The Effect of Tax Revenues, Exports and Imports on Economic Growth: Analysis using *Error Correction Model* (ECM)

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Abstract

The purpose of this study is to analyze the effect of tax revenues, exports and imports on economic growth in Indonesia in the long and short term. In this study, secondary data obtained from BPS Indonesia 2000-2019 was used. The analysis used is regression analysis using Error Correction Model (ECM). The tests used in the model are Stationarity Test, R-Square Test, F Test and T Test. The results showed. Tax revenues, exports and imports together have a significant influence on economic growth, both in the long and short term. Where the export variable has a significant effect on economic growth in the long and short term. The tax revenue variable has no effect in the long term, but has a significant effect on economic growth in the short term. Meanwhile, the import variable has no effect on economic growth, both in the long and short term.

Keywords: Tax revenue, export, import, economic growth, ECM.

1. Introduction

One of the conditions for economic development is economic growth. Many researches on economic growth have been carried out, both by researchers from developed and developing countries, such as Indonesia. Tax is a very important instrument for state revenue and for economic growth. Taxation is the main source of income for every economy (Chigbu & Njoku, 2015). An effective tax system as a source of domestic income is the key for developing countries in driving the wheels of development to be able to get out of dependence on foreign aid and natural resources (Fjeldstad, 2014). International trade and a more open trade policy are also important factors for economic growth apart from taxes. Countries that have a more liberal trade attitude will usually enjoy higher amounts of liberal inputs and lower costs, which will result in higher growth (Edwards, 1992, and 1993).

Research in several countries has shown that tax revenues, exports and imports are important factors of various factors that affect economic growth, such as research conducted by: Zhang & Cui (2008) in China; Muibi & Sinbo (2013) in Nigeria; and Neog & Gaur (2020) in India. There is a strong relationship and influence between gross domestic product, price level, and foreign trade with tax revenues (Zhang & Cui, 2008). Income levels, exchange rates, and inflation rates have a strong relationship with tax revenue (Muibi & Sinbo, 2013). Economic growth, aid and trade have a strong relationship with tax revenue (Neog & Gaur, 2020).

Researching the effects of four tax categories namely income tax, tax on goods and services, tax on income, profit, and capital gains as well as international trade tax on economic growth of 47 developing countries by mobilizing dynamic panel data for the period 2000–2012 and using an estimator system GMM to overcome the problem of endogeneity, (Nantob, 2014) suggests that there is a non-linear relationship from econometric results which produces two important findings. First, there is a nonlinear relationship between tax revenue and economic growth. Second, there is a non-linear (U-shaped) relationship between taxes on income, capital gains and gains, taxes on international trade and economic growth. The recommendation from this research is that policy makers in developing countries need to evaluate between economic growth and an effective and fair taxation system.

Gökçe & Cankal (2013) look at how the application of the Thirlwall model on the balance of payments of the Turkish economy for the period 1968-2011. This study attempts to evaluate the Thrilwall principle testing procedure by estimating the income elasticity of import demand using the stationarity and cointegration methods. The results of the study prove that there is a positive and significant relationship between GDP and exports. And this study also proves that the Thirlwall equilibrium growth model can be

applied to the Turkish economy.

Based on research and empirical evidence in several countries, the analysis of tax revenues, exports and imports is very important in optimizing economic growth in Indonesia as a condition for the development of a country. This study tries to see the effect of tax revenues, exports and imports on economic growth in the short and long term using ECM.

ECM is a time series econometric technique introduced by: Granger & Weiss (1983), and Engle and Granger (1987). ECM is a dynamic analysis model that explains the effect of changes in independent variables on the dependent variable in the short and long term (Engle & Granger, 1987). The influence of the dynamics of the variables of tax revenue, exports, and imports on economic growth in the long and short term is a crucial part in analyzing economic growth, so in this study an ECM will be built to analyze the effect of the balance of variables on tax revenues, exports, and imports. economic growth in the long and short term.

The differences between this research and previous research are: changes to several types of variables studied, the updatedness of the data studied, the sources of research data, and the analytical model used. This study uses time series data from 2000-2019, so it is hoped that the results of this study will better reflect the current tax and economic conditions in Indonesia.

2.   Research Methods

2.1.   Types and Sources of Data

This study uses secondary data with time series data, sourced from the Central Statistics Agency, and other data sources such as economic and tax books and journals. The data used in this study are data on tax revenues, exports and imports of oil and gas and non-oil and gas, as well as the GDP growth rate at constant prices (ADHK) during the period 2000-2019.

2.2.   Data Analysis Method

The analytical technique used to answer the problems in this research is quantitative analysis. Quantitative analysis was conducted to analyze the effect of tax revenue, export and import variables on economic growth using multiple regression analysis. The data analysis model used to analyze the effect of the independent variable on the dependent variable is ECM. The stages in testing the ECM method are as follows:

1.   **Stationary Test**
To test whether the data or variables analyzed in this study were stationary or not, a stationarity test was carried out with a unit roots test and a degree of integration test.

2.   **Cointegration Test**
To detect the stability of the long-term relationship between two or more variables, it is necessary to perform a cointegration test. And if there is cointegration among the related variables, it means that there is a long-term relationship between these variables (Granger, 1980). Seeing the presence or absence of cointegration is carried out using the Augmented Engel-Granger test, namely by estimating the regression model and then calculating the residual value, if the residual value is stationary then the regression is a cointegration regression (Ariefianto, 2012). The long-run regression model is as follows:

$$\text{LGDP}_t = C_0 + \alpha_1 \text{LTAX}_t + \alpha_2 \text{LEKS}_t + \alpha_3 \text{LIMP}_t + u_t \tag{1}$$

Note :
LGDP = Logarithm of Economic Growth
LTAX = Logarithm of Tax Revenue
LEKS = Export Logarithm
LIMP = Import Logarithm
u   = Confounding Variables
t   = Time Period

3.   **ECM Regression Test**
ECM is a regression model that corrects the regression equation among variables that are individually not stationary to return to their equilibrium value in the long run, with the main condition being the existence of a cointegration relationship between the constituent variables (Engle & Granger, 1987). Furthermore, by using the residuals from the long-term equation or from the cointegrated equation, an ECM model can be formed. The residual of the long-term equation used as error correction is the Error

Correction Term (ECT) which will have an effect on the short-term equation. The ECM model is formed by entering the first lag residual from the regression results in the equation into the regression of stationary variables at the same difference. The following is the ECM model that will be used in this study:

$$DLGDP_t = \beta_0 + \beta_1 DLTAX_t + \beta_2 DLEKS_t + \beta_3 DLIMP_t + \beta_4 ECT + u_t \qquad (2)$$

Note :

DLGDP	=	Changes from the Logarithm of Economic Growth
DLTAX	=	Changes from the Logarithm of Tax Revenue
DLEKS	=	Changes from Export Logarithm
DLIMP	=	Changes from Import Logarithm
ECT	=	residual equation or ECT, a representation of the actual adjustment to a state of equilibrium when an imbalance condition occurs
β_0	=	Constant
$\beta_1, \beta_2, \beta_3, \beta_4$ =		ECM Coefficient
β_5	=	Residual Coefficient of ECT Equation
u	=	Confounding Variables
t	=	Time Period

The validity of the ECM model can be seen from the cointegrated variables that must be supported by a significant and negative ECT coefficient value. So it can be interpreted, that if the value of the ECT coefficient is positive, then the direction of the variables used will be further away from the long-term balance, so it can be said that the ECM model is invalid and cannot be used (Rahutami, 2011).

4. Statistic Test
Statistical test is a test conducted to see the value of: t statistic, F statistic value, and coefficient of determination. The results of the statistical test are said to be statistically significant if the value of the statistical test is in the critical area (area H0 is rejected). And it is said to be insignificant if the value of the statistical test is in the area where H0 is accepted.

3.   Results and Discussion

3.1.   Research Result

Stationarity in this study used the Augmented Dickey-Fuller (ADF) test. The results of the unit roots test using the ADF method at the level level can be seen in Table 1.

Table 1. Unit Root Test Value with ADF Test Method at Level

Variable	ADF Test Value	*Mackinnon* Critical Value 5%	Probability	Decision
GDP	-2.332179	-3.029970	0.1727	Not Stationary
LTAX	-2.944404	-3.040391	0.0598	Not Stationary
LEKS	-1.256943	-3.029970	0.6268	Not Stationary
LIMP	-1.237524	-3.029970	0.6354	Not Stationary

Based on the ADF test with a critical value of 5% Mackinnon, not all variables are stationary at the unit root, so it is necessary to test the degree of integration. The results of the degree of integration test with the ADF method on the first difference are in Table 2.

Table 2.
The Value of the Degree of Integration Test with the ADF Test Method on the First Difference

Variable	ADF Test Value	*Mackinnon* Critical Value 5%	Probability	Decision
GDP	-5.664135	-3.040391	0.0003	Stationary
LTAX	-5.492166	-3.040391	0.0004	Stationary
LEKS	-3.553413	-3.040391	0.0184	Stationary
LIMP	-4.334003	-3.040391	0.0038	Stationary

The results of the ADF test on the first difference are all stationary variables at the Mackinnon critical value of 5% and are ready to be used in ECM analysis. Because all variables are stationary, the next step is to create a cointegration regression equation using the OLS (Ordinary Least Squares) method. The cointegration regression equation uses a double log model, which is as follows:

$$GDPt = C_0 + \alpha_1 LTAXt + \alpha_2 LEKSt + \alpha_3 LIMPt + ut \qquad (3)$$

The results of the regression equation above can be seen in Table 3.

Table 3. OLS Estimation Results Cointegration Regression-Long-Term Equation Test

Variable	Coefficient	t-statistics	Probability	Adjusted R^2
C	-22.79067	-2.724659**	0.0150	
LTAX	-0.913530	-2.052476***	0.0569	
LEKS	5.423373	2.893120*	0.0106	0.556369
LIMP	-2.024104	-1.429470[d]	0.1721	

From the regression equation, the residual value will be obtained. Furthermore, this residual value will be tested using the ADF test to determine whether the residual value is stationary or not. The results of the ADF test can be seen in Table 4 below:

Table 4. Cointegration Test Value with the ADF Method at the Level –
Long-Term Stationary Test

Variable	ADF Test Value	*Mackinnon* Critical Value 5%	Probability	Decision
Residual	-3.601824	-3.029970	0.0161	Stationary

By using the ADF method, the cointegration test results in Table 4, it can be seen that the residual of the absolute value of ADF is -3.601824 > the critical value of 5%, which is -3.029970, so it can be concluded that the residual is stationary at the level level, which means that cointegration occurs between variables.

From the results of the cointegration test, it was found that the data in the study was stationary, meaning that there was a long-term relationship between the independent variable and the dependent variable. Furthermore, because it is stationary, the ECM model can be made using the residual results from the long-term equation or the cointegrated equation. Further ECM testing can be done to see how the effect of the short-term equation. By using the ECM model, it can be seen that changes in the variables between: TAX, EKS and IMP have a significant relationship and/or influence (in the short term) on GDP. Here is the ECM equation model:

$$DGDPt = \beta_0 + \beta_1 DLTAXt + \beta_2 DLEKSt + \beta_3 DLIMPt + \beta_4 ECT + ut \qquad (4)$$

Based on the dynamic model of the ECM approach, the estimation results from the regression are obtained as shown in Table 5.

Table 5. Estimation Results with the ECM Approach - Short-Term Equation Test

Variable	Coefficient	t-statistics	Probability	Adjusted R^2
C	0.006723	0.053840[d]	0.9578	
D(LTAX)	-1.693099	-2.120729**	0.0523	
D(LEKS)	4.526067	3.865852*	0.0017	0.746277
D(LIMP)	-0.067222	-0.082925[d]	0.9351	
ECT(-1)	-0.983589	-4.918648*	0.0002	

Long term equation:
GDP = -22.79067-0.913530LTAX+5.423373LEKS-2.024104LIMP   **(5)**
Short term equation:
DGDP = 0.006723-1.693099DLTAX+4.526067 DLEKS-0.067222DLIMP–0.983589ECT(-1)   **(6)**

Based on the ECM equation model, it can be seen that the magnitude of the cointegration coefficient which functions as a speed of adjustment or ECT has a negative value with a coefficient of -0.983589 with a significant probability at = 5% (0.05) which is 0.0002, so it can be concluded that the ECM test model is valid. The ECT coefficient figure of -0.983589 illustrates that fluctuations in the short-term balance will be corrected towards long-term equilibrium, with a percentage of around 98.3589% with the adjustment process occurring in the first year and the remaining 1.6411% the adjustment process will occur in the following years. next year.

Meanwhile, for the results of the F Statistical Test, based on the processing results, the calculated F value (F-statistic) is 14,23587 with probability F-statistic: 0.000077 < from the value of = 5% (0.05), with a 95% confidence level, if seen from this figure, it can be concluded that the independent variables in the form of: tax revenues, exports and imports, together have a significant effect on the dependent variable: economic growth. Furthermore, when viewed from the results of the coefficient of determination test, the adjusted R^2 value is 0.746277, meaning that the influence of the independent variable in influencing the dependent variable is 74.6277% and the remaining 25.3723% is influenced by other variables outside the model.

3.2. Discussion

3.2.1. Effect of Tax Revenue (TAX); Exports (EKS) and Imports (IMP) on Long-Term Economic Growth

By using the ECM model, the estimation results in the long term are obtained (Table 3). The adjusted R^2 value is 0.556369, explaining that the influence of the independent variable, which consists of: tax revenues, exports, and imports in the model can explain the variation of the dependent variable by 55.6369 percent. And the F-statistic number is 8.942801 with probability: 0.001035 < from the value of = 5%, indicating that the independent variables in the long term have a joint effect on the level of economic growth. By using a significance level of 5%, it can be analyzed that only one significant variable is the number of exports while the variables of tax revenue and imports are not significant.

In the long term, the number of exports has a positive and significant impact on economic growth. The number of exports increases by 1 percent, it will increase economic growth by 5.423373 percent. And if the number of exports decreases by 1 percent, it will reduce economic growth by 5.423373 percent. This is of course in accordance with the theory of international trade which states that the greater the number of goods or services that are exported, the more the production of goods and services in the country will increase. An increase in goods exported abroad will result in an increase in capital flows into the country. The inflow of capital will be managed as capital funding for large, medium and small businesses. Furthermore, an increase in the amount of output both goods and services can certainly increase economic growth in the long term.

3.2.2. Effect of Tax Revenue (TAX); Exports (EKS) and Imports (IMP) on Economic Growth in the Short Term

The estimation results show the coefficient value of the ECT variable is -0.983589 (Table 5), meaning that the difference between the growth rate and the equilibrium value will be adjusted within 1 year. The ECT coefficient is used to measure the regressand response of each period that deviates from balance. The magnitude of the ECT coefficient value will explain how quickly it takes to get the balance value (Widarjono, 2009). The ECT value of -0.983589 with a probability of 0.0002 means that it is significant at a 1 percent significance level so that the ECM model in the short term is valid.

The adjusted R^2 value of 0.746277 explains that 74.6277 percent of the variation of the economic growth variables together can be explained by the independent variables consisting of tax revenues, exports and imports. Meanwhile, the remaining 25.3723 percent is explained by other variables outside the model. From the regression results, the F-statistic value is 14,23587, this shows that the independent variables: tax revenues, exports and imports together affect the rate of economic growth. The export variable is significant at the 1 percent significance level and tax revenues are also significant at the 5 percent significance level, while imports are not significant in the short term. Imports in the short term or less than five years have no effect on economic growth. This means that an increase or decrease in the value of imports will not affect economic growth.

In the short term, the export variable has a positive and significant effect on economic growth. With an export coefficient of 4.526067, it means that if exports increase by 1 percent, it will increase economic growth by 4.526067 percent and if exports decrease by 1 percent, it will reduce economic growth by 4.526067 percent. An increase in exports will encourage domestic production. Increased production will drive the wheels of the domestic economy so that it will certainly increase economic growth. Tax revenue

has a negative and significant effect on economic growth. With a coefficient of -1.693099, it means that if tax revenue increases by 1 percent, it will reduce economic growth by 1.693099 percent and if tax revenue decreases by 1 percent, it will increase economic growth by 1.693099 percent. Tax revenues reduce economic growth in the short term. However, this effect will then diminish over time due to an increase in tax revenues.

The results show that tax revenue has a negative and significant effect on economic growth, this result is also in line with research conducted by Nantob (2014), where there is a nonlinear relationship between tax revenue and economic growth, and this study recommends that policy makers need to evaluate the system effective and fair taxation in relation to economic growth in developing countries. Research conducted by Zheng & Severe (2016), entitled Teaching the Macroeconomic Effects of Tax Cuts with a Quasi-Experiment, shows that tax cuts significantly induce higher consumption decisions, meaning that reducing or cutting taxes will increase economic growth through an increase in the number of consumption. Lower taxes can increase tax revenues for the government and stimulate production (aggregate supply) (Nantob, 2014). According to Fjeldstad (2013), tax policies and practices can result in a decline in economic growth, so the government must design a tax system that can positively accelerate economic growth. Taxes have a fundamental role and place in the economy of every country, so they must be determined optimally in order to contribute to the economy (Kalaš et al., 2018). Based on the results of this study, it is hoped that the role of tax revenue on the economy should be even greater, because an effective tax system is a source of domestic income and prosperity.

4.   Conclusion

1. This study aims to examine the relationship and influence of tax revenues, exports and imports on economic growth. Based on the results of the study, there is a strong relationship and influence between tax revenues, exports and imports on economic growth both in the long and short term. Economic growth is closely related to the process of increasing the production of goods and services in economic activities in society. The increase and decrease of economic growth can be seen from the results of production and income. Increasing the quantity and quality of exports of goods and services is necessary to increase economic growth, because based on the results of research exports have a significant influence and relationship on economic growth.

2. High economic growth allows the realization of an increase in the prosperity and welfare of a country. This research can be used as a reference and input for the government in making economic policies, especially in terms of taxation, export and import policies. For further analysis, it is recommended for other researchers. For example, by replacing or adding other macroeconomic variables in the study. In addition, it is to examine the mechanism in the form of steps or policies that must be carried out by the government related to export provisions and tax revenues in maintaining or increasing economic growth.

5.   References

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