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DETERMINANTS OF SPATIAL MARKET INTEGRATION OF GARLIC IN INDONESIA

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ABSTRACT

Indonesia's dependence on the international market causes garlic prices to tend to fluctuate. Fluctuations in garlic prices tend to follow the amount of production and available import supply. Because Indonesia is an archipelagic country, garlic prices vary in each province. The availability and demand for garlic in each province are different, as well as fluctuations and disparities in garlic prices between regions, which are driving factors for inter-regional trade, which indicates the integration of the garlic market in Indonesia. The purpose of this study was to analyze the determinants of spatial garlic market integration in Indonesia. The types of data used are cross-section data on the amount of garlic consumption by province, gross regional domestic product by province, distance between reference and follower provinces, amount of garlic production by province, number of markets by province, length of paved roads by province in 2020 sourced from the Central Statistics Agency and Google Map. The analysis method used is multiple linear regression. The results of the study indicate that the determinants of spatial garlic market integration at the consumer level in Indonesia are the amount of consumption of follower provinces, gross regional domestic product of reference and follower provinces, and the distance between reference and follower provinces. Based on the results of the analysis, the suggestion from this study is that to improve the efficiency of garlic marketing in Indonesia, especially related to market integration, the government needs to pay attention to the determining factors of market integration.

INTRODUCTION

Garlic is an important horticultural commodity for the Indonesian people considering its variety and utilization (Kementan, 2018). In 2023, garlic production will be 39.25 thousand tons and garlic consumption will be 552.48 thousand tons. The very large gap between production and consumption encourages garlic imports. If imports are not implemented, the national garlic consumption needs will not be met. The main country of origin for garlic imports is China with an import volume reaching 570.78 thousand tons (BPS, 2024). This shows that Indonesia has a very large dependence on the international market.

Indonesia's dependence on the international market causes the national garlic price to tend to fluctuate (Ashari et al., 2019). From August 2018 to June 2021, the national garlic price was higher and fluctuated compared to the international garlic price. This is indicated by the higher value of the national garlic price variation coefficient, which is 23% compared to the international garlic price variation coefficient, which is 14% (Sandra, 2023). According to Ola et al. (2021), if the coefficient of variation is more than 9%, it is called high fluctuation.

Price fluctuations or spikes tend to follow the amount of garlic supply available. When the amount of supply increases, the price of garlic tends to decrease, and when the amount of supply decreases, the price of garlic tends to increase. Fluctuating prices create uncertainty on the producer side which causes problems in planting time and production input costs. Meanwhile, price fluctuations on the consumer side cause household spending to increase (Ahmad, 2018).

In Indonesia, not all provinces can produce garlic. This happens because some areas are not suitable for planting garlic, so production is concentrated in several areas. In 2023, the provinces with the largest garlic production are Central Java, West Nusa Tenggara, and East Java. Central Java contributes 74%, West Nusa Tenggara contributes 17.98%, and East Java contributes 2.68% to national production (BPS, 2024). With the concentration of production areas, garlic must be distributed to all regions in Indonesia.

Indonesia as a country with a vast ocean area makes the distribution process difficult. The location of the consumer market which is far from the production area and the imbalance in the amount of production and consumption make the trade costs high (Arnanto, 2015). This can also cause price differences or disparities in garlic prices. Price disparities between regions that are too high can indicate that the garlic commodity market is not yet efficient and that market integration between regions has not developed well. This is contrary to Law of the Republic of Indonesia Number 7 of 2014 concerning trade which explains that inter-island trade activities aim to integrate domestic markets. In short, the availability and need for garlic in each

province are different, and fluctuations and disparities in garlic prices between regions are quite high factors driving inter-regional trade and garlic market integration in Indonesia (Hardjanto, 2014).

Market integration shows the relationship between one market and another in trade which is seen through price relationships. Market integration describes how close the price of a commodity in one market to another market will move together (Erviana, 2019). Market integration analysis is one of the indicators to determine market efficiency. A well-integrated market is an efficient market because information can be distributed (Adrianto, 2022). According to Patil and Kerur (2016), if the market is efficient, then prices in different markets must be integrated together.

In an integrated market, government intervention in reducing price fluctuations can be distributed to other markets. The implementation of price policies can be carried out at a lower cost so that if there is a price fluctuation in an area, effective action can be taken so that the price fluctuation does not spread and becomes a national fluctuation (Arnanto, 2015). This is in line with Agung and Daryanto (2017) who stated that the implementation of price stabilization policies will be more effective in integrated markets. According to Suharno (2018), good trade flows and increased access to market information will make the market more integrated.

This study focuses on the determinants of spatial market integration of garlic in Indonesia considering that research on the determinants of spatial market integration is still rare. Hidayanto (2014) studied the determinants of rice market integration in Indonesia. The results showed that the highway factor as transportation infrastructure, per capita income, and rice purchasing activities of farmers by BULOG significantly and positively affected rice market integration. The factor that significantly affected negatively was the distribution of Raskin rice to poor households.

Rahmawati et al. (2019) studied the determinants of spatial market integration of shallots at the producer level in Indonesia. The results showed that the factor that determined spatial market integration was the total production of the destination province.

Jojo (2021) studied the determinants of broiler chicken meat market integration at the producer level in Indonesia. The results of the analysis showed that the amount of broiler chicken meat production in the destination province had a significant and negative effect on broiler chicken meat market integration. The number of markets in the destination province and the length of paved roads in the province of origin did not significantly affect broiler chicken meat market integration.

Adana et al. (2023) studied the determinants of red chili spatial market integration in Indonesia. The results of the study indicate that the factors that determine spatial market integration are the population of the province of

origin, the amount of red chili production in the destination province, and the price of fuel in the destination province.

Based on the background and formulation of the problem that has been stated, this study aims to analyze the determining factors of spatial market integration of garlic in Indonesia. This study is interesting and important to be conducted to respond to changes in garlic prices quickly and accurately and can be used as one of the considerations in efforts to increase spatial market integration of garlic in Indonesia.

RESEARCH METHODS

Method of Collecting Data

The type of data used in this study is secondary data in the form of a cross-section in 2020. The independent variables used are presented in Table 1. The variables used refer to previous studies conducted by Goletti et al. (1995), Yang (2002), Varela et al. (2012), Hidayanto (2014), Rahmawati (2018), Bacud et al. (2019), Jojo (2021), and Adana et al. (2023). Meanwhile, the dependent variable used is the trace statistic from the Johansen cointegration test which shows the level of integration between market pairs referring to research conducted by Rahmawati (2018), Jojo (2021), and Adana et al. (2023).

Table 1. Independent variables in the analysis of determinants of spatial market integration of garlic in Indonesia

Variables	Information	Source
CON	Amount of garlic consumption by province in 2020 (tons/year)	Central Bureau of Statistics
PDRB	Gross regional domestic product at current prices by province in 2020 (billion rupiah)	Central Bureau of Statistics
PROD	Total garlic production by province in 2020 (tons)	Central Bureau of Statistics
JRK	Distance between provinces calculated from the capital of the province of origin and the capital of the destination province (km)	Google Maps
PSR	Number of traditional markets selling food ingredients by province in 2020	Central Bureau of Statistics
JLN	Length of paved roads in 2020 (km)	Central Bureau of Statistics

Data Analysis Method

The analysis method used in this study is multiple linear regression analysis. Multiple regression is a model where the dependent variable depends on two or more independent variables (Firdaus, 2011). The independent variables used include the amount of garlic consumption in the follower province, the gross regional domestic income of the reference and follower provinces, the amount of garlic production in the follower provinces, the distance between the reference and follower provinces, the number of markets in the reference and follower provinces, and the length of paved roads in the follower province. The dependent variable of this regression is the trace statistic (TS) from the Johansen cointegration test between pairs of garlic markets in 33 provinces using Johansen cointegration. The regression equation model to examine the determinants of market integration is based on previous research models conducted by Goletti et al. (1995), Yang (2002), Varela et al. (2012), Hidayanto (2014), Rahmawati (2018), Bacud et al. (2019), Jojo (2021), and Adana et al. (2023), which are stated as follows:

$$TS_{ij} = \beta_0 + \beta_1 CON_j + \beta_2 PDRB_i + \beta_3 PDRB_j + \beta_4 PROD_i + \beta_5 PROD_j + \beta_6 JRK_{ij} + \beta_7 PSR_i + \beta_8 PSR_j + \beta_9 JLN_j + e_{ij} \dots\dots\dots\dots (1)$$

Where:

TS_{ij}	:	Trace statistic of Johansen cointegration between reference and follower provinces
CON_j	:	Total garlic consumption of follower provinces in 2020 (tons/year)
$PDRB_i$	:	Gross regional domestic product at current prices of reference provinces in 2020 (billion rupiah)
$PDRB_j$	:	Gross regional domestic product at current prices of follower provinces in 2020 (billion rupiah)
$PROD_i$	:	Total garlic production of reference provinces in 2020 (tons)
$PROD_j$	:	Total garlic production of follower provinces in 2020 (tons)
JRK_{ij}	:	Distance between reference and follower provinces in 2020 (kilometers)
PSR_i	:	Number of traditional markets selling food in reference provinces in 2020
PSR_j	:	Number of traditional markets selling food in the follower province in 2020
JLN_j	:	Length of paved roads in the follower province in 2020 (km)
e_{ij}	:	Residual
$\beta_1 - \beta_9$	:	Model coefficient

The expected signs of the estimated parameters are $\beta 1, \beta 2, \beta 3, \beta 4, \beta 7, \beta 8, \beta 9 > 0; \beta 5, \beta 6 < 0$

The regression estimation method is carried out using the least squares method (OLS/Ordinary Least Squared) because this method is relatively easy, popular, and has the properties of the Best Linear Unbias Estimator (BLUE) (Firdaus, 2011). To obtain the best unbiased linear regression coefficient (BLUE), it must meet the criteria for the classical assumption test, which is a requirement for the Ordinary Least Square (OLS) method. The classical assumptions include Gujarati (2006) and Rahmawati (2018):

1. Normality Test

A normality or data normality test is needed in multiple regression analysis. The error normality check aims to see the error distribution. The error normality check is carried out by checking whether the error term approaches a normal distribution. The test hypothesis is:
H0: The error term is normally distributed.
H1: The error term is not normally distributed.

The critical region for rejection of H0 is the probability (p value) $<\alpha$, while the acceptance region is the probability (p value) $>\alpha$. If H0 is rejected, it is concluded that the error term is not normally distributed, while if H0 is accepted, it is concluded that the error term is normally distributed.

2. Multicollinearity Test

Multiple collinearity is the existence of a perfect or exact linear relationship between independent variables in a regression model. The term collinearity itself means a single linear relationship, while multiple collinearity indicates the existence of more than one perfect linear relationship. In practice, it is often not distinguished between one or more relationships; the term multiple collinearity is used. If perfect collinearity occurs, the regression coefficient of the independent variable cannot be determined, and the standard error is infinite. If collinearity is less than perfect, although the regression coefficient of the independent variable is determined, the standard error is high, which means that the regression coefficient cannot be estimated with a high level of accuracy. So the smaller the correlation between the independent variables, the better the regression that will be obtained (Firdaus, 2011).

The multicollinearity test is used to determine the linear relationship between independent variables. The presence of multiple collinearities causes

the coefficient estimation to become unstable. The approach to the occurrence of multiple collinearity can be seen in the results of the Variance Inflation Factors (VIF). The model is free from multicollinearity problems if the VIF value is less than 10. A VIF value greater than 10 indicates that the variables are multiple collinear.

3. Heteroscedasticity Test

The third assumption in a regression function is that the variation of the interfering factor is always the same in one observation data to another observation data. If this characteristic is met, it means that the variation of the interfering factor in the data group is homoscedastic. If this assumption is not met, then it can be said that there is a deviation. Deviations from such interfering factors are called heteroscedasticity (Firdaus, 2011).

The detection of heteroscedasticity in this study used the Glejser test. The hypothesis tested is

H0: There is no heteroscedasticity

H1: There is heteroscedasticity.

The critical region of rejection of H0 is the probability of Obs*squared < α, while the region of acceptance of H0 is Obs*squared > α. If H0 is rejected, then the variance of the error term for each observation is different for each independent variable; conversely, if H0 is accepted, then the variance of the error term for each observation is the same for all independent variables.

In addition, the value of the determination coefficient (R2) will also be seen to determine the amount of contribution of the independent variable to the variation (rise and fall) of the dependent variable together. Multiple regression hypothesis testing is carried out using partial tests (t-test) and simultaneous tests (F-test). In this study, it was done by looking at the significance value. If the significance value is smaller than the required significance level (for example, 0.05), then H0 is rejected, and if the significance value is greater than the required significance level, then Ho is accepted (Firdaus, 2011). The t-test hypothesis is:

H0: Independent variables individually do not affect the dependent variable.

H1: Independent variables individually affect the dependent variable.

The F-test hypothesis is:

H0: Independent variables collectively do not affect the dependent variable.

H1: Independent variables collectively affect the dependent variable.

RESULTS AND DISCUSSION

Factors that determine the spatial integration of garlic markets were analyzed using multiple linear regression with the OLS (Ordinary Least Square) estimation method. To obtain a good model, it must meet the BLUE (Best Linear Unbiased Estimator) requirements by meeting the classical assumptions. The classical assumption tests carried out in this study are multicollinearity tests, normality tests, and heteroscedasticity tests.

Independent variables (influencing variables) that are suspected to be determining factors of consumer market integration of garlic between provinces in Indonesia are regressed with dependent variables (influenced variables) in the form of trace statistic values. Trace statistic values are cointegration test results between market pairs in 33 provinces in Indonesia using Johansen cointegration analysis.

Factors that are suspected to influence garlic market integration in Indonesia include the amount of garlic consumption in the follower province, the gross regional domestic product (GRDP) of the reference province and the follower province, the production level of the reference province and the follower province, the distance between the reference province and the follower province, the number of markets in the reference province and the follower province, and the length of paved roads in the follower province.

Table 2. VIF Values Of Independent Variables From Multicollinearity Test Results

Variables	VIF
CONj	3,863596
PDRBi	1,554666
PDRBj	2,466371
PRODi	1,439178
PRODj	1,809425
JRKij	1,439757
PSRi	1,713829
PSRj	6,326111
JLNj	6,141932

The multicollinearity test is conducted by looking at the Variance Inflation Factors (VIF) value of each independent variable. This test aims to see whether there is a strong correlation or relationship between independent variables (there is multicollinearity in the model). The linear regression model requires that the independent variables are independent of each other or in other words have a weak correlation between the independent variables (there is no multicollinearity). The model is said to meet the assumption of no

multicollinearity if the VIF value is less than 10. Table 2 presents the VIF values of the independent variables from the multicollinearity test. Based on Table 2, it is known that the VIF values of all independent variables are less than 10 so the assumption of no multicollinearity is met.

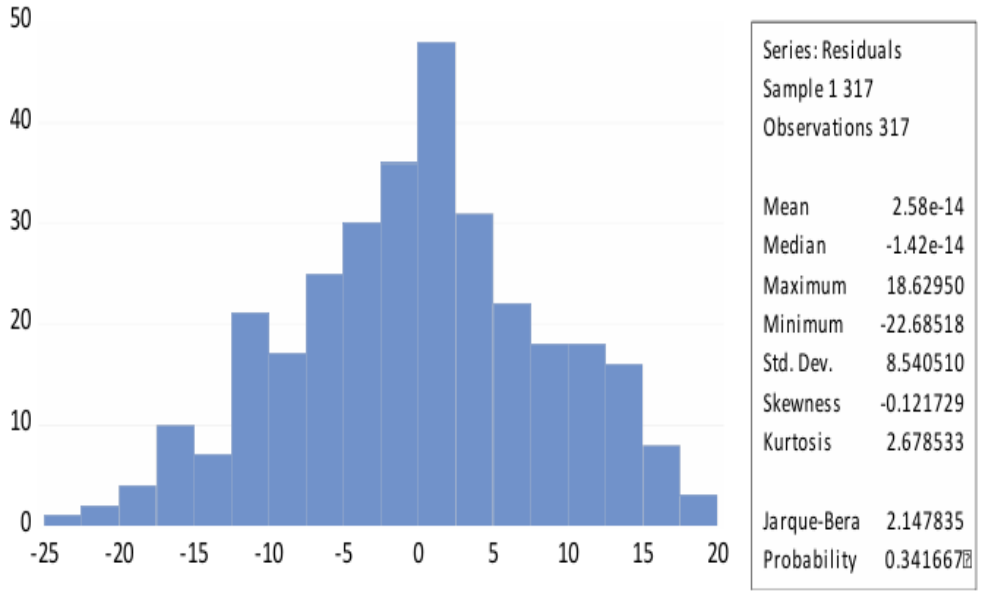

Figure 1
Normality test results

Next, a normality test is carried out. The normality test is carried out using the Jarque Bera method. The regression model is said to meet the normality assumption if the Jarque Bera probability value exceeds the 5% real level. Figure 1 presents the results of the normality test. Based on Figure 1, the Jarque Bera probability value is known to be 0.341667, which is more than the 5% real level, so it can be concluded that the residuals are normally distributed so that the classical assumption of normality is met.

Table 3. Results of heteroscedasticity test

F-statistic	1,498300	Prob. F(27,289)	0,0601
Obs*R-squared	37,53997	Prob. Chi-Square(27)	0,0668
Scaled explained SS	36,16787	Prob. Chi-Square(27)	0,0886

The last assumption test is the heteroscedasticity test. The linear regression model assumes a homogeneous residual variance (homoscedastic). If this assumption is not met, then the residual variance is considered heteroscedastic (not homogeneous). The method used in this test is the Glejser method, where the regression model is said to meet the homoscedasticity

assumption if the Chi-square probability value is greater than the 5% level of significance. Table 3 presents the results of the heteroscedasticity test. Based on Table 3, it is known that the Chi-square probability value of 0.0668 is greater than the 5% level of significance. So it is concluded that the assumption of homoscedasticity of the residual variance is met. Based on the results of the classical assumption test, this function model meets the BLUE (Best Linear Unbiased Estimator) requirements so that the right conclusions can be drawn from this model. The results of the regression model estimation of the determinants of spatial market integration of garlic in Indonesia can be seen in Table 4.

Table 4. Results of estimation of the determinants of market integration of garlic in Indonesia at the consumer level

Variables	Coefficient	Prob
CONj	-0,000114**	0,0435
PDRBi	0,0000016**	0,0126
PDRBj	0,00000273**	0,0273
PRODi	0,0000583	0,2859
PRODj	0,000171	0,0879
JRKij	0,001115**	0,0198
PSRi	-0,000555	0,6006
PSRj	-0,002053	0,4966
JLNj	0,000137	0,4264
Konstanta	62,89691	0,0000
F-statistic		7,008939
Prob (F-statistic)		0,000000
R-squared		0,385896

Keterangan: **significant at the 5 percent level

A positive sign on the coefficient indicates that the variable has a positive effect on the integration of the garlic market in Indonesia, conversely, if the sign is negative, it means that the variable has a negative effect on the integration of the garlic market in Indonesia. Of the nine independent variables used in the model, four independent variables significantly affect the integration of the garlic market in Indonesia, namely the amount of consumption of the follower province (CONj), the gross regional domestic product of the reference province (PDRBi), the gross regional domestic product of the follower province (PDRBj), and the distance between the reference and follower provinces (JRKij). These variables have a significant effect at the 5% level of significance on the integration of the garlic market.

The variable of the amount of garlic consumption of the follower province has a negative effect on the integration of the garlic market in

Indonesia. This means that if the amount of garlic consumption in the target province increases by 1%, market integration will decrease by 0.000114% assuming other variables are constant. The variable of the gross regional domestic product of the reference province has a positive effect on the integration of the garlic market in Indonesia. This means that if the gross regional domestic product of the reference province increases by 1%, market integration will increase by 0.0000016% assuming other variables are constant. The variable of gross regional domestic product of the follower province has a positive influence on the integration of the garlic market in Indonesia. This means that if the gross regional domestic product of the follower province increases by 1%, market integration will increase by 0.00000273% assuming other variables are constant. The variable of distance between the reference and follower provinces has a positive influence on the integration of the garlic market in Indonesia. This means that if the distance between the reference and follower provinces increases by 1%, market integration will increase by 0.001115% assuming other variables are constant.

Table 4 also shows the probability value of the F-statistic which is less than the 5% real level. This means that overall, the independent variables entered into the model have an effect on the spatial market integration of garlic in Indonesia at a real level of 5%. The R-squared value shows a value of 0.385896, which means that 38.5896% of the diversity of garlic market integration in Indonesia can be explained by the independent variables, and the remaining 61.2554% is explained by other variables outside the model.

1. Amount of Garlic Consumption in the Following Provinces

The provinces with the highest garlic consumption in Indonesia are East Java and Central Java, amounting to 81,738.06 tons and 75,734.18 tons. These provinces are also garlic-producing provinces in Indonesia. Meanwhile, the provinces with the lowest garlic consumption levels are Gorontalo and North Kalimantan, amounting to 1,206.85 tons and 1,225.34 tons.

The results of the model estimation in Table 4 show that the garlic consumption factor of the follower province in the model significantly and negatively affects the spatial market integration of garlic. This means that if there is an increase in consumption in the follower province, it will reduce the level of market integration. This is thought to occur because Indonesia is experiencing a fairly large garlic deficit so each province tries to meet the needs of its province first before marketing to other regions. This is what causes market integration to decrease if the consumption of the follower market increases. This is not by the hypothesis which states that the amount of consumption has a positive relationship with market integration, if the amount of consumption in the follower province increases, it will increase market integration. One way that the government can overcome this is to change the

consumption patterns of the community so that they do not always depend on fresh garlic. This can be done by encouraging the community to consume downstream products from garlic such as garlic paste, fried garlic, and garlic powder so that public consumption of fresh garlic will decrease and can increase market integration. The results of this study are not in line with the research conducted by Rahmawati (2018) which states that population as a proxy for demand does not affect market integration.

2. Gross Regional Domestic Product (GRDP) of Reference and Follower Provinces

Provinces with higher gross regional domestic income will have more developed markets, better infrastructure, and smoother trade (Rahmawati, 2018). Based on the estimation results of the market integration determinant factor model in Table 4, it can be seen that the gross regional domestic income factor of the reference and follower provinces has a significant and positive effect on garlic market integration. This is due to the hypothesis that the higher the gross regional domestic income of the reference and follower provinces, the greater the garlic market integration. An example is West Papua Province, which is one of the provinces with the lowest GRDP. Based on the cointegration test, Papua has a low trace statistic value with other reference provinces, including West Java, North Sumatra, Bali, and West Sumatra. This shows that the smaller the GRDP, the lower the market integration.

The gross regional domestic income factor of the reference and follower provinces that has a significant and positive effect on market integration is in line with research conducted by Yang (2002), Varela et al. (2012), and Hidayanto (2014). A higher GRDP indicates higher economic activity, such as trade in the area. Markets with higher GRDP are more able to intervene, such as improving road infrastructure, to help the trade process (Bacud et al., 2019). So that it can increase market integration. However, the results of this study are not in line with the research conducted by Rahmawati (2018) which states that the gross regional domestic income factor does not have a significant effect on market integration.

3. Reference Province Production and Follower Province Production

The largest garlic producing provinces in Indonesia are Central Java and West Nusa Tenggara, which produce 33,304 tons and 24,609 tons. Meanwhile, 16 provinces do not produce garlic, namely Riau, Bangka Belitung Islands, Riau Islands, DKI Jakarta, Banten, West Kalimantan, Central Kalimantan, South Kalimantan, East Kalimantan, North Kalimantan, Southeast Sulawesi, Gorontalo, Maluku, North Maluku, West Papua, and Papua.

The estimation results in Table 4 show that the production volume of the reference province and the production volume of the follower province do not

have a significant effect on the integration of the garlic market. This is thought to occur because the amount of garlic production produced in Indonesia is much less than that of garlic consumption in Indonesia, so most of the supply shortage is met by imports. In 2020, garlic production in Indonesia was 81.8 thousand tons. Meanwhile, the amount of garlic consumption is 444.23 thousand tons, so that Indonesia experiences a garlic deficit estimated at 362.42 thousand tons. This is what causes the amount of production of the reference province and the follower province to have no significant effect on the spatial integration of garlic in Indonesia because most of the garlic needs are met from imports.

The results of this study differ from the results of research by Jojo (2021) and Varela et al. (2012) which stated that the variable amount of production of the destination province has a negative effect on market integration. This means that if the amount of production in the destination province increases, market integration will decrease assuming other variables are constant.

4. Distance Between Reference Province and Follower Province

The estimation results of the market integration determinant model in Table 4 show that the distance between the reference and follower provinces has a significant and positive effect on garlic market integration. This means that increasing the distance between provinces will increase the integration of the garlic market at the consumer level in Indonesia. Based on the trace statistic value in the cointegration test, it shows that a close distance between the two provinces does not always indicate a high trace statistic value, and vice versa, a long distance does not always indicate a low trace statistic value. A high trace statistic value but with a fairly large distance is found in the pair of West Sumatra Province (SMB) - Southeast Sulawesi (STE). Meanwhile, a low trace statistic value but with a fairly close distance is found in West Nusa Tenggara Province (NTB) - South Kalimantan (KLS).

This is thought to occur due to changes in consumer behavior who prefer to use marketplaces or e-agribusiness. The existence of e-agribusiness can help consumers obtain information on the development of garlic prices between regions anytime and anywhere easily. In addition to obtaining information, consumers can also make transactions with producers spread across various provinces in Indonesia so that distance is no longer a barrier to cross-regional trade transactions. In addition, promotions such as free shipping or cashback offered by marketplaces or e-agribusiness are increasingly attracting buyers and increasing market integration. This is in line with the Google Temasek Report (2019); and Kemenkominfo (2020) which states that the growth of the ICT industry is driving the rapid growth of application-based platforms in Indonesia, such as e-commerce, ride-hailing, and digital payments, which has made Indonesia one of the countries in Asia with the highest internet economic

growth, above Malaysia and Thailand. On the e-commerce side, Indonesia has achieved very good growth in e-commerce transaction value, increasing by 50% per year over the past 3 (three) years, from USD 8 billion to USD 27 billion.

This significant and positive distance factor between reference and follower provinces is not in line with the research results of Goletti et al. (1995), Varela et al. (2012), and Bacud et al. (2019) which is significant and negative. Distance has a negative effect on market integration because the greater distance between markets requires higher transportation costs. Thus, there are fewer trade opportunities. Bacud et al. (2019) also stated that distant markets will increase traders' costs for transporting and selling products to other markets, thereby reducing trade activity. Meanwhile, the results of Rahmawati's (2018) study showed that the distance between provinces was not significant for market integration. This means that the distance factor between provinces does not affect market integration.

5. Number of Markets in Reference Provinces and Number of Markets in Follower Provinces

The number of markets is a proxy for marketing infrastructure (physical capital) (Rahmawati, 2018). The number of markets referred to is the number of traditional markets selling food ingredients in the reference and follower provinces. The provinces with the largest number of markets in Indonesia include East Java and Central Java, which have 2,005 and 1,712 markets respectively, while the provinces with the smallest number of markets are the Bangka Belitung Islands and Riau Islands, which have 63 and 66 respectively.

Table 4 shows that the number of markets in reference and follower provinces is not significant for the spatial market integration of garlic in Indonesia. This means that the number of markets in reference and follower provinces as a means of physical marketing capital does not affect the spatial market integration of garlic in Indonesia. The results of this study are in line with the results of research by Rahmawati (2018) and Jojo (2021) which state that the number of markets as a means of physical marketing capital does not affect the spatial market integration of garlic in Indonesia. This condition is thought to occur due to the increasing development of information technology such as e-commerce in the agricultural sector which makes it easier for Indonesian people to carry out agricultural commodity trading activities. Examples of e-commerce in the agricultural sector (e-agribusiness) in Indonesia include TaniHub, HappyFresh, Etanee, Sayurbox, Agromaret, PantauHarga, LimaKilo, SiKumis.com, Nurbaya Initiative, and others.

6. Length of Paved Roads in the Follower Province

Paved roads are a proxy for physical marketing infrastructure (physical capital). The results of the estimation model of market integration determinants

in Table 4 show that the length of paved roads in the follower province does not significantly affect the integration of the garlic market in Indonesia. This means that the length of paved roads in the destination province does not affect the spatial market integration of garlic in Indonesia.

The insignificant factor of the length of paved roads on spatial market integration is in line with the research of Goletti et al. (1995), Yang (2002), Varela et al. (2012), Rahmawati (2018), and Jojo (2021) which also showed insignificant results. However, these results differ from the research results of Hidayanto (2014), and Bacud et al. (2019) which stated that the road factor has a significant positive effect on market integration. This means that the better the condition of the road as one of the transportation infrastructures, the more it will increase market integration because it will reduce the transportation cost of trade or the flow of goods between these markets. Infrastructure is represented by the existence of quality roads, namely asphalt or concrete, and is positively related to market integration. High-quality roads facilitate trade between spatially separated markets, thus having a strong positive relationship with market integration. Road quality or the existence of good infrastructure is also a strong determinant of lower prices.

The insignificance of factors representing the physical infrastructure of garlic marketing shows that in general, trade between garlic regions is not only influenced by physical infrastructure such as the length of paved roads. This condition is thought to occur partly because of the increasing development of technology in the dissemination of agricultural commodity information via smartphones so that consumers can access price information anytime and anywhere. This causes the role of roads as a means of connecting between locations to not affect supporting consumer-level garlic market integration. This is in line with data from the Ministry of Communication and Information (2020) which states that as of December 2019, the Ministry of Communication and Information has built Base Transceiver Stations (BTS) in 1,253 locations. BTS is a telecommunications infrastructure that facilitates wireless communication between communication devices and operator networks. With the large number of BTS built and utilized, more and more villages are covered by telecommunications signals so that more and more people can enjoy cellular telephone connectivity and can access information more easily.

CONCLUSIONS AND POLICY IMPLICATIONS

Conclusions

The determining factors that significantly influence the spatial market integration of garlic at the consumer level in Indonesia are the amount of consumption of follower provinces, the gross regional domestic product of the

reference province, the gross regional domestic product of the follower province, and the distance between the reference and follower provinces.

Suggestion

To improve the efficiency of garlic marketing in Indonesia, especially related to market integration, the government needs to pay attention to the determinants of market integration, namely the amount of consumption of follower provinces, the gross regional domestic product of reference and follower provinces, and the distance between reference and follower provinces. One way that can be done is to reduce dependence or the amount of public consumption of fresh garlic and encourage people to consume downstream products from garlic, increase the gross regional domestic product of each province, and improve the performance of existing marketplaces or e-agribusiness. Further research suggestions can be conducted on the spatial market integration of garlic by considering the Covid variable and using daily data and research related to garlic marketing or trade so that it will provide a general picture of the condition of the garlic market in Indonesia.

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