IS THERE A CAUSALITY RELATIONSHIP BETWEEN LOCAL TAX REVENUE AND REGIONAL ECONOMIC GROWTH? A PANEL DATA EVIDENCE FROM INDONESIA

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Abstract

The main objective of the study is to investigate the causal relationship of economic growth, local tax revenue, and local retribution revenue in Indonesia. A panel data set of 24 provinces over the period of 2003-2015, and then, Pedroni's and Kao's Co-integration test, Panel Vector Error Correction Model (PVECM) and Granger causality test were applied to analyze the relationship between the variables. The finding of the study indicates that in the long run, there would be a negative relationship between local tax revenue and regional economic growth and a positive and significant relationship between local tax revenue and local retribution revenue. Granger causality test proved that there is bi-directional causality between local tax revenues and economic growth, and uni-directional causality running from local retribution revenue to economic growth and local tax revenue.

Keywords: Local tax revenue, local retribution revenue, economic growth, and Panel Vector Error Correction Model

JEL classification: H71, O4

1. Introduction

Research on the role of tax revenue for economic development has been an interesting topic of economic researchers (Cerqueti & Coppier, 2011; Kafkalas et al., 2014). For the context of local government, the revenue aside from being the main source of government revenues can also affect the economic activities like production, consumption, and distribution, and which in turn impacts on economic growth (Yang, 2016; Olayungbo & Olayemi, 2018). The tax revenue is the main source of government revenue and is very important for economic growth (Raifu & Raheem, 2018).

For the case of a regional economy in Indonesia, the local tax revenues make the biggest contribution to total local government revenue after other kinds of local revenues is like the local retribution, profit sharing of the local government-owned enterprises, and everything else legal local revenue (Ruliana, 2015). The local tax commonly collected by the local government and sourced from within the local area. Furthermore, the local retribution is non-tax local revenues defined as receipts directly and significantly from the payer. The local retribution is mandatory payments of the resident to for the local government due to certain services provided by the government (Harahap et al., 2017).

So far, local governments in Indonesia have been trying to increase the local tax and retribution revenues. In accordance with the differences of potency and sources of the two kinds of revenue, the realization of revenues of the region is also different, respectively. Following the differences, the economic growth of each region in Indonesia is relatively

different from each other (Amri, 2018). On the one side, there are regions with high economic growth even above the national average, while on the other side there are also regions with lower economic growth (Indonesian Bureau of Statistics, 2018). If the economic growth is related to the local government revenues which are allocated to the development financing of the local area, an empirical study on the impact of these two types of local government revenues on regional economic growth in Indonesia importantly to be investigated.

The research studies on the relationship between economic growth and tax revenue have been carried out by many previous researchers. But, the results of their empirical studies are still paradoxical and inconsistent with one another. Tax revenue has a negative impact on growth (Holcombe & Lacombe, 2004; Mark et al., 2000; Reed, 2008). The negative impact of taxes is due to the impact of taxes directly reducing people's income. The results of the empirical study conducted by Romero-Avila & Strauch (2008) also found that taxes have a negative impact on economic growth.

In contrast to the findings of the study above, a number of other researchers prove the existence of a unidirectional relationship between tax and economic growth. Tax revenue is significantly related to economic growth (Ojong et al., 2016). Increased tax revenues encourage an increase in government revenues which then impacts economic growth (Suárez Serrato & Zidar, 2018). An empirical study conducted by Puonti (2016) also concluded that increasing tax revenues to fund government spending had a positive impact on growth. In line with Puounti's findings, the study conducted by Ofoegbu et al. (2016) also provides empirical evidence that there is a positive and significant relationship between tax revenue and economic growth. The recent research on the relationship between the two variables was proved by Chang (2017) that regional tax revenues have an impact on the regional economy.

The results of other studies regarding the relationship between economic growth and tax revenue make the relationship between the two variables confusing. Such as empirical research conducted by Caballero & López (2012) and Samaniego (2014) for the case of Mexico economy provides empirical evidence that taxes have a negative impact on economic growth using OLS data panel models, and have a positive effect on fixed and random effects models. In addition, a number of other studies also prove that the relationship between economic growth and local taxation is inverted U-shape (Aghion et al., 2016; & Loganathan et al., 2017).

Given the findings of the previous research are still presenting asymmetric and confusing information about the causality relationship between these variables, this study re-examines the causality relationship between the local government revenue and regional economic growth for the case of the Indonesian economy. In contrast to the previous studies, our study included the local retribution revenue as one of the regional revenues. Furthermore, in terms of data analysis approach, we examine the long-run and short-run relations and analyze the direction of causality between these variables. So that, the research findings are able to present empirical evidence in detail about the extent of the impact of local tax and retribution revenue that can affect economic growth for the case of a regional economy in Indonesia.

Systematically, this study organized into five sections. The second section is a literature review focused on a number of results of empirical studies relating to the causal relationship between taxes and regional retribution and economic growth. The third section describes the research method, consisting of data used, data sources and analysis model which are utilized to analyze the relationships between variables. Then the fourth section is the result and discussion, and lastly, the fifth section highlights the conclusions and suggestions.

2. Data and Research Methods

The operationalized data of the study is a panel data set of 24 provinces from Indonesia, sourced from statistical reports published by The Indonesian Central Bureau of Statistics. The data is time series data during the period 2003-2015. The economic growth is measured by yearly per capita gross regional domestic product at the constant price of 2000. Furthermore, both local tax revenues and local retribution revenues are measured by the per capita revenue of the two kinds of local government revenues by the unit of IDR1000 per capita, respectively.

The first stage in our empirical study is to test the stationarity of data. In this respect, we used the Levine–Lin–Chu (LLC) method (Levine, Lin, & Chu, 2002) and the I'm–Pesaran–

Shin (IPS) method (Im, Pesaran, & Shin, 2003) to determine the order of integration to see where the time series variable achieve stationarity. Both the LLC and IPS methods were employed on the principles of the conventional Augmented Dickey-Fuller (ADF) test. The LLC method checks 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 a cointegration test. The concept of cointegration, introduced by Granger (1969), is relevant to the problem of determining the long-run relationship between the variables. The basic idea that underpins cointegration is simple. If the difference between two non-stationary series is itself stationary, then the two series are cointegrated. If two or more series cointegrated, 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 cointegration suggests that the variables have no long-run relationship.

Furthermore, in the third stage, the econometric means of a panel vector error correction model (PVECM) is utilized to analyze the causality relationship between the economic growth, local tax revenue, and local retribution revenue. The econometric model combines the traditional VAR approach putting all the variables in the system as endogenous (Grossmann et al., 2014). Prior to the implementation of the PVECM as data analysis approach, we determine the optimal lag length by using the criterion of Schwarz information. Econometrically, the PVECM model applicated to examine the causality relationship among the regional economic growth, local tax revenue, and local retribution revenue formulated as follow:

$$\Delta lPI_{it} = \alpha_0 + \sum_{j=1}^{n} \beta_{1j} \Delta lPI_{i,t-j} + \sum_{j=1}^{n} \beta_{2j} \Delta lTR_{i,t-j} + \sum_{j=1}^{n} \beta_{3j} \Delta lRR_{i,t-j} + \gamma e_{i,t-1} + \mu_{it}$$

$$\Delta lTR_{it} = \alpha_0 + \sum_{j=1}^{n} \beta_{1j} \Delta lTR_{i,t-j} + \sum_{j=1}^{n} \beta_{2j} \Delta lPI_{i,t-j} + \sum_{j=1}^{n} \beta_{3j} \Delta lRR_{i,t-j} + \gamma e_{t-1} + \varepsilon_{it}$$

$$\Delta lRR_{it} = \alpha_0 + \sum_{j=1}^{n} \beta_{1j} \Delta lRR_{i,t-j} + \sum_{j=1}^{n} \beta_{2j} \Delta lPI_{i,t-j} + \sum_{j=1}^{n} \beta_{3j} \Delta lTR_{i,t-j} + \gamma e_{t-1} + \epsilon_{it}$$

where Δ*l*PI is the first difference of the logarithm of per capita income per capita, as the proxy of regional economic growth, ΔlTR is the first difference of the logarithm of the local tax revenue per capita, and ΔlRR is the first difference of the logarithm of local retribution revenue per capita.

The model above can avoid loss of short-run information. The short-run deviations towards long-term equilibrium directly adjusted to long-run equilibrium. Therefore, the error term allows the imbalance proportion of the next period can be corrected. The term of error correction model (ECM) is represented by the coefficient of γ if the variables are cointegrated one another.

3. THE RESULT AND DISCUSSION

3.1. The descriptive statistics of the variables

The local tax revenue and local retribution revenues of local government in Indonesia are relatively different from each other. On the one side, there is a number of regions noted as the higher- local tax and retribution revenue province. In contrast, on another side, there are also a number of regions noted as the lower-local tax and retribution revenue province. Furthermore, per capita gross regional domestic product (as a proxy for regional economic growth) is also a relatively different one another. Table 1 shows the descriptive statistics and correlation matrix of the variables.

Table 1. Descriptive Statistics and Correlation Matrix

	Local Tax	Local Retribution Revenue	Gross Regional Domestic

	Revenue (IDR1000 per capita)	(IDR1000 per capita)	Product (IDR1000 per capita)
Descriptive Statistics			
Mean	218,177.90	6,517.44	8,084.63
Median	178,156.20	4,235.90	7,123.60
Std. Dev.	179,215.10	7,148.03	4,578.46
Skewness	3.17	2.87	2.34
Kurtosis	17.45	14.51	8.65
Correlation Matrix			
Tax Revenue	1		
Retribution Revenue	0.004	1	
Per capita Income	0.746	-0.206	1

Sources: Secondary Data (Processed), 2018.

Table 1 above shows that local tax revenues positively related to economic growth, indicated by a correlation coefficient of 0.746. The direction of the relationship between the local tax revenue and local retribution revenue is also positive, but it relatively weak with a correlation coefficient of 0.004. Furthermore, the local retribution revenue negatively related to economic growth with a correlation coefficient of -0.206.

3.2 The result of unit root test

As explained earlier, the unit root test which is used to determine the stationary of the data pertains to six methods. The methods are namely, LLC, IPS, ADF-Fisher, ADF-Choi, PP-Fisher, and PP-Choi. The statistical test result of the unit root test panel test as shown in Table 2, respectively.

Table 2. The Result of Panel Unit Root Test

No	Variabel	Methods	Individual Intercept				Intercept & Trend			
			Level		First Difference		Level		First Difference	
			T-stat	Prob	T-stat	Prob	T-stat	Prob	T-stat	Prob
1	*l*PI	Levin, Lin & Chu	-2.382	0.009	-3.279	0.000	-2.771	0.003	-8.956	0.000
		Im, Pesaran & Shin	4.166	1.000	-0.969	0.166	0.820	0.794	0.098	0.539
		ADF - Fisher X^2	24.360	0.998	56.578	0.185	39.260	0.812	52.685	0.297
		ADF - Choi Z-stat	4.829	1.000	-1.405	0.080	1.1936	0.884	0.452	0.674
		PP – Fisher	48.334	0.459	78.631	0.004	30.732	0.975	79.562	0.003
		PP – Choi	5.779	1.000	-2.684	0.004	4.757	1.000	-1.351	0.088
2	*l*TR	Levin, Lin & Chu	-1.663	0.048	-9.351	0.000	-3.946	0.000	-11.499	0.000
		Im, Pesaran & Shin	3.371	0.999	-5.317	0.000	0.105	0.542	-1.985	0.023
		ADF - Fisher X^2	16.678	1.000	122.509	0.000	46.318	0.542	95.798	0.000
		ADF - Choi Z-stat	4.092	1.000	-6.449	0.000	-0.262	0.397	-4.431	0.000
		PP – Fisher	35.262	0.914	243.981	0.000	123.220	0.000	236.352	0.000
		PP – Choi	3.285	0.999	-11.571	0.000	-5.261	0.000	-10.844	0.000
3	*l*RR	Levin, Lin & Chu	-4.1823	0.000	-6.962	0.000	-7.308	0.000	-4.711	0.000
		Im, Pesaran & Shin	-0.856	0.196	-3.862	0.000	-0.799	0.212	-0.431	0.333
		ADF - Fisher X^2	60.456	0.107	97.207	0.000	63.758	0.064	58.275	0.147
		ADF - Choi Z-stat	-0.739	0.229	-4.694	0.000	-1.674	0.047	-1.467	0.071
		PP – Fisher	71.706	0.015	173.921	0.000	83.314	0.001	154.650	0.000
		PP – Choi	-0.982	0.163	-8.337	0.000	-1.322	0.093	-7.165	0.000

Source: Own calculation by E-views software

Note: * indicate the significant at 95% level, and ** indicate the significant at 99% level.

Table 2 above shows that at the level, most of the panel unit root test method produces p-value >.05. This indicates that the data has not achieved a stationary at the level. Furthermore, at the first difference, most of the p-value <.05, both using individual intercept and intercept and trend approaches. Thus, it can be interpreted that the data have achieved a stationary at the first difference.

3.2. The result of co-integtation test

Since the three data have reached stationary at the first difference, then we can do a cointegration test to detect the existence of a long-run equilibrium relationship between economic growth, local tax revenue, and local retribution revenue. In this respect, the cointegration test uses Pedroni's Residual-Based Cointegration Test, Kao's Residual Cointegration Test and Johansen Fisher Panel Cointegration Test.

Pedroni (1999) recommend seven statistical tests to ascertain the existence of panel cointegration. The statistical methods divided into two approaches. The first approach pertains to panel v-statistic, panel rho-statistic, panel PP-statistic, and panel ADF-statistics. The all statistical test is termed "within-dimension" (Panel test). The second approach pertains to group rho-statistic, group PP-statistic, and group ADF-statistic are termed "between-dimension" (group test). The null hypothesis proposed that the is no cointegration between economic growth, local tax revenue, and local retribution revenue, while the alternative hypothesis is that the all variables are cointegrated. The result Pedroni's cointegration test as shown in Table 3.

Table 3. The Result fo Pedroni's Residual-Based Cointegration Test

Panel Cointegration Statistics (Within-Dimension)				
Test Statistics	Statistical Values			
	Intercept		Intercept and Trend	
	Statistic	p-value	Statistic	p-value
Panel v-Statistic	1.203	0.114	0.401	0.344
Panel rho-Statistic	0.006	0.502	1.904	0.972
Panel PP-Statistic	-5.707	0.000	-10.161	0.000
Panel ADF-Statistic	-3.516	0.000	-4.692	0.000
Group Mean Panel Cointegration Statistics (Between-Dimension)				
Test Statistics	Statistical Values			
	Intercept		Intercept and Trend	
	Statistic	p-value	Statistic	p-value
Group rho-Statistic	2.039	0.979	4.103	1.000
Group PP-Statistic	-12.267	0.000	-14.683	0.000
Group ADF-Statistic	-5.252	0.000	-6.319	0.000

Note: Ho: no cointegration; p-value < 0.05 indicate the rejection of null hypothesis at 95% confidence interval.

Table 3 above shows the results of Pedroni (1999) 's panel cointegration tests that some of p-value are greater than 0.05, especially for the panel - rho and group - rho statistics. On the contrary, some of the p-values for the PP Panel, ADF Panel, PP Group, and ADF-Statistics Group are smaller than 0.05. Thus, it can be interpreted that there is strong evidence that proves the existence of long-run cointegration relationships among the three variables.

Furthermore, acceptance or rejection of the hypothesis with Kao's Residual Panel Cointegration Test also based on p-value. The provision of the test is if the p-value <0.05 indicate that there is cointegration among the three variables. Otherwise, the p-value> 0.05 means the variables have no cointegrated. The result of Kao's residual panel cointegration test in Table 4.

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

Null Hypothesis	T-Statistic	P-value
No cointegration	-3.567***	0.000
Residual Variance	0.019	
HAC variance	0.015	

Note: *** Indicates the rejection of null hypothesis at 1% level of significant.

Table 4 provides the results of Kao (1999) panel cointegration test. The statistical result of the test shows that the p-value of 0.000 <0.05. Therefore, the null hypothesis rejected and this thing indicates that the long-run relationship exists between regional economic growth, local tax revenue, and local retribution revenue. In other words, there is strong evidence pointing out the three variables are co-integrated in the long-run. (OK)

Finally, Johansen Fisher panel cointegration test employed to determine the number of co-integration equation. The result of the test as shown in table 5. (OK)

Table 5. Johansen Fisher Panel Cointegration Test

Null Hypothesis	Alternative Hypothesis	Fisher Stat.* (from trace test)	Fisher Stat.* (from max-eigen test)

		Trace test	Prob	Max-eigen test	Prob
r = 0	r ≠ 0	257.9	0.0000	257.9	0.0000
r ≤ 1	r > 1	179.8	0.0000	172.0	0.0000
r ≤ 2	r > 2	58.53	0.0006	58.53	0.0006

Note: * Probabilities are computed using asymptotic Chi-square distribution

Base on the tabel below, can conclude that at least there are two co integration equation. Hence, we have to employee panel vector error correction model (PVECM) as means of the data analysis.

3.3. 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 5. The standard information criteria of Hannan-Quinn (HQ) and Akaike information criterion shows an optimal lag length of 3 and 7, respectively. Information criteria of Schwarz information criterion shows an optimal lag length of 7. In this respect, the information criteria based on Schwarz information criterion.

Table 5. Result of VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-151.9627	NA	0.014860	4.304518	4.399379	4.342283
1	230.1912	721.8462	4.68e-07	-6.060866	-5.681422	-5.909809
2	265.5138	63.77697	2.26e-07	-6.792051	-6.128023*	-6.527699
3	279.7810	24.57122	1.96e-07	-6.938360	-5.989750	-6.560716*
4	288.0970	13.62897	2.01e-07	-6.919360	-5.686166	-6.428422
5	301.5435	20.91692	1.79e-07	-7.042876	-5.525099	-6.438645
6	309.3573	11.50356	1.88e-07	-7.009925	-5.207564	-6.292400
7	330.2954	29.08072*	1.38e-07*	-7.341539*	-5.254595	-6.510721

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

Since the variables achieved stationarity after first differencing and Schwarz information criterion shows an optimal lag length of 7, we use lag length of 7 in using panel *vector error correction model.* The result of using econometrics method comprised of two parts covering short-term and long-term effects as described in the following sections.

3.4. The Result of Panel Vector Error Correlation Model (PVECM)

Taking into account the variables studied can either have short- or long-run effects, this study utilized a PVECM to disaggregate these effects. The other reason for the usage of the econometric model is that it allows us to distinguish the long and short-run impacts of the three variables. The output of data processing using software E-views categorized into two parts. The first part shows short and long-run relationships between variables. Then the second part deals with dynamic models informing the short-run causality effects. The following is the output E-views parts describing both long and short-run relationships between variables.

Tabel 6. The parts of PVECM representing the short-run and long-run relations.

Cointegrating Eq:	**CointEq1**	**CointEq2**
DLPI(-1)	1.000000	0.000000
DLRR(-1)	0.000000	1.000000

DLTR(-1)	**3.793783**	**-3.233395**	
	(1.19010)	(0.94141)	
	[3.18780]	**[-3.43463]**	
C	**-56.28918**	**32.14376**	
Error Correction:	**D(DLPI)**	**D(DLRR)**	**D(DLTR)**
CointEq1	4.11E-05	-0.105149	-0.017830
	(0.00129)	(0.08989)	(0.01058)
	[0.03191]	[-1.16981]	[-1.68561]
CointEq2	0.000898	-0.198479	0.009813
	(0.00156)	(0.10875)	(0.01280)
	[0.57622]	**[-1.82514]**	[0.76679]

Standard errors in ( ) & t-statistics in [ ]

whereby: DLPI is the first difference of the logarithm of income per capita, as the proxy of regional economic growth, DLTR is the first difference of the logarithm of the local tax revenue per capita, and DLRR is the first difference of the logarithm of local retribution revenue per capita.

The result of VECM provides empirical evidence deal with the long run relationship between the variables. There are two co-integration equations representing the long run equilibrium relations of the variables. Each of the equation as follow:

$$\Delta lPI = 56.289 - 3.794\Delta lTR_{t-1} \quad (1)$$
$$[-3.187]^*$$

$$\Delta lRR = -32.144 + 3.233\Delta lTR_{t-1} \quad (2)$$
$$[3.435]^*$$

The first equation represents the long run equilibrium relationship between economic growth and local tax revenue. The local tax revenue has a negative and significant relationship with economic growth in the long-run. This thing is showed by the estimated coefficient of the variable amount of -3.794 (t statistic = -3.187). The existence of the long run between the two variables is consistent with the empirical finding of Canicio & Zachary (2014) for the case of Zimbabwe economy concluding that there is a long run relationship between the two variables.

The existence of a negative relationship between economic growth and local tax revenue in the long run, due to the taxes can affect economic activities such as consumption and distribution and allocation of resources which in turn have a destructive impact on economic growth (McNabb & LeMay-Boucher, 2014). This finding is also consistent with the results of empirical research conducted by Ahmad et al. (2016) in Pakistan that in the long run, tax revenues have negative and significant effects on economic growth. One percent increase in total taxes, economic growth would be decreased by -1.25 percent. Previously, empirical studies conducted by Dackehag & Hansson (2012) for the case of 25 rich OECD countries also confirmed the existence of a negative relationship between the two variables.

However, the results of this study contradict the empirical finding of Mehrara & Farahani (2016) concluding that a more tax will be beneficial to a better economic condition. These findings are also not in line with the results of the study by Chang (2017) for the case of the Chinese economy and Arowoshege et al. (2017) for the case of the Nigerian economy which also proves that taxes can increase economic growth.

The second equation represents a long-term relationship between local tax revenue and local retribution revenue. In the long run, the relationship between the two variables is positive. The increasing local tax revenue is related to the increase in local government revenues sourced from local retribution. The existence of a positive relationship between the two variables indicates that the ability of taxpayers to pay tax is parallel with their ability to pay retribution.

The error correction part as in the VECM result above represents a short-term relationship between variables. CointEq1 relates to economic growth with local tax revenue evincing the estimated coefficient is positive. This thing can be interpreted that in the short-run, if economic growth lies above the long-run equilibrium, then local tax revenues will increase in the next period. The positive relationship explicitly informs that the ability of taxpayers to pay taxes related to the economic growth. The higher the economic growth, the higher the ability

of taxpayers to pay taxes. This thing causes a positive relationship between the two variables in the short-run.

CointEq2 relates to local retribution revenue with local tax revenue which shows the coefficient marked negative. In the short term, if the local tax revenue lies above the long-run equilibrium, then in the next period the local retribution revenue will decrease. This due to the most of local tax revenue comes from road motorcycle tax. The increase of the tax has implicated to the lower desire of the community to own the road motorcycle. In turn, the condition has a negative impact on the revenue of parking retribution. This thing causes a negative relationship between the two kinds of local government revenue in the short-run.

3.5. The Short-run effect between the variables

In related to the short-run effect of the three variables, the results of PVECM indicate that economic growth in a certain year positively and significantly influenced by economic growth before. The local retribution revenue has an insignificant and negative effect on economic growth at the 1-period time horizon, but it has a positive and significant effect on the 3-period time horizon. Furthermore, the local tax revenue has a negative and significant effect on the economic growth at the 1-2 and 4-5 period time horizon. In detail, the short-run effects of the variables as seen in Table 7.

Table 7. The Short-run effect among the variables

Exogenous Variable	Endogenous Variable								
	ΔlPI			ΔlRR			ΔlTR		
	Coefficient	Standard errors	t-statistics	Coefficient	Standard errors	t-statistics	Coefficient	Standard errors	t-statistics
ΔlPI(-1)	**0.905**	**0.232**	**3.896**	-5.148	16.199	-0.318	0.875	1.906	0.459
ΔlPI(-2)	-0.194	0.250	-0.777	0.666	17.469	0.038	-0.197	2.056	-0.096
ΔlPI(-3)	0.011	0.170	0.062	-6.099	11.872	-0.514	1.075	1.397	0.769
ΔlPI(-4)	**0.332**	**0.165**	**2.015**	-6.627	11.488	-0.577	-1.056	1.352	-0.781
ΔlPI(-5)	-0.098	0.118	-0.831	5.656	8.263	0.685	0.867	0.972	0.892
ΔlPI(-6)	0.299	0.132	2.278	13.646	9.177	1.486	-2.549	1.080	**-2.361**
ΔlPI(-7)	**-0.819**	**0.140**	**-5.839**	-7.974	9.793	-0.814	-1.417	1.152	-1.229
ΔlRR(-1)	-0.002	0.003	-0.737	-0.196	0.211	-0.931	0.020	0.025	0.833
ΔlRR(-2)	0.004	0.003	1.632	-0.018	0.184	-0.096	0.043	0.023	1.985
ΔlRR(-3)	**0.004**	**0.002**	**2.100**	0.131	0.126	1.040	0.023	0.015	1.534
ΔlRR(-4)	-0.002	0.002	-0.769	0.282	0.146	1.927	-0.027	0.017	-1.550
ΔlRR(-5)	-0.002	0.003	-0.796	-0.059	0.209	-0.284	-0.017	0.025	-0.679
ΔlRR(-6)	0.000	0.003	0.115	-0.506	0.199	**-2.537**	-0.029	0.023	-1.233
ΔlRR(-7)	0.006	0.003	1.709	-0.406	0.233	-1.745	-0.014	0.027	-0.499
ΔlTR(-1)	**-0.045**	**0.027**	**-1.696**	-1.113	1.869	-0.595	0.235	0.220	1.069
ΔlTR(-2)	**-0.002**	**0.016**	**-0.097**	-0.391	1.126	-0.347	-0.151	0.133	-1.139
ΔlTR(-3)	0.013	0.012	1.031	-0.046	0.847	-0.054	-0.009	0.099	-0.100
ΔlTR(-4)	**-0.029**	**0.018**	**-1.675**	0.681	1.223	0.556	0.081	0.144	0.566
ΔlTR(-5)	**-0.000**	**0.017**	**-0.047**	0.068	1.205	0.056	0.060	0.142	0.426
ΔlTR(-6)	**-0.018**	**0.027**	**-0.649**	-1.851	1.886	-0.982	0.357	0.222	1.609
ΔlTR(-7)	0.012	0.013	0.900	0.627	0.925	0.678	0.150	0.109	1.382
C	0.029	0.011	2.707	1.084	0.744	1.457	0.148	0.087	1.687
	R-squared : 0.901 Adj. R-squared : 0.806 Sum sq. resids : 0.000 S.E. equation : 0.006 F-statistic : 9.535 Akaike AIC : -6.952 Schwarz SC : -6.017			R-squared : 0.609 Adj. R-squared : 0.234 Sum sq. resids S.E. : 4.811 equation : 0.448 F-statistic : 1.625 Akaike AIC : 1.538 Schwarz SC : 2.473			R-squared : 0.778 Adj. R-squared : 0.565 Sum sq. resids S.E. : 0.067 equation : 0.053 F-statistic : 3.654 Akaike AIC : -2.742 Schwarz SC : -1.806		
Akaike information criterion : -7.941437 ; Schwarz criterion: -4.900736									

Source: Own calculation by E-views software

As shown in Table 7, the estimated coefficient of the local tax revenue to the economic growth shows a negative sign but not significant. That thing indicates that the increase in local tax revenue does not significantly impact the decline in economic growth. This finding is not in line with the results of the study of Eugene & Abigail (2016) for the Nigerian economic

case which concluded that taxes have a significant influence on economic growth. In addition, this finding also contradicts to the result of the empirical study conducted by Sackey & Ejoh (2014) and Egbunike et al. (2018) who found the existence of the positive impact of tax revenue on economic growth.

However, the existence of a negative estimate coefficient of local tax revenue towards economic growth as shown in Table 7 above supports the results of the study of Mark et al (2000), Holcombe & Lacombe (2004), and Reed (2008) which provide the empirical evidence on the negative relationship between the two variables. The results of the empirical study conducted by Romero-Avila & Strauch (2008) also found that taxes have a negative impact on economic growth. The negative impact of the tax on growth is due to the impact of taxes directly reducing real income in a community.

3.6. Variance Decomposition Analysis (VDA)

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 variance decomposition analysis to assess the dynamic interactions between the variables (economic growth, local tax revenue, and local retribution revenue). The analysis would provide the statistical information related to the contribution of the variables in explaining their forecast error variance (either one or two variable).

The variations in economic growth (PI) explain around 90.33 percent of its forecast error variance at the 5-period horizon. This thing indicates that increasing has been the most important thing to explain economic growth. The VDA result also informs that local retribution revenue (RR) and local tax revenue (TR) contributes up to 0.51 percent and 9.16 percent of the forecast error-variance of economic growth for the same period horizon, respectively. The results of the variance decomposition as in Table 8.

Table 8. The result of the Variance Decomposition of The Variables

Period	Variance Decomposition of ΔlPI			Variance Decomposition of ΔlRR			Variance Decomposition of ΔlTR		
	ΔlPI	ΔlRR	ΔlTR	ΔlPI	ΔlRR	ΔlTR	ΔlPI	ΔlRR	ΔlTR
1	100.000	0.000	0.000	0.465	99.535	0.000	2.744	0.233	97.023
2	96.760	0.244	2.995	1.056	98.206	0.738	1.598	4.250	94.152
3	93.316	0.148	6.535	2.068	97.089	0.842	1.088	15.722	83.190
4	91.461	0.533	8.006	5.027	94.241	0.732	1.231	25.183	73.586
5	90.332	0.509	9.158	11.222	87.085	1.693	1.272	25.587	73.141
6	89.158	0.353	10.489	15.868	80.919	3.212	1.177	24.463	74.360
7	87.807	0.279	11.913	16.328	80.491	3.181	2.497	20.400	77.103
8	85.424	0.630	13.946	16.655	79.949	3.397	6.481	16.110	77.409
9	82.558	1.083	16.358	17.222	77.889	4.889	10.476	13.652	75.871
10	80.391	1.233	18.376	17.126	76.169	6.705	13.298	12.426	74.276

Note: ΔlPI denotes the first difference of the logarithm of per capita income; ΔlRR denotes the first difference the logarithm of per capita local retribution revenue; and ΔlTR denotes the first difference of the logarithm of per capita local tax revenue.

The variation of local tax revenue (TR) explains around 73.14 percent of its forecast error variance at the 5-period horizon. At the same period horizon, the contribution of economic growth and local retribution revenue on the local tax revenue is 1,27 percent and 25,58 percent, respectively. Accordingly, the two variables have a very little contribution in explaining the variance of local tax revenue.

3.7. The result of Granger causality test

In order to test the causality relationship between the variables, we utilized VECM Granger Causality/Block Exogeneity Wald Tests. The result of the test indicates that there is a unidirectional causality running from local retribution revenue to local tax revenue and economic growth. Bidirectional causality exists between local tax revenue and economic growth. The result of VAR Granger Causality/Block Exogeneity Wald Tests as in Table 9 below.

Tabel 9. VAR Granger Causality/Block Exogeneity Wald Tests

Dependent Variable	Independent Variable		
	ΔlPI	ΔlRR	ΔlTR
ΔlPI	-	(14.789) [0.038]*	(25.724) [0.000]**
ΔlRR	(5.707) [0.574]	-	(1.599) [0.979]
ΔlTR	(16.996) [0.017] *	(17.207) [0.016] *	-

Note: Δ is the first difference operator, the values in parentheses ( ) are chi-square, the values in bracket [ ] are p-values. * indicate the significant at 95% level, and ** indicate significant at 99% level.

Based on the results of the Granger causality test above, can be seen that there is a two-way causality relationship between local tax revenue and economic growth. The increased economic growth reflects the increase of local tax capacity indicating the ability of people to pay taxes also increases. For example, the findings of Tosun and Abizadeh (2005) concluded that economic growth, measured by gross domestic product (GDP) per capita, has a significant effect on the tax revenue. Research findings of Loganathan et al. (2017) also confirm that higher growth has a positive and significant impact on tax revenue. On the other side, the increase in tax revenue indicates the higher ability of local government to fund infrastructure development activities in the regions. In turn, the conditions encourage economic activity and economic growth in the community. This thing causes the bi-directional causality between economic growth to local tax revenues. The finding support to the empirical finding of Roşoiu (2015) for the case of Romanian economy and Loganathan et al. (2017) for the case of emerging Asian Countries concluding that there is bidirectional causality between local tax revenue and economic growth. This finding is also in line with the empirical finding of Birhanu (2016) who found that there a two-way causality between the two variables.

However, this finding contradicts the results of the study of Anastassiou & Dritsaki (2005) which confirms that the causality relationship between the two variables is one-way causality from tax revenue to economic growth. Taha et al. (2011) also prove that there is a unidirectional relationship between economic growth and tax revenue. Other research as done by Abomaye-Nimenibo et al. (2018) in Nigeria which provides empirical evidence that there is no causal relationship between economic growth and tax revenue. This result is also different from the findings of Canicio & Zachary (2014) for the case of Zimbabwe economy clearly showed that there was an independent relationship between economic growth and tax revenue.

4. Conclusions and Suggestion

This study aimed to analyze the effect of the local tax and retribution revenue on regional economic growth in Indonesia. Using a panel data set of 24 provinces in Indonesia, the data was analyzed using Pedroni's and Kao's co-integration test, PVECM, and Granger causality test. The study proves the existence of a long-term relationship between the three variables. In the long run, the local tax revenue was negatively and significantly related to economic growth. Conversely, in the short-run, the relationship between the two variables was positive and insignificant. Furthermore, the relationship between local tax and retribution revenue is negative in the long-run, and positive insignificantly in the short-run. The results of the Granger causality test indicated there is a two-way causality relationship between local tax revenue and economic growth, and one-way causality running from the local retribution revenue to local tax revenue and economic growth.

Referring to the conclusions described above, the findings of the study implies that the government's efforts to encourage local economic growth should consider local tax rates. On the one hand, local taxes revenue had been the main source of local government revenue to finance development that oriented towards increasing economic activity, but on another hand, in the long run, local taxes revenue has a negative relation with economic growth. Therefore, the local government in Indonesia should be able to determine an optimal rate of the local

taxes which can minimize the negative impact of taxes on the economic activities of the community.

Furthermore, the future researcher interested in investigating the effect of local tax revenue on economic growth should specify the tax revenues based on the kinds of local tax. Thus, the information related to the causal relationship between each kind of tax revenue and local economic growth will be detected in detail..

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