DOES GOODS AND SERVICES SPENDINGS REDUCE INCOME INEQUALITY? A PANEL DATA EVIDENCE FROM INDONESIA

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Abstract

The main purposes of our study are to investigate the effect of goods & services spending (GSS) and social spending (SS) on income inequality (GR). Using a panel data set of 26 provinces in Indonesia from 2005 to 2015, panel vector autoregressive and Granger causality test are employed to explore the causal relationship of the variables. The study found out that the SS has a negative and significant effect on GR at the 2-period horizon. The GR has a positive and significant effect on the GSS at the 4-period horizon, but negative and significant effects at the 3-period horizon. The result of the Granger causality test indicates that there is a unidirectional causality running from GSS to SS, and bidirectional causality exists between GR and SS, and between GR and GSS.

Keywords: Income inequality, goods and services spendings, social spendings, Panel Vector Autoregressive, and Granger Causality test.

JEL classification: D33, H53, I38

1. Introduction

Income inequality had been a common phenomenon in developing economies (Cabrera et al., 2015). The existence of this economic variable can cause social problems which affect various aspects of people's lives (Wu & Li, 2017). Therefore, the government should be able to take development policies which not only oriented towards increasing output but also improving income distribution in communities. Of the most popular policies used by the government in reducing income inequality is through the allocation of public spendings.

So far, research studies on the relationship between government spending and income inequality have received serious attention from many economic researchers (Muinelo-Gallo & Roca-Sagales, 2014; Celikay & Gumus, 2017). Physical infrastructure development activities carried out by the government to increase economic activities are believed to be able to improve the welfare of the community, but not necessarily able to improve income distribution. On the one hand, economic growth is increasing fastly, but on the other hand, income inequality is also getting higher. Actually, the expected ideal conditions as measurement of the success of economic development are high economic growth in line with better income distribution (Amri & Nazamuddin, 2018).

Local government policies in Indonesia to reduce income inequality is carried out through local government expenditure policies in the form the goods & services spending, and social spending. Through spending on goods and services, the local government seeks to increase the supply of goods and services that aims to improve public services to meet the needs of the people in the region (Wu & Li, 2017). Furthermore, the allocation of social spending is usually channeled to low-income communities, especially the poor, so that it is expected to reduce the income gap in the community. Moreover, social spending in Indonesia is usually channeled in the form of transfer payments and subsidies for low-income households.

Regarding the income distribution, primarily data discover that income inequality of the perspective provinces in Indonesia is relatively different from one another. This can be seen from the development of the Gini ratio of each region. In 2015, regions with a high level of income inequality and above the national average were West Papua with a Gini ratio of 0.44,

DI Yogyakarta and East Java with a Gini ratio of 0.43 and 0.42, respectively. At the same time, the allocation of local government budgets in the form of goods and services and social spending was also relatively different. The largest-expenditure regions on goods and services are Papua, West Papua, and Aceh province. The opposite is West Java and Central Java province. In terms of social spending, the first-highest-expenditure province is West Papua, then Papua in the second. On the contrary, Lampung and Central Java are the lowest-social expenditure provinces compared to other regions in Indonesia. So, the income inequality in the respective provinces is in line with differences in local government budget allocations on goods, services, and social spendings.

As stated earlier, the study of the relationship between the allocation of government expenditure and income inequality has been carried out by previous researchers. Crudu (2015) in his research in European Union countries concluded, that local government budget policies could change income distribution (reduce inequality or increase inequality). Previously, Gallo & Sagales (2013) in their research with a sample of 21 high-income countries over the period 1972-2006 found out that income inequality was an important determinant of the outcome of fiscal policy in terms of government spending, especially goods and services and social spending.

A number of researchers found a negative relationship between the two kinds of government spending with income inequality. For example, Higgins & Pereira's (2014) research in Brazil concluded that government spending for goods and services as well as social spending, especially in the form of transfer payments and subsidy, could improve income distribution. Doerrenberg & Peichl's (2014) study for the case of OECD Countries also found a negative impact on social spending on income inequality. Previously, research study which is conducted by Ramos & Roca-Sagales (2008) and Niehues (2010) also presented the same conclusions where some components of fiscal policy such as goods and services spending and social spending could reduce income inequality. Recently, research study of Heer & Scharrer (2018) also concludes that the increasing in government spending will decrease income and wealth inequality.

In contrast to the empirical findings of the researchers as explained above, the same research study which is conducted by Muinelo-Gallo & Sagales (2013) concluded that government spending increases income inequality. In line with Gallo and Sagales, the findings of Claus et al.'s (2014) study for the case of 15 Asian countries also found that social spending has an impact on increasing income inequality. Likewise, Sabir et al. (2015) also show that regional government spending has a positive and significant influence on income inequality.

Having the absence of consistent results regarding with the direction of causality between the two kinds of government expenditure and income inequality, then our research study re-examined the relationship between these variables in the context of the Indonesian economy. Unlike the previous researchers, our study utilizes panel vector autoregressive as means of an econometric model that is applied to analyze the relationships between the variables. In addition, the use of Granger causality tests also allows us more detail to investigate the nature of causal relationships of the variables.

The paper is composed of five sections. The second section contains information about the literature review that explains empirical findings on the relationship between government spending and income inequality. The third section describes the research method containing data sources and econometric analysis models that are applied to analyze relationships between variables. The fourth section is the result and discussion containing information about the trends of spending on goods and services, and social spending as well as the dynamics of income inequality in Indonesia, the result of PVAR estimate coefficient and Granger Causality test and its discussion. Then, the last section is conclusions and recommendations.

2. Empirical literature

Local government expenditure is an important instrument of regional fiscal policy reflected in the local administrations budget. This expenditure excludes the form of public expenditure to finance development, employee salaries and the provision of public infrastructure to meet community needs but also in the form of goods and services, and social

spending (Crudu, 2015). The allocation of the two kinds of spending at the regional budget is an important policy for local governments that are expected to affect economic growth and income inequality (Afonso et al., 2008).

So far, there have been many research studies on the impact of government spending, especially for good and services, and social spending on income inequality. However, their empirical findings are still confusing. That is, the research findings of researchers do not yet have the same conclusions regarding the direction of the causal relationship between the variables. Ali & Ahmed (2010) prove that government spending in the form of providing public goods and services enables to reduce income inequality. Anderson et al. (2017) also found that the allocation of the government budget on goods and services spending was able to reduce income inequality. Likewise, with the empirical study conducted by Heer & Scharrer (2018) regarding the impact of government spending shock on income inequality also provides empirical evidence that increases in government spending will decrease income inequality.

The findings of the studies are consistent with previous studies conducted by Donoaghue et al. (2004) and Decoster et al. (2009) concluding that public spending on goods and services may be able to reduce inequality. When the government increases the budget for goods and services to meet the needs of the community, the policy can improve income distribution.

Regarding the linkage of social spendings and income distribution, several studies have pointed out the positive impact of the spending on income distribution. For example, the empirical study conducted by Niehues (2010) and Martinez-Vazquez et al. (2012) discovered that social spending has a positive impact on income distribution. The impact of the spending on income inequality reduction is even greater when compared to the impact of increasing taxes which also aims to improve income distribution (Lustig et al., 2014; Doerrenberg & Peichl, 2014).

In contrast to the empirical findings as explained above, the results of the study by Claus et al. (2014) in Pakistan found that social spending increases income inequality. Similar to the results of the study of Khan & Hashmi (2015) in Pakistan proofing that social spending increase income inequality. Gallo & Sagales's (2013) research also prove that government spending increases income inequality. The findings are in line with the findings of Sabir et al. (2015) founding out that government spending had a positive and significant influence on income inequality. Previously, the study of Jones (2007) on the linkage of income inequality and social spending in Japan also concluded that the impact of social spending on income quality in Japan is weak compared to other OECD countries.

3. Data and research methods

The data used in this study is a secondary data which is provided by Indonesian central bureau of statistics. The secondary data are an annual panel dataset of 26 provinces in Indonesia from 2005 to 2015. The measurement of income inequality uses the Gini ratio. A number of the previous research study also utilizes the ratio as measures of income inequality (Modalsli, 2018; Amri & Nazamuddin, 2018). Furthermore, the measurement of goods & services spending and social spending are based on per capita spending for the two kinds of spending and then measured by IDR thousand per capita.

A first stage in our empirical study is represented by the analysis of stationary. I used the Levine–Lin–Chu (LLC) method (Levine, Lin, & Chu, 2002) and the Im–Pesaran–Shin (IPS) method (Im, Pesaran, & Shin, 2003) to check the order of integration to see where the time series variable attains stationary. Both the LLC and IPS methods were deployed on the principles of the conventional Augmented Dickey–Fuller (ADF) test. The LLC methods explores the heterogeneity of intercepts across members of the panel, while the IPS method explores the heterogeneity in the intercepts, as well as in the slope coefficients. Both tests were applied by averaging individual ADF t-statistics across cross-section units.

The second stage in the method of the analysis is co-integration test. The concept of co-integration, introduced by Granger (1969), is relevant to the problem of determining long-run relationship between the variables. The basic idea that underpins co-integration is simple. If the difference between two non-stationary series is itself stationary, then the two series are co-integrated. If two or more series co-integrated, it is possible to interpret the variables in these

series as being in a long-run equilibrium relationship (Engle & Granger, 1987). By contrast, a lack of co-integration suggests that the variables have no long-run relationship-thus, in principle, the postulated variables can arbitrarily move far away from each other.

In the three stage, the causality analysis between the three variables is performed by means of a panel vector auto regression (PVAR) model. The panel data VAR methodology combines the traditional VAR approach, which treats all the variables in the system as endogenous, with the panel-data approach, which allows for unobserved individual heterogeneity (Grossmann et al., 2014). The optimal of lag length is evaluated by means of the Schwarz information criterion. PVAR model employed to examine the causality relationship among income inequality, social spending and good & services spending formulated as follow:

$$\Delta LGR_{it} = \alpha_0 + \sum_{j=1}^{n} \beta_{1j} \Delta LGR_{i,t-j} + \sum_{j=1}^{n} \beta_{2j} \Delta LGSS_{i,t-j} + \sum_{j=1}^{n} \beta_{3j} \Delta LSS_{i,t-j} + \mu_{it}$$

$$\Delta LGSS_{it} = \alpha_0 + \sum_{j=1}^{n} \beta_{1j} \Delta LGSS_{i,t-j} + \sum_{j=1}^{n} \beta_{2j} \Delta LGR_{i,t-j} + \sum_{j=1}^{n} \beta_{3j} \Delta LSS_{i,t-j} + \varepsilon_{it}$$

$$\Delta LSS_{it} = \alpha_0 + \sum_{j=1}^{n} \beta_{1j} \Delta LSS_{i,t-j} + \sum_{j=1}^{n} \beta_{2j} \Delta LGR_{i,t-j} + \sum_{j=1}^{n} \beta_{3j} \Delta LGSS_{i,t-j} + v_{it}$$

where ΔLGR denotes the first difference of the natural logarithm of Gini ratio as the measurement of the income inequality, $\Delta LGSS$ denotes the first difference of the natural logarithm of goods and service spending per capita, and ΔLSS denotes the first difference of the natural logarithm of social spending per capita, i denotes the province of i, and t denotes the period of t. Furthermore, α and β are constants to be estimated, as well as, μ , ε , and v denotes a stochastic error term of the PVAR equation, respectively.

4. The findings and discussion

4.1. The descriptive statistics of the variables

From 2005 to 2015, income inequality at the provincial level in Indonesia differed one and another. The difference likely is shown from the Gini ratio of the respective province. Besides the dynamics of income inequality also change over the period. On one side, there are several provinces have an increased Gini ratio, and others with a Gini ratio that tends to decline. The results of descriptive statistics show that the highest Gini ratio of 0.44, and the lowest of 0.35 with an average of 0.351.

The local government budget for the provision of public good and services and social spending also differs between the province. Highest-goods and services spendings province is IDR1,267,956.00 per capita. Conversely the lowest-goods and services spendings provinces of IDR106,307.40 per capita with an average of IDR173,621.60 per capita. The government budget for social spendings is lower compared to spending on public goods and services. The highest social spendings are IDR641,332.50 per capita and contrarily the lowest of IDR51,651.71 per capita. In detail, the results of the descriptive statistics and correlation coefficients of the variables, as shown in Table 1.

Table 1. Descriptive statistics of the research variable

Statistical Measures	Gini Ratio	Goods and Services Spending (IDR000 per capita)	Social Spending (IDR000 per capita)
Mean	0.3514	173,621.60	90,761.93
Median	0.3500	106,307.40	51,651.71
Maximum	0.4400	1,267,956.00	641,332.50
Minimum	0.2600	16,821.30	316.95
Std. Dev.	0.0422	202,529.60	91,494.22
Observations	286	286	286
Correlation between variables			
GR	1		
GSS	0.2248	1	
SS	0.3626	0.6397	1

Sources: Authors' Computation using E-views 9.0

Table 1 above also show the correlation between the three variables. The relationship between income inequality (GR) and GSS showed a correlation coefficient of 0.228. This thing evidence that the two variables correlated positively. Coefficient correlation between SS and income inequality, and between the GSS and SS showed by a correlation coefficient of 0.3626 and 0.6397, respectively. Thus, it is can conclude that the nature of relations between the variables is positive. Goods and services spending are positively related with social spending. higher goods and services spending, higher social spending.

4.2. The result of unit root test

The most important thing about the use of the econometric model in analyzing time series data is that the data attains a stationary condition (no unit roots). Therefore, the main step in data analysis is testing whether the data suffers from unit roots or vice versa have achieved stationarity. The unit root test of panel data set utilizes six approaches consisting of Levin, Lin & Chu (LLC), I'm, Pesaran & Shin (IPS), ADF - Fisher X2, ADF - Choi Z-stat, PP - Fisher, and PP - Choi test (Amri, 2018). The result of the test summarized in table 2.

Table 2. The result of panel unit root test

No	Variabel	Methods	Individual Intercept				Intercept & Trend			
			Level		First Difference		Level		First Difference	
			T-stat	P-value	T-stat	P-value	T-stat	P-value	T-stat	P-value
1	Income Inequality (LGR)	Levin, Lin & Chu	-3.813	0.000	-5.771	0.000	-2.898	0.002	-4.672	0.000
		Im, Pesaran & Shin	0.309	0.622	-2.092	0.018	0.705	0.759	0.488	0.687
		ADF - Fisher X^2	40.790	0.869	74.064	0.024	36.876	0.944	42.368	0.827
		ADF - Choi Z-stat	0.340	0.633	-3.027	0.001	0.792	0.786	0.370	0.644
		PP – Fisher	43.597	0.790	133.716	0.000	32.048	0.987	126.262	0.000
		PP – Choi	-0.021	0.492	-6.502	0.000	2.341	0.990	-4.529	0.000
2	Sosial Spendings (LSS)	Levin, Lin & Chu	-3.885	0.000	-9.034	0.000	-9.171	0.000	-12.646	0.000
		Im, Pesaran & Shin	1.266	0.897	-4.707	0.000	-1.148	0.125	-2.002	0.022
		ADF - Fisher X^2	36.318	0.952	118.664	0.000	76.853	0.014	97.903	0.000
		ADF - Choi Z-stat	1.550	0.939	-5.828	0.000	-2.269	0.012	-4.033	0.000
		PP – Fisher	38.485	0.918	286.997	0.000	135.358	0.000	252.354	0.000
		PP – Choi	1.865	0.969	-12.646	0.000	-4.576	0.000	-11.278	0.000
3	Good and Services Spending (LGSS)	Levin, Lin & Chu	-3.229	0.000	-5.287	0.000	-3.758	0.000	-5.913	0.000
		Im, Pesaran & Shin	2.373	0.991	-3.061	0.001	0.186	0.574	-0.487	0.313
		ADF - Fisher X^2	26.444	0.999	92.707	0.000	56.201	0.321	63.326	0.135
		ADF - Choi Z-stat	2.771	0.997	-3.785	0.000	0.365	0.643	-1.768	0.038
		PP – Fisher	96.075	0.000	182.799	0.000	57.338	0.284	163.151	0.000
		PP – Choi	-2.510	0.006	-8.726	0.000	1.498	0.933	-7.162	0.000

Note: p-value < 0.05 indicates the 95% level of significant, and p-value > 0.05 indicates the 95% level of insignificant.

Sources: Authors' Computation using E-views 9.0

As shown in table 2 above, at the level, the majority of the respective p-value for all methods of panel unit root test is more than 0.05. This thing indicates that the variables are

non-stationer at the level. However, the p-value is less than .05 at the first difference either for Individual intercept, and intercept & trend approach. Thus, the variables achieved stationary after the first differencing.

4.3. The result of co-integtation test

Co-integration tests are aimed to test whether the long run-relations exists between the variable analyzed, or vice versa. The test uses Pedroni's (1999) co-integration test, which suggests seven statistical methods to detect the existence of cointegrating conditions for a set of panel data. The statistical methods categorized into two groups. The first group tests a cointegrating phenomena within-dimension (test panel) containing the panel v-statistics, panel rho-statistics, panel ADF-statistics, and panel PP-statistics. The second group detects cointegrating phenomena between dimension (group test), including rho-Statistic, PP-Statistics, and ADF-Statistics. The test proposes two hypotheses consisting of null hypotheses proposing that there is no cointegration between income inequality, GSS, and SS, and then alternative hypotheses that suggest that the three variables are co-integrated. Acceptance or rejection of the hypotheses refers to the p-value of Eviews output with the criterion that the alternative hypothesis is accepted, and vice versa the null hypotheses is rejected if the p-value is <.05. Conversely, the alternative hypotheses rejected and the null hypotheses is accepted if p-value> .05. The result of Pedroni's cointegration test shown in Table 3.

Table 3.The result of Pedroni's cointegration test

Panel Cointegration Statistics (Within-Dimension)		
Test Statistics	Statistical Values	
	Individual Intercept	Individual Intercept and Trend
Panel v-Statistic	1.4643 (0.0716)	-1.6320 (0.9487)
Panel rho-Statistic	1.1158 (0.8678)	3.6916 (0.9999)
Panel PP-Statistic	-1.2782 0.1006)	-0.3773 (0.3530)
Panel ADF-Statistic	-1.8293 (0.0337)*	0.0712 (0.5284)
Group Mean Panel Cointegration Statistics (Between-Dimension)		
Test Statistics	Statistical Values	
	Individual Intercept	Individual Intercept and Trend
Group rho-Statistic	3.1527 (0.9992)	5.3443 (1.000)
Group PP-Statistic	-1.8430 (0.0327)*	-2.0688 (0.0193)**
Group ADF-Statistic	-0.5207 (0.3013)	1.5011 (0.9333)

Note: The values in parentheses give the probabilities values. Ho: no cointegration; * and ** indicate the rejection of null hypothesis at 95% and 97.5% significant level, respectively.

Sources: Authors' Computation using E-views 9.0

Table 3 above informs that the criterion of unit root test has not fully attained. Among the four measures of statistical criteria used to detect the cointegrating phenomena within-dimension of panel data set, only the ADF-Statistic Panel has p-value <0.05, whereas the p-value of the other statistical value > 0.05. This thing statistically means that there is no within-dimension cointegration of the data set panel. In term of the cointegration test for between dimensions, table 3 above also shows that among the three approaches used, only PP-Statistics has p-value <0.05. Conversely, two more approaches (rho-Statistics and ADF-Statistics) have a p-value >0.05. This thing also statistically indicates that there is no cointegration between dimensions in the panel data set. Referring to the results of Pedroni

(1999)'s panel cointegration tests described above that can be known that the majority of p-value > 0.05. Thus, it can interpreted the absence of co-integrative relations between the three variables. In other words, there is no long-run relationship between them.

The absence of an equation that explains the long-run relationship of the variables is also in line with the results of the Kao's Residual Panel Cointegration Test. The existence of long-term relationships based on the p-value generated by econometric calculation. P-value <0.05 indicates that there are co-integrated relations between the variables. Conversely, the p-value> 0.05 statistically explained that there are no co-integrated relations. The result of the panel cointegration test, as summarized in Table 4.

Table 4. The Result of Kao's Residual Panel Cointegration Test

Null Hypothesis	T-Statistic	P-value
No cointegration	0.327	0.415
Residual Variance	0.002	
HAC variance	0.005	

Source: Authors' Computation using E-views 9.0

The statistical result of the Kao's panel integration test shows the p-value of 0.415 (> 0.05). This thing statistically provides the strong evidence that in the long-run, the three variables are not co-integrated.

4.4. The result of the lag length criteria

The tests used were determined based on informational criteria - *the Akaike information criterion (AIC), Hannan-Quinn (HQ), and Schwarz information criterion (SC)*, taking into consideration that if the number of lags is too small then the model does not capture all the information while if there are too many lags then the degree of freedom are wasted. Different information criteria suggest different optimal lag lengths for the VAR model, as shown in Table 3. The standard information criteria of sequential modified LR test statistic and Final prediction error shows an optimal lag length of 6. Information criteria of Akaike information criterion also shows an optimal lag length of 6. Whereas, the standard information criteria of Schwarz information show and optimal lag length of 1. In this respect we use Akaike information criterion in making sure optimal lag of PVAR.

Table 5. Result of VAR lag order selection criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-125.7819	NA	0.002389	2.4766	2.5528	2.5075
1	104.0780	442.0382	3.42e-05	-1.7707	-1.4656*	-1.6471
2	114.5699	19.5715	3.32e-05	-1.7994	-1.2655	-1.5831
3	123.3653	15.8993	3.34e-05	-1.7955	-1.0327	-1.4865
4	141.1376	31.1016	2.83e-05	-1.9642	-0.9725	-1.5624
5	152.6232	19.4372	2.70e-05	-2.0119	-0.7915	-1.5175
6	**175.7245**	**37.7617***	**2.07e-05***	**-2.2832***	**-0.8338**	**-1.6959***

* indicates lag order selected by the criterion; LR is stand for sequential modified LR test statistic (each test at 5% level); FPE is stand for Final prediction error; AIC is stand for Akaike information criterion; SC is stand for Schwarz information criterion; and HQ is stand for Hannan-Quinn information criterion.

Sources: Authors' Computation using E-views 9.0

Since the variables achieved stationarity after first differencing and Akaike information criterion shows an optimal lag length of 6, we use lag length of 6 in using panel vector auto regressive.

4.5. The result of VAR stability test

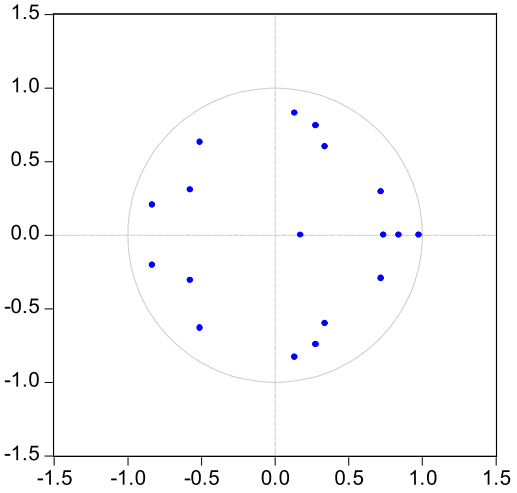
The stability of the analysis model is very important to ensure that the model provides accurate estimation results. The econometric model used in this study is PVAR. When the model is unstable, then the analysis of Impulse Response Function and Variance

Decomposition are unbelievable. The stability test of the econometric model utilizes the roots of characteristic polynomials. A VAR system has a stability condition if the modulus of its roots is smaller than one (Gujarati, 2004), and all of the points lies on the AR roots graph circle (Wibowo & Mubarok, 2017). Refer to the results of the lag order selection criteria as previously explained, the stability test, in this case, is carried out at the lag length of 6. In detail the results of the PVAR stability as shown in Table 6 and Graph 1.

Table 6. AR Roots Table

Root	Modulus
0.995461 - 0.029179i	0.995889
0.995461 + 0.029179i	0.995889
-0.885347 + 0.439470i	0.988420
-0.885347 - 0.439470i	0.988420
-0.543707 + 0.692502i	0.880441
-0.543707 - 0.692502i	0.880441
0.614385 - 0.576339i	0.842399
0.614385 + 0.576339i	0.842399
0.081268 + 0.821413i	0.825423
0.081268 - 0.821413i	0.825423
0.306529 - 0.747021i	0.807465
0.306529 + 0.747021i	0.807465
0.762651 - 0.067650i	0.765645
0.762651 + 0.067650i	0.765645
0.707759 + 0.276518i	0.759859
0.707759 - 0.276518i	0.759859
-0.710601 - 0.265038i	0.758418
-0.710601 + 0.265038i	0.758418
0.177861 + 0.695746i	0.718120
0.177861 - 0.695746i	0.718120
-0.340390 - 0.377508i	0.508309
-0.340390 + 0.377508i	0.508309
-0.401404	0.401404
0.288909	0.288909
No root lies outside the unit circle	
VAR satisfies the stability condition	

Figure 1.
Inverse Root of AR Characteristic Polynomial



Sources: Authors' Computation using E-views 9.0

Based on the VAR stability test as in the table and figure above, it is able concluded that the VAR estimation used for IRF and VD analysis is stable in the lag length of 6 due to a modulus range of 0.288909-0.995889.

4.6. The result of panel vector autoregressive

Taking into account the variables studied have no long-run equilibrium and stationary at the first difference, then the econometric model used to analyze causality between variables is panel vector autoregressive (PVAR). The result of PVAR shows that income inequality in a certain period is positively and significantly affected by its self at the 1-2 period before. GSS negatively affect income inequality. Similarly, SS also has an impact on reducing income inequality. The negative effect of GSS on income inequality occurs after the 4th period, while the negative influence of social spending exists after the 2nd period, faster compared to the negative effect of GSS. This thing indicates that in the short term, the increase in SS is the best solution for local governments in improving income distribution. Allocating government budgets to these expenditures can directly have an impact on income in the community. For example, government spending on education and health assistance for the poor, government spending on community empowerment and institutional strengthening and spending on implementing poverty reduction programs are part of social spending. The difference in the effectiveness of GSS and SS in reducing poverty in the short-term is consistent with the results of the research of Costa & Gartner (2017) for the case of Brazilian economy that social spending of local governments has a faster effect in reducing income inequality. This finding supports the results of the study of Ali et al. (2015) concluding that social spending is the most favorite fiscal policy to improve income distribution.

The GSS positively influenced by its self in the 1-period time horizon. Income inequality for a certain period has a positive and insignificant effect on GSS in the 2-period time

horizon. This thing indicates that income inequality is not the main consideration of the local government in determining local budget policy, especially in term of the goods and services public expenditure. Furthermore, SS has an ambiguous effect on the GSS, but the effect is not significant. At the 1-3 period time horizon, SS has a positive effect, but at the 4-6 period time horizon, the effect is negative. In details of the functional relations of the three variables in the dynamic model of PVAR as shown in table 5.

Table 7. The Summary of panel vector autoregresion

Independent Variable	Dependent Variable					
	ΔLGR		ΔLGSS		ΔLSS	
	Coefficient	t-statistics	Coefficient	t-statistics	Coefficient	t-statistics
ΔLGR(-1)	0.6481	6.2663	0.1629	0.5507	-1.1356	-1.3802
ΔLGR(-2)	0.2373	2.0023	0.1120	0.3304	2.6907	2.8534
ΔLGR(-3)	-0.2592	-2.0226	-0.9207	-2.5119	0.5241	0.5141
ΔLGR(-4)	0.2087	1.6330	0.3703	1.0131	-4.6657	-4.5887
ΔLGR(-5)	0.0223	0.1378	-0.5411	-1.1702	3.7879	2.9451
ΔLGR(-6)	-0.0618	-0.5276	0.6418	1.9152	-1.5798	-1.6948
ΔLGSS(-1)	-0.0208	-0.5346	0.8047	7.2161	-0.5088	-1.6403
ΔLGSS(-2)	0.0514	1.0663	-0.0426	-0.3087	0.1567	0.4086
ΔLGSS(-3)	0.0040	0.1082	-0.0178	-0.1673	-0.0879	-0.2965
ΔLGSS(-4)	-0.0806	-2.3221	0.0944	0.9514	0.4716	1.7085
ΔLGSS(-5)	0.0905	2.8314	0.2506	2.7409	-0.6333	-2.4897
ΔLGSS(-6)	-0.0315	-1.2309	-0.1245	-1.7018	0.6637	3.2616
ΔLSS(-1)	0.0118	1.0700	0.0152	0.4797	0.4031	4.5869
ΔLSS(-2)	-0.0331	-3.3100	0.0225	0.7863	0.1241	1.5615
ΔLSS(-3)	0.0159	1.4816	0.0149	0.4871	-0.1543	-1.8094
ΔLSS(-4)	-0.0033	-0.3062	0.0307	0.9871	0.2268	2.6236
ΔLSS(-5)	-0.0145	-1.6914	-0.0019	-0.0794	0.1272	1.8681
ΔLSS(-6)	0.0143	1.7988	-0.0213	-0.9346	-0.1496	-2.3635
C	-0.2413	-2.0563	-0.1795	-0.5351	4.3787	4.6903
R-squared	0.7178		0.9659		0.7176	
Adj. R-squared	0.6580		0.9588		0.6579	
F-statistic	12.0103		134.1009		12.0025	
Akaike AIC	-2.7869		-0.6853		1.3608	
Schwarz SC	-2.3038		-0.2022		1.8439	
Mean dependent	-0.9788		12.0627		11.6054	
S.D. dependent	0.0946		0.7796		0.7527	

Note: t statistics > 2,00 indicate a significant effect; and t statistics < 2,00 indicate an insignificant effect.

Sources: Authors' Computation using E-views 9.0

The income inequality for a certain period has a positive effect on SS at the 2-period later. This thing means that income inequality has been the main determinant factor of public spending policy for the local government, especially regarding social spending allocations. This finding confirms the empirical research of Cimoli et al. (2010) for the case of Latin America discovering, that the social spending growth is parallel to the hike of income inequality.

Further, The GSS has a negative and insignificant effect on SS at the 3-period horizon. This statistical evidence indicates a trade-off between GSS and SS. When local governments increase budget allocations for GSS, they must reduce SS. Conversely, when GSS decreases, the budget allocation for SS can be increased. However, the trade-off relationship between the

two instruments of fiscal policy is not significant. The existence of the inverse relationship between the two variables is in line with the study of Jones (2007) in OECD countries founding out that social spending hike depends on the fiscal situation.

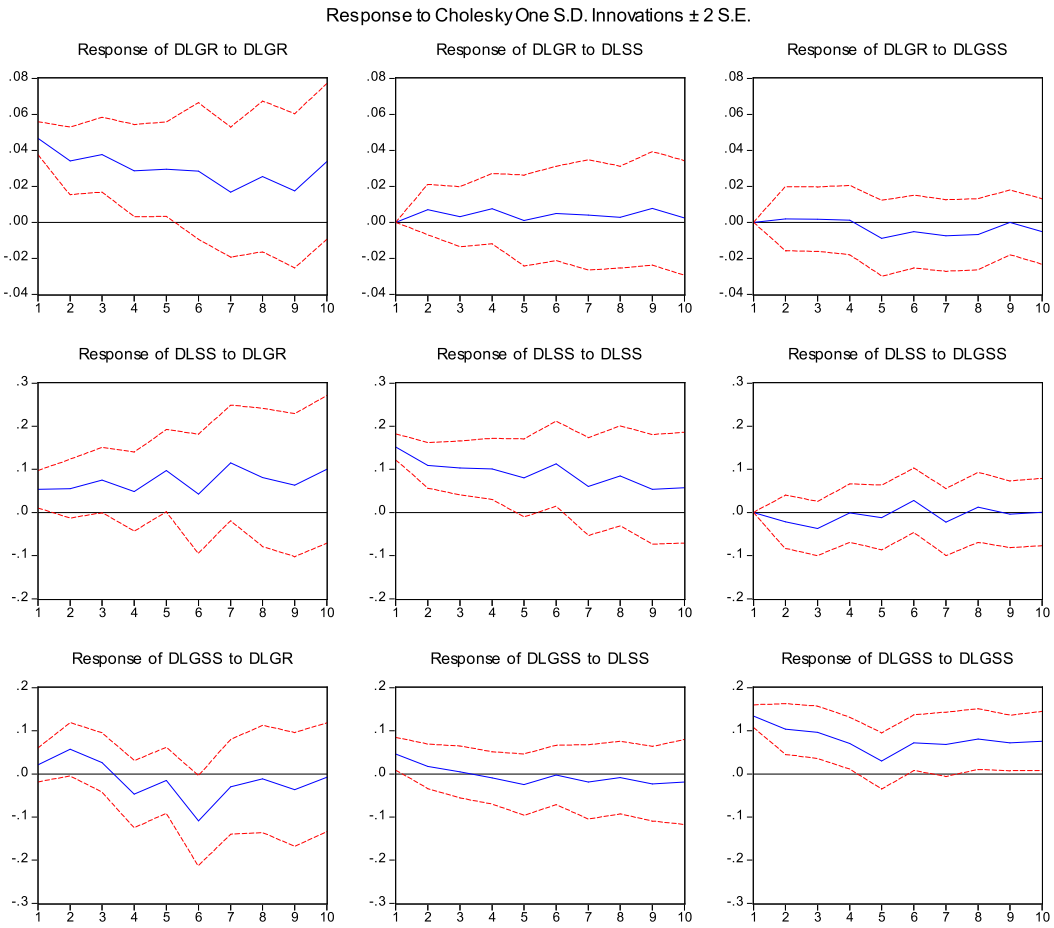
The negative effect of SS on income inequality is faster than the effect of spending on goods and services. The increase in GSS spending decreases income inequality after the 4 periods, whereas social spending decreases income inequality after 2 periods. Thus, in the short term, government budget allocation in the form of social spending is more effective in improving income distribution in society compared to goods and services.

This finding supports the results of a study by Johanson (2000) discovering that the reallocation of government spending towards goods and services would increase income in the long run, while the increase in social welfare spending will improve income distribution in the short-run. This finding is also consistent with the results of an empirical study by Higgins & Pereira (2014) proofing that social spending effectively increases the distribution of income. A recent research study conducted by Sánchez & Pérez-Corral (2018) for the case of several EU countries also revealed a negative relationship between SS and income inequality. A contrarily, this finding is not in line with the result of Goudswaard & Caminada's (2008) study discovered that there is no significant relationship between social spendings and the distribution of income.

4.7. The result of impulse response function

The IRF graphically depicts the time spanning and nature of the response of the inter variables in the VAR dynamic models. Figs 2 provide the impulse response graphs for relationship income inequality, GSS, and SS, respectively. The GR positively and weakly reacts to the shock of its own self. When examining the impulse response of income inequality to the shock of SS social spending (upper central), we find that the existence of shock in SS tends to increase the income inequality over the period. At the 5 and 10-period horizons, the response is towards the equilibrium point. The response of income inequality to the GSS is zero for the 4-period horizon, then is negative in the following period.

Figure 2. Impulse response function of the variables



The SS negatively responds to the shock of the GSS at the 1-3 period horizon, and then positively at the 6th period. Further, the GSS positively reacts on the shock of the SS at the 1-2 period horizon, and then negatively at the following period. Then, the GSS positively responds to the shock of itself, but the reactions weakly tend for the 5th period and then strongly until the 6th period.

4.8. The result of variance decomposition analysis

One way to determine how important the different exogenous shocks are in explaining the dependent variables is to calculate the fractions of the forecast error variance of these variables attributable to the respective orthogonal shocks. The analysis would reveal the contribution of the variable in explaining the forecast error variance of either itself or others. The variance decomposition analysis is utilized to assess the dynamic interactions between the variables in panel VAR model.

The results of the variance decomposition are shown in Table 4. In general, the results further substantiate the earlier findings which base on the impulse response function. Variations in GR variable explain around 98.63 percent of its forecast error variance at the 3-year horizon, indicating that decreasing in GR is one of the most important variables in explaining the dynamic of its own variance. The VDA result also shows that GSS and SS contribute up to 0.143 percent and 1.225 percent of the forecast error-variance of GR at the 3-year horizon, respectively. This indicates the two variables are not one of the important factors in explaining the evolution of GR in the community.

Table 8. Variance decomposition of variables

Period	Variance Decomposition of ΔLGR:			Variance Decomposition of ΔLSS:			Variance Decomposition of ΔLGSS:		
	ΔLGR	ΔLSS	ΔLGSS	ΔLGR	ΔLSS	ΔLGSS	ΔLGR	ΔLSS	ΔLGSS
1	100.000	0.000	0.000	11.083	88.917	0.000	2.120	10.568	87.312
2	98.419	1.467	0.114	14.253	84.581	1.166	10.583	7.085	82.332
3	98.632	1.225	0.143	19.538	77.231	3.230	9.769	5.554	84.677
4	97.811	2.043	0.146	19.366	77.965	2.669	12.603	4.939	82.458
5	96.912	1.765	1.323	26.639	71.019	2.343	12.608	5.938	81.454
6	96.590	1.880	1.529	24.452	72.776	2.772	26.150	4.524	69.326
7	95.835	2.010	2.155	31.887	65.313	2.801	25.324	4.619	70.057
8	95.554	1.939	2.507	33.464	63.921	2.614	23.448	4.335	72.216
9	95.075	2.521	2.405	34.659	62.839	2.502	23.091	4.581	72.328
10	95.324	2.283	2.392	38.174	59.539	2.287	21.672	4.642	73.686
Cholesky Ordering: ΔLGR ΔLSS ΔLGSS									

Sources: Authors' Computation using E-views 9.0

Table 8 above statistically informs that the statistical contribution of income inequality to explain variations in GSS and SS is greater than the statistical contribution of the two kinds of spending in explaining variations in income inequality. This thing provides empirical evidence that the decisions of local governments in Indonesia in determining spending policies for the provision of goods and services and social spending make income inequality a consideration.

4.9. The result of PVAR Granger causality test

Causality test is used to investigate the nature and direction of causal relationships between variables. The results of the test can explain whether two variables have a reciprocal or one-way relationship. Due to the research operationalizes a panel data set, the causality test which we employed is PVAR Granger causality. The result of the test statistically points out that bidirectional causality exists between SS and income inequality, and between income inequality and GSS, as well as unidirectional causality running from GSS to SS. Table 5 describes the causality relationship between the variables.

Table 9. The result of VAR Granger causality

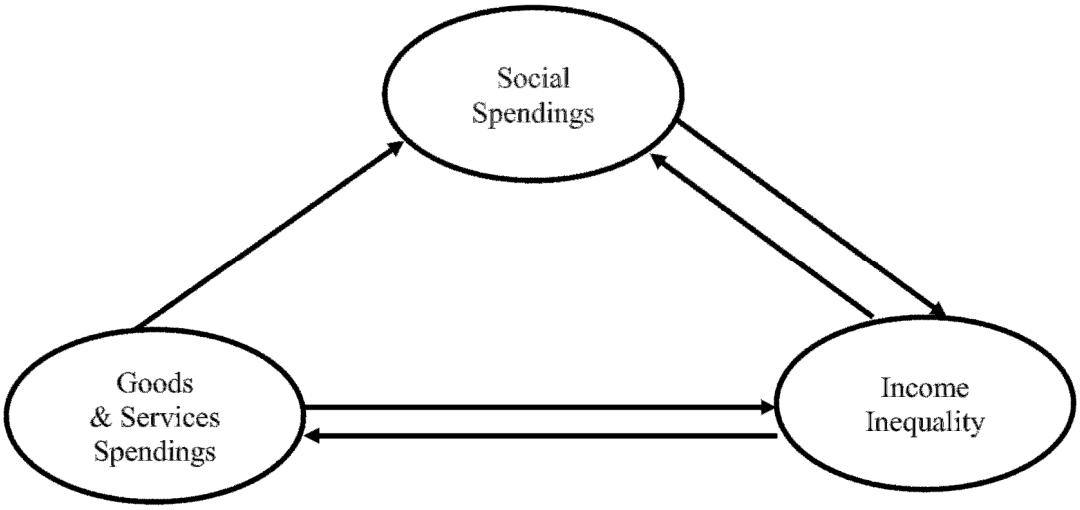
Endogenous Variable	Exogenous Variable		
	ΔLGR	ΔLSS	ΔLGSS
ΔLGR	-	(14.709) [0.023]**	(11.919) [0.064]*
ΔLSS	(37.999) [0.000]***	-	(16.991) [0.009]***
ΔLGSS	(12.877) [0.045]**	(4.920) [0.554]	-

Note: Number in ( ) is chi-square; Number in [ ] is p-value

* significant at 90% level, ** significant at 95% level, and *** significant at 99% level.

Referring to the table 8 below, the direction of causality relationship among goods and services spending, social spending and income inequality as seen on Figure 3.

Figure 3. The nature of causality relationship among the variables



The existence of two-way causality between income inequality and SS indicates that the variable can lead to income inequality. Likewise, income inequality also causes SS. This thing proves that the strategic decision of the local government to allocate public budgets in SS also based on income inequality the main reason. These findings are consistent with the PVAR results which explicitly show, that social spending in a certain period positively and significantly affected by income inequality at the two periods earlier. On the other hand, income inequality is negatively and significantly affected by the SS of the previous two periods.

The existence of two-way causality between income inequality and spending on goods and services indicates that the distribution of income had been an important consideration for local governments to determine the budget allocation into the two kinds of spendings. In other word, the government's policy in determining these spendings indicates that they have a positive response toward the change of income inequality. Conversely, changes in government spending on goods and services can also cause changes in income inequality. This thing is consistent with the results of the PVAR explained earlier that informs positive and insignificant effect of income inequality on goods and services spendings at one and two-period horizons. Meanwhile, an increase in spending on goods and services has a significant impact on decreasing income inequality at the four-period horizon.

The figure 3 above shows that the existence of one-way causality between spending on goods and services and social spending indicates the local government expenditure into social spendings not may be separated from the total spending budget composition of the government. The change in goods and services spendings lead to a change in social spending. As explained earlier, the spendings on goods and services negatively and insignificantly affect social spending at the one-period horizon. But at the two-period horizon, the effects are positive and insignificant.

This finding is in line with the results of a study by Gallo and Sagales (2013) which concluded that income inequality is an important determinant of the composition of the government budget. Previously, an empirical study conducted by Ospina (2010) also pointed out that the increase in income inequality related to social and economic changes and in turn, affect government spending. This finding also supports the results of the empirical study conducted by Ali et al. (2015) in Pakistan which emphasizes that government policies for social spending are very important to improve income distribution in the community.

5. Conclusions and Suggestion

Debate on the effectiveness of government spending on goods and services and social welfare in improving income distribution has long been the highlight of economic researchers. Some researchers conclude that these spendings cannot reduce income inequality. Others found empirical evidence suggesting that spending on goods and services and social spending can be a solution for improving income distribution in the short-run. This study

seeks to reveal the effect of these two kinds of spendings on income inequality in the perspective of the Indonesian economy. In addition to analyzing the direction of causality relationships between variables, this study also examines which of these spending is more effective in reducing income inequality.

Using a panel data set of 26 selected provinces in Indonesia for periods of 2005 to 2015, then the data is analyzed by econometrical models of PVAR, and Granger causality test. The main finding of the research as follows: Firstly, there is no long-term relationship between the three variables. At the 2-periods horizon, income inequality is positively influenced by itself. This thing means that income inequality in a certain period has an impact on decreasing income distribution in 1-2 periods later. At the same period horizon, goods and services spending has a positive but not significant effect on income inequality. At the 3-period horizon, the expenditure has a negative and significant impact on income inequality. Furthermore, social spending reduces income inequality at the 2-period horizon. That is, the increase in social spending of a certain period has a significant impact on income inequality reduction after 2-periods later. Then, in the 3 to 6 -periods horizon, social spending does not affect income inequality. Secondly, the policy of local government sets the social spendings to improve income distribution regarding the allocation of goods and services spendings. The change in budget allocation in social spending is a response to the increase in other expenditure budgets, especially for goods and services spendings. The results of the causality test indicate a two-way causality between social spending and income inequality, and between goods and services spendings and income inequality. The local government policy in allocating these two types of expenditure is a response to income inequality. Furthermore, the decline in income inequality is a response to spending on goods and services and social spending.

This research implies that local government policies in reducing income inequality should do through increased public expenditure on goods, services, and social spending. However, the implementation of spending not enable to reduce income inequality in the long-run. Social spending is a short-term solution for reducing income inequality and not being able to improve income distribution in the long-run. Therefore, it is better for local governments in Indonesia to formulate regional budget policies that oriented towards increasing income distribution in the community. The occurrence of income inequality should not be responded with increase the public expenditure component for social spending and the provision of goods and services significantly, but be prefaced through spending policies that oriented towards improving public infrastructure to increase economic activities, especially for people living in rural areas.

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