

Analysis of Indonesian Rice Price Transmission in The ASEAN Economic Community (AEC) Framework

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ABSTRACT

The policy of trade barriers carried out by ASEAN countries, especially rice-producing countries can hamper the achievement of long-term food security because it can obscure the transmission of price signals. This study aims to analyze the relationship of rice price transmission between Indonesia and other ASEAN countries, and also to analyze the effect of the application of AEC and other factors on rice prices in Indonesia. This study uses the VECM model using secondary data from January 2008 - December 2017. IRF analysis show that the response of the Indonesian rice market to the shock of the Thai and Vietnamese rice markets is greater than the response of the Indonesian rice market when there are shocks to the Philippines rice market. This is also reinforced by the results of the FEVD analysis which shows that variations in the price of Indonesian rice are largely explained by variations in rice prices of exporting countries (Thailand and Vietnam). It can be concluded that there has been an integration between Indonesian rice market with other ASEAN's rice market (Thailand, Vietnam, Philippines) with the factors that affected Indonesian rice prices were exchange rate, world oil prices, ATIGA agreements and AEC integration.

Keywords : AEC, Price Transmission, Rice Price, Trade Policy, VECM Model

I. INTRODUCTION

Development of the agricultural sector is always an interesting thing to discuss, because it deals with basic human needs, namely food needs. In line with the growth of population in the world, demand for food continues to rise, so that the efforts to fulfill the food needs become an important issue. It because food is a primary need for millions people in the world, because food keeps human alive, including ASEAN region whose the economy still depends on the agricultural sector as the main economic driver (Daite 2015).

Rice is the main and strategic staple food commodity in the world. Rice is consumed by half of seven

billion people in the world, more than 90 percent is consumed by people in Asia and more than 22 percent is consumed by people in Southeast Asia . Based on data from the ASEAN Statistical Year Book 2017, it is known that paddy (rice) is included in the five main food commodities in ASEAN. According to data from the United States Department of Agriculture (USDA 2018), ASEAN is the third largest rice producing region in the world with 24.94 percent share and also the region with the third largest rice consumer in the world with a share of 21.24 percent, where Indonesia, Thailand, Philippines and Vietnam as countries in the ASEAN region with the highest level of rice consumption. The USDA data (2018) shows that the ASEAN region is the fourth largest rice importing region in the world with a 9.59

percent share where Indonesia and Philippines are the largest rice importing countries in ASEAN.

Trade Map data (2018) shows that Thailand and Vietnam are the largest rice exporters in the ASEAN region, while Indonesia and Philippines are the largest rice importers in the region. The export-import activities of rice that occurred in the ASEAN region indicated that there had been integration between the rice markets in Indonesia, Philippines, Thailand and Vietnam. That is, when a change or shock occurs in a market it will affect other markets. The global food crisis shocks in 2007/2008 led to a debate about the extent to which ASEAN trade policies can protect food security in its member countries. Considering ASEAN as an open economy region, trade is very important for ASEAN, not only to increase economic growth, help reduce poverty but also an important component for the ASEAN integration process (Chandra and Lontoh 2010).

In fact, when there is a global food shock, most countries take trade policies by hampering the food imports and carrying out export barriers to maintain the domestic market from global food shocks (World Bank 2015), including ASEAN countries. The policies made by rice-producing countries in ASEAN to hamper rice exports not only undermine regional solidarity which is a key component in achieving AEC goals, but can also reduce the efficiency of agricultural production globally and make it less resistant to shocks. Policy which distorts production and trade of food commodities also has the potential to impede the achievement of long-term food security as obscure price signal transmission for production efficiency (World Bank 2015).

AEC is an implementation of economic integration that occurs between countries in ASEAN. AEC is a regional community that has a joint agreement to integrate the economy including the markets of all ASEAN member countries. The enforcement of the AEC will lead to market integration between

countries, which means that change of one country's market will influence each other's markets. That is, changes in prices in a market are partially or totally transmitted to prices that occur in other markets, both in the short term or long term (Aryani 2009). The establishment of ASEAN economic integration in the form of AEC is expected to be able to increase integration between markets in the ASEAN region, especially the rice market, because the rice market is sensitive to change.

Indonesia as a large rice importing country and also the country with the highest level of rice consumption in ASEAN, is important to know how much changes in rice prices in ASEAN countries affect on changes in Indonesian rice prices so that appropriate policies can be taken. Based on the problems described above, the purpose of this study is to analyze the relationship of rice price transmission in Indonesia and selected ASEAN countries and analyze determinants that affect rice prices in Indonesia. The countries that were focused in this study were Indonesia, Thailand, Vietnam and Philippines. These countries were chosen because they were considered to represent rice exporters and importers in ASEAN.

II. LITERATURE REVIEW

2.1 Economic Integration

The theory of economic integration refers to a commercial policy or trade policy that discriminatively reduces or eliminates trade barriers only among countries that mutually agree to form a limited economic integration (Salvatore 1996). Levels of economic integration itself varies from preferential trade arrangements, which can be further developed into the formation of a free trade area or areas, then into a customs union, common market and will ultimately lead to an overall economic union.

The ASEAN Economic Community (AEC) is a regional community that has a joint agreement to

integrate the economy including the markets of all ASEAN member countries. The main objective of the 2015 AEC is to make ASEAN as a single market and production base, which is a free flow of goods, services, investments and skilled workers and free capital flows (Ministry of Trade 2015). The foundation of the establishment of the AEC was because in 1997-1998, ASEAN member countries realized the importance of increasing cooperation, especially during the economic crisis in Southeast Asia, as a form of the attitude of ASEAN member countries especially in facing economic conditions and global competition.

Economic integration through the AEC is expected to become a momentum to realize regional food security, so it is important to eliminate trade barriers to increase the specialization of rice trade based on the support of natural resources from each ASEAN country.

2.2 Price Transmission

Price transmission is a condition when changes in one price cause another price to change. The mechanism of transmission of global food prices is a way in which changes in food prices affect economic activity and inflation in several ways (Selliah et al. 2015).

Price transmission is differentiated into spatial price transmission and vertical price transmission. Meyer and Taubadel (2004) explained that spatial price transmission occurred when changes in product prices at a level are transmitted to product prices at the same level in the market chain but at different locations. Then, Taubadel (1998) explained that vertical price transmission is the response of prices at a level to changes in prices at other levels in the market chain, both changes in the form of price increasing or price decreasing. Vavra and Goodwin (2005) add that vertical price transmission is the response or price adjustment at the producer level to price changes at the consumer level or vice versa.

Spatial price transmission is described as a price relationship between markets that is geographically separated, this concept is explained by using the spatial balance model. This model was developed using excess supply curve and excess demand curve in the two regions to trade. Prices formed in each market and the number of commodities traded can be predicted through this spatial balance model (Tomek and Robinson 1990).

2.3 Previous Research

Research on the integration of the rice market and transmission of prices has been carried out, including Irawan and Rosmayanti (2007) who examined spatial integration and vertical integration between the rice markets in Bengkulu Province using the Vector Error Correction Model (VECM). The results showed that the rice market in the Bengkulu region did not have full spatial integration, the rice market vertically in Bengkulu Province did not exist or was segmented. In the short term, there is a mutual influence between the price of rice at the level of consumers and wholesalers even though consumer prices have a stronger influence on prices at the wholesale level. So the rice market in Bengkulu Province is independent and there are interdependencies with one another. This condition shows that there are still exogenous influences that can affect rice prices.

Aryani (2009) examines the integration of the rice and sugar markets in Thailand, the Philippines and Indonesia through the Vector Autoregression (VAR) approach. The results show that the rice and sugar markets in Thailand, the Philippines and Indonesia have been integrated with a very weak level of integration. This means that if there is a change in the market for rice and sugar, a country will affect the market movements of rice and sugar in other countries with very small changes (seen from the coefficient value which is smaller than one). This condition is caused by the existence of an import control policy (both tariff and non-tariff) applied by

the three ASEAN countries towards the commodity of rice and sugar.

Llyod et al. (2015) examine the extent to which food prices are transmitted and analyze the factors that influence differences in food prices in 11 countries in the European Union (EU) using SVAR. The results showed that the contribution of world prices to the behavior of bread prices showed a significant difference between EU countries and the differences in the role of the food sector (in particular barriers to competition and vertical supervision) were seen to be related to the role of world prices, particularly the importance of structural features in commodity price transmission.

III. METHODS

3.1 Data Sources

This research used secondary data in the form of time series data. The time period used in this study starts from January 2008 to December 2017. The data in this study were obtained from various sources, including the Food Agricultural Organization (FAO), World Bank, International Financial Statistics (IFS), and the related web.

3.2 Analysis of Price Transmission

The method used to analyze the data in this study is through the VAR model approach to see the transmission of rice prices among selected ASEAN countries and analyze the factors that influence rice prices for each ASEAN country. The quantitative method used in this research is the VECM model. The VECM model is the estimated VAR used for variables that are non-stationary but have the potential for cointegration (Enders 2015). The specifications of the VECM model for the transmission of rice prices between selected ASEAN countries and analyze the factors that influence domestic prices in selected ASEAN countries based on the model used by Lloyd (2015) are as follows:

$$\Delta X_t = \mu_0 + \alpha\beta'X_{t-1} + \sum_{i=1}^{k-1} \Gamma_i \Delta X_{t-i} + \phi D_t + \varepsilon_t$$

Where μ_0 is a vector of interception, β' is a cointegration vector, X_t is an endogenous variable vector used in the VECM model:

LNINA_RICE : Indonesian rice price (USD/kg),

LNTHAI_RICE : Thai rice price (USD/kg),

LNVIET_RICE : Vietnamese rice price (USD/kg),

LNPHIL_RICE : Philippine rice price (USD/kg).

While D_t is an exogenous variable used in the model:

LNINA_ER : exchange rate (IDR/USD),

INA_TEMP : temperature change in Indonesia (°C),

LN_OIL : world oil price (USD/barrel),

Dummy AEC is defined as:

1 : period after AEC (January 2016–December 2017)

0 : period before AEC (January 2008–December 2015),

Dummy of ATIGA agreement is defined as:

1 : period after the signing of the ATIGA agreement (February 2009–December 2017)

0 : period before the signing of the ATIGA agreement (January 2008–January 2009).

IV. RESULTS AND DISCUSSION

Analysis of Transmission of Rice Prices

The transmission of rice prices and the factors that affect rice prices in Indonesia will be analyzed using the VECM model, which is the VAR model that is estimated because of the cointegration which shows the existence of long-term relationships between variables within the VAR system (Enders 2015). The VECM estimation results in this research model show the relationship of short and long term variables.

A. Stationary Test

The first step in building a VECM model is to examine the level of data stationarity. In checking data stationarity, the ADF (Augmented Dickey Fuller) test is used both for models with constants and with/without trends. The ADF test results for each variable at the level or first difference are presented in Table 1.

Table 1. ADF Unit Root Test Results

Variable	Trend&Intercept	
	Level	First Difference
lnthai_rice	0,0097	0,0000
lnviet_rice	0,0002	0,0000
lnina_rice	0,9025	0,0000
lnphil_rice	0,0436	0,0000
lnina_er	0,7073	0,0000
ina_temp	0,0225	0,0000
ln_oil	0,2396	0,0000
dum_mea	0,7889	0,0000
dum_policy	0,3477	0,0000

It can be seen that all variables are stationary on order 1 (I (1)), then analysis using the VECM model can be done.

B. Cointegration Test

The concept of cointegration is a phenomenon in which linear combinations of two or more variables that are not stationary will become stationary. This linear combination is known as the cointegration equation and can be interpreted as a long-term balance relationship between variables (Enders 2015). Cointegration testing method is based on Johansen's test method.

This test is carried out in order to obtain a long-term relationship between variables that meet the requirements in the integration process, namely where all variables are stationary at the same degree, namely first degree I (1). Long - term information is obtained by first determining the cointegration rank to find out what the system of equations can explain from the whole system. Cointegration testing criteria in this study are based on trace statistics. If the trace statistics value is greater than t-McKinnon then we accept an alternative hypothesis that states the number of cointegration. The cointegration test results are shown in Table 2.

Table 2. Cointegration Test Results

Hipotesis	Trace		
	Trace-Stat	CV (5%)	Prob.**
None ($r = 0$)	179,8093	63,8761	0,0000
At most 1 ($r \leq 1$)	92,6482	42,9153	0,0000
At most 2 ($r \leq 2$)	34,7955	25,8721	0,0030

Based on the results of the cointegration test using the Johansen method, it can be seen that there are 3 (three) cointegration equations for the country of Indonesia.

C. VECM Model

The results of VECM estimation in this research show the relationship of short- and long-term variables. The results of the VECM model test were conducted to see the effect of price changes in the rice markets of ASEAN countries on Indonesian rice prices and the factors that affect Indonesian rice prices. Table 3 presents the cointegration equation for long-term balance.

Table 3. Result of VECM - Indonesia

A : Long Run Equation	
LNINA_RICE(-1)	1.0000
LNTHAI_RICE(-1)	-0.141089**
LNVIET_RICE(-1)	-0.327067**
LNPHIL_RICE(-1)	-0.525677**
@TREND(08M01)	-0.008221**
C	-0.031274
B : Short Run Equation	
ECT1	-0.227766**
D(LNINA_RICE(-1))	0.047299
D(LNTHAI_RICE(-1))	0.083380**
D(LNVIET_RICE(-1))	-0.046062
D(LNPHIL_RICE(-1))	0.005658
C	3.607675**
LNINA_ER	-0.360739**
INA_TEMP	-0.001894
LN_OIL	-0.063324**
DUM_AEC	-0.022175**

DUM_ATIGA	0.030054**
R-squared	0.512493
F-statistic	11.248400

Note : **significant at 5% level

Based on Table 3, it can be seen that in the long run, Indonesian rice prices are affected by rice prices in Thailand, Vietnam and the Philippines. This shows that there has been integration between the Indonesian rice market and the rice markets of other ASEAN countries. That is, when there is a change in rice prices in Thailand, Vietnam and the Philippines, the price of Indonesian rice will also change. A negative sign indicates that Indonesian rice prices in the long run are still influenced by domestic policies in order to maintain the stability of Indonesian rice prices.

The coefficient of ECT (Error Correction Term) found in Table 3 shows the speed of adjustment for each period towards long-term balance. Based on the results shown in Table 3 , it can be seen that the ECT value is significant and negative. This shows that there is an adjustment of the short-term equation to the long-term, where the magnitude of the adjustment is -0.23. The magnitude of the ECT coefficient value can be interpreted that the magnitude of the adjustment speed from the short term to the long term when there is a deviation will be corrected by 0.23 percent each month. This indicates the importance of the long-term cointegration relationship in the process of determining rice prices in the Indonesian market.

In the short term, Indonesian rice prices were influenced by Thailand rice prices in the previous period. In addition to being affected by the prices of other market rice in the previous period, the Indonesian rice price was also influenced by other factors, namely the exchange rate, world oil prices, ATIGA agreements and MEA integration. This shows that the Indonesian rice market is not only influenced by the rice markets of other countries and their own

rice markets, but also there are other factors that influence rice prices in Indonesia.

The exchange rate affects the formation of rice prices in Indonesia. According to the World Bank (2015), when the domestic currency appreciates against the dollar, the price of imported goods is cheaper than domestic prices, which causes more imported rice to enter Indonesia, this will reduce domestic rice prices (rice prices are measured in USD/kg). In addition to exchange rates, world oil prices also affect Indonesian rice prices. According to Huh and Park (2013) world oil prices are one of the determinants that affect Asian food prices, because oil prices have an impact on the production and transportation costs of agricultural commodities, thus affecting prices from the supply side. While world oil prices negatively affect Indonesia's rice prices. That is, when world oil prices increase, the price of Indonesian rice decreases. This indicates that the influence of rice price stabilization policy in Indonesia is still strong.

The ATIGA agreement variable (DUM_ATIGA) is also one of the significant determinants, which means that there are differences in rice prices in Indonesia after the ASEAN Trade in Goods Agreement (ATIGA) policy. A key instrument of trade integration is the elimination of trade barriers, especially tariffs. Through ATIGA, ASEAN regulates the elimination of tariffs and non-tariffs and integrates all ASEAN initiatives relating to trade in goods into a comprehensive framework that guarantees synergy and consistency (Hermawan 2013). The variable of economic integration of AEC (DUM_AEC) which is a variable that describes the level of integration in the ASEAN region is also significant for rice prices in Indonesia.

This variable agreement and integration although the impact is thin, but it significantly affect domestic rice prices. This means that the agreement on the elimination of tariffs and non-tariffs is important in the process of determining rice prices. This is in

accordance with a study conducted by the World Bank (2015) that the higher the level of trade integration as reflected in the implementation of an agreement to eliminate trade barriers can facilitate trade activities between countries, so that they can protect domestic prices when shocks occur.

D. Analysis of Impulse Response Function (IRF)

IRF analysis was conducted to see the effect of changes in an endogenous variable on other endogenous variables. In other words, this analysis looks at the impact of shock from endogenous variables on other endogenous variables of 1 standard deviation (SD) in the VAR system. In this study, the IRF analysis will be used to see how rice price transmission in selected ASEAN countries.

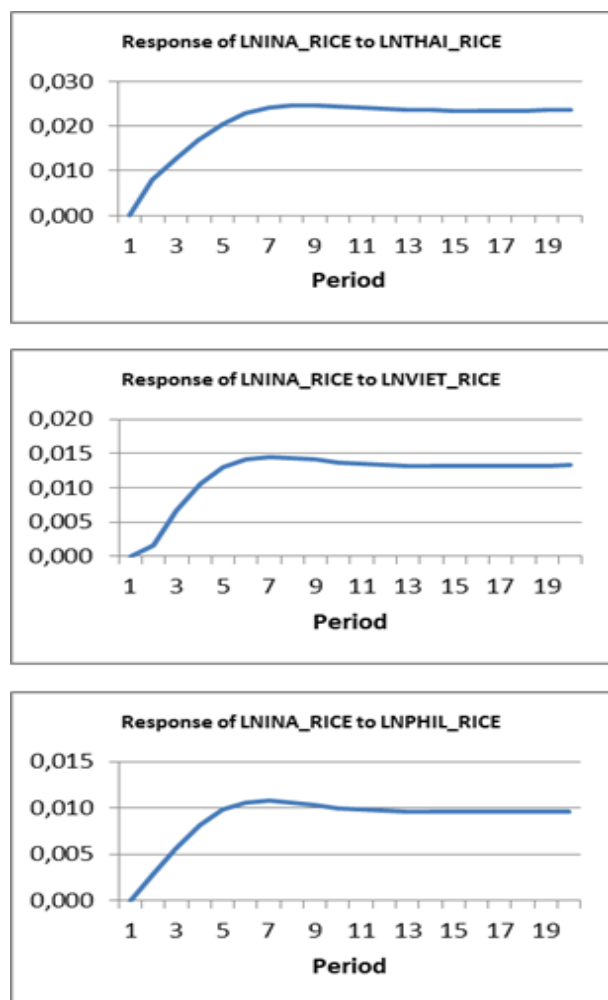


Figure 1. Impulse Response Function (IRF) of the VECM model

In Figure 1, the results of the IRF are presented for the next 20 periods (1 period = 1 month) to see how rice prices are transmitted in Indonesia. It can be seen that the price transmission pattern when there is 1 SD shock from the price of rice in Thailand, Vietnam and the Philippines is the same, namely increasing up to the 8th period then slowly decreasing until the 12th period then stabilizing until the end of the period. The biggest response was shown when there was a 1 SD shock in the Thai and Vietnamese rice markets compared to when there was a shock on the Philippine market. This indicates that the Indonesian rice market is more influenced by the Thai and Vietnamese rice markets than the Philippine rice market. This condition is in accordance with Badan Pusat Statistik (BPS) data which shows that the largest Indonesian rice import value still comes from Thailand and Vietnam (BPS 2017).

E. Analysis of Forecast Error of Variance Decomposition (FEVD)

FEVD analysis is used to predict the contribution of the percentage variation of each endogenous variable due to changes in other endogenous variables in the system, so that the source of variation of the model formed will be known.

Table 4. Forecast Error of Variance Decomposition (FEVD) Results

Period	Variance Decomposition of INA_RICE:			
	LNINA_RICE	LNTHAI_RICE	LNViet_RICE	LNPhil_RICE
1	100.00	0.00	0.00	0.00
5	61.55	24.39	8.69	5.37
10	48.99	32.97	11.56	6.48
15	47.49	34.56	11.60	6.36
20	46.83	35.20	11.64	6.32

Based on the results of the FEVD analysis it can be seen that the variation in the price of Indonesian rice in the next 20 periods is largely explained by variations in the price of Indonesian rice itself by

46.83 percent, variation in Thai rice prices 35.20 percent, and variations in the prices of Vietnamese and Philippine rice are 11.64 percent and 6.32 percent respectively.

Generally, it can be seen that variations in rice prices in Indonesia are predicted to still be influenced by variations in the price of Indonesian rice itself and variations in rice prices in other countries, especially the prices of Thai and Vietnamese rice which are the largest rice exporters in ASEAN.

V. CONCLUSION AND SUGGESTION

Based on the results of price transmission analysis, it can be concluded that rice market integration occurred between Indonesia and other ASEAN countries. The results of the IRF analysis show that the response of the Indonesian rice market to the shock of the Thai and Vietnamese rice markets is greater than the response of the Indonesian rice market when there are shocks to the Philippines rice market. This is also reinforced by the results of the FEVD analysis which shows that variations in the price of Indonesian rice are largely explained by variations in rice prices of exporting countries (Thailand and Vietnam).

Based on the results of the VECM analysis, it can be concluded that there are many factors that influence rice prices in Indonesia, considering that rice is a strategic commodity and sensitive to changes. In addition to rice prices, other factors suspected of influencing rice prices in Indonesia include the exchange rate, world oil prices, the ATIGA agreement, and the integration of AEC.

Seeing the large influence of the rice exporters (Thailand and Vietnam) on the Indonesian rice market, it is important for the government to keep domestic rice stocks safe. The policies that can be done including revamping the national rice system, from nurseries, processing to distribution and sales.

The acceleration of the non-rice food diversification program also needs to be improved so that the food production and consumption of the people is not too influenced by the fluctuations in rice prices. In addition, given that Indonesian rice imports are mostly from Thailand, it is also important to diversify rice sources, namely not only from Thailand, but also from Vietnam, Pakistan or India, so that when there is a shock in one market, the effect is not too large for domestic rice prices.

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