

Inequality and Fiscal Policy Effectiveness

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EXECUTIVE SUMMARY

This paper examines the role of income inequality in determining fiscal policy effectiveness by using panel data of 42 advanced and developing countries during Q1 2000–Q3 2007. Our panel VAR analysis shows that the effect of fiscal policy on output is smaller in economies with high income inequality: the 1-year fiscal multiplier for a country with relatively equal income distribution is estimated to be significant at 0.52 or greater significantly, while that for a country with relatively unequal income distribution is insignificant from zero. The responses of consumption to an expansionary fiscal policy shock show that consumption is more crowded-out for relatively more unequal economies, thus affirming that the low-income households in the economies with high inequality tend to have strong incentives to save additional income from fiscal policy for precautionary reasons.

Keywords: Income Inequality, Fiscal Multiplier, Panel VAR, Dynamic Panel Estimation, Precautionary Savings

JEL Classification: E61, E63, E65

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Ju Hyun Pyun⁺ and Dong-Eun Rhee[‡]

I. Introduction

The various aspects of economic inequality have increasingly discussed and received attention.¹ Considering that global inequality level has been worsening rapidly, inequality may become a significant threat to the world's economy. In this vein, Piketty (2014) argues that inequality is an intrinsic nature of capitalism and a country should remedy the problem with a strong progressive tax system. Many studies have also focused on the role of fiscal policy (redistributive policy) in reducing income inequality (IMF 2014). Indeed, a country's income inequality is

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¹ For instance, recent studies have debated whether national income inequality is the hidden cause of GFC (Rajan 2010; Kumhof and Rancière 2011; Bordo and Meissner 2012). Many scholars have started to reexamine how inequality and economic growth affect each other (Ostry *et al.* 2014; Cho *et al.* 2014).

closely related to its policy-making: Not only is it affected by well-designed fiscal policy, but it also influences policy effectiveness through certain channels. Therefore, fiscal policy needs to be considered in terms of not only a redistributive tool for reducing income inequality, but also its general effectiveness of stabilization depending on the level of inequality.²

In this paper, we shed light on the effect of inequality on fiscal policy, but not the role of fiscal policy in reducing inequality. We test the hypothesis that the level of income inequality affects the effectiveness of fiscal policy. Income inequality implies heterogeneity of economic agents, which generates differences in the liquidity conditions, and marginal propensity to consume (MPC) for different income groups. Theoretically, there might be two contradictory channels in which inequality affects fiscal policy effectiveness. On the one hand, if borrowing constraints affect mostly low-income households, and not high-income households who have large assets, an increase in inequality through redistribution from the poor to the rich makes liquidity constraints more likely to bind (Schmidt-Hebbel and Servén 2000). As a consequence of high inequality level, if more low-income agents face liquidity constraints in a country, the agents should spend most of the additional resources from an expansionary fiscal policy in the current period. Therefore, in the presence of liquidity constraints, more unequal countries may have higher fiscal multipliers. Jappelli and Pistaferri's (2013) results are consistent with this hypothesis. They find that the marginal propensity of low-income households is higher than that of high-income households.

On the other hand, if low-income agents are confronted with significant un-

² Currently, fiscal policy effectiveness and its determinants are timely topics because while most of the advanced economies implemented expansionary fiscal policy during the crisis to cope with the recession, there is no consensus on the effectiveness of the policy.

certainty in future income streams, possibly caused by the absence of a proper social safety net in the relatively unequal economies, the low-income agents may tend to save most of the additional resources and consume only a limited portion.³ Accordingly, an increase in inequality may lead to higher precautionary savings because the poor have stronger incentives of precautionary saving than the rich (Schmidt-Hebbel and Serven 2000). This implies that in a country with high inequality, fiscal multiplier may be smaller because a greater portion of relatively poor households will save additional income from fiscal policy.

The political economy theory of Alesina and Rodrik (1994) and Alesina and Perotti (1996) supports the negative impact of inequality on investment. They suggest that a more unequal society causes social tension and political instability, and investment and growth decrease in response to increased uncertainty. Thus, we can conjecture that fiscal policy effectiveness might be hampered by the uncertain environment of countries with more unequal income distribution.

This paper examines if income inequality affects fiscal policy effectiveness by using panel data of 42 countries during the period Q1 2000–Q3 2007. For this purpose, we divide our sample countries into two sub-groups on the basis of the average income inequality level and estimate each group's government consumption multipliers. Our analysis shows the impulse response of the output component to government spending shock and computes fiscal multipliers. Furthermore, the paper focuses on the consumption response of government spending shock to examine which of the theoretical channels introduced in the study dom-

³ The results of Cunha and Heckman (2007) show that for less skilled workers (with relatively low income), income uncertainty is an important factor to determine their earning inequality. In addition, previous empirical studies show that economic uncertainty goes with precautionary savings (Dardanoni 1991; Mody *et al.* 2012).

inate. Our paper is in line with Ilzetzi *et al.* (2013), Corsetti *et al.* (2012), and Pyun and Rhee (2014) in that this study estimates cross-country fiscal multipliers in terms of a country's various characteristics such as exchange rate regime, debt level, policy interaction etc. through panel VAR methodology. However, this paper is different from the previous research in that we investigate whether fiscal multipliers vary with particularly a country's income inequality level.

The results of this paper show that the dynamic fiscal multiplier for a country with relatively low inequality level is higher than that for a country with relatively high inequality level. Moreover, the 1-year fiscal multipliers of relatively unequal economies are not statistically different from zero, which implies very strong impotence of fiscal policy in the presence of high income inequality. Also, our results affirm that consumption channels of fiscal policy are different between countries with low inequality and high inequality. In particular, the results imply that low-income households do not respond to expansionary fiscal policy by increasing their consumption in the country with high inequality.

The rest of this paper is organized as follows. In Section II, we set up our empirical methodology and data. In Section III, we report our main finding and discuss the result. In Section IV, concluding remarks follow.

II. Empirical Analysis

1. Panel VAR Model

We employ a panel VAR model for the 42-country data introduced in this study. We assume that an economy i ($i = 1, 2, \dots, 42$) is described by the following structural form equation:

$$A(L)Y_t^i = a^i + t_t + \varepsilon_t^i \quad (1)$$

where $Y_t^i = \begin{pmatrix} g_t^i \\ y_t^i \\ c_t^i \\ inv_t^i \end{pmatrix}$ is a 4×1 vector, which includes government consumption (g_t^i),

output (y_t^i), private consumption (c_t^i), and investment (inv_t^i) for a quarter t and country i , a^i is a 4×1 constant matrix of the fixed effects for country, and t_t is that of fixed effects for time. $A(L)$ is a matrix polynomial in the lag operator L and ε_t^i is a vector of structural disturbances. Because we assume that structural disturbances are mutually uncorrelated, $\text{var}(\varepsilon_t^i)$ is denoted by \mathcal{A} , a diagonal matrix in which diagonal elements are the variances of structural disturbances.

Equation (1) is transformed into the reduced-form panel VAR with individual-fixed effects and year-fixed effects as follows:

$$Y_t^i = a^i + t_t + B(L)Y_{t-1}^i + e_t^i \quad (2)$$

where a^i and t_t are transformed matrices of the fixed-effect, $B(L)$ is a matrix polynomial in the lag operator L , and $\text{var}(e_t^i)$ is denoted by Σ . Since the fixed effects, a^i , are correlated with the regressors, we can use the mean-differencing procedure of purging the fixed effects to obtain consistent coefficients. However, in equation (2), we include the dependent variable lags, and thus, the within-group estimator is also biased. Thus, we employ the system GMM proposed by Arellano and Bover (1995) and Blundell and Bond (1998).

Several methods are used to recover the parameters in the structural form equation from the estimated parameters in the reduced form equation.⁴ Changes in government consumption are assumed to be at least one quarter period of time to respond to the innovation in output because a long administrative process before actually implementing fiscal policy exists that prevents fiscal authorities from responding to output change contemporaneously. Hence, the identification strategy under consideration imposes recursive zero restrictions on contemporaneous structural parameters by applying the Cholesky decomposition (Blanchard and Perotti 2002).

Denote A_0 as the contemporaneous coefficient matrix and $A^0(L)$ as the coefficient matrix in $A(L)$ without the contemporaneous A_0 . Hence, we have

$$A(L) = A_0 + A^0(L) \quad (3)$$

So, $B(L)$ and the transformed fixed effects in the estimated reduced form are re-

⁴ Debates on the identification of the exogenous fiscal policy shocks have been ongoing. Please find more detailed discussion on the identification in Pyun and Rhee (2014).

lated by

$$B(L) = -A_0^{-1}A^0(L), \quad a^i{}' = A_0^{-1}a^i, \quad \text{and} \quad t_t{}' = A_0^{-1}t_t \quad (4)$$

The variance of the structural disturbances and that of the residuals of the reduced form are also related as follows; $\Sigma = A_0^{-1} \Lambda A_0^{-1}$.

2. Data

Our sample covers 42 countries for Q1 2000–Q3 2007 (see the list of countries in Appendix). We choose a short sample period because most data on emerging market countries is available from 1999 onwards. Moreover, the recent studies such as Christiano *et al.* (2011) and Pyun and Rhee (2014) show that fiscal policy during the global financial crisis is more effective than before due to specific policy interactions of countries. Corsetti *et al.* (2012) also find that fiscal policy effectiveness in crisis times is greater than that in normal times. So, in order to avoid any structural or systematic influence of the financial crises on fiscal policy effectiveness, we also exclude the period of financial crises (the Asian financial crisis in the late 1990s, the crisis of Latin American countries in the early 2000s, and the GFC of 2007–2009, which is based on the U.S. NBER recession date.)

The vector of variables is $\{\text{GOV}, \text{GDP}, \text{CONS}, \text{INV}\}$, where GOV is government consumption, GDP is a country's GDP, CONS is private consumption and INV is investment. All variables are in the unit of national currency, and the data was obtained from the OECD Quarterly National Accounts. Quarterly government spending, GDP, consumption, investment and the GDP deflator are available from the OECD statistics for developed countries and from CEIC da-

tabase for emerging and developing countries.⁵ All variables are in real terms, and detrended with a quadratic trend after calculating their logarithmic values. Table 1 reports the descriptive statistics of our data in terms of GDP share. It shows that two groups of countries with different inequality levels have very similar ex-post national saving rates (identical to INV/GDP), whereas the ratio of consumption to GDP (CONS/GDP) in countries with relatively high inequality is greater than that with relatively low inequality. This indicates that positive correlation between inequality and CONS/GDP. However it does not imply that consumption response to government spending is greater in countries with higher inequality than those with lower inequality. Note that we are not able to report private saving rate, a variable of our interest in this study because quarterly tax data is not available for most countries including developing countries in our sample.

We also collect net-Gini index from the Standardized World Income Inequality Database (SWIID). The SWIID currently provides comparable Gini indices of market and net income inequality for 173 countries during 1960–2013. See the

Table 1. Descriptive Statistics

	Countries with relatively high inequality (Gini>=31.1)				Countries with relatively low inequality (Gini<31.1)			
	Mean	S.D.	Min.	Max.	Mean	S.D.	Min.	Max.
GOV/GDP	0.154	0.049	0.062	0.294	0.200	0.039	0.108	0.312
CONS/GDP	0.610	0.079	0.385	0.753	0.529	0.071	0.332	0.659
INV/GDP	0.210	0.043	0.110	0.362	0.214	0.035	0.135	0.382
Observations	638				620			

Note: S.D. denotes standard deviation. All variables in our sample are in the unit of national currency. Summary statistics of variables of pooled sample are not informative so we use the ratio of variables to GDP.

⁵ <https://www.ceicdata.com>

detailed information of a country's Gini index in Table 2.

No.	Country	Net Gini index (1980-2007 avg.)
1	Slovak Republic	22.3
2	Sweden	22.4
3	Finland	22.5
4	Norway	23.7
5	Slovenia	23.7
6	Denmark	23.8
7	Belgium	24.5
8	Netherlands	25.2
9	Luxembourg	25.3
10	Austria	26.6
11	Japan	26.7
12	Hungary	26.8
13	Germany	26.8
14	Poland	28
15	France	29.1
16	Canada	29.4
17	Switzerland	29.9
18	Australia	30.1
19	Estonia	30.5
20	New Zealand	31
21	Portugal	31.1
22	Spain	31.9
23	Italy	32.2
24	Korea, Republic of	32.4
25	Ireland	32.5
26	United Kingdom	32.5
27	Israel	33
28	Russia	33.8
29	United States	34.9
30	Argentina	42.8
31	Indonesia	46.2
32	Mexico	46.2
33	Malaysia	47.5
34	Turkey	47.6
35	Philippines	48.5
36	India	49.1
37	Colombia	49.6
38	Chile	49.8
39	Brazil	51.2
40	Peru	53.3
41	Thailand	56.6
42	South Africa	56.9

Source: SWIID database.

3. Dynamic Fiscal Multiplier

A fiscal multiplier is defined as the change in real GDP caused by a 1-unit increase in a fiscal variable. Dynamic multiplier measures are used in the paper according to the forecast horizon (see Ilzetzi *et al.* 2013). Hence, the cumulative multiplier at time T is defined as $\frac{\sum_{t=0}^T \Delta GDP_t}{\sum_{t=0}^T \Delta GOV_t}$, which shows the ratio of cumulative change in GDP to change in additional government spending from the impulse to time T.

III. Empirical Results

1. Baseline results

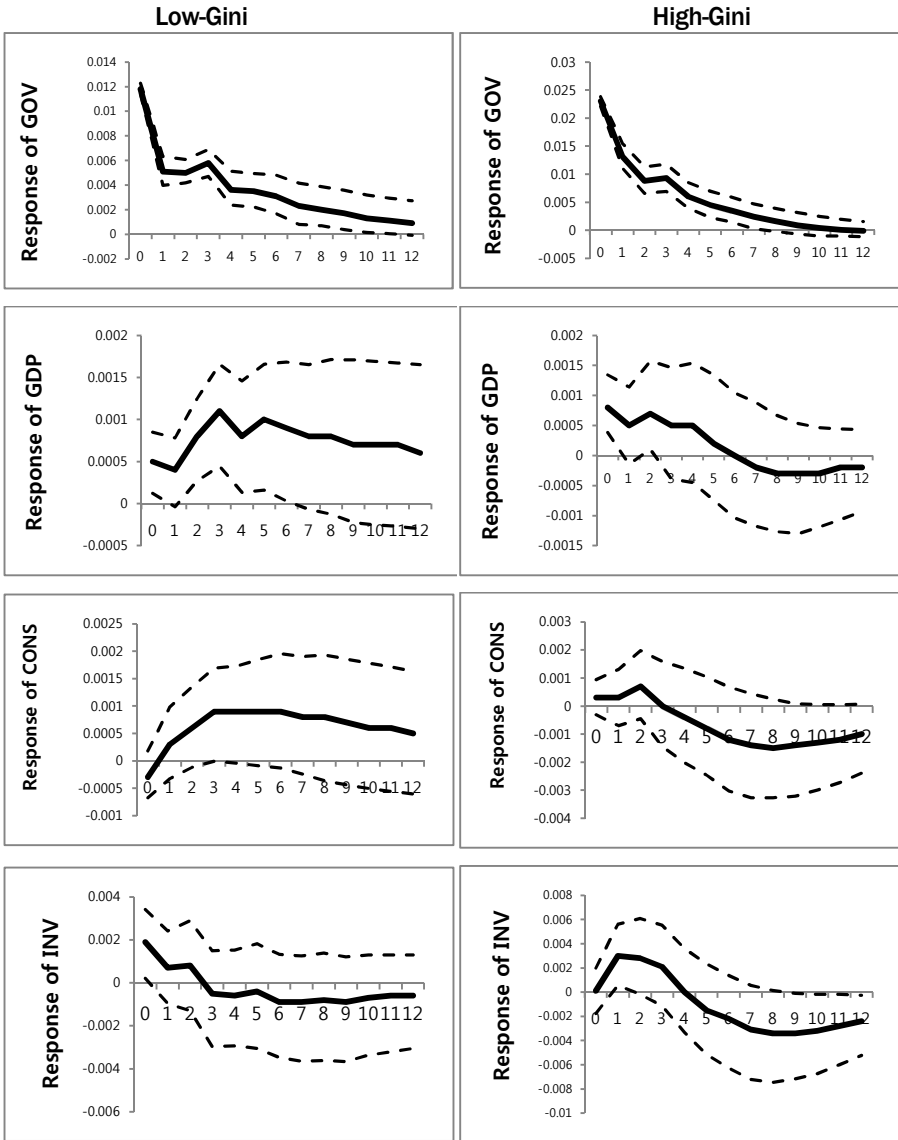
We divide our sample into two subsample groups on the basis of median level of income inequality (net-Gini index), 31.1%, observed in Table 2.⁶ Figure 1 shows the responses of output components to a 1-standard-deviation shock in government consumption over 12 quarters. The left and right panels in Figure 1 display the results for countries with low Gini scores (henceforth low-Gini) and those with high Gini scores (henceforth high-Gini), respectively. We compute standard errors of the impulse response functions and generate 90% confidence intervals with Monte Carlo simulations with 1000 repetitions.⁷ For the countries with low-Gini, the impact response of the output to government spending is positive at the impulse and remains significantly positive at the 90% confidence interval from the sixth quarter. However, for the countries with high-Gini, the output response to the government spending shock is not statistically significant from zero. Hence, the results show that the fiscal multiplier is indeed smaller in a country with high inequality level.

Moreover, the response of consumption to government spending shock is different between the two groups of countries: the countries with low-Gini have

⁶ Table 1 shows individual countries' net-Gini index. The median of Gini index of the sample is 31.1%.

⁷ In practice, we randomly generate a draw of coefficients of the reduced form model in equation (2) using the estimated coefficients and their variance–covariance matrix, and calculate the impulse-responses again. This procedure is repeated 1000 times.

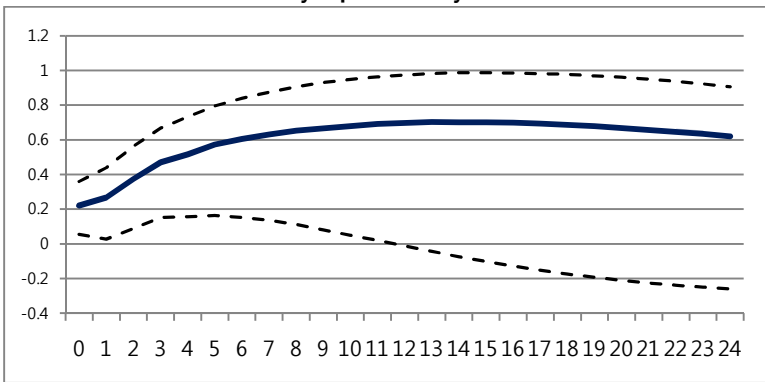
Figure 1. Baseline: Impulse Response to GOV Shock



Note: Dotted lines represent 90% confidence intervals based on 1000 Monte Carlo simulations.

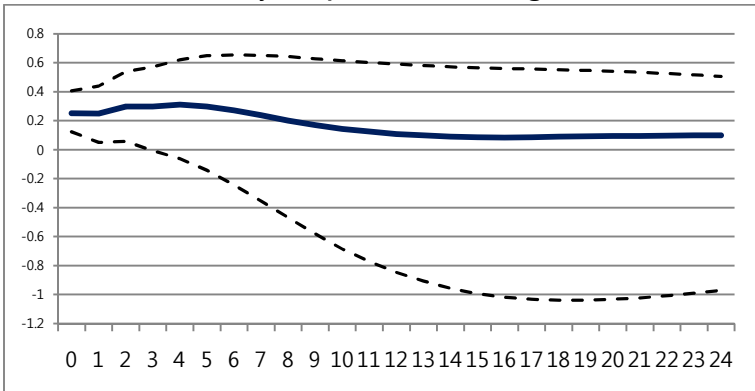
a positive but slightly insignificant consumption response to government spending shock, while those with high-Gini show insignificant consumption responses

Figure 2. Fiscal Multipliers Depending on Income Inequality
 <Relatively Equal Society: Low Gini>



Low-Gini	T=0 (Impact)	T=4	T=8	T=∞
Cumulative multiplier	0.22*	0.52*	0.65*	0.62

<Relatively Unequal Economies: High Gini>



High-Gini	T=0 (Impact)	T=4	T=8	T=∞
Cumulative multiplier	0.25*	0.31	0.20	0.1

Note: * indicates statistical significance at the 10% critical level.

to the shock. This implies that for relatively more low-income households under certain income level, when additional income from expansionary fiscal policy is given, their precautionary saving motives dominate, although their marginal propensity of consumption is usually considered greater than that of high-income households.

Based on the impulse response reported in Figure 1, we calculate the fiscal multipliers of the low-Gini and high-Gini countries in Figure 2. Since the fiscal expansion may take effect with lags, dynamic responses of macroeconomic variables need to be considered. Therefore, we also report cumulative multipliers of government spending over time. The upper panel in Figure 2 shows that the impact multiplier in the countries with low-Gini is 0.22. The cumulative multiplier increases up to 0.65 at the eighth quarter after the impulse. The fiscal multipliers for the countries with high-Gini are described in the lower panel in Figure 2. The fiscal multiplier is 0.25 on impact, which is similar to those of low-Gini countries. However, the cumulative multipliers after three quarters for the countries with high-Gini are insignificant and not different from zero. The results show again that the fiscal multiplier in countries with low-Gini is relatively greater than that in countries with high-Gini, although the observed fiscal multipliers in countries with low-Gini is not even greater than 1, which indicates that fiscal policy overall is not substantially effective.

2. Robustness checks

The finding that higher fiscal multipliers in the countries with low-Gini than those with high-Gini is important, but one may argue that other economic char-

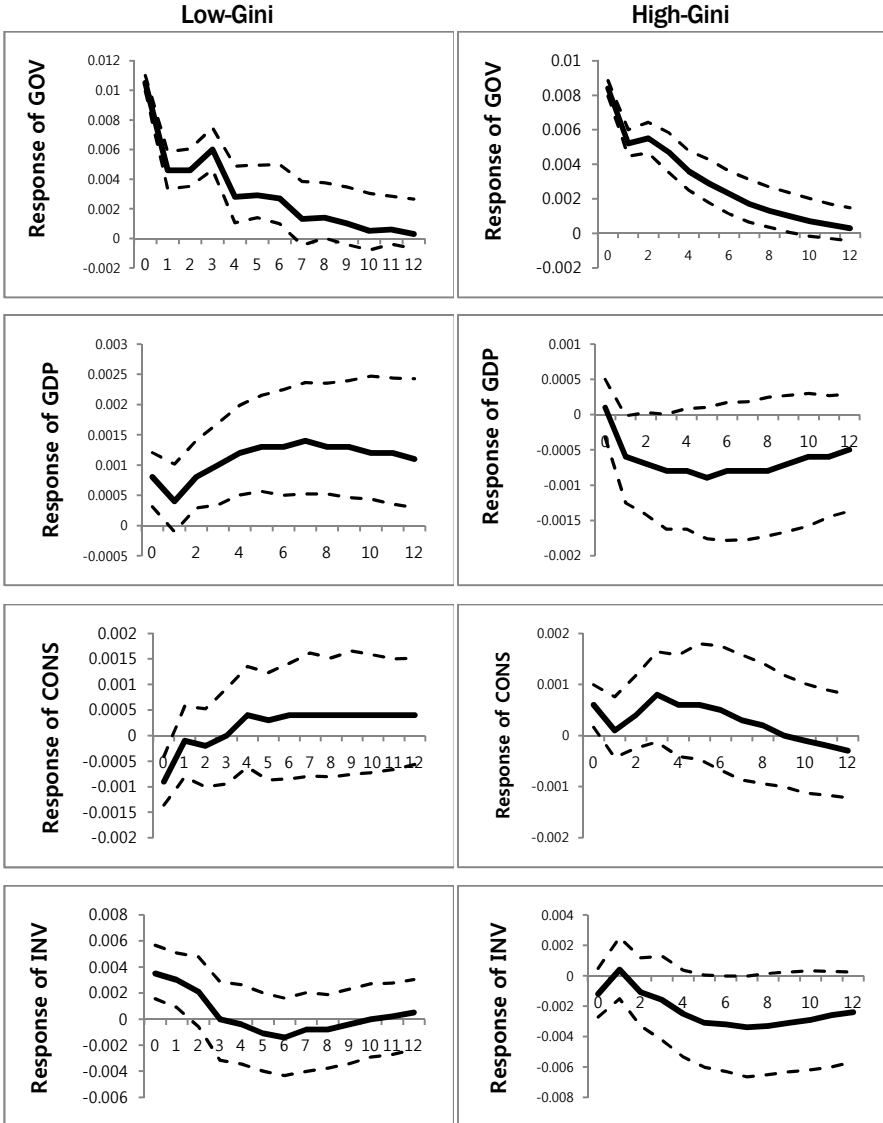
acteristics intrinsic to the two sub-samples can also drive our results.⁸ For instance, Ilzetzki *et al.* (2013) show that fiscal multipliers of advanced countries are greater than those of developing countries. Since income level is generally negatively correlated with income inequality, we need to test if the fiscal multiplier gaps are indeed generated from income inequality or from other source of economic features such as income level between the two groups of economies. To reinforce robustness of the result, we pursue another sub-sample analysis that considers not only income inequality but also income level. We first divide our full sample into advanced countries and developing countries and further divide each sub-sample according to income inequality.

Figure 3 shows the impulse-response of government spending shock for advanced countries (high-income countries) and Figure 4 shows that for developing countries (low-income countries). Each figure also shows different responses of output components between countries with low-Gini and high-Gini. The threshold of Gini is 31.1% in both sub samples.

The responses of government spending, GDP, consumption, and investment from each sub-sample in Figure 3 are similar to the previous results in Figure 1. For advanced countries that have relatively low Gini index among themselves, the expansionary fiscal policy increases output and investment significantly. However, the response of output is rather negative for the countries with high-Gini even in the advanced country group. This implies that a country's inequality plays a more important role in determining its fiscal policy effectiveness than a country's income level. Note that no significant responses of consumption to government spending shock existed in both sub-samples of advanced countries.

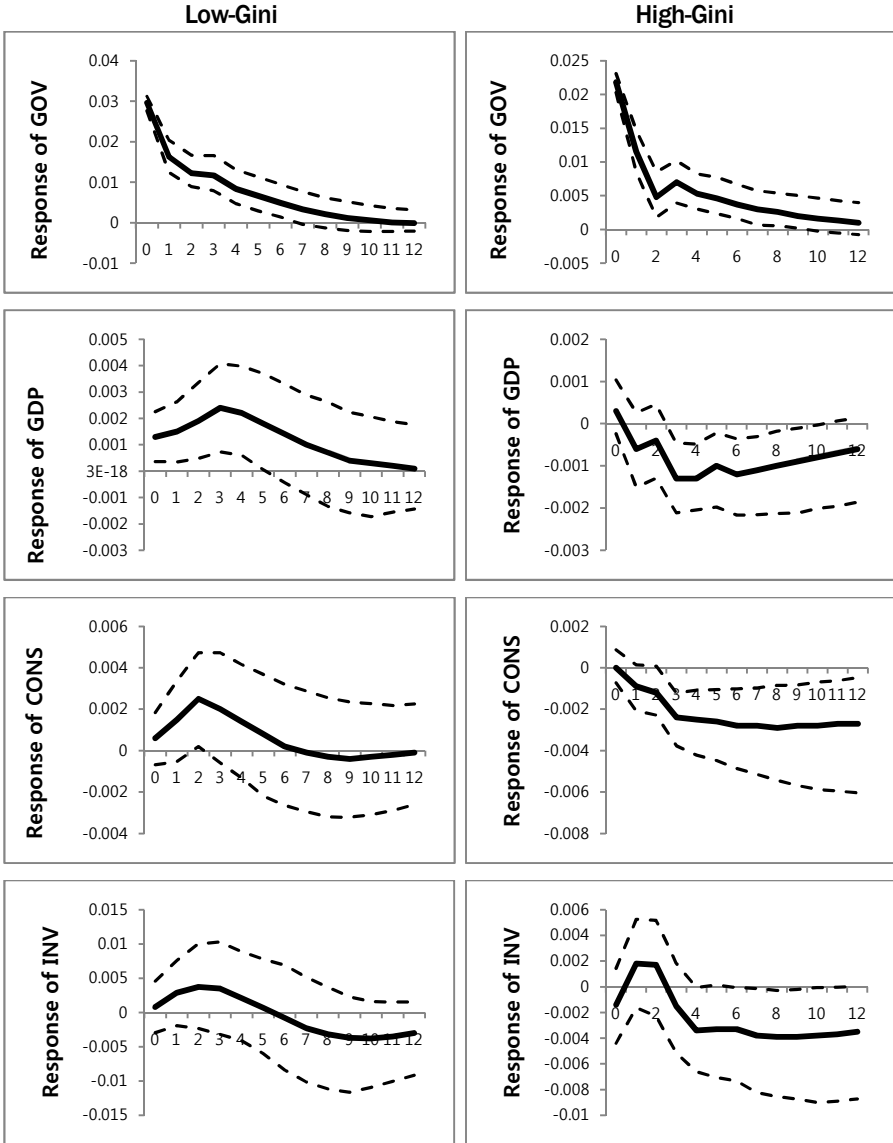
⁸ Our fixed-effect techniques capture a country's unobserved and time-invariant characteristics, and thus, our analysis indirectly considers the country's heterogeneous institution, regulation, etc.

Figure 3. Impulse Response to GOV Shock in Advanced Countries



Note: Dotted lines represent 90% confidence intervals based on 1000 Monte Carlo simulations.

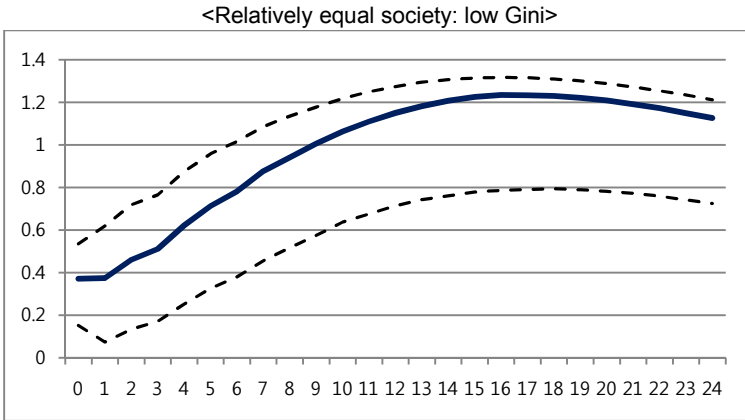
Figure 4. Impulse Response to GOV Shock in Emerging & Developing Countries



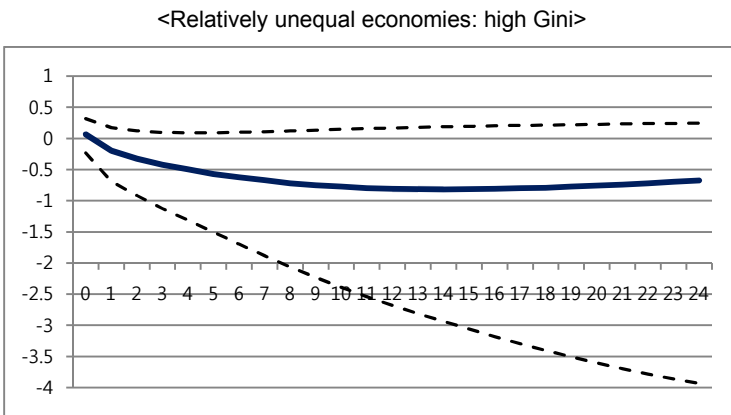
Note: Dotted lines represent 90% confidence intervals based on 1000 Monte Carlo simulations.

Figure 4 displays the responses of output components to a government spending shock in developing countries. For countries with low-Gini in this sample,

Figure 5. Fiscal Multipliers Depending on Income Inequality in Advanced Countries



Low-Gini	T=0 (Impact)	T=4	T=8	T=12	T=∞
Cumulative multiplier	0.37*	0.62*	0.94*	1.15*	1.12*

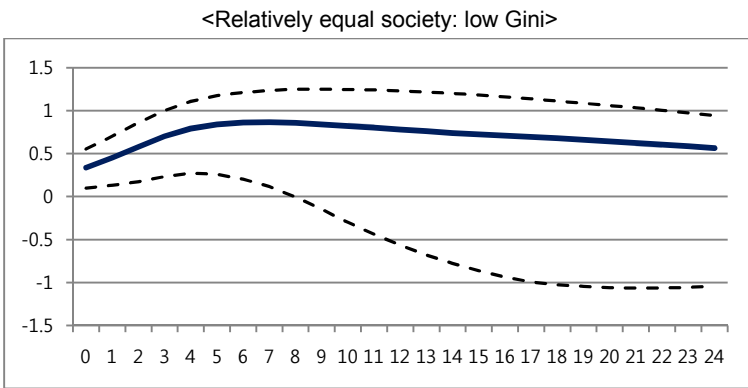


High-Gini	T=0 (Impact)	T=4	T=8	T=12	T=∞
Cumulative multiplier	0.07	-0.49	-0.72	-0.8	-0.65

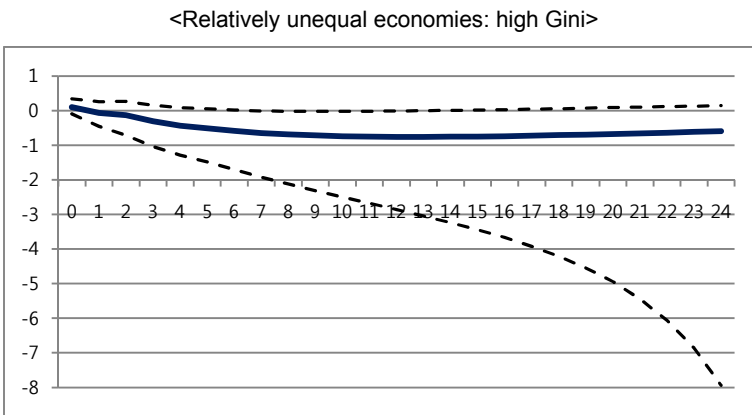
Note: * indicates statistical significance at the 10% critical level

the increased government spending indeed causes increase in output and consumption significantly, contributing to a higher fiscal multiplier. In contrast, for

Figure 6. Fiscal Multipliers Depending on Income Inequality in Emerging & Developing Countries



Low-Gini	Impact (T=0)	T=4	T=8	T=12	T=∞
Cumulative multiplier	0.34*	0.79*	0.86	0.78	0.56



High-Gini	Impact (T=0)	T=4	T=8	T=12	T=∞
Cumulative multiplier	0.11	-0.44	-0.68	-0.75	-0.58

Note: * indicates statistical significance at the 10% critical level.

countries with high-Gini, the responses of output and consumption are significantly negative, which confirms our theoretical conjecture on the role of inequality in determining fiscal policy effectiveness.

Figures 5 and 6 report fiscal multipliers for inequality sub-samples for advanced and developing economies based on Figures 3. For advanced countries in Figure 5, the multipliers of countries with low-Gini reached up to 1.15 at the eighth quarter from the impulse and remain significantly positive in the long run. By contrast, the impact multiplier with high-Gini is not statistically different from zero. The multipliers became negative in the long run. Figure 6 shows very similar results with Figure 5. In the developing country sample, countries with low-Gini have relatively higher fiscal multipliers than those with high-Gini.

IV. Conclusion

This paper has shown that the effect of fiscal policy on output is smaller in an economy with high income inequality. In the full-sample estimation, the 1-year fiscal multiplier for a country with relatively equal income distribution is estimated to be significant at 0.52 or greater, while that for a country with relatively unequal income distribution is insignificant from zero. The responses of consumption to an expansionary fiscal policy shock show that consumption is more crowded-out for high-income inequality economies, which imply that low-income agents tend to have stronger incentives to save for precautionary reasons. If the main purpose of unexpected fiscal expansions is to stabilize the business cycle during a downturn, we can say that the fiscal policy is not a proper macroeconomic instrument for an economy with high inequality level.

This is, to our best knowledge, the first paper to consider inequality as a determinant of fiscal policy effectiveness. Therefore, it sheds new light on the planning and implementation of macroeconomic policy, especially in a country with high inequality level. Policy makers very frequently encounter difficulties since fiscal multipliers are time-variant and country-specific. It is observed that the global average inequality level has deteriorated in both advanced and developing countries. The results of this paper suggest that one of the reasons for the various fiscal multipliers is inequality, and policy makers should consider a country's income distribution when implementing fiscal policy in the era of rising inequality.

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Appendix

Advanced Countries (25)

Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Israel, Italy, Japan, Korea, Republic of, Luxembourg, Netherlands, Norway, New Zealand, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, United Kingdom, and United States

Emerging and Developing Countries (17)

Argentina, Brazil, Chile, Colombia, Estonia, Hungary, Indonesia, India, Mexico, Malaysia, Peru, Philippines, Poland, Russia, Thailand, Turkey, and South Africa

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- 11-01 Empirical Tests of Comparative Advantage: Factor Proportions, Technology, and Geography Nakgyoon Choi

국문요약

본 연구는 소득 불평등도가 재정정책의 효과에 미치는 영향에 대해 2000년 1/4분기부터 2007년 3/4분기까지의 기간 동안 선진국과 개발도상국을 포함한 42개국의 패널 자료(panel data)를 이용하여 실증분석하고 있다. 패널 VAR 모형을 통해 재정승수(fiscal multiplier)를 추정된 결과, 소득 불평등도가 높은 국가군에서 상대적으로 낮은 재정승수가 관찰되었다. 상대적으로 소득 불평등도가 낮은 국가군에서는 1년 동안의 누적 재정승수가 통계적으로 유의하게 0.52 이상으로 추정되었으나, 상대적으로 소득 불평등도가 높은 국가군에서는 재정승수가 유의하게 추정되지 않았다. 같은 분석을 통해 소득불평등도가 높은 국가군에서는 재정 확장 충격에 대해 소비의 구축(crowding out)이 상대적으로 크게 나타나는 현상이 관찰되었는데, 이는 소득 불평등도가 심한 국가의 저소득층은 재정책대에 대해 소비를 늘리기보다는 예비적 동기의 저축을 할 유인이 크기 때문인 것으로 해석된다. 본 연구 결과는 소득불평등도가 큰 국가에서는 재정 확장을 통한 경기부양 효과가 제한적일 수 있음을 시사하고 있다.

핵심용어: 소득 불평등, 재정승수, 패널 벡터자기상관회귀 모형(Panel VAR), 동태 패널 추정(Dynamic Panel Estimation), 예비적 동기의 저축

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