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Government revenue and spending nexus in regional Indonesia: Causality approach

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Abstract: This study aims to test the hypothesis that explains the relationship between tax revenue and government spending in six Indonesian regions. Furthermore, the units of analysis were districts and cities in each region from 2006 to 2017, and a Granger panel causality approach was used. The results showed five experienced bidirectional causalities between tax revenues and local government spending out of the six regions, namely Java, Sumatra, Kalimantan, Sulawesi, and the Bali & Nusa Tenggara. Also, there was fiscal synchronisation in five regions, while the tax-spend hypothesis applies in the Papua & Maluku regions. Therefore, the local governments in these regions need to be careful in deciding actions related to increasing revenue. This can be achieved through the tax sector's optimisation and expenditure increment by encouraging public spending from the administration.

Keywords: fiscal synchronisation hypothesis, tax revenue, government spending, granger panel causality

1. Introduction

The dynamics of economic development are inseparable from the role of implementing fiscal policy. Furthermore, the accuracy of applying this policy is vital in determining the development of economic activities that promote quality and sustainable growth. In the economic blueprint, fiscal policy is considered an instrument to mitigate fluctuations in output and job opportunities in the short term. Besides, it is also directed to bring the economy closer to the level of potential output (Zagler & Durnecker, 2003). This revenue system plays its role through two important indicators: the allocation of government spending and net sales collection. The interaction between these two indicators will trigger stability in the budget, therefore, contributing to a significant impact on economic decisions such as labour supply, investment, and savings.

Fiscal action synchronisation in government taxation and spending plans is related to the timeliness of implementing this policy. In other words, the government should consider increasing taxes before spending or vice versa. This is because income and spending are fiscal policy tools.

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Hence understanding their relationship is an important aspect in policy formulation, especially in countries experiencing severe financial imbalances.

A complete understanding of the relationship between government revenues and spending by policymakers will prevent persistent budget deficits. There are several important reasons for examining the relationship between spending and revenue. Firstly, when the relationship pattern in the form of revenue increases spending, the budget deficit can be overcome by policies to stimulate the income sector. Secondly, when spending increases revenue, it indicates that the government spends and finances the expenditure; therefore, taxes are raised. In this light, taxpayers become fearful due to the upcoming tax hike. Thirdly, in the event of fiscal synchronisation, the administration takes a decision to collect taxes and spend simultaneously; therefore, changes and causality co-occur in two directions.

Several economic thoughts provide different views on the relationship between income and spending. From the Keynesian point of view, the government should spend before collecting taxes. This perspective is based on the principle of financial compensation, where a fiscal deficit is created to increase economic activity. Furthermore, the budget multiplier effect will eliminate any output gap and ensure a higher tax base through the established mechanism. Hence, the additional tax revenue will offset the fiscal deficit that was originally created.

On the other hand, classical thinkers assume that the budget is always balanced, also known as fiscal neutrality. The implication of this statement is that the government should ensure that its spending does not exceed revenues. This principle is based on the premise that the mismatch between spending and income impacts price mechanism distortion. This difference in views between Keynesian and Classical is mediated by the fiscal synchronisation hypothesis, a condition in which encouraging income and spending are simultaneously determined. Musgrave (1966) stated that essence is in the context of fiscal federalism, more precisely in assessing city/regency government services and related to its function as an economic agent.

In Indonesia, taxes are the main source of revenue, especially those paid to the central government. Few are paid to the federal administration, which eventually returns to the local government in the form of transfer funds. Meanwhile, the ability of this legislative body to obtain local taxes, which are the main regional income, is still low. Therefore, the majority of the municipal authorities receive the largest income from these transfer funds as a source of local government revenue.

Concerning implementing decentralisation and regional expansion in Indonesia, which began rapidly in 2004, local governments (cities and regencies) were allowed to increase tax revenues with Law Number 28 of 2009 concerning regional taxes. This law states that most tax collection is transferred to regency and city governments. The impact of the law enactment is evident in the acquisition of local revenue. Furthermore, the ratio of tax revenue to total local revenue has increased from 11% in 2009 to 16.7% in 2017. This shows the effectiveness of the law. Likewise, there is an increase in the ability of local governments to obtain locally-generated revenue.

Government spending is the funds needed to carry out development. As an agent, the administration continues to improve public services (facilities and infrastructure), such as roads, electricity, various means of communication, transportation, and goods and services to support economic activity. Many believe that regardless of how advanced an economy is, the role of the government is essential to providing regulations and efforts to improve public welfare through insurance. In carrying out this development, the majority of the local governments experience budget deficits.

Also, tax revenue and spending are closely related to one another, and therefore, by understanding this relationship, policymakers will overcome the budget deficit. However, this connection is not as simple as it seems, considering many studies that have discussed the relationship between government revenue and spending. This is due to the various patterns of connection between tax revenue and government spending in the public sector known as the four hypotheses (tax-spend, spend-tax, fiscal synchronisation, and neutrality hypothesis) (Irandoust, 2018). Hence, determining which hypotheses prevail within a region can potentially contribute to finding solutions to the increasing budget deficit problem.

Furthermore, understanding the link between tax revenue and government spending is very important from a policy perspective, especially in local governments, which often experience a persistent budget deficit. Therefore, this study aims to test the hypothesis that explains the relationship between tax revenue and spending for six regions in Indonesia, namely Sumatra, Java, Kalimantan, Sulawesi, Bali & Nusa Tenggara, and Papua & Maluku, with a total of 545 local governments. Does tax income lead to government spending and vice versa, or is there a two-way relationship?

This study explains tax revenue and local government spending and then presents a literature review on four hypotheses that describe the relationship between government revenue and

spending. Subsequently, the hypothesis applicable to each region was tested, followed by explaining how it applies in Indonesia.

2. Literature review

The relationship between government revenues and spending is essential in public finance. The four hypotheses about government revenue and spending explain the relationship between taxes and spending.

The first hypothesis is tax-spend. According to Friedman (1978), the tax-spend hypothesis explained that high tax revenue would increase government spending, causing a budget deficit in administration funds. Furthermore, it implies unidirectional causality from revenue (such as taxes) to spending (Irandoust, 2018). Related to this hypothesis, Hondroyiannis & Papapetrou (2001) and Buchanan & Wagner (1978) showed an identification that an increase in tax income reduces government spending through fiscal illusion.

Many previous studies supported the tax-spend hypothesis, such as those conducted in the UK from 1955 to 2009 with the momentum TAR method (Saunoris & Payne, 2010) and in the USA from 1959 to 2005 with TAR and MTAR (Zapf & Pyne, 2009). This also includes studies in Bangladesh from 1973 to 2013 using Johansen's cointegration and the Granger causality test based on VECM (Rahman & Wadud, 2014. In addition, Hondroyiannis & Papapetrou (2001) applied the VECM method in Greece during the 1961-1994 period.

This hypothesis was also carried out in several other countries, such as the USA, with panel data from 1963 to 1997 using the ECM method (Westerlund et al., 2011). It was also carried out in Southeast European countries from 1990 to 2015, with a granger causality panel (Tashevska et al., 2020), in 48 US states from 1951-to 2008 with OLS dynamics (Saunoris, 2015), and in 10 ASEAN countries during 1980-2012 with granger causality and Dynamic OLS panels (Magazzino, 2014).

Meanwhile, in the study conducted in European Union countries from 1960-to 2006 with a granger causality panel, tax spending occurred in Germany, Belgium, Austria, Finland, and the UK (Afonso & Rault, 2008). Likewise, Narayan & Narayan (2006) showed the results vary between countries as the tax spend hypothesis was proven significant for Chile, El Salvador, Mauritius, Paraguay, and Venezuela, and fiscal synchronisation for Haiti, while in South Africa, Ecuador, Guatemala, Guyana, and Peru fiscal neutrality was identified.

The second hypothesis (spend-tax) states that spending decisions are followed by tax adjustments to meet needs. This hypothesis was introduced by Peacock & Wiseman (1979). The government determines spending before considering taxes to meet needs in this context. Furthermore, Peacock and Wiseman stated that an increase in temporary spending during a war crisis would lead to a permanent increase in taxes. This is consistent with Barro (1979), that future tax revenues will ultimately finance spending.

This hypothesis is valid in several regions, such as Pakistan from 1978 to 2009 with the Granger Causality method (Husain et al., 2010), and in Nigeria, with observations from 1970 to 2017 based on the ARDL method (Jibir & Aluthge, 2019). Likewise, it also applies in Australia and South Africa, according to Chang et al. (2002), who used the causality method with observations in the 1951-1996 period.

Other studies explained the spend-tax hypothesis in several countries, such as Greece in 1957-2009, using the TAR and MTAR methods (Apergis et al., 2012) (Apergis et al., 2012), Japan, South Korea, Taiwan, UK, and the US with observations during 1951-1996 with the Granger causality method (Chang et al., 2002). The hypothesis was also explained in Serbia with monthly data from the first month of 2003 to the 11th month of 2014 using autoregressive distributed lag (ARDL) and causality Granger (Lojanica, 2015), as well as in Pakistan in the 1972-2007 observation period using the Granger causality method (Aisha & Khatoon, 2009).

The third hypothesis (Fiscal synchronisation) is where there is bidirectional causality between tax revenue and spending. This shows that tax revenue and spending are simultaneously determined and dependent on providing goods and services for community welfare (Irandoust, 2018).

Previous studies proved that this hypothesis occurs in several countries. Irandoust (2018) showed that the fiscal synchronisation hypothesis applies in Sweden in the observation period of 1722-2011 based on the Granger causality test method. In addition, Gounder et al. (2007) examined Fiji with quarterly data for the years 1968-2003 and applied the causality method. Likewise, Chang & Chiang (2009) examined 15 OECD countries in the observation period of 1992-2006 and discovered the occurrence of a bidirectional causality hypothesis between income and spending.

Other studies have also found the occurrence of the hypothesis in 40 Asian countries from during 1995-2008 (Mehrara et al., 2011), Iran from 1963 to 2007 with ECM (Elyasi & Rahimi, 2012), Jordan from in 1990- 2011 with granger causality and VECM (Al-Zeaud, 2015). Furthermore, similar

results were obtained in Pakistan from during 1972-2014 with the adopted non-linear ARDL method (Raza et al., 2019), Greece from the period 1833 to 2009 with the granger causality test method (Richter & Dimitrios, 2013), and Zambia, during the period 1980-2016 using the VAR method (Champita, 2016), as well as nine industrialised countries from 1953-1992 using the structural VAR model (Koren & Stiassny, 1998).

The fourth hypothesis is fiscal neutrality, which occurs because the decision on the amount of revenue is made independently, hence income and spending are not directly related due to the different autonomous institutions that regulate them.

3. Research methodology and data

This study examines the relationship between government revenue and spending. The data used were in the form of panel data with an observation period from 2006 to 2017, and the object's scope consisted of 6 regions in Indonesia. Furthermore, the unit of analysis was the regency and city in each region. The regencies in each region are 154 for Sumatra, 114 for Java, 56 for the Kalimantan, 81 for Sulawesi, 41 for the Bali & Nusa Tenggara, and 63 for Papua & Maluku. To answer the problems in this study, a panel data Granger Causality test was carried out using the Dumitrescu-Hurlin model. This model is the analysis method of causal relationships in the time series formed by Granger. Dumitrescu-Hurlin added a test designed to detect causality in panel data. Therefore, the approach produced strong results with cross-sectional dependence and heterogeneity in panel data (Lopez & Weber, 2017). The variables analysed in this study are tax ($x_{i,t}$) and government spending ($y_{i,t}$). The data from these two variables is transformed into natural logarithms (ln).

The panel data Granger causality regression model is as follows:

$$y_{i,t} = \alpha_i \sum_{k=1}^{k} \beta_{ik} y_{i,t-k} + \sum_{k=1}^{k} \Upsilon_{ik} x_{i,t-k} + \mathcal{E}_{i,t} \quad (1)$$

Where $x_{i,t}$ and $y_{i,t}$ are the observation of two static variables for individual i in period t. The coefficients are allowed to differ between individuals but are assumed to be time-invariant. The lag sequence K was assumed to be identical for all individuals, and the panels should be balanced. β_{ik} are autoregressive parameters and Υ_{ik} is the regression coefficient.

By Granger (1969), the procedure for determining the existence of causality is by performing a significance test for the previous value of χ against the present value of y. Hence, the hypothesis is null when there is no causality for all individuals in the panel equation as defined below;

$$H_0 : \Upsilon_i 1 = \cdots = \Upsilon_i K = 0 \qquad \forall_i = 1, \dots, N \quad (2)$$

Provided it is assumed that there is a causality relationship for some individuals but not for all, the alternative hypothesis can be written as follows:

$$H_1 : \Upsilon_i 1 = \cdots = \Upsilon_i K = 0 \qquad \forall_i = 1, \dots, N_1 \quad (3)$$

$$\Upsilon_i 1 \neq 0 \; or \; \dots or \; \Upsilon_i K \neq 0 \qquad \forall_i = N_1 + 1, \dots, N \quad (4)$$

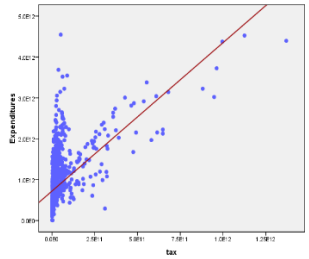
Where $N_1 \in [0, N-1]$ is unknown, provided $N_1 = 0$, there is causality for all individuals on the panel. N_1 is smaller than N. Otherwise, there is no causality for all individuals, and H_1 is reduced to H_0.

4. Results and discussion

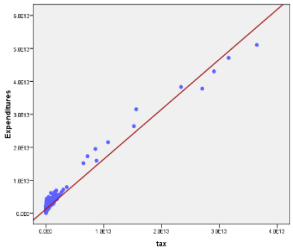
As an agent for realising people's welfare, the government plays a role in various policies. The main administration instruments are revenue and spending. Therefore, to finance all community welfare, there need to be improved services, such as social, education, and health assistance programs, and there should also be a supportive funding source from the government.

Each region has the potential for income and various different policy programs. Regions with abundant sources will maximise their income through programs that promote welfare at an optimal level. The pattern formed between government revenue and spending in the six regions illustrates a unidirectional relationship. The higher the collected tax, the more the ability to allocate funds to various fields.

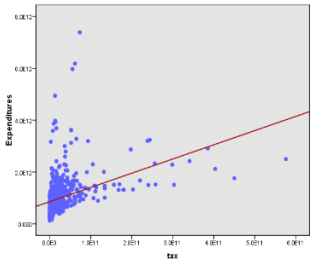
Figure 1: The pattern of the relationship between taxes and government spending



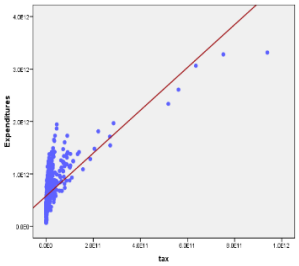
a. Sumatra Region



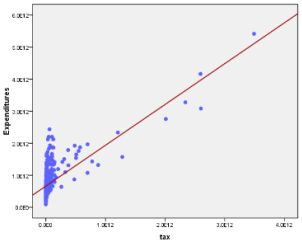
b. Java Region



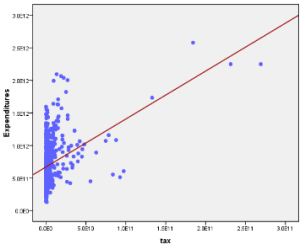
c. Kalimantan Region



d. Sulawesi Region



e. Bali & Nusa Tenggara Region



f. Papua & Maluku Region

Based on Figure 1, it was shown that even though there is a constant pattern of government revenue and spending (significant income is also followed by increased spending), the distribution is different. The Sumatra region has a larger and more dispersed distribution level, while in the Java Region, the revenue and spending are at a greater level. This is because it has more industrial growth and sources of income, and better infrastructure development.

The pattern formed indicates the communities have a role in properly managing their finances, while the administration budget is based on the principles of (1) independence, (2) priority, (3) efficiency, effectiveness, economy, transparency, and participation, as well as (4) budget discipline. Also, the implementation of good budgeting needs to acknowledge the ability of financing, which is encouraged not to depend on funds from the central government. This means local governments should increase their income to carry out exploration, which can achieve a high level of community welfare. The attainment of prosperity level is reflected in the increase of job opportunities, decline in unemployment, and the implementation of community services that provide optimal satisfaction.

4.1. Causality relationship of tax revenues and government spendings

The Granger causality test and Dumitrescu-Hurlin approach were used to determine the relationship between the two variables. This was carried out to prove the appropriate hypothesis validity in the regions, whether it is the spend-tax, the tax-spend, or fiscal synchronisation. Before the test, an optimum lag determination was performed using the Akaike Information Criterion (AIC) method, and the Granger test was carried out.

The results of the Granger causality test shown in Table 1 indicated a two-way relationship between government revenue and spending. These results refute the spend-and-tax and the tax-and-spend hypothesis. Meanwhile, out of the six regions in Indonesia, 5 experienced bidirectional causality between tax income and regional government spending. These regions are Java, Sumatra, Kalimantan, Sulawesi, as well as Bali & Nusa Tenggara. In these five regions, local taxes and spending simultaneously influence each other. In other words, it was proven that the fiscal synchronisation hypothesis applies to regions in Indonesia. Furthermore, it was shown that tax revenue and spending

are determined, and it depends on the behavior of government officials in the redistribution function (Irandoust, 2018).

Table 1: Results of Dumitrescu - Hurlin panel causality regression

Variable per Region	W-Stat.	Zbar-Stat.	Prob.
Bali and Nusa Tenggara[1]			
lnTax —→ lnGS	3.06***	4.39***	0.0001
lnGS —→ lnTax	2.09**	1.93**	0.0533
Kalimantan[1]			
lnTax —→ lnGS	4.76***	10.20***	0.0000
lnGS —→ lnTax	5.66***	12.87***	0.0000
Java[2]			
lnTax —→ lnGS	5.43***	2.99***	0.0027
lnGS lnTax	23.42***	28.65***	0.0000
Papua and Maluku[2]			
lnTax —→ lnGS	37.51***	38.95***	0.0000
lnGS —→ lnTax	4.67	1.39	0.1627
Sulawesi[2]			
lnTax —→ lnGS	10.17***	7.84***	0.0004
lnGS —→ lnTax	16.27***	14.83***	0.0000
Sumatera[2]			
lnTax —→ lnGS	5.60***	3.74***	0.0002
lnGS —→ lnTax	4.65**	2.18**	0.0291

Note: *** refers to significance level at 1%, ** refers to significance level at 5%.

[1] refers to the optimum of 1 lag is chosen based on Akaike info criterion (AIC).

[2] refers to the optimum of 2 lag is chosen based on Akaike info criterion (AIC).

This hypothesis does not apply in the Papua & Maluku regions, indicating that there is a one-way relationship (unidirectional causality) between revenues and government spending. The tax-and-spend hypothesis is more dominant, meaning that to finance spending, the government should increase its income by optimising tax collections. However, the government should not overemphasise its source because the nature of policies that rely on increasing taxes is like a fiscal illusion. Friedman (1978) stated that the hypothesis shows that an increase in tax revenue will encourage increased spending, but a reduction in the budget deficit is unlikely. Therefore, increasing the amount of income only provides the government with additional resources, nevertheless, they should reduce spending to decrease the budget deficit.

The regional governments in Papua & Maluku are very dependent on central funds, especially in Papua, which has the privilege of being a special autonomous region. Furthermore, revenue sources that are still based on the primary sector with traditional management and limited human resources quality make economic development face its challenges. Therefore, the tax collected by local governments in this region is still meagre, even though they impact spending. Also, local governments in Papua & Maluku should be wiser in overcoming the fiscal illusions when taxes at high rates are forced. The community, in this case, will perceive the indirect use of taxes to spend less.

Conversely, the enforceability of the fiscal synchronisation hypothesis presents complications for the Indonesian government to control the budget deficit. Unlike Greece and Zambia, the prevailing spend-and-tax hypothesis provides a more precise direction for the government to overcome the budget deficit. This can be achieved by determining how much to spend, therefore making adjustments to tax policy and revenue sources (Champita, 2016; Richter & Dimitrios, 2013). In Bangladesh, the proven one-way relationship from revenue to spending in the long term supports the tax-and-spend hypothesis and provides a leeway for the government (Rahman & Wadud, 2014).

Studies on the realisation of the fiscal synchronisation hypothesis in Indonesia showed that the dependence of the aggregate budget differs significantly between each country. One of which is caused by the politico-economic tradition of budget decision making (Koren & Stiassny, 1998).

The challenge faced by the government in decisions making was due to the two-way relationship between revenues and spending. Hence, it will be difficult for the central government to determine possible solutions to overcome the public sector deficit, where an increase in spending will encourage a rise in revenue and vice versa. Accordingly, this possibility can help explain the high public debt of Indonesia. As experienced by Spain, fiscal synchronisation hinders public sector efforts to reduce deficits. Hence, lawmakers should use deficit reduction mechanisms by increasing public income or decreasing spending (Jaén-García, 2019). Also, India experienced prudence in making decisions to overcome the fiscal shortfall problem. Therefore, increasing income without cutting the spending will be very sensitive, considering the interdependence between the two (Akram & Rath, 2019; Samal, 2017).

5. Conclusion

By using the Granger panel causality test to capture the relationship between revenue and spending, it was found that there was a two-way relationship between government income and spending in five regions in Indonesia. However, the Maluku and Papua regions were proven to have a unidirectional relationship. The results support the fiscal synchronisation hypothesis for the five regions and the tax spending for the Maluku and Papua regions. These are consistent with several studies conducted by Raza et al. (2019), Irandoust (2018), Al-Zeaud (2015), Elyasi & Rahimi (2012), Chang & Chiang (2009), and Gounder et al. (2007). The proof of the fiscal synchronisation hypothesis can guide local governments in making policies related to the financial shortfall. In addition, the government should be aware of actions needed for revenue increment by optimising the tax sector.

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Conflicts of interest

The author declares no conflict of interest.

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