

Granger Causality Between Minimum Wage and Labor Supply in South Borneo, Indonesia

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Abstract: This study uses a causality research design, which analyzes the causality relationship between research variables in accordance with the hypotheses compiled. The research data will be analyzed using a statistical tool, the Granger causality test with the help of Eviews 9.0. Granger's causality test is a method to find out a dependent variable (dependent variable) can be requested by the independent variable (independent variable) and on the other hand the independent variable can be determined the position of the dependent variable. The purpose of this research is to refute theories or hypotheses to support or oppose theories or hypotheses of the results of previous studies The variable minimum wage has a positive effect on labor supply with a coefficient of 0.727046.

KEY WORDS: Minimum Wage, Labor Supply.

1. INTRODUCTION

Developing countries have multiple characteristics in the labor market. The market is divided between the formal sector and the informal sector. This is usually characterized by high salary levels and low salaries, their income can also be recognized from the level of education. These two sectors are the result of meaningful inequalities and disconnections in their economic systems. There is an institutional inequality between the formal and informal labor markets because they operate with two different labor backgrounds, which results in a significant difference between labor productivity and their salaries. In addition, it appears that restrictions on labor mobility between the formal and informal sectors give the appearance of a disconnected labor market.

The labor market can also be interpreted as a market that brings together sellers and buyers of labor. As labor sellers in this market are job seekers (Workers Owners), while as buyers are people / institutions that need labor. The labor market is organized with a view to coordinating meetings between job seekers and people or institutions that need labor. In order to meet the workforce needs of companies, the labor market is felt to provide a way out for companies to meet them. Thus not impressed only job seekers who benefit from the existence of this market. To create a synergistic condition between the two parties, namely between the seller and the provider of labor, good cooperation is needed between all parties concerned, namely the seller of labor, the buyer of labor,

In the first place, the problem of unlimited labor supply can be said to be a country with a large population but with abundant natural resources (Lewis, 2013). The country will develop other new economic activities without experiencing a shortage of educated workers. Initially there will be a problem of shortage of skilled and educated workers, but in the long run this can be overcome by expanding education.

The neo-classical analysis begins with the view that labor supply in society is not excessive. While Keynes's analysis departs from the notion that there is not only an excess supply of labor, but also available land and unlimited production capacity. This situation is contrary to the conditions in developing countries. Based on the foregoing Lewis considers that in many developing countries there is an excessive workforce, but faces the problem of lack of capital, and limited land use (Lewis, 2013).

The number of labor supply from time to time continues to change. Understanding the variables that can affect labor supply is needed to determine labor supply behavior and to be able to predict future supply. From the two analyzes of labor supply above, namely micro and macro, the variables that determine labor supply can also be grouped into two, namely micro and macro. From the micro analysis there are wage and reference variables, while from the macro analysis known variables are population, labor force participation, unemployment rate, physical wealth, and economic structure. According to Keynes (2003) in the aggregate it is concluded that the level of wages has a direct role in the hours of work offered.

2. RESEARCH METHODOLOGY

This study uses a causality research design, which analyzes the causality relationship between research variables in accordance with the hypotheses compiled. This type of research was chosen considering the aim of the researcher is to test a theory or hypothesis in order to strengthen or even reject the theory or hypothesis of the results of previous research. Also based on observations of the effects that occur, and look for factors that might be the cause through certain data and emphasize the theory testing through the measurement of variables with numbers and data analysis using statistical data.

The research data will be analyzed using statistical tools, namely Granger causality test with the help of Eviews 9.0. Granger Causality Test is a method to find out where a dependent variable (dependent variable) can be influenced by other variables (independent variables) and on the other hand variables These independent variables can occupy the dependent position.

Analysis of the relationship between the Minimum Wage and labor supply uses the Granger Causality Test (1969)

$$(MW)_t = \alpha + \sum_{i=1}^m \beta_i (MW)_{t-i} + \sum_{j=1}^n T_j (LS)_{t-j} + \mu_t \dots \dots \dots (1)$$

$$(LS)_t = \theta + \sum_{i=1}^p \phi_i (LS)_{t-i} + \sum_{j=1}^q \psi_j (MW)_{t-j} + \eta_t \dots \dots \dots (2)$$

Based on the estimated OLS coefficients for the equations (1) and (2) three different hypotheses about the relationship between MW and LS can be formulated:

1. Unidirectional Granger-causality from MW to LS.
2. Unidirectional Granger-causality from LS to MW.
3. Bidirectional causality

Explanation :

MW = Minimum Wage

LS = Labor Supply

m = Number of Lags

Ut1,Ut2 = Disturbing Variables

$\alpha, \beta, \lambda, \delta$ = The coefficients of each variable (assumed to be uncorrelated)

3. DATA AND SOURCES OF DATA

In this study secondary data, namely data and information collected and processed from internal sources of Statistics of Kalimantan Selatan Province, as well as from other external sources, in the form of time series data for a period of 13 years from 2004-2016, minimum wage, and labor supply.

4. THEORETICAL FRAMEWORK

Keynes (2003) assumes that wages generally have a positive correlation with the hours of work offered. But after passing a certain time limit, wages are no longer positively related, but negatively related to the number of hours of work offered. This happens when wage levels are already so high that most material needs can be met, people are no longer interested in money. They will allocate some of their time for leisure time.

Labor market conditions can affect the movement of aggregate supply from factor production markets. Furthermore, changes in the equilibrium in the labor market that are formed based on the intersection between prices formed by producers and wages expected by workers can affect the unemployment rate. The balance that occurs in the labor market then becomes a determinant of the movement of aggregate supply. Aggregate supply movements as a representation of labor market conditions and government policy interventions in terms of wages, but low wages also do not have a positive impact, Keynes (2003) says let us assume, for now, that labor is not ready to work with lower money wages and that a reduction in the level of existing money wages will cause, through strikes or vice versa, to withdrawal from the labor market which is now in use.

Keynes (2003) states that any increase in the cost of living, however moderate, relative to money wages will cause a withdrawal from the labor market the number of workers is greater than all existing unemployment. Based on the knowledge that transmission from the labor market to the balance of supply and aggregate demand, conditions that occur in the labor market can determine the level of natural output and unemployment. Therefore, to know the effect of the dynamics of labor market conditions, especially the influence of the minimum wage on the unemployment rate, it is necessary to understand carefully the characteristics of the labor market, labor qualifications and wage regulations in Indonesia.

Beni Teguh Gunawan and Ardhian Kurniawati (2017) discuss the increase in minimum wages that is always interesting to be associated with phenomena in the labor market, the decision to enter the labor market, the possibility of the labor force finding work until the possibility of workers being laid off from work as a result of the increase in the minimum wage. This study seeks to see the impact of minimum wage increases in the Greater Jakarta area at the highest rate of increase in 2013 and the lowest in 2015. Empirical analysis using Sakernas micro data shows that at the time of high minimum wage increases in 2013 that reached an average of 48.10 % increases a person's likelihood of entering the job market, decreases a person's likelihood of working and increases the risk of layoffs. The opposite result was shown when the regime of low minimum wage increases in 2015, which reduced a person's interest in the labor market, and increased the possibility of work. The only thing that is the same in both regimes is that the risk of layoffs continues to increase.

Zahra Moshfegh, Hassan Taei, and Mohammadi Teymour (2014) examined the effect of minimum wage variables on labor supply and labor participation rates in the labor market received less attention. The results showed that age, education and marriage had positively influenced the participation of urban and rural women in the labor market and the income of urban and rural women laborers had a negative effect on their level of participation in the labor market. In addition, the family dimension variable does not have a significant effect on urban and rural female labor supply. In relation to the behavior of female workers' participation behavior with minimum wages, despite the positive impact of increasing minimum wages on labor supply, the marginal effect of minimum wages on female urban worker participation differs from the respective effects on rural areas - this effect on the participation of women workers in bigger urban.

Tom Ahn, Peter Arcidiacono, and Walter Wessels, (2011) discuss a general equilibrium search model with endogenous entries, and therefore no benefits are expected, by companies and endogenous labor supply by workers. The positive employment effect of increasing minimum wages can occur as a result of the level of employment depending on the number of search firms and the number of workers seeking. The welfare implications are similar to the classical analysis: workers who mostly want a job with a minimum wage are disadvantaged by an increase in the minimum wage of workers who are marginally attracted to the minimum wage job that benefits.

Laura Giuliano (2013) examines how the increase in the federal minimum wage in 1996 affected both the level of employment opportunities in each shop and the fraction of teenagers employed. Because the minimum wage causes adolescent relative wages to increase in many stores, examine the relative work of teenager to test the replacement hypothesis of more skilled employees.

5. GRANGER CAUSALITY TEST

This study uses time series data which is based on the assumption that the data is stationary at the level, meaning that the data is constant and independent all the time (Gujarati, 2003). But in reality, some time series data are non stationary data. The use of non-stationary data can result in failure of estimations in showing the actual values (spurious regression) even though the number

of samples has been enlarged. Therefore, before conducting further analysis, it is necessary to do a stationary test of all variable time series data that will be used through the unit root test. Before conducting the analysis phase, the minimum wage variables (MW), labor supply (Ls), are transformed into logarithms, so they become LNMW, LNLs.

Table 1 Stationary Test Results Variable Level and First Difference Level

Variable	T-statistic Value and Critical Value				Test results
	t-statistic	C- Values 1%	C- Values 5%	C- Values 10%	
LNMW	-19.11321	-4.165756	-3.508508	-3.184230	Stasioner (2 nd difference)
LNLS	-5.123515	-4.148465	-3.500495	-3.179617	Stasioner (Level)

Based on the test results in table 1, the data meets stationary requirements so that further data processing can be performed. Testing the optimum lag in this study using FPE criteria, because the number of samples used is relatively small. The results of determining the length of the lag are presented in the following table:

Table 2 Optimal Lag Length

Lag	LogL	LR	FPE	AIC	SC	HQ
0	123.2597	NA	4.49e-09	-5.032327	-4.835503	-4.958260
1	250.5236	222.0349	5.82e-11	-9.383982	-8.203036*	-8.939584
2	280.4849	45.89828	4.89e-11	-9.595104	-7.430038	-8.780375
3	304.2060	31.29155	5.70e-11	-9.540679	-6.391492	-8.355619
4	353.5658	54.61094*	2.46e-11*	-10.57727	-6.443962	-9.021878*
5	386.2400	29.19814	2.54e-11	-10.90383*	-5.786399	-8.978105

Source: Summarized from the results of Eviews

The optimal lag length is 4 based on the Final Prediction Error (FPE) criteria. The selection of criteria using FPE follows Reimers (1992), finding that FPE runs well in choosing the optimal lag length. Next to enter the cointegration test, VECM then the lag length must be reduced by one. Therefore, the lag length used is 3. Meanwhile, for the causality test the lag length used is 4.

Table 3 Johansen Cointegration Method Cointegration Test Results (trace statistics)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.793915	151.4750	79.34145	0.0000
At most 1 *	0.479619	75.66064	55.24578	0.0003
At most 2 *	0.388526	44.30729	35.01090	0.0039
At most 3 *	0.315291	20.69690	18.39771	0.0235
At most 4	0.051073	2.516320	3.841466	0.1127

Trace test indicates 4 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Table 4 Cointegration Test Results Method Johansen's Cointegration Test (Maximum Eigenvalue Statistics)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.793915	75.81434	37.16359	0.0000
At most 1 *	0.479619	31.35336	30.81507	0.0429
At most 2	0.388526	23.61039	24.25202	0.0606
At most 3 *	0.315291	18.18058	17.14769	0.0353
At most 4	0.051073	2.516320	3.841466	0.1127

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Based on tables 3 and 4 it can be seen that the trace statistic and maximum eigenvalue values at $r = 0$, $r \leq 1$, and $r \leq 2$ are greater than critical values with a significance level of 5%. This means that the null hypothesis which states that no cointegration is rejected and the alternative hypothesis which states that there is no cointegration is accepted. Based on the above analysis it can also be seen that among the five variables in this study, there is one cointegration at a significance level of 5%.

Table 5 Probability Values and F-Statistics from the Causality Test

No	Null Hypothesis:	Obs	F-Statistic	Prob.
1	LNLS does not Granger Cause LNMW	48	3.52135	0.0151
	LNMW does not Granger Cause LNLS		3.22482	0.0222

Source: Output Processing Eviews 9.0; *): significant at the 5% level.

Based on table 1.2, it appears that in number 1, the minimum wage variable (LNMW) can affect labor supply (LNLS) and vice versa labor supply (LNLS) affect the minimum wage (LNMW) because the probability value in both directions is smaller than 5%, so the relationship that occurs is bidirectional causality. Thus it can be stated that there is a two-way influence of the minimum wage on labor supply

6. RESULTS

The variable minimum wage (LNMW) in the long run has a positive effect of 0.727046. This means that for every 1 percent increase in the minimum wage (LNMW) assuming other variables are fixed (*ceteris paribus*), the supply of labor (LNLS) increase by 0.72 percent when other variables remain (*ceteris paribus*). with economic theory which states that there is a positive relationship between the minimum wage and labor supply proposed by the findings is in accordance with the findings of Benni and Ardhan (2017), Zahra Moshfegh, Hassan Taei, and Mohammadi Teymour (2014), Tom Ahn, Peter Arcidiacono, Walter Wessels (2011), and Giuliano (2012).

7. CONCLUSION

In the long run minimum wages have a positive relationship and have a significant effect on labor supply. The value of the ECT coefficient is negative and statistically significant so that there is a possibility of variable labor supply in a period to go into a long-term balance when shock occurs outside the balance. In general, the response of labor supply when there is shock from the minimum wage variable, before the forty (short term) period is fluctuating and dynamic. Then after the forty (long-term) period, it seems that the response tendency of labor supply will be convergent or not in achieving balance. The first period has not been contributed by other variables that can explain the variability of labor supply. In the intermediate period, the contribution of the minimum wage variable decreased by 3.89%. In the period of one hundred (long-term) in which the variable contribution of the minimum wage, is increasingly reduced in explaining the variability of labor supply, which is equal to 3.81%. In the period of one hundred variables the labor supply forecast error variance which can be explained from the labor supply itself is 81.57%. Fluctuations in labor supply are more influenced by other variables than the labor supply variable itself.

8. REFERENCES

- [1] Ahn, Tom, Arcidiacono, Peter, Wessels, Walter, 2011, The Distributional Impacts of Minimum Wage Increases when Both Labor Supply and Labor Demand are Endogenous. *Journal of Business and Economic Statistics* 29, no.1: 12-23.
- [2] Gunawan, Beni Teguh, Kurniawati, Ardhan .2017, Effects of Minimum Wages on Individual Transitions in the Labor Market. *Journal Of Research In Economics And Management*. Volume 17, No. 1, Januari - Juni (Semester I) 2017.
- [3] Giuliano, Laura. 2013, Minimum Wage Effects on Employment, Substitution, and the Teenage Labor Supply: Evidence from Personnel Data, *Journal of Labor Economics*, Vol. 31, No. 1, pp. 155-194.

- [4] Granger, C. W. J.,1969, Investigating Causal Relations by Econometric Models and Cross-spectral Methods,Econometrica, Vol. 37, No. 3, pp. 424-438.
- [5] Gujarati, Damodar N. 2003. Basic Econometrics . New York : McGraw Hill.
- [6] Keynes, Jhon Maynard. 2003, The General Theory of Employment, Interest, and Money. Electronic Texts Collection. Adelaide University Library.
- [7] Lewis, W. Arthur. 2013, The Theory of Economic Growth. UK : Manchester School.
- [8] Moshfegh, Zahra, Taei, Hassan, and Teymour, Mohammadi, 2014, The Effect of Minimum Wage on Women's Labor Supply, The Journal of Planning and Budgeting. 2014; 19 (3) :23-46.
- [9] Reimers, H.E., 1992, Comparisons of Tests for Multivariate Cointegration, Statistical Papers 33, 335-359.

