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To Link this Article: http://dx.doi.org/10.6007/IJAREMS/v7-i2/4212 DOI: 10.6007/IJAREMS/v7-i2/4212

Received: *23 April 2018,* ***Revised:*** *21 May 2018,* ***Accepted:*** *23 June 2018*

Published Online: 28 June 2018

In-Text Citation: (KhairulAmri & Nazamuddin, 2018)

To Cite this Article: KhairulAmri, & Nazamuddin. (2018). Is There Causality Relationship between Export and Employment: A Time Series Data Evidence from Indonesia. *International Journal of Academic Research in Economics and Management Sciences*, *7*(2), 86–99.

Vol. 7, No. 2, April 2018, Pg. 86 - 99

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Is There Causality Relationship between Export and Employment: A Time Series Data Evidence from Indonesia

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Abstract: The main purpose of the study is to investigate the relationship between the export and employment creation in Indonesia. Using time series data for the period of 1987-2013. Johanson co-integration test employed to determine the long-run relationship between the variables. Vector autoregressive and Granger causality test utilized to test the short-run relationship between the variables. The study found that in the long-run, there is no relationship between employment and export. In a short-run, the employment positively and significantly causes the export. Granger causality test indicates that there is unidirectional causality running from the export to employment.
Keywords: *Employment, Export, Vector autoregressive and Granger Causality Test.*

Introduction

The employment creation has become an important issue for the developing country. Especially for the high population growth countries, growing occupation is a necessity to reduce the unemployment rate. The increase in employment is usually in line with the increase of economic activities including inter-state trade both export and import. Increased exports in addition to expanding the marketing area are also expected to increase the absorption of the labor force and higher profits for the company (Meersman & Nazemzadeh, 2017).

Study on the linkages between exports and employment often investigated by previous researchers. However, the direction of the relationship between the two variables still be the open question, and some studies provide paradoxical empirical evidence (Belenkiy & Riker, 2015). An increase in exports will increase economic activity which is in turn impact on the formation of employment opportunities in the long-term (Dizaji & Badri, 2014). The export can

create high quality create jobs (Uexkull, 2012). The study conducted by Sousa, Arto, & Andreoni (2012) for the case of panel data set of European countries for the period of 2000-2007 also found the empirical evidence that the exports of goods and services to the rest of the world supported around 25 million jobs. Previously, the findings of Lapadre's (2011) research in Italy using panel data for 1999-2008 also conclude that exports have a positive and significant impact on the employment creation.

In line with Lapadre's finding, Kiyota's (2011) studies on the relationship between the employment creation and trade for the case ofJapan's economic also reveals that an increase in the exports promotes the employment in the manufacturing and non-manufacturing sectors. The positive relationship between the two variables also supported by the results of Katz & Istrate's (2011) studies concluding that exports stimulate the increase in the employment and economic growth. Previously, a study conducted by Goldar (2009) in India also provides empirical evidence of a positive relationship between the export and employment creation.

In contrast to the studies described above, Ernst's (2005) study in Argentina, Brazil and Mexico in 1995-2000 concluded that the economic opening in Argentina, Brazil and Mexico did not lead to the export dynamism and had a disappointing impact on the employment, even though the trade liberalization and regional integration caused a strong increase in trade and led to a better integration into the world economy. Only Mexico experienced an export ground in the manufacturing production and the employment during the 1990s, mainly due to the booming of the maquiladora sector. Previously, the Falk & Wolfmayr (2005) studies for the 7 EU countries for the period of 1950-2000 concluded that the effect of materials import on total employment is negative and significant for countries with low wage levels.

Other empirical findings relating to the linkage between exports and employment was provided by Lesage & Redd (1989) for the case of 8 metropolitan areas in Ohio. They found that exports and employment opportunities were influenced by the lag of the two variables. Furthermore, Felbermayr, Larch, & Lechthaler, (2013) reported an econometric analysis of a panel of 20 OECD countries and a broader cross-section of 62 countries for the period 1990- 2007. They find that a ten percent point increase in the trade openness reduces the aggregate unemployment by about three-quarters of one percent point. Dutt, Mitra, & Ranjan (2009) in their study with a sample of 90 countries found that by using cross-sectional regression, the unemployment rate in a country is negatively related to trading openness in the country. However, using the dynamic econometric model of the unemployment rate during the period of 1985-2004, they found that trade liberalization led to an increase in the unemployment rate.

Studies on the linkages between the exports and employment opportunities for the case of Indonesian economic have not been widely discovered by the previous researchers. If any, the study has not provided the detailed information on the direction of the causality between the two variables. Unlike previous studies, the present study not only detects the presence or absence of long-term relationships between the variables but also reveals the direction of causality between them. The use of VAR and Granger causality test as a data analysis model allows the information clearly expressed. Thus, this study not only reinforces the previous research findings but also enlarges the empirical evidence of the linkages between exports and employment. In addition, the findings of this study can also be an important consideration for the Indonesian government in determining policies related to increased exports and employment creation.

The paper organized into four sections. The first sections related to the introduction providing information on the background of the study. The second sections are the research methods pertaining information about the data source, data measurement, and econometric technique used to analyze the relationships between the variables. Finally, the fourth part highlights the conclusion and suggestions

Research Method

The data used for this study is the annual time series data during the period of 1987-2013, sourced from the Indonesian Central Bureau of Statistics. The export meant in this research is non-oil/gas export measured by millions of US$. Then, the employment opportunity is the total workforce that is measured by millions of people.

The initial phase of data processing started with the unit root test. The test is an important requirement for the time series analysis. There are two methods can be utilized to test the unit root of the data, i.e Augmented Dickey-Fuller (ADF) test and Phillips-Peron (PP) test. By Using the two methods the unit root test formulated as follows (Albiman and Suleiman, 2016)

$$\Delta Y_t = \propto_0 + \propto Y_{t-1} + \sum_{k=1}^{n} \propto \Delta Y_{t-k} + \varepsilon_t \quad (1)$$
$$\Delta Y_t = \propto_0 + \sum_{k=1}^{n} \propto \Delta Y_{t-k} + \delta_t + \varepsilon_t \quad (2)$$

Then, using the Phillips-Perron (PP) methods, the unit roottest formulated as follow:

$$\Delta x_t = \beta_0 + \beta_2 x_{t-1} + \delta + \varepsilon_{2t} \quad (3)$$
$$\Delta x_t = \beta_0 + \beta_2 x_{t-1} + \delta + \varepsilon_{2t} \quad (4)$$

Where: Δ is the first difference for all variables, Y and X are time series data, t is linear time trend, n is the optimum lag for dependent variables important to make the serial term error not correlated between the first and second equations, and ε is random error terms. The same method applies to x_{t-1} in equations 3 and 4. The benchmark of the unit root of the data based on probability values. If the value <0.05 interpreted the data is stationary. Conversely, if the value> 0.05 means the data is not stationary

After the unit root test, then continued with lag length criteria test. In analyzing the slowness models the most important question is how to determine the length of slowness and this is a problem in the model specification (Widarjono, 2009: 207). So, in order to determine the model of causality test (the relationship between variables) required determination of optimal lag length as a prerequisite step

The next stage is to conduct cointegration test. The cointegration test used in this research is the Johansen cointegration technique. The determination of whether a cointegration equation based on comparing the trace statistic value and the max-Eige statistic value on one side with the critical value on another side. if the trace statistic value > critical value, and the max-Eige statistic value > critical value can be concluded there is cointegration.

The stationary test results show that all variables reach stationary at first difference, and based on cointegration test results, it is known that the two variables are not cointegrated. Therefore, the analysis model used is Vector Autoregressive on first difference formulated as follows:

$\Delta LEmply = \propto_0 + \propto_1 \Delta LEmply_{t-1} + \cdots + \propto_m \Delta LEmply_{t-m} + \beta_1 \Delta LExpt_{t-1} + \cdots + \beta_m \Delta LExpt_{t-m} + \varepsilon_1$ (5)

$\Delta LExpt = \propto_0 + \propto_1 \Delta LExpt_{t-1} + \cdots + \propto_m \Delta LExpt_{t-m} + \beta_1 \Delta LEmply_{t-1} + \cdots + \beta_m \Delta LEmply_{t-m} + \varepsilon_2$ (6)

Where$\Delta LEmply$ is the first difference of the natural logarithm of the employment, and. $\Delta LExpt$ denotes the first difference of the natural logarithm of the export, α and β are constants to be estimated, as well as ε denotes a stochastic error term.

The model above can avoid the loss of short-term information. Short-term deviations lead to long-term equilibrium, adjusted directly to long-run equilibrium. Therefore, the term error helps to correct the proportion of imbalances in the next period. The term error correction model (ECM) is represented by the coefficient γ if the variables are cointegrated. Furthermore, Impulse Response Function (IRF) is used to check the shock response of each independent variable to the dependent variable. Finally, Granger causality is used to test the causality relationship between the variables studied.

Result and discussion

The trend of the employment and export of Indonesia

During the period 1987-2013 Indonesia's exports fluctuated, and it is tended to increase over the year. In 1987 Indonesia's export of US$1,086.4 million. This number decreased to the US $ 1,067.9 million for 1988, and the US $ 909.0 million for 1989. In contrast, in 1990 it increased to the US $ 1,195.0 million. The increases indicate that the existence of the increase in the production of the export commodities in Indonesia. Until 2013, Indonesia's non-oil and gas export reached US $ 42,564.2 million higher than the previous year period of US $ 40,701.5 million. For a detailed to trends of Indonesian non-oil export for the period of 1987 to 2013 can be seen in figure 1.

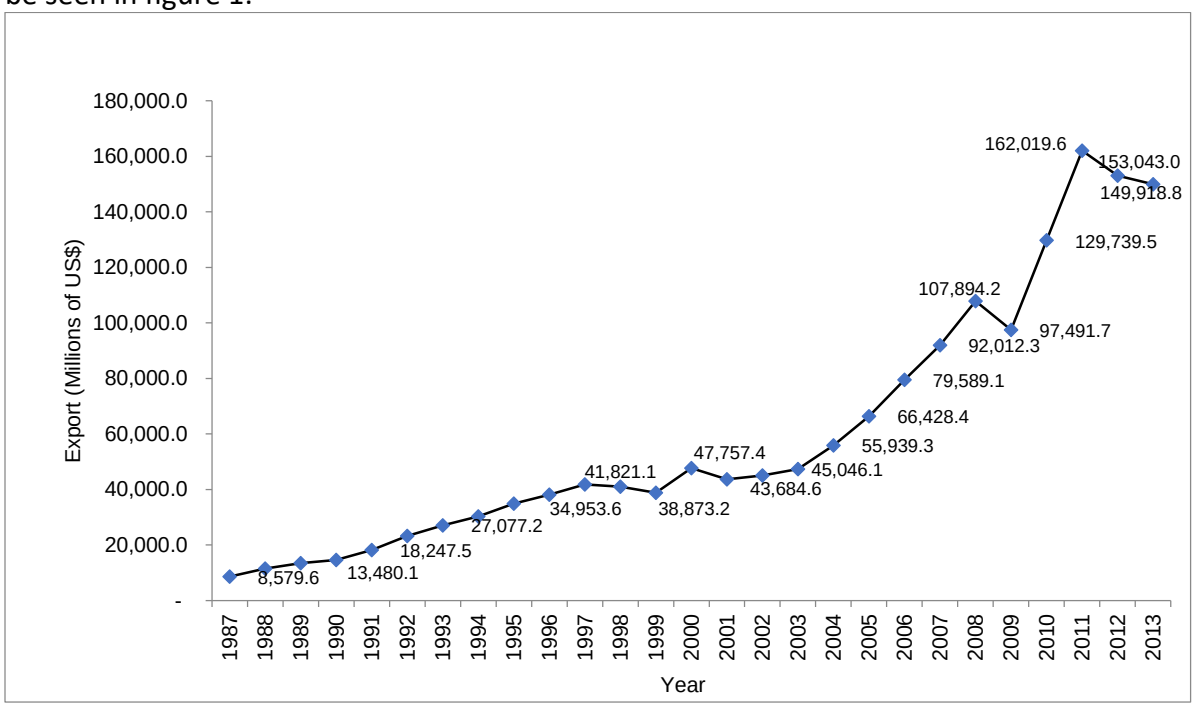


Figure 1

The dynamics of Indonesian non-oil export for the period of 1987 to 2013

With regard to the employment, during the period of 1987-2013 employment opportunities in Indonesia also tend to increase. The employment opportunities within a given year period proxied from the total of the labor force that is working in the period. In 1987 the labor force that is working in Indonesia amounted to 67.58 million, then increased to 89.84 million people in 2000. Until 2013 total employment opportunities in Indonesia of 118.19 million people. The dynamics of employment opportunities in Indonesia during the period of 1987-2013 is shown in Figure 2.

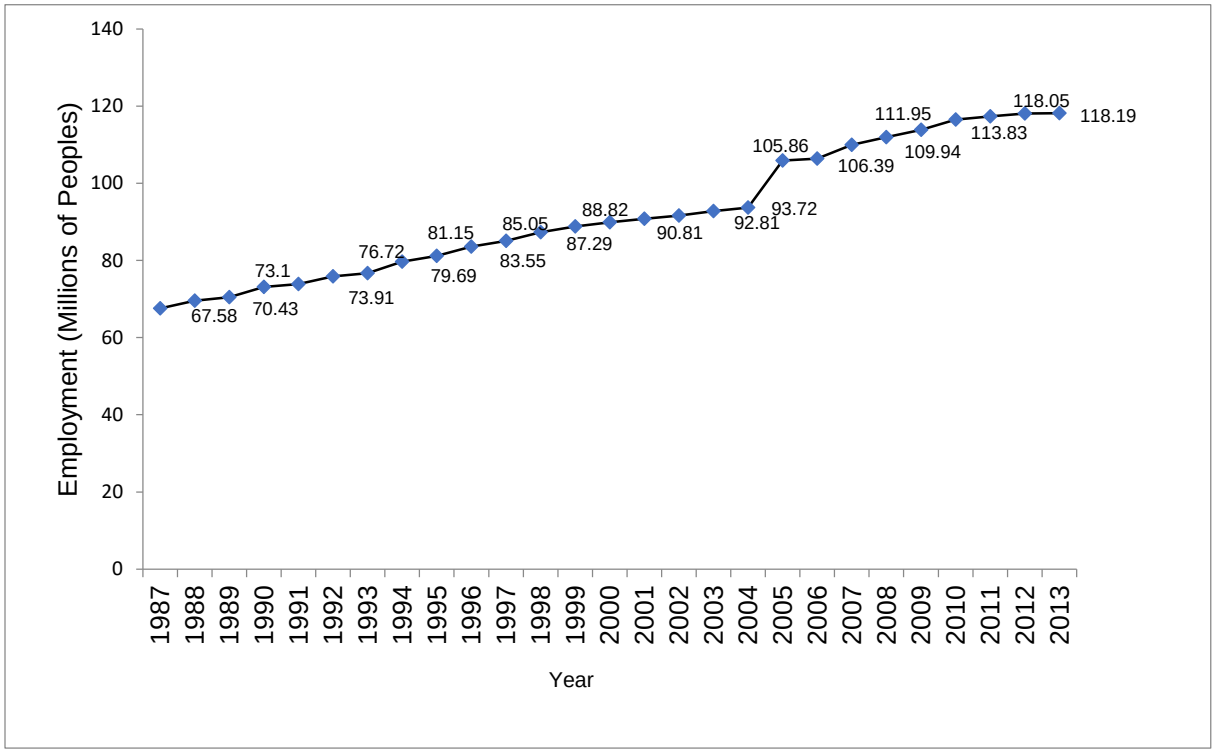


Figure 2

The dynamics of employement in Indonesia for the period of 1987 to 2013

The result of Unit root test

The first step of research time series data is to test unit root for the variable tested. The unit root test in this research using ADF (Augmented Dickey-Fuller) and Phillips-Perron (PP) test. Prior to testing the unit root, each of the variables transformed into the logarithmic form. The unit root test at the level indicates that none of the variables reaching stationary, either by ADF test or PP test. This indicated by the p-value of the variable is insignificant, respectively. Furthermore, the unit root test performed at the first difference, and results in a statistically significant p-value, both for the ADF and PP method, as shown in Table 1.

Table1.The result of unit root test

Variable	Augmented Dicky Fuller (ADF)				Phillips-Perron(PP)			
	Constant		*Constant and Trend*		*Constant*		*Constant and Trend*	
	Level	*First*	*Level*	*First*	*Level*	*First*	*Level*	*First*
Employ-ment	-0.749 (0.816)	-5.932 0.000)***	-2.452 (0.347)	-5.836 (0.000)***	-0.768 (0.812)	-5.921 0.000)***	-2.571 (0.295)	-5.826 (0.000)***
Export	-1.913 (0.322)	-4.656 0.001)***	-2.568 (0.296)	-4.696 (0.005)***	-1.893 (0.330)	-4.653 0.001)***	-2.568 (0.296)	-4.693 (0.005)***

Source: Secondary Data (Author's own computation), 2017.
Note: the number in ( ) is p-value
**) significant at 95% level
***) significant at 99% level.

Based on Table 1 above it understood that using both ADF test and PP-test methods, the data reaches stationary at first difference. Conversely, at the level of none of the research variables declared stationary.

The Result of Lag Length Criteria Test

In a VAR model, the optimal lag determination is important, since that is useful for eliminating the autocorrelation problem in the model. In addition, the optimal lag determination is useful to show how long the reaction of a variable to the others. Thus, in order to determine the causality relationship between the variables, required determination of optimal lag length as a prerequisite step. The optimal lag is a time horizon giving a significant influence or response. The optimal lag testing in this study uses the Akaike information criterion. The test results of Lag Length Criteria as shown in Table 2.

Table 2. The Result of Lag Length Criteria Test

Lag	LogL	LR	FPE	AIC	SC	HQ
0	23.38461	NA	0.000577	-1.782051	-1.683880	-1.756006
1	**81.13761**	**101.0678***	**6.56e-06***	**-6.261468***	**-5.966954***	**-6.183333***
2	81.89325	1.196427	8.68e-06	-5.991104	-5.500249	-5.860880

* 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
Source: Secondary Data (Author's own computation), 2018.

Based on the test results above, the optimal response of the variables to the others obtained at the lag of 1. So, the lag length utilized for each VAR equation is lag of 1.

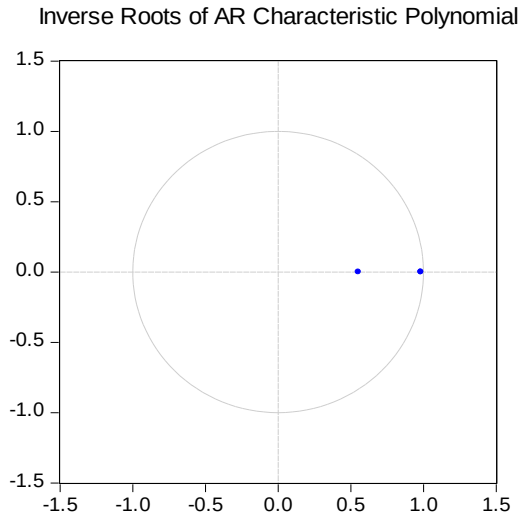
After performing the optimal lag length test, the next step is to test the VAR stability condition. A VAR system is considered stable if all of its roots have a modulus smaller than one and are located within its circle unit (Gustiani, Ascarya & Effendi, 2010). The test results of stability VAR as shown below.

The Result of the VAR stability model

Roots of Characteristic Polynomial
Endogenous variables: DLEMPLY DLEXPT
Exogenous variables: C
Lag specification: 1 1
Date: 09/03/17 Time: 21:22

Root	Modulus
0.983441	0.983441
0.551849	0.551849

No root lies outside the unit circle.
VAR satisfies the stability condition.



The Result of Co-integration test

Co-integration tests for this research using Johansen co-integration test. The presence or absence of the co-integration equation refers to the comparison of trace statistic and Max-Eigen Statistic with critical value 0.05. If trace statistic> critical value and max-eigen statistic > critical value that signifies that the equation co-integrated. Conversely, if the trace statistic <critical value and max-eigen statistic <critical value indicates that the equation is not co-integrated. The results of Johansen's cointegration test as shown in Table 3.

Table 3. The Result Summary of Johansen Cointegration Test

Hypothesized No. of CE(s)	Eigenvalue	Unrestricted Cointegration Rank Test (Trace)			Unrestricted Cointegration Rank Test (Maximum Eigenvalue)		
		Trace Statistic	0.05 Critical Value	Prob.**	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.2543	7.6870	15.4947	0.4995	7.3365	14.2646	0.4501
At most 1	0.0139	0.3505	3.8415	0.5538	0.3505	3.8417	0.5538
Trace test indicates no cointegration at the 0.05 level Max-eigenvalue test indicates no cointegration at the 0.05 level **MacKinnon-Haug-Michelis (1999) p-values							

Source: Secondary Data (Author's own computation), 2018.

Table 3 above shows that trace statistic is <critical value, so is the max-Eigen statistic <critical value. This means that in the long-run there is no cointegration within the model of the equation. In econometrics, the non-co-integrated variables are concluded to be not in long-term

equilibrium conditions. That is, in the long-run, there is no cointegration between employment and export.

Since the data reach stationer at first difference and not cointegrated, hence the econometric model used to analyze the relationship between employment and export is VAR with the first difference data. As explained before, the lag length criterion test shows that optimal lag of 1. Therefore, the application of the VAR model with the first difference data uses the optimal lag. The Eviews output describing the functional relationship between the two variables summarized in Table 4.

Table 4. The Result of Vector Autoregressive (VAR)

	ΔLEmply	ΔLEXPT
Constanta	0.2511 (0.2828) [0.8881]	-2.5375 (1.1552) [-2.1966]
ΔLEmply (-1)	0.9036 (0.1278) **[7.0659]**	1.4622 (0.5225) **[2.7986]**
ΔLEXPT (-1)	0.0192 (0.0289) [0.6653]	0.6317 (0.1179) **[5.3550]**
R-squared Adj. R-squared F-statistic Log likelihood	0.9828 0.9813 629.3424 59.8881	0.9844 0.9830 695.0582 24.7013

Note: Standard errors in ( ); t-statistics in [ ]
Source: Secondary Data (Author's own computation), 2018.

Referring to the Eviews output as shown in Table 4 above, the equation describing the functional relationship between the employment creation and the export as in the following equation.

Equation 1:

$$\Delta\text{LEmply} = 0.251 + \underset{[7.066]}{0.904}\Delta\text{LEmpy}_{t-1} + \underset{[0.665]}{0.019}\Delta\text{LExpt}_{t-1}$$

R-squared : 0.9828
Adj. R-squared : 0.9813
F-statistic : 629.3424

Equation 2:

$$\Delta\text{LExpt} = -2.538 + \underset{[5.355]}{0.632}\Delta\text{LExpt}_{t-1} + \underset{[2.799]}{1.462}\Delta\text{LEmply}_{t-1}$$

R-squared : 0.9844
Adj. R-squared : 0.9830
F-statistic : 695.0582

Equation 1 represents the functional relationship between the employment and its own self and export at the one-year before. The increase in the employment at a certain year period significantly affected by the employment at the previous one-year period. This indicated by the regression coefficient of 0.904 and t-statistics of 7.006. Furthermore, exports also have a positive effect on employment, but the effect is not significant, indicated by regression coefficient of 0.019 and t statistics of 0.665. This indicates that the increase in exports does not significantly affect employment opportunities in Indonesia. This finding is different from the empirical evidence found by Dizaji & Badri (2014) for the case of Iranian economy concluding the export has a positive and significant effect on employment. The absence of the positive and significant effects of the export on employment is also inconsistent with Lapadre's (2011) research findings for the case of Italy and Sousa et al. (2012) for the case of European countries concluding that the export has a positive and significant impact on the employment creation.

The positive and significant effects of the employment to itself is due to the job creation in a certain economic sectors impact on the job opportunity in another sector. For example, the increasing employment in the agricultural sector is able to promote the employment creation for the industrial and services sectors, and others. Similarly, the employment creation in the industrial sector can also affect the employment in the agricultural, commercial and other sectors.

Equation 2 shows the functional relationship between exports in a given year period with exports and employment in the previous year shown by the export regression coefficient of 0.632 and t statistics of 5.355. This indicates that exports are positively and significantly influenced by itself. The increase in exports in certain periods of the year has an impact on increasing exports in the next year period. In other words, the export volume in a given year affected by the export volume of the previous year period. Furthermore, employment opportunities also have a positive and significant impact on Indonesian exports, shown by the export coefficient of 1.462 and t-statistical of 2.799. Increased employment has an impact on increasing exports. This indicates that some of the labor force in Indonesia works on the export-related businesses.

So far, most of Indonesia's non-oil and gas export commodities come from agriculture and plantation sectors. The two sectors employe more labor force compared to other sectors. Thus, increased employment opportunities in the agricultural and plantation sectors have an impact on increasing the production of these two sectors, which in turn increase exports. The existence of the effect of the employment on the exports supports Lesage & Redd (1989) research findings in 8 Ohio metropolitan areas on the dynamic relationship between export change and local employment opportunities that find that exports and employment are affected by lag of the two variables.

***The Impulse Response Function* (IRF)**

Impulse Response Function (IRF) was used to check the response of a certain variable to the shock that occurs in other variables within the system of equations. The IRF explains that how long the variable back to a balance point after the shock of another variable. The response depicted by the IRF graph that points out the positive, negative, or no response. The IRF graph reflecting the relationship between the employment and export as shown in Figure 3 & 4.

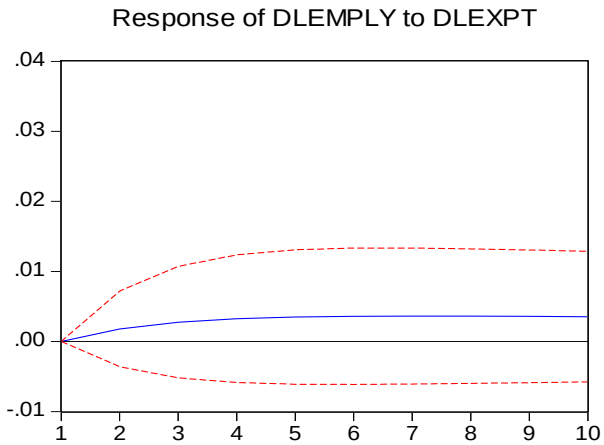


Figure 3: The impulse Response Function of employment to Export

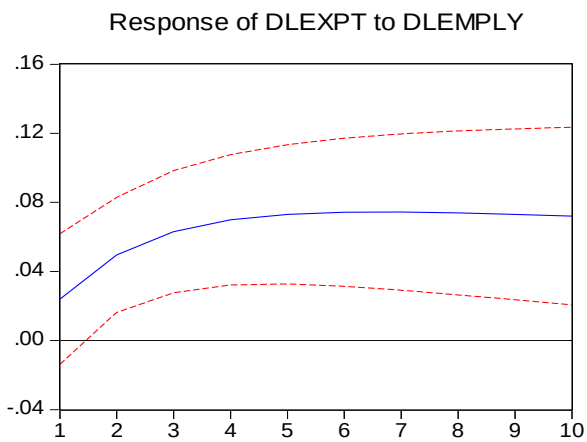


Figure 4: The impulse Response Function of Export
to employment

In the first year, there was no employment response to exports. The employment response to exports is positive starting from the second and following year, indicated by the IRF line above the horizontal line. The shock on export is positively responded by employment, meaning there is a direct relationship between the two variables. Although the response is relatively small, a positive response means there is a direct relationship between the employment and export. Until the 10-year period, the response of the employment to the exports is still positive. Furthermore, the export response to employment is also positive starting from the first period to the next period. The biggest response occurs within the time horizon of 6-7 periods. This indicates that changes in exports are the response to a change in employment. Increased employment in the year t period has a significant impact on the increase in exports at the next 6-7 periods.

Based on the impulse response function it can be stated that the export response to employment is greater compared to the response of employment creation to export. This is consistent with the VAR result which shows that in the short term, employment has a significant effect on export and vice versa export has no significant effect on employment creation.

Variance decomposition is intended to analyze the variance of a variable that can be explained by the lag of that variable and other variables in the past. The variance of decomposition analysis may support the explanation of the impulse response function described earlier. This analysis can explain how much variation a variable is explained either by itself or by variations that occur in other variables. At the 5-year predicted horizon, about 1.49 percent of the predictive variance of the employment sourced from exports. In contrast, 98.5 percent came from the employment opportunity itself. Up to the 10-year horizon, only 2.49% of the employment prediction variance comes from exports. The remaining of 97.51 percent come from its own self.

Table 5. The Variance Decomposition

Variance Decomposition of ΔLEMPLY:				Variance Decomposition of ΔLEXPT:		
Period	S.E.	ΔLEmply	ΔLEXPT	S.E.	ΔLEMPLY	ΔLEXPT
1	0.023505	100.0000	0.000000	0.096032	6.247903	93.75210
2	0.032040	99.68918	0.310823	0.122987	20.02953	79.97047
3	0.038167	99.26468	0.735322	0.143787	33.86278	66.13722
4	0.043114	98.85861	1.141387	0.162492	45.00537	54.99463
5	0.047333	98.51015	1.489850	0.179659	53.35720	46.64280
6	0.051046	98.22291	1.777087	0.195400	59.55220	40.44780
7	0.054379	97.98908	2.010924	0.209820	64.20869	35.79131
8	0.057408	97.79861	2.201393	0.223052	67.78269	32.21731
9	0.060189	97.64240	2.357602	0.235233	70.58701	29.41299
10	0.062759	97.51303	2.486966	0.246489	72.83351	27.16649

Source: Secondary Data (Author's own computation), 2018.

At the 1-year prediction, 93.75% of the prediction variance of the export sourced from itself, the remaining 6.25% sourced from employment. Until the 5-year prediction horizon, most of the prediction variance derived from employment opportunities that amounted to 54.36%, and only 46.64% sourced from exports. At the 10-year prediction horizon, 71.83% of the prediction variance of the export comes from employment opportunities. The remaining of 27.17% come from its own self.

Based on the variance of decomposition, it can be interpreted that the ability of the employment creation to explain the changes that occur in export is greater than the ability of export to explain the changes of the employment. This is consistent with the IRF described earlier that the export response to employment is greater compared to the employment response to exports. In other words, the impact of employment change on the export change is greater than the impact of the export changes on the employment change. The employment creation is better able to explain changes in exports compared to the export capability in explaining changes in the employment.

In order to examine the causality relationship between employment and export can be seen from the result of VAR Granger causality/block Exogeneitywald tests. The test results are as shown in Table 6.

Table 6. The Result of VAR Granger Causality/Block Exogeneity Wald Tests

	Exogenous Variable	
Endogenous Variable	ΔlnEmply	ΔlnExpt
ΔlnEmply	-	[0.443] (0.506)
ΔlnExpt	[7.832] (0.005)***	-

Source: Secondary Data (Author's own computation), 2018.

[ ] denotes for the chi-square; ( ) denotes for the p-value; *** significant at 99% level.

Table 6 above shows that there is one-way causality from employment to export. This indicates that the increase in exports is the impact of employment opportunities. In general, Indonesian non-oil export commodities in the form of agricultural goods and the largest employment opportunities in Indonesia are also employment opportunities in the agricultural sector. The increased employment in this sector will promote the agricultural commodity production which in turn has an impact on increasing exports. This is what causes unidirectional causality from the employment to export.

Conclusion and Suggestion

This study aims to analyze the causality relationship between the employment creation and export in Indonesia. Using time series data during the period of 1987-2013 the data were analyzed using Johansen co-integration test, vector autoregression (VAR) and Granger causality test. There are two important conclusions of the study. Firstly, there is no long-term relationship between employment and export. At the 1-year horizon, employment formation is affected by itself. In contrast, exports have no significant effect on employment. The exports in a certain year period are affected by exports and employment of the previous year. Secondly, the Granger causality test indicates that there is one-way causality from employment to export. This indicates that the improvement of the exports due to the employment creation. This is because most of the Indonesian labor force work in agriculture and plantation sectors, and Indonesian non-oil and gas export commodities generally come from these two sectors.

Based on the conclusions above, the Indonesian government should encourage the increase in employment creation, especially in the agricultural and plantation sector. However, it should also be accompanied by the expansion of employment opportunities in the industrial sector, so that the increases in exports not only depend on the agricultural commodities, but it also comes from the manufacturing sector.

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