000q1–2021q1	MOEL LaborStat
WorkingHour(per month)	2000q1–2021q1	MOEL LaborStat
Interest Rate(Yields on CP(91-day))	2000q1–2021q1	BOK ECOS

III. Effect of Fiscal Policies

In this section, we analyze the responses of macroeconomic variables to the different government expenditure shocks through the VAR model described above. In particular, subsection 3.1 investigates the impact of different government expenditure components, e.g., government consumption and investment versus transfers to GDP and private consumption and investment. Subsection 3.2 computes various spending multipliers across expenditure categories.

3.1. Dissecting the Impacts of Different Components

The government's total outlays consist of three major components: government consumption, investment, and transfers. Hence, many previous studies have examined the impact of these components separately to obtain policy implications that are more informative (B.-G. Kim, 2011; S. Kim, 2012; Kwark, 2014; K. K. Lee and Hur, 2017; W. Kim, 2019; S. Kim and Kim, 2020).

In this article, we also attempt to distinguish the differences in stimulus effects among these components. In particular, two variations of the benchmark proxy VAR model are introduced. First, government consumption plus investment is considered to analyze the impact of direct government spending policies. To do so, we use the supplementary budget that is provided for direct government consumption and investment to identify the government consumption plus investment shock instead of employing the whole supplementary budget. Similarly, the stimulating effect of government transfers is computed by substituting

government transfers for government consumption and investment spending. In this case, we use the supplementary budget for transfers as the instrumental variable.

We distinguish these two categories for two reasons. First, the current identification strategy is limited because it cannot separate government consumption and investment. Given that the announced supplementary budget contains limited information, separating government consumption and investment is not applicable. We rely on the supplementary budget to identify the structural government spending shock. Thus, we cannot identify the government consumption and investment shock separately in the current framework. Second, we consider the distinction between final government spending, which consists of government consumption and investment, and government transfers much more important than a separation between government consumption and investment. While final government spending directly contributes to GDP and to real activity, transfers indirectly affect GDP by increasing the disposable income of private agents. Hence, we can conjecture that the impact of the two outlays should be different. In addition, the proportion of transfers within the total government spending has been increasing recently. Therefore, this distinction bears important policy implications.

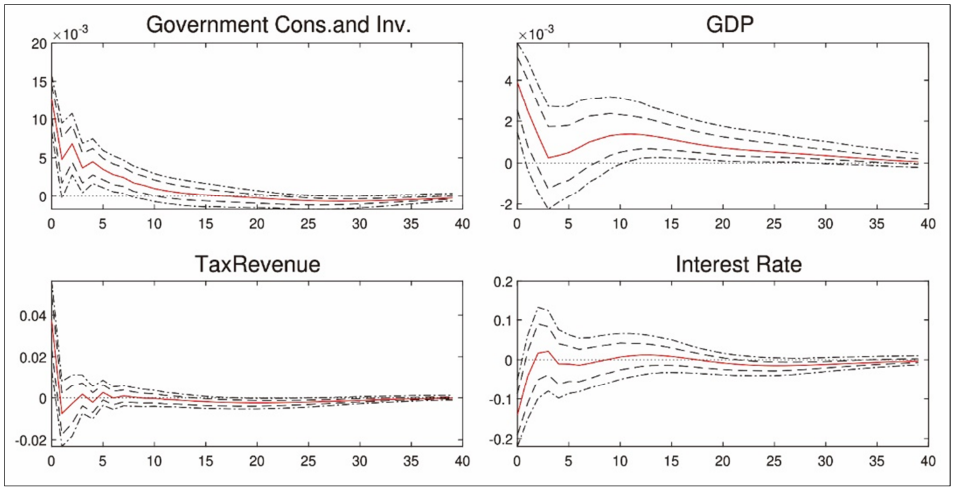
3.1.1. Government Consumption and Investment

First, we present the impact of government consumption and investment instrumented by the supplementary budget related to government consumption and investment. Figure 2 shows the impact of an increase in government consumption plus investment. GDP rises immediately after the impact and shows a hump-shaped delayed response. It rises by 0.4% right after the impact and then returns to close to zero. Then, it rises again and remains significant for approximately two years at both the 68% and 90% confidence levels. The average size of response around this period corresponds to approximately 0.08% of the GDP. At the same time, the responses of tax revenue and interest rate are not statistically significant.

To investigate the stimulating channel of government consumption and investment, we derive the responses of private consumption, investment, and labor market variables. Private consumption falls approximately 0.5% on impact but starts to recover immediately. On the other hand, private investment increases in impact and remains positive for an extended period. This response is statistically significant even at the 90% confidence level for more than three years.

These findings can be supported by the responses of labor market variables. To be precise, increases in the employment rate, real wages, and working hours can explain the increase in GDP and private investment. Put differently, strong labor market conditions can support an expansion of private demand and GDP, as shown in the above impulse responses.

[Figure 2] Impulse Responses of Macroeconomic Variables to Government Consumption and Investment Spending Shocks



Note: The red solid line represents the point estimates, and the black dash-dotted lines show the 68% and 90% confidence intervals. We estimated the confidence interval using the bootstrap method (iteration=4,000), which is the same for all figures below.

In sum, government consumption and investment increase the GDP in a statistically significant way, which appears to be due to the effect of promoting private investment followed by strong labor market conditions. These results are in line with those discussed in A. Auerbach et al. (2020). In their research, using US local data and purchasing data from the Department of Defense, they found that government spending significantly boosts employment while private consumption is not affected.

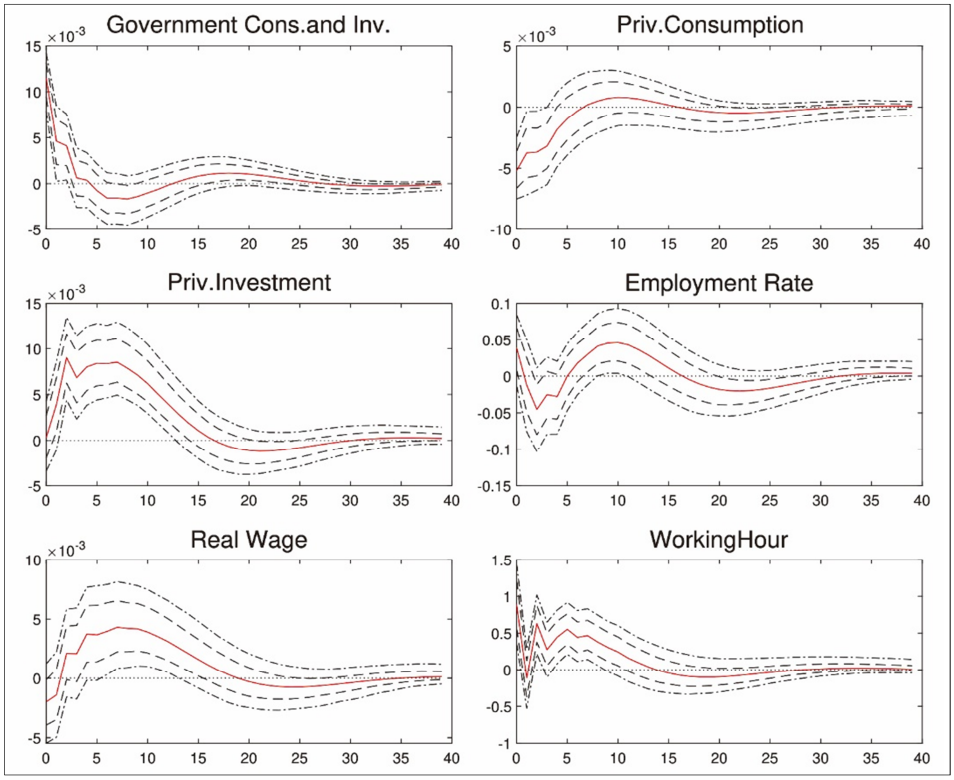
3.1.2. Government Transfers

Figure 4 presents the impulse response of the GDP to the government transfer spending shock. In general, the response is similar to that from the government consumption and investment case. In particular, the GDP increases in a statistically significant way at the 90% confidence interval for two years after the shock arrives. It remains significant for more than a year, and the maximum response is approximately 0.37%. The tax revenue and the interest rate tend to increase with some lag. However, the responses are significant only at the 68% confidence level.

Looking at the reactions of private consumption and investment, they show qualitatively similar responses compared with the model using government consumption and investment. In particular, although private consumption rises, it is only significant at the 68% confidence level. Meanwhile, private investment shows a significant increase, as in the model using government consumption and investment

expenditures. Specifically, it remains significantly positive for approximately two years with a maximum response of approximately 0.9%.

[Figure 3] Private Sector Responses to Government Consumption and Investment Spending Shocks

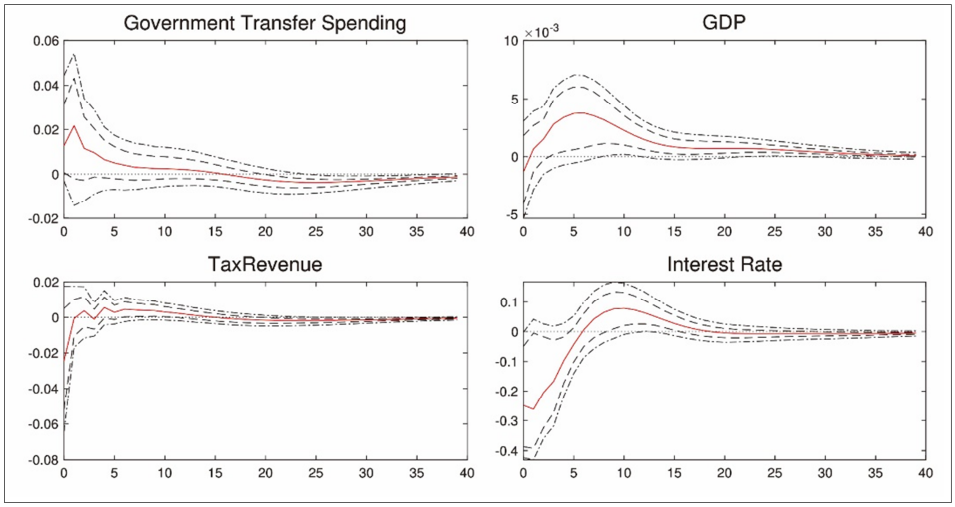


Note: The red solid line represents the point estimates, and the black dash-dotted lines show the 68% and 90% confidence intervals.

In general, the responses of labor market variables are also similar to the government consumption and investment spending cases. In particular, an increase in government transfers leads to increases in real wages and hours. However, the response of working hours is not statistically significant. One notable difference is that the employment rate declines initially, while the drop is not statistically significant at the 90% confidence level. Therefore, we can conclude that stimulus through government transfers can raise wages but is not capable of raising the quantity of labor.

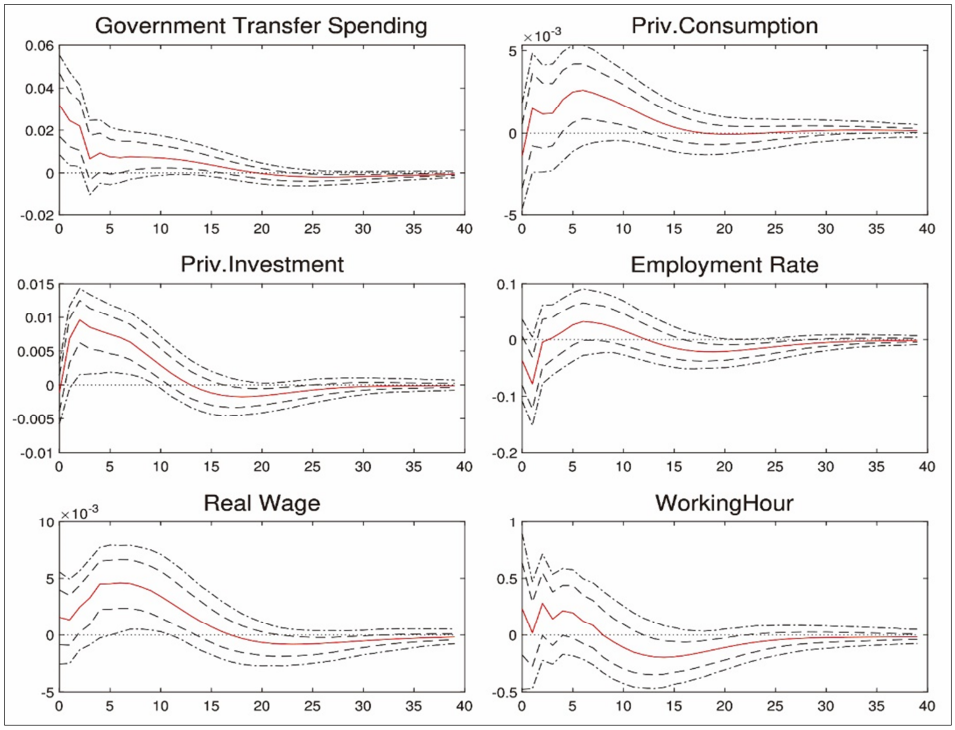
In the previous literature analyzing the impact of fiscal policy in Korea, the responses of macroeconomic variables to transfer expenditure shocks are often similar to those obtained in this study. For instance, S. Kim and Kim (2020) find that an increase in transfer expenditures has a small multiplier effect and that the

[Figure 4] Impulse Responses of Macroeconomic Variables to Government Transfer Spending Shocks



Note: The red solid line represents the point estimates, and the black dash-dotted lines show the 68% and 90% confidence intervals.

[Figure 5] Private Sector Responses to Government Transfer Spending Shocks



Note: The red solid line represents the point estimates, and the black dash-dotted lines show the 68% and 90% confidence intervals.

effect lacks statistical significance compared with government consumption and investment expenditures.

Overall, government consumption and investment show clearer stimulus effects in terms of increasing the GDP than transfers. These results can be supported by improvements in the labor market measured by increases in employment and real wages.

3.2. Fiscal Multipliers

In the previous subsection, the impulse responses of macroeconomic variables to two types of government spending shocks are provided to analyze the qualitative impact of fiscal policy on the economy. Next, in this subsection, we compute the fiscal multipliers to quantify the size of the impact of various types of government spending policies. In particular, we derive the cumulative multipliers (CM) to take into account the fact that government expenditure can have prolonged effects on the economy. The cumulative multiplier is computed as

$$CM = \frac{\sum_{t=1}^{T} \Delta Y_t}{\sum_{t=1}^{T} \Delta G_t} = \frac{\sum_{t=1}^{T} \Delta \ln(Y_t)}{\sum_{t=1}^{T} \Delta \ln(G_t)} \times \frac{\overline{Y}}{\overline{G}}, \tag{5}$$

where Y_t and G_t are the GDP and the amount of government spending that can be either government consumption and investment (GCI) or transfers (GT), respectively. $\overline{Y}/\overline{G}$ represents the ratio of government spending to the GDP during the sample period. We take $T = 4$ and compute one-year cumulative multipliers as the benchmark. In addition, we take statistical significance into account while computing the multipliers. Specifically, the point estimates of the impulse responses are removed when calculating the multipliers when the point estimates are not statistically significant.

The last row in Table 2 contains the estimated multipliers. The one-year cumulative multiplier for government consumption and investment expenditure and that for transfers are computed to be 1.02 and 0.54, respectively. That is, the transfer multiplier is less than the government consumption and investment multiplier, as has been widely documented in the previous literature (Zubairy, 2014; Coenen et al., 2012).

In Table 2, we also compare the multipliers estimated in this study to those derived in the previous literature using Korean data. It shows that the computed multipliers are in the middle of the previously obtained ones from ordinary SVAR models, which identify government expenditure shocks using the Cholesky or Blanchard-Perotti[13] method. Notably, the overall spreads of estimated

[13] This methodology identifies structural shocks by imposing the sensitivity of government

[Table 2] Government Spending Multipliers in the Korean Literature, 1-year Cumulative Multipliers

Authors	Method	Total	Consumption and Investment	Transfer
S.-S. Kim (2007)[1]	SVAR	-0.06–-0.07[1]	-	-
B.-G. Kim (2011)	SVAR	-	1.64[3], 2.67[4]	0.46
S. Kim (2012)	Econometric Model	-	0.71–0.90	1.65
Park & Oh (2015)	DSGE	-	0.61–1.20[3], 0.72–1.50[4]	0.23
T. B. Kim & Hur (2017)	SVAR	-	0.19–0.40[3]	-
K. K. Lee & Hur (2017)	BVAR	0.15	0.31	0.37
E. K. Lee & Park (2021)	Narrative VAR	1.27[2]	-	-
W. Kim (2019)	FAVAR	0.24	0.55[3], -0.14[4]	-
Ma & Lee (2020)[1]	LP	-	2.34–11.76[3]	-
S. Kim & Kim (2020)	SVAR	0.67–1.01	2.87–4.15[3], 0.39–0.97[4]	-0.62–0.43
W. Kim (2021)	LP-IV	-	-	0.31
This Paper	Proxy VAR	1.09	1.02	0.54
	Choleski	0.00	0.00	0.00

Notes: 1. Three-year Multipliers.
2. Five-year Multipliers.
3. Government Consumption Multipliers.
4. Government Investment Multipliers.

multipliers derived in the previous literature in Korea are larger than those from other countries, e.g., the United States (Ramey, 2011b). We return to this issue and discuss the relationship between identification strategy and estimated impacts of government spending in section 5.

Previous results derived from the literature on government fiscal policy can be classified into two categories, neoclassical and Keynesian, based on the impacts of government spending shocks on the real economy. The former asserts that government spending is not an effective tool to boost aggregate demand because it crowds out private spending, while the latter argues that government spending is effective in boosting real activity and consequently increases aggregate demand (Ramey, 2016; Blanchard and Perotti, 2002). Labor market reactions are at the center of this difference. The former is associated with a decline in real wages, while the latter is the opposite. In this study, not only GDP but also private investment increases because of the impact of government spending. Moreover, these hikes in private demand are accompanied by increases in real wages and hours of working, as expected by the Keynesian view. These results are similar to those derived in E. K. Lee and Park (2021). The increases in private spending they observed appear to be supported by increases in employment and real wages.

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expenditure to changes in total output (elasticity) from external data. See Blanchard and Perotti (2002) and B.-G. Kim (2011).

3.3. Robustness of the Results

We close this section by examining the robustness of the results obtained in the previous subsections. First, we test the robustness of the refining procedure on the supplementary budgetary data using an alternative set of data. In particular, we consider the case in which the total supplementary budget data are used as the instrument instead of the modified one, as discussed in subsection 2.2. In the interest of space, we delegate corresponding figures to subsection B.1.

The results show that employing the raw supplementary budget data does not considerably change the results. Figure 12 and Figure 13 present the resulting impulse responses. They show that the shapes of the impulse responses are almost identical to those obtained in the benchmark model. This outcome supports the robustness of the preprocessing procedure that we take on concerning the supplementary budget data. However, the significance of the responses becomes weak under alternative instruments. This result is intuitive because the alternative supplementary budget seems more prone to statistical noise. Therefore, the variations in exogenous shifts in government spending become increasingly difficult to capture.

Next, we check whether excluding the COVID-19 pandemic period substantially changes our results. Given that economic behavior has dramatically changed during the pandemic due to social distancing and to a fear of infection, the policy effects may have also been affected. To this end, we estimate the proxy-VAR while including data only up to the first quarter of 2020. We have selected this end date because the first social distancing measure was only introduced at the end of March 2020 in Korea.

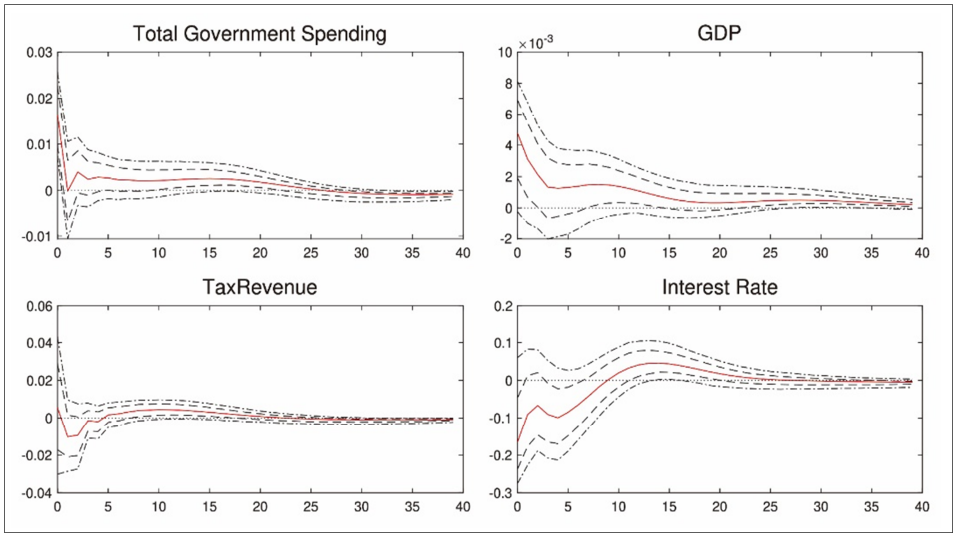
Subsection B.2 contains the impulse responses of the proxy-VAR model while excluding the pandemic period. Although the response to transfers becomes slightly less effective, the rest of the responses do not qualitatively differ compared with the benchmark results. Therefore, we can conclude that our results are intact regardless of whether the pandemic period in general is included.

IV. Impact of Total Government Outlays

In this section, we examine the impact of total government outlays to gauge the overall effect of government spending activity. This exercise is oriented by policy interest rather than an academic one. Little academic research has examined the impact of the total amount of government outlays, including transfers. However, policymakers sometimes require a single measure that can summarize the effects of the total amount of government activity, as dissecting the government budget into separate expenditure categories is not easy. For this reason, we analyze the effect of

the total amount of government expenditure, which consists of government consumption, investment, and transfers.

[Figure 6] Impulse Responses of Macroeconomic Variables to Total Government Spending Shocks



Note: The red solid line represents the point estimates, and the black dash-dotted lines show the 68% and 90% confidence intervals.

Figure 6 represents the responses of the GDP to a one standard deviation of the total government outlay shock. After the impact, the GDP rises but is not statistically significant at the 90% confidence level due to the wide confidence interval estimated. However, it clearly tends to increase and shows some significance at the 68% confidence level.[14]

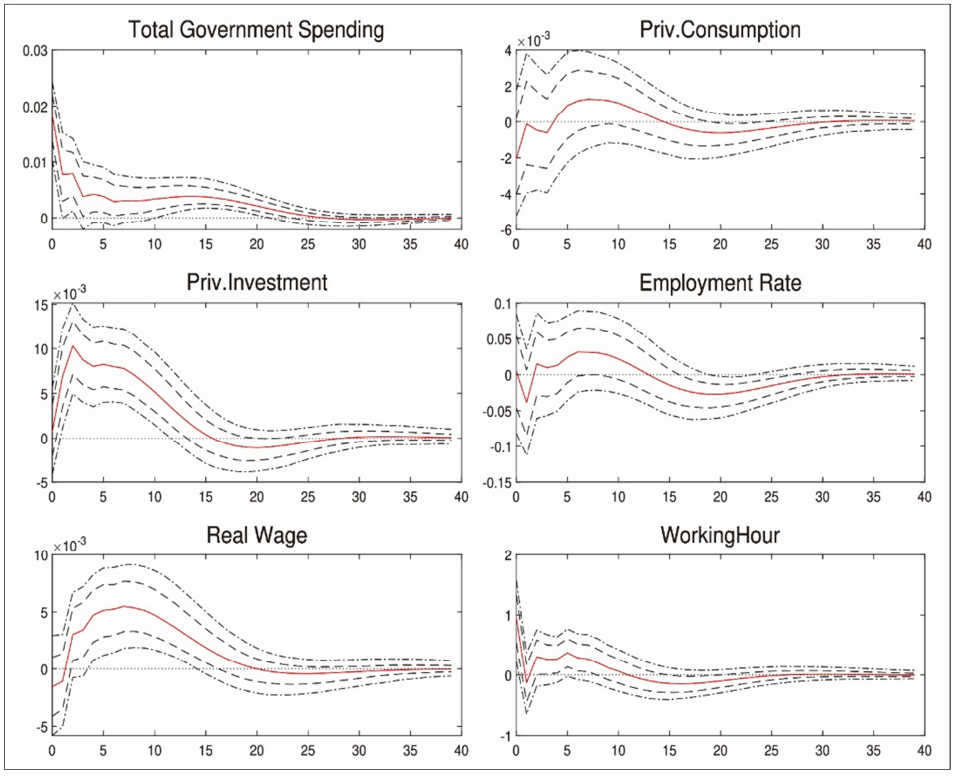
Figure 7 represents the responses of the components of the GDP and the labor market to a one standard deviation of the total government outlay shock. Consumption rises, and the maximum response arrives in eight quarters. In addition, the magnitude is approximately 0.12% but is statistically insignificant at the 68% and 90% confidence levels. Private investment also reacts to the government spending shock. In particular, the investment starts to increase in a statistically significant way and preserves its significance for approximately three years. The peak response of 1% is achieved in two quarters. The responses of consumption and investment to the government outlay shock suggest that

[14] Although no theoretical justification has been given, using the 68% confidence interval is a common practice in the government spending literature, as noted by Ramey (2011a). Other previous studies that used the 68% confidence interval include Mertens and Ravn (2010), W. Kim (2019), T. B. Kim and Hur (2017), K. K. Lee and Hur (2017), and Son and Lee (2014).

significant stimulus effects exist and that the crowding out of government spending in private demand is weak.

Next, we examine the impact of the total government outlay shock on labor market variables. The last row of Figure 7 shows that both real wages and hours increase after the impact. In particular, the response of real wages shows a statistically significant increase for approximately three years. Working hours also rise, but their statistical significance is somewhat lower than that of real wages. The response of employment is muted and is not statistically significant.

[Figure 7] Private Sector Responses to Total Government Spending Shocks



Note: The red solid line represents the point estimates, and the black dash-dotted lines show the 68% and 90% confidence intervals.

Finally, we discuss the one-year cumulative multiplier shown in Table 2. The computed multiplier is 1.09, which is located in the upper half of the pool of previously computed multipliers in the literature. This result supports the view that a government spending policy is an effective tool for stabilizing business cycle fluctuations, as the policy moves effective demand from the peak to the trough throughout the business cycle without too many costs.

V. Discussion of Information and Identification

As discussed in the previous literature, properly identifying fiscal shocks is important to analyze the impact of government spending policy (Ramey, 2016). Hence, new methodologies that seek to identify fiscal shocks accurately have been introduced recently in the literature (Ben Zeev and Pappa, 2017; Ricco, 2014; Stock and Watson, 2012; Ramey, 2011a; Fisher and Peters, 2010; Ramey and Shapiro, 1998). These advances can be summarized as incorporating additional information that can help identify government spending shocks. Ellahie and Ricco (2017) argue that disagreements in the results regarding the effects of fiscal policy in the literature can be attributed to information deficiency in the VAR system employed in the research. Moreover, they show that enlarging the information set of the VAR by introducing a large dataset can mitigate the identification problem. In particular, changing the identification strategy does not affect the results in a large VAR model.

The literature on the effects of fiscal policy in Korea presents even more diversified results than those in other advanced countries, especially the United States. In this section, we address this issue by presenting the importance of the identification strategy and the role of an enlarged information set. The importance of identifying an exogenous government spending shock can be emphasized when we compare the results obtained from the benchmark model to those derived from the alternative model using a Cholesky identification without an instrumental variable. Figure 8 presents the impulse responses obtained from the Cholesky identification. As is common in the literature, government spending is ordered first and is assumed the most exogenous among the endogenous variables.

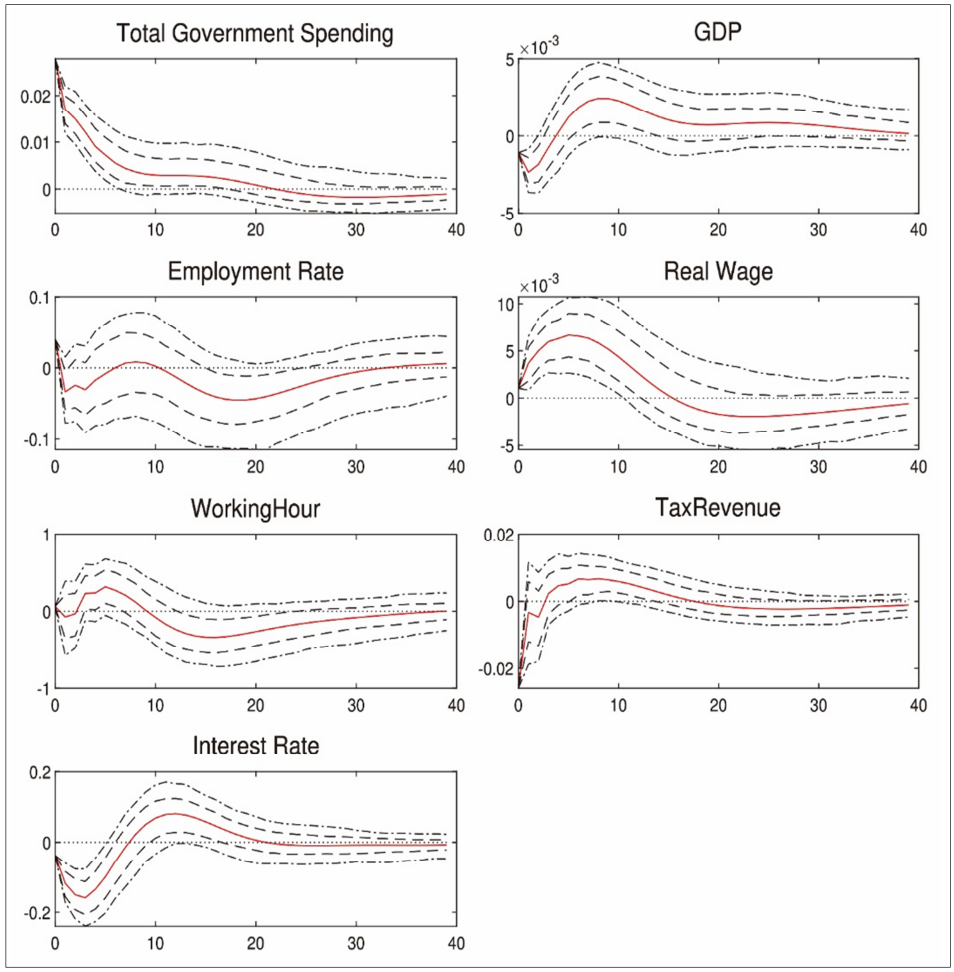
The stimulating effects of government spending are weak compared with the benchmark case. In particular, the impulse response indicates that the GDP declines at impact and increases later on. In particular, the one-year cumulative multiplier is 0.00, which is substantially lower than the multiplier computed from the benchmark model (1.09). That is, government spending has a negligible effect on the GDP according to the estimated results from the Cholesky method. This outcome is not too odd compared with the previous literature on government spending policy in Korea (S.-S. Kim, 2007; Hur, 2007).

Figure 9 clearly contrasts the difference observed in the responses of real GDP to the spending shock using the benchmark and the Cholesky identification strategy. In particular, the real GDP increases immediately in the benchmark model, while it declines initially when the Cholesky method is implemented. This result graphically shows why the computed output multiplier is larger in our benchmark model than that in the model using the Cholesky identification.

This outcome leads to two observations. First, using a different identification strategy can considerably affect the quantitative results of the study. While the

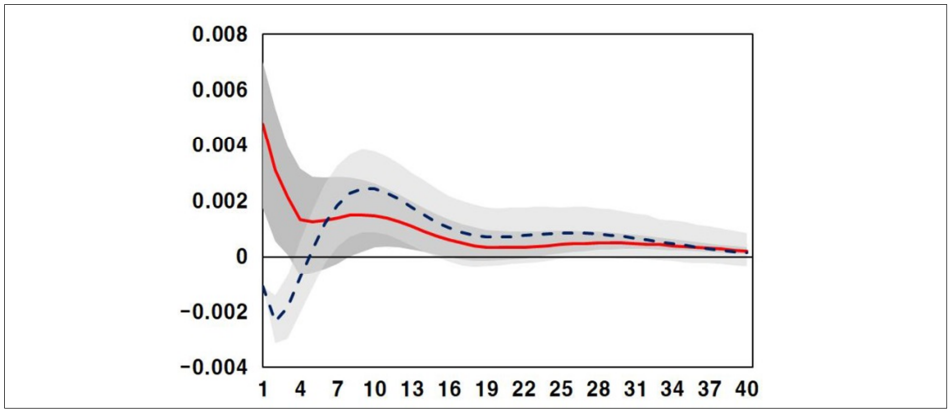
benchmark proxy-VAR identification finds a significant stimulating effect of fiscal policy, the Cholesky identification results in no stimulus impact on real activity. Second, this result suggests a possible explanation as to why some previous studies about government spending policy in Korea have reported small multiplier effects. As is evident from Table 2, a small SVAR model using the Cholesky or Blanchard-Perotti method tends to result in a small multiplier effect or even a negative one. Our examination suggests that these results may be attributed to an unsatisfactory identification of fiscal shocks. These results are in line with E. K. Lee and Park (2021), who also introduced a new identification method instead of the usual recursive identification methods.

[Figure 8] Impulse Responses of Macroeconomic Variables to Total Government Spending Shocks Using Cholesky Identification



Note: The red solid line represents the point estimates, and the black dash-dotted lines show the 68% and 90% confidence intervals.

[Figure 9] Impulse Responses of Macroeconomic Variables to Total Government Spending Shocks Using Cholesky Identification vs. Under the Benchmark Model



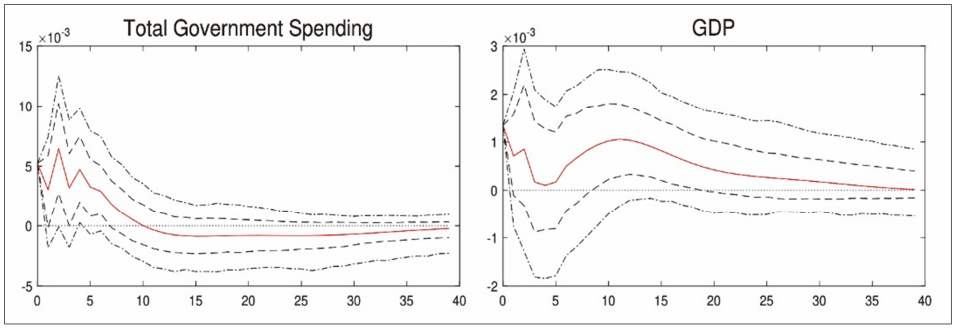
Note: The red solid and black dashed lines represent the point estimates using the benchmark and Cholesky identification, respectively. The shaded areas show the 68% confidence intervals.

Finally, we discuss whether enlarging the information set helps to identify government spending shocks precisely and to improve the accuracy of the fiscal multiplier estimation. Ellahie and Ricco (2017) find that in a large VAR system that incorporates a substantially large amount of information, any differences in the results between identification methods disappear. On the basis of these findings, we discuss whether enlarging the information set can narrow the dispersion of the spending multiplier. To do so, we provide two suggestive pieces of evidence. First, we make a small deviation from the above Cholesky-identified VAR by augmenting the supplementary budget data. As the supplementary budget data have additional information that can help to identify government spending shocks, we can expect that the resulting multiplier becomes substantially larger than zero and becomes closer to our benchmark result. Second, we compare the estimated multipliers between two groups of previous results. The first group consists of studies that incorporate an external or large information set into the estimation: the current study, W. Kim (2019), and E. K. Lee and Park (2021). The second group consists of the rest of VAR works included in Table 2. While these analyses are not formal tests, we believe that we can promote future research into this matter in the future.

Figure 10 shows the impulse responses of government spending and GDP to the exogenous change in the supplementary budget. On the basis of these responses, we can compute the government spending multiplier as in Fisher and Peters (2010) and E. K. Lee and Park (2021). The one-year cumulative multiplier increases from zero to 0.24, which is close to our result using total government spending (1.09). This result suggests that providing additional information regarding the exogenous shifts in government spending can substantially improve the accuracy of identifying

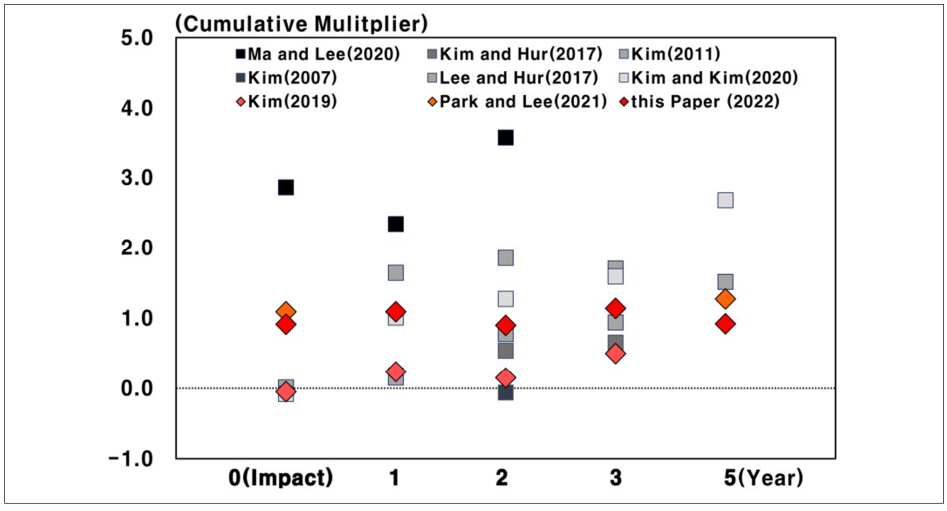
the government spending shock within a traditional Cholesky-identified VAR model. Moreover, it calls for shaping the identification strategy for accurate studies regarding the macroeconomic impact of government spending.

[Figure 10] Impulse Responses of Macroeconomic Variables to Total Government Spending Shocks (Cholesky Identification + Augmenting Supplementary Budget Data)



Note: The red solid line represents the point estimates, and the black dash-dotted lines show the 68% and 90% confidence intervals.

[Figure 11] Cumulative Multipliers Derived from the Literature



Note: The red diamonds represent the multipliers computed in the studies that incorporate an external or larger information set into the estimation (group 1), whereas the black squares show the multipliers from the other studies (group 2).

Next, we compare the two groups of studies that are distinguished by their usage of external information to identify the government spending shock, as explained above. In terms of the total government spending multiplier, the distance between the maximum and minimum multiplier for the first group is smaller (0.85) than

that of the other group (2.19). Hence, studies with enlarged information sets tend to show substantially lower uncertainty when estimating the effect of government spending. In addition, the computed multiplier from the Cholesky-identified VAR with a supplementary budget is located in the middle of the first group, which additionally supports our assertion.

Finally, the whole range of multipliers from the literature is marked in Figure 11, regardless of their government spending and horizon characteristics. The multipliers from the first group, including those computed in this article, are presented with red diamonds, whereas those from the second group are shown with black squares. This figure shows that the multipliers from the first group lie close to each other compared with those from the second group regardless of the horizon. These results also suggest that enlarging the information set may reduce uncertainty in deriving the government spending multipliers.

Although the above results are not sufficient to claim that including a larger information set improves the accuracy of fiscal multiplier estimation, we consider an enlarged information set to be a promising future research endeavor because models with external or larger information sets result in a less dispersed fiscal multiplier estimation band.[15]

VI. Conclusion

As the role of fiscal policy in economic recovery becomes important, calls for research into the effects and characteristics of fiscal policy have increased to establish and implement fiscal policy in a more effective manner. To understand the impacts of fiscal policy better, a precise identification of exogenous government spending shocks is required prior to estimating the multipliers. Various studies have been conducted in other countries in consideration of this point. However, studies of fiscal policy in Korea have not been able to keep up with this trend sufficiently.

In this study, we estimate a proxy-VAR model developed by Stock and Watson (2012) and Mertens and Ravn (2013) while using the revised supplementary budget as the instrumental variable. The revised supplementary budget is suitable for the instrumental variable because it is not only mostly determined exogenously but also highly correlated with government spending. In addition, it avoids the subjectivity problem that arises from narrative approaches used elsewhere in the literature, such as in Fisher and Peters (2010). Using this method, we identify exogenous government spending shocks that have purged effects, such as automatic stabilizers

[15] While the average multiplier for government consumption and investment turns out to be smaller for the first group than for the second group, the distance between the maximum and minimum estimates is still substantially smaller for the first group.

and examine the effectiveness of expansionary fiscal policies.

The benchmark model shows that government spending shocks increase the GDP statistically significantly. In particular, the one-year cumulative government spending multiplier is computed to be 1.02. The impact of this shock on private investment also shows significant increases, which are possibly supported by increases in real wages and working hours. These results are in accordance with the Keynesian view of the effectiveness of government spending and are consistent with recent studies that estimate the spending multiplier in Korea (E. K. Lee and Park, 2021; W. Kim, 2019).

The usefulness of the identification strategy used in this study can be emphasized when the results are compared with those derived through a conventional Cholesky method. Identifying the impact of government spending shocks on the basis of the timing constraints suggests that government spending does not stimulate the economy at all or that the effect is extremely large, as provided in the previous literature that used timing constraints. This outcome is likely due to the lack of sufficient control over the endogenous nature of government spending. Hence, the exogenous government spending shock is not properly identified.

One possible suggestion for future research is as follows. According to A. J. Auerbach and Gorodnichenko (2012) and Christiano et al. (2011), the effects of fiscal policy are likely to vary depending on the business cycle fluctuations and the possibility of easing the monetary policy further. These features can be addressed in future studies while considering the information deficiency problem, as in the current study. Accounting for state dependency has become important recently given that the impacts of government spending are now different from those studied before COVID-19 and the pandemic has altered the economic environment in which fiscal policy works.

Appendices

Supplementary Budget Data

[Table 3] Supplementary budget data (based on government announcements)

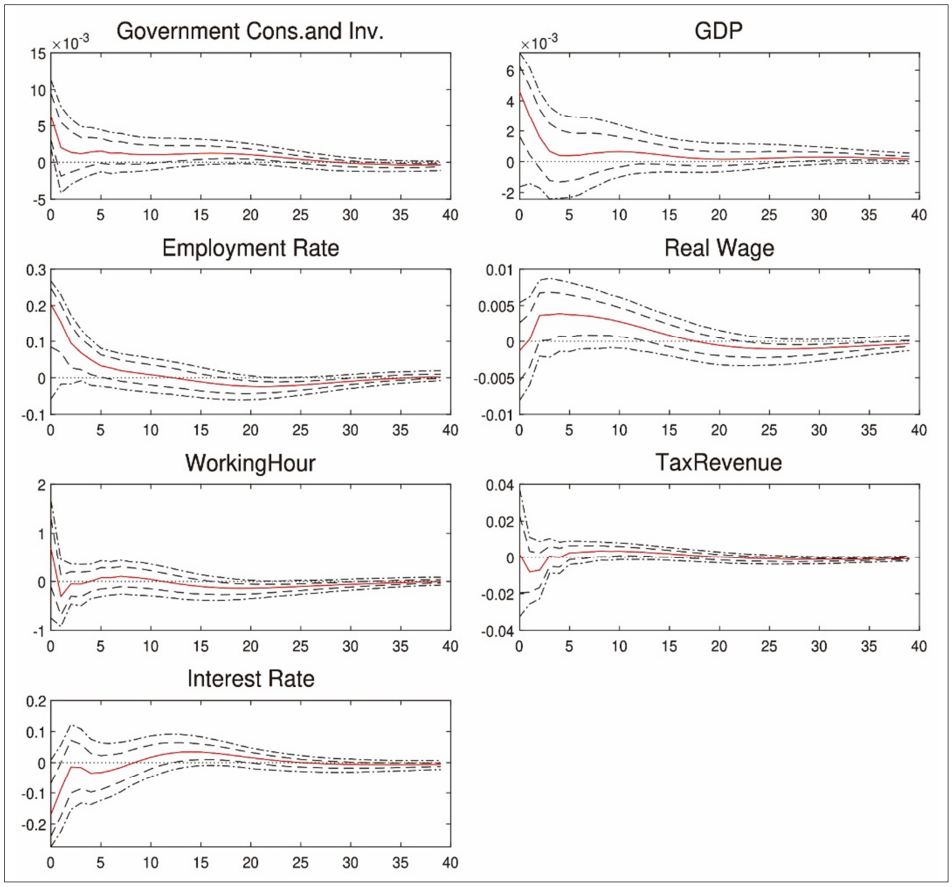
	Total[1]	Consumption and Investment	Transfer	Note
2000 2Q	1,300	391	834	
2001 2Q	1,500	25	1,200	-
2001 4Q	1,884	831	280	-
2002 3Q	3,600	3,600	-	Typhoon RUSA
2003 2Q	3,400	2,300	774	SARS
2003 4Q	3,000	3,000	-	Typhoon MAEMI
2004 2Q	1,800	740	1,043	-
2005 3Q	900	310	267	-
2006 3Q	2,200	1,760	-	Typhoon EWINIAR, Heavy Rain
2008 3Q	4,900	2,638	1,768	High Oil Price Shock
2009 2Q	17,730	3,460	14,270	Global Financial Crisis
2013 2Q	5,300	1,045	595	-
2015 3Q	6,200	2,900	1,200	MERS
2016 3Q	9,800	4,200	5,600	-
2017 2Q	11,200	2,200	4,000	-
2018 2Q	3,900	441	1,742	-
2019 2Q	6,700	2,106	3,050	Yellow Dust
2020 1Q	8,500	2,000	5,074	COVID-19 Crisis
2020 2Q	7,600	-	7,600	COVID-19 Crisis
2020 3Q	23,900	1,171	9,893	COVID-19 Crisis
2020 3Q	7,800	3	7,200	COVID-19 Crisis

Note: 1. Given the loan projects and interest expenditures, the sum of the details and the total data may not be matched exactly.

B Robustness Checks

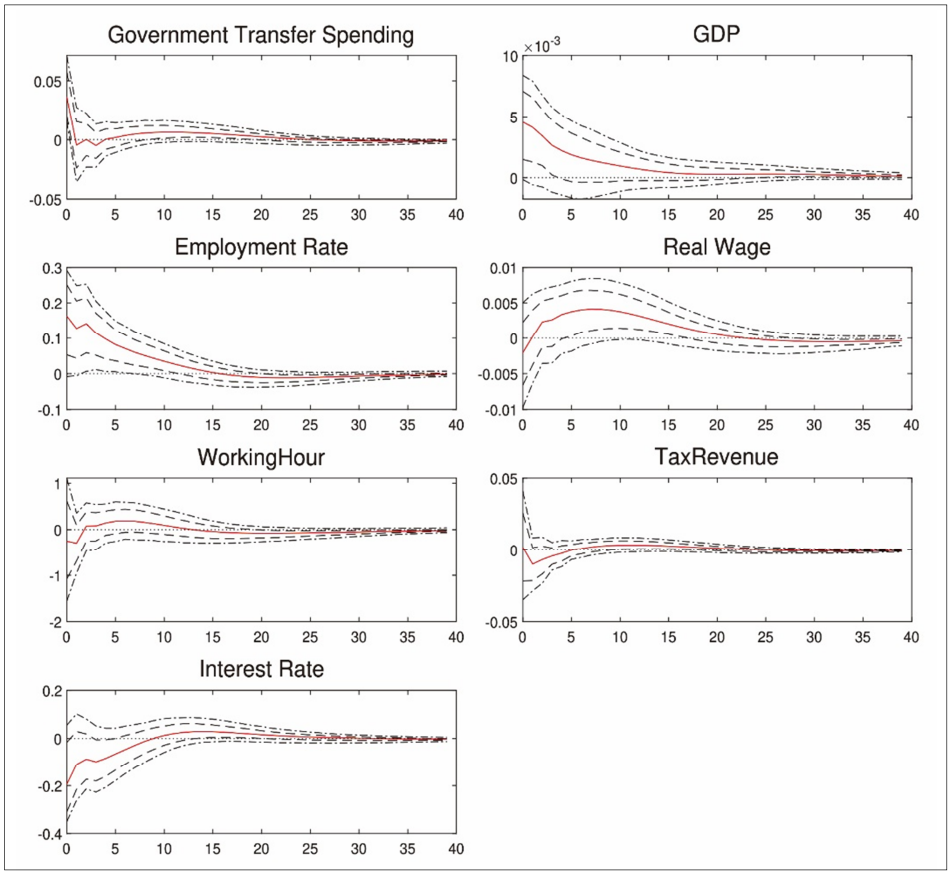
B.1 When Using Supplementary Budget Data as a Whole

[Figure 12] Impulse Responses of Macroeconomic Variables to Government Consumption and Investment Shocks When Using Supplemental Budget Data as a Whole



Note: The red solid line represents the point estimates, and the black dash-dotted lines show 68% and 90% confidence intervals.

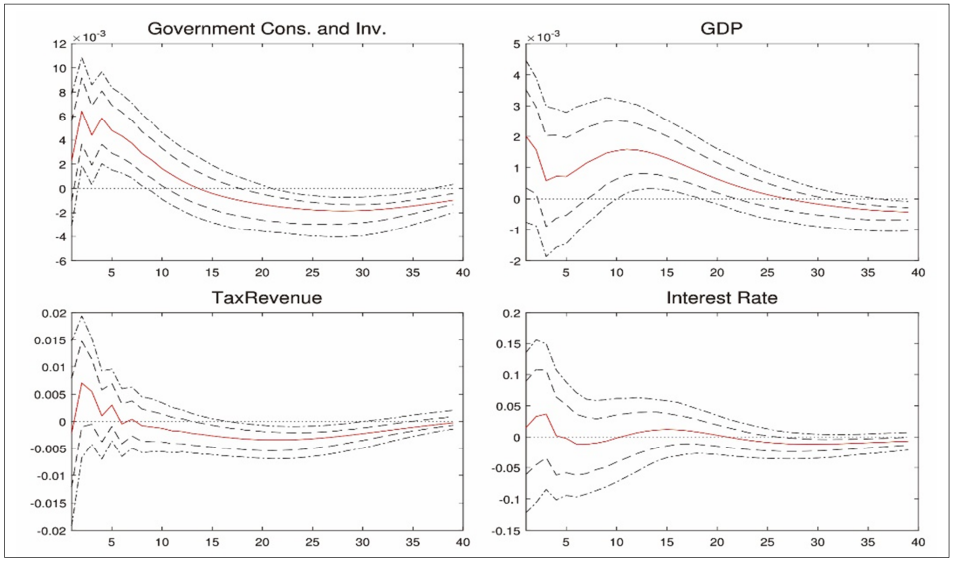
[Figure 13] Impulse Responses of Macroeconomic Variables to Government Consumption and Investment Shocks When Using Supplemental Budget Data as a Whole



Note: The red solid line represents the point estimates, and the black dash-dotted lines show 68% and 90% confidence intervals.

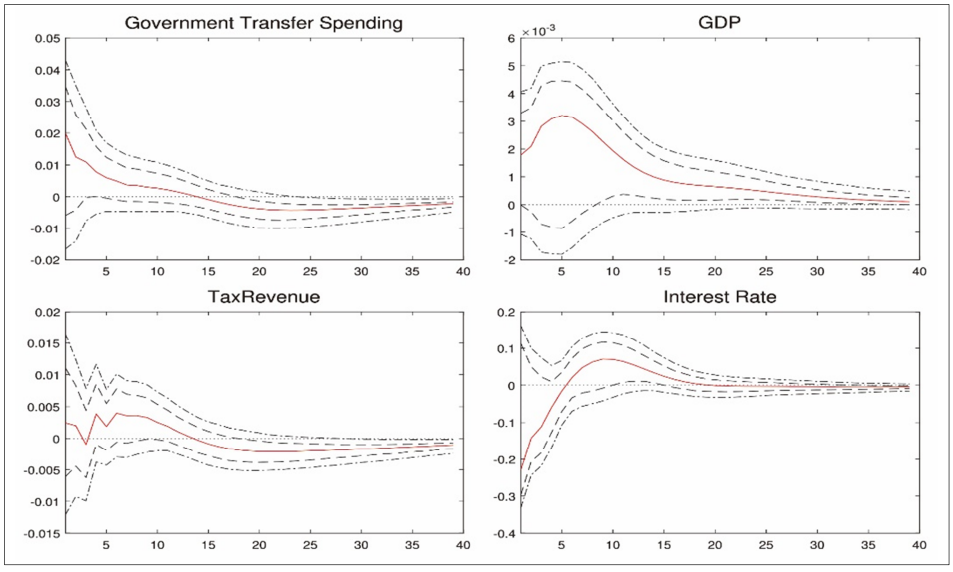
B.2 When Excluding the COVID-19 Period

[Figure 14] Impulse Responses of Macroeconomic Variables to Government Consumption and Investment Shocks When Excluding the COVID-19 Period



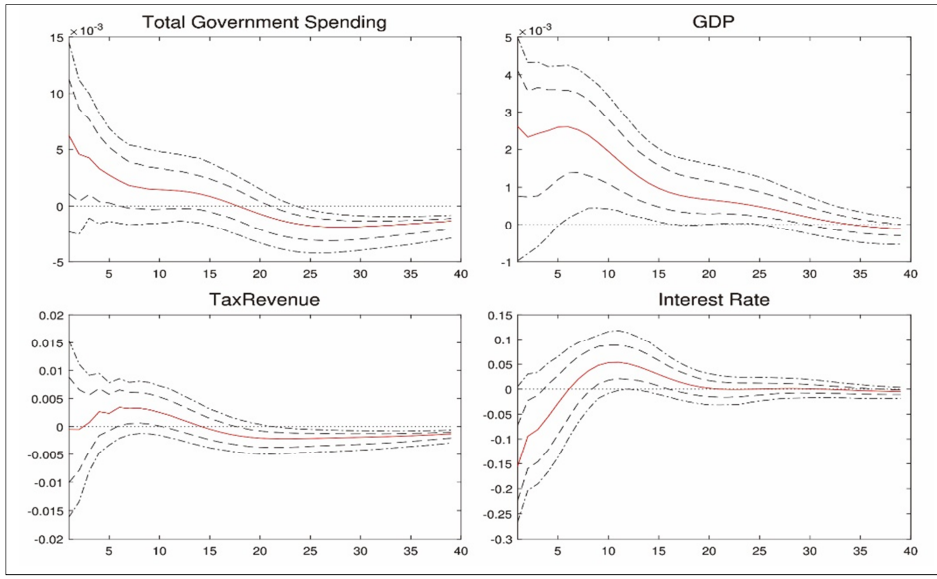
Note: The red solid line represents the point estimates, and the black dash-dotted lines show 68% and 90% confidence intervals.

[Figure 15] Impulse Responses of Macroeconomic Variables to Government Transfer Spending Shocks When Excluding the COVID-19 Period



Note: The red solid line represents the point estimates, and the black dash-dotted lines show 68% and 90% confidence intervals.

[Figure 16] Impulse Responses of Macroeconomic Variables to Total Government Spending Shocks When Excluding the COVID-19 Period



Note: The red solid line represents the point estimates, and the black dash-dotted lines show 68% and 90% confidence intervals.

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추가경정예산정보를 활용한 정부지출 승수 분석*

박 광 용** · 이 병 호***

초 록 정부지출의 효과를 정확하게 측정하기 위해서는 외생적 정부지출충격을 정확히 식별할 필요가 있다. 본고에서는 Stock and Watson (2012)과 Mertens and Ravn(2013)의 Proxy VAR을 바탕으로, 추가경정예산을 정부지출충격의 도구변수로 사용하여 한국 정부지출 승수를 추정하였다. 이러한 방법론으로 기존 연구에서 빈번히 활용되나 다소 임의적 가정이 필요한 시차 제약(timing restriction)을 사용하지 않고 정부지출 충격을 식별했다. 분석 결과 외생적인 정부소비 · 투자 지출 증가 충격과 이전지출 증가 충격은 GDP와 민간 수요에 대한 부양효과를 통계적으로 유의하게 발생시켰다. 보다 정확히는, 1년 누적 승수를 기준으로 정부소비 · 투자 지출과 이전지출 충격 승수는 각각 1.02와 0.54로 시산되었다.

핵심 주제어: 정부지출 승수, 재정 정책, 외부도구변수, Proxy VAR
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