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Trade Effect of Sanitary and Phytosanitary (SPS) and Technical Barriers to Trade (TBT) on Indonesia's Shrimp Export

Muhammad Khaliqi[1], Amzul Rifin[2], and Andriyono Kilat Adhi[2]

[1]Agribusiness Department, Faculty of Agriculture, Universitas Sumatera Utara, Indonesia
[2]Agribusiness Department, Faculty of Economic and Management, Institut Pertanian Bogor, Indonesia

Abstract. The development of the implementation of non-tariff measure policy, in the world market which has a trend, increased every year. There are seven (7) NTM policies mostly implemented in the international market. The most policy application is the implementation of Technical Barriers to Trade and Sanitary and Phytosanitary. Agricultural commodities both vegetables and live animal products are commodities mostly become subject to NTM policy in the form of SPS (Sanitary and Phytosanitary) and TBT (Technical Barriers on Trade) in the international market. Indonesia as an agricultural country that has advantages in agriculture and fisheries cannot avoid the implementation of SPS and TBT policies. This research was aimed to analyze the effect of SPS and TBT on Indonesia's shrimp export using the gravity model. The results showed that the GDP of exporters and the exchange rate have negative influences on Indonesia's shrimp exports. Meanwhile, the GDP of the importers and trade cost have positive influences on the export of shrimp Indonesia. while the SPS policy and TBT don't affect Indonesia's exports of shrimp in the international market. This indicates that Indonesian shrimp exporters are able to quickly adjust the SPS and TBT policies applied by importing countries.

Keywords: sanitary and phytosanitary, shrimp export, technical barriers to trade

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1. Introduction

One of the policies that cannot be separated from trade policy and becomes a policy that has a particular interest in the world is the Agreement of Agriculture. Over time, changes are occurring in this agreement on agriculture. One of which is to change quota regulation into tariff regulation. According to the United Nations Conference on Trade Analysis and Information System (TRAINS), the average rate of agricultural commodities in the international market has decreased from 19.9 percent in 1995 to 7.4 percent in 2008. The reduction of the implementation of this agreed tariff policy on the global market had initiated the establishment of a policy called the Non-Tariff Measures (NTM).

*Corresponding author at: Agribusiness Department, Faculty of Agriculture, Universitas Sumatera Utara, Jl. A. Sofyan No. 3 Medan, Indonesia

E-mail address: muhammadkhaliqi@usu.ac.id

NTM is a policy other than taxes that can affect trade. The implementation of Non-Tariff Measures (NTM) policy has caught the attention of countries around the world. These countries give particular attention since NTM policy is considered to be one of the main barriers to international trade, especially for developing countries. In the global market, several policies derived from the NTM policy have been agreed.

The development of the implementation of non-tariff measure policy, in the world market which has a trend, increased every year. There are 7 NTM policies mostly implemented in the international market. The most policy application is the implementation of Technical Barriers to Trade and Sanitary and Phytosanitary. Agricultural commodities both vegetables and live animal products are commodities mostly become subject to NTM policy in the form of SPS (Sanitary and Phytosanitary) and TBT (Technical Barriers on Trade) in the international market. Application of SPS policy in international trade is often imposed on products of agriculture, fisheries and animal husbandry to ensure the quality of agricultural products before consumers receive them. TBT policy is more widely applied, not only aimed at the standardization of production process but also the harvesting process until the postharvest handling of products (labeling, packing, and traceability).

Fisheries sub-sector has the third most considerable contributor to the GDP of Indonesia compared with other agricultural sub-sector. A contribution of the fisheries sector in total compared to industrial area is still relatively small, Indonesian fisheries contributed 1.77 percent in 2015. One of the fisheries products which have the potential to be developed is shrimp. Moreover, shrimp is one of the commodities that has the highest export value and continues to increase over years. Export value of Indonesian shrimp which is predicted to increase over time may be hampered due to the implementation of international trade policies which are continually changing toward liberal trade.

Indonesian shrimp products exported to essential destination countries such as USA, Japan, Belgium, Italy, China, Hong Kong, Germany, Britain, Vietnam, and France are from aquaculture and capture. Shrimp culture which is done intensively leads to the application of antibiotics by businesspeople for treatment, prevention of disease and accelerate the growth of the shrimp. Domestic shrimp farmers still use antibiotic type Chloramphenicol in performing the shrimp cultivation. Concerns arisen in importing countries caused countries importing shrimp from Indonesia started to apply non-tariff policies which can assess the quality and health of products to be imported from other countries, namely the policy of SPS and TBT.

2. Materials and Methods

2.1. Data

This research used secondary data. These data were obtained from various sources such as WTO, World Bank, International Trade Center, WITS, CEPII, Fx Sauder, international publication and other sources related to the objective of the research. Trade data examined was shrimp commodity with 6 digits of HS code that was HS 030613 (frozen shrimp) to observe shrimp commodity which is a prime export commodity of Indonesia to 10 countries (United Stated of America, Japan, Belgium, United Kingdom, Hongkong, China, France, Vietnam, Germany and Italy from 2004 until 2013.

2.2. Method

Frequency index is used to observe whether Non-Tariff Measure is present or not, and conclude which percentage of the product is imposed by one or more NTMs [1]. Mathematically, frequency index of NTM applied by importing is as follows:

$$Fijt = \left[\frac{\sum DktMkt}{\sum Mkt}\right] \times 100 \quad (1)$$

An important measure on NTM of total importing products is called coverage ratio of which it calculates the percentage of trade subject imposed by NTM.

$$Cijt = \left[\frac{\sum DktVkT}{\sum VkT}\right] \times 100 \quad (2)$$

Where Fijt: frequency index of exporting country i to importing country j in year t (%), Dkt: dummy variable shows whether there is one or more NTMs in product k in year t (1= NTM is present, 0= NTM is not present), Mkt: number of product k with total year from the imported quantity, Vkt: import volume of commodity from country i to country j, Cijt : coverage ratio of exporting country i to importing country j in year t (%).

The gravity model is an economic model that is often used to predict bilateral relations. The distance between two trading partners is geographically an important determinant of trade patterns since distance may increase costs [2]. Since the early 1940s, the gravity model has been applied to a wide variety of goods and factor of production moving across regional and national boundaries under differing circumstances [3]. In empirical studies of foreign trade flows the gravity model has been widely used [4]. In its original form, the gravity equation specifies that bilateral trade flows are determined by the economic sizes of and the bilateral distance between, the two countries [5];[6]. Variable of GDP and distance are basic variables of this model. However, these basic variables are not able to significantly explain the pattern of trade relations so that other variables need to be added in the model; therefore, augmented gravity model was used. In addition to GDP, volume and value of export are influenced by the relative price of a commodity in the international market which is related to the currency exchange rate [6]. This

analysis was used to see the relationship between the impact of SPS and TBT on Indonesian shrimp export volume and export destination countries. In this study using two models, where the first model represents the frequency of the application of SPS and TBT policies applied by the importing country, while the second model presents the coverage of SPS and TBT policies applied to Indonesian shrimp products. The model used as in equation (3) and (4):

$$\ln Exp_{ijt} = \alpha_0 + \alpha_1(lnGDPe_i)_t + \alpha_2\left(lnGDPi_j\right)_t + \alpha_3\left(lnER_{ij}\right)_t + \alpha_4\left(lnCOT_{ij}\right)_t + \alpha_5\left(lnPOP_j\right)_t + \alpha_6\left(FI\ SPS_{ij}\right)_t + \alpha_7\left(FI\ TBT_{ij}\right)_t + \varepsilon \quad (3)$$

$$\ln Exp_{ijt} = \alpha_0 + \alpha_1(lnGDPe_i)_t + \alpha_2\left(lnGDPi_j\right)_t + \alpha_3\left(lnER_{ij}\right)_t + \alpha_4\left(lnCOT_{ij}\right)_t + \alpha_5\left(lnPOP_j\right)_t + \alpha_6\left(CR\ SPS_{ij}\right)_t + \alpha_7\left(CR\ TBT_{ij}\right)_t + \varepsilon \quad (4)$$

Where $ln\ Exp_{ijt}$: Export value of Indonesian shrimp to importing country (million US$) in natural log (ln), $lnGDPi_j$: GDP per capita of importing country (million US$) in natural log (ln), $lnGDPe_i$: GDP per capita of exporting country (million US$) in natural log (ln), $lnER_{ij}$: Value of real exchange rate of exporting country on the currency of importing country (Rp/LCU) in natural log (ln), $lnCOT_{ij}$: Cost on Trade is cost spent by importing country in carrying out trade (US$) in natural log (ln), $lnPOP_j$: Population of importing country (person) in natural log (ln), $CR\ SPS_{ij}$: Coverage ratio of SPS of importing country j on Indonesian shrimp in year t (%), $CR\ TBT_{ij}$: Coverage ratio of TBT of importing country j on Indonesian shrimp in year t (%), $FI\ SPS_{ij}$: Frequency index of SPS importing country j on Indonesian shrimp in year t (%), $FI\ TBT_{ij}$: Frequency index of TBT importing country j on Indonesian shrimp in year t (%), α_0: Constant/intercept, $\alpha_1, \alpha_2, \alpha_3 \alpha_4, \alpha_5, \alpha_6, \alpha_7$: Parameter estimated, ε : *Error term*

3. Result and Discussion

3.1. Test of Goodness of Fit

The best estimation model in this study was the fixed effect model. This estimation model was derived from the result of Chow test and Hausman test. Chow test was used to select one model between the common effect model and the fixed effect model. Chow test performed on model 1 and model 2 resulted in similar probability value of 0.000<0.05. Both models rejected H_0 which means that the fixed effect model was more appropriate to be used. Furthermore, the model was tested again using Hausman test to choose one model between the fixed effect model and the random effect model. Results of Hausman test on both models estimated showed that the probability value for model 1 was 0.0027<0.05 and for model 2 was 0.0046<0.05. Both models rejected H0 which means that the more appropriate model to be applied was the fixed effect model. Based on the test result, it was decided that two models would be estimated using the fixed effect model.

Moreover, values of probability (F-statistic) as a test of goodness of fit for both models were 0.000000 and 0.000000, respectively. This result (F-statistic) explained that there was at least one independent variable that affected the dependent variable. Goodness of fit of the model can be seen from the coefficient of determination (R^2) of those two models which were 0.934 and 0.933, respectively. Coefficient of determination in model 1 indicated that 93.4 percent of independent variable in the first model was able to explain the dependent variable and 6.6 percent was able to be explained by the independent variables which were not included in the model. However, a coefficient of determination in model 2 means that 93.3 percent of the independent variable in the second model was able to explain the dependent variable, and 6.7 percent was able to be explained by the independent variables which were not included in the model.

Table 1. Estimation Result of Model 1 and 2

Independent Variable	Model 1	Model 2
	Coefficient	**Coefficient**
C	-46.05369	-70.36193
GDP Exporter (EXGDP)	-0.485174**	-0.459267**
GDP Importer (IMGDP)	1.307499*	1.174034*
Cost on Trade (COT)	1.819583**	1.619177**
Population (POP)	3.163887	4.617561
Exchange Rate (EXRATE)	-1.776797*	-1.758200*
Frequency Index SPS (FI_SPS)	4.17E-05	
Frequency Index TBT (FI_TBT)	0.002264	
Coverage Ratio SPS (CR_SPS)		0.001813
Coverage Ratio TBT (CR_TBT)		-0.000261
R-Squared	0.934813	0.933513
Adjusted R-Squared	0.922247	0.920697
F-Statistic	74.39165	72.83576
Prob (F-Statistic)	0.000000	0.000000

Note: *) $\alpha = 1\%$ (0.01); **) $\alpha = 5\%$ (0.05)

3.1.1. GNP per capita of exporter

GDP of exporter describes the economic development of the shrimp exporting country, which is in this study is Indonesia. Higher GDP of exporter indicates an improvement in the domestic economy and will increase domestic consumption of products and services. Increase in domestic consumption will decrease Indonesia's export. The estimation results obtained showed that the exporting country's GDP had a significant influence on both models by using confidence level of 5 percent. Coefficients of GDP of exporter of both models were 0.48 and -0.45, respectively.

Interpretation of those coefficients is that for every increase in GDP of the exporter that is Indonesia, as much as 1 percent, Indonesia's shrimp export value will relatively decrease by 0.48 percent and 0.45 percent, respectively. This is consistent with the macroeconomy theory stated which revealed that the national GDP is the sum of consumption, investment, government expenditure, and exports- imports. Therefore, an increase in national GDP will boost domestic

consumption [7]. The increase in GDP per capita also reflects an increase in purchasing power; thus, domestic consumption increases [8].

3.1.2. GDP per capita of importer

From the estimation result, it was found that PDB of importer had a significant effect at a confidence level of 1 percent. This indicates that GDP of the importer was a component of the variable that had a significant influence on Indonesian shrimp trade flow to the importing countries. Coefficients of GDP per capita of the importer for both models were 1.30 and 1.17, respectively. GDP per capita of importers had a positive influence on Indonesia's export trade.

GDP per capita of importing country is able to describe the country's welfare and the market absorption in the importing country. Theoretically, GDP has a positive relationship to export. Interpretation for coefficient resulted from the estimation is that every increase in GDP per capita of the importing country by 1 percent will relatively increase Indonesia's shrimp exports by 1.30 percent and 1.17 percent [9], [10].

3.1.3. COT (Cost on Trade)

Variables affecting the cost of trading through sea shipping are a distance between countries, shipping scale (volume), levy rates, the cost of insurance, waiting time at the port and others [11]. Increase in the number of products to be exported by the exporting countries will increase the trade cost. The result of this study indicated that COT significantly influenced by 5 percent. Coefficients of COT variable in model 1 and 2 were 1.81 and 1.61, respectively. These coefficients explain that increase in trade cost by 1 percent will increase Indonesia's shrimp exports in the international market by 1.81 percent and 1.61, respectively. This result was possible since trade cost depends on the quantity of imported products.

3.1.4. Exchange rate of Rupiah

Appreciation of the values of world currency would lead to increase in purchasing power of the currency in the international market, in other words, depreciation of currency of exporting countries will cause the export value of the country to be higher than before. An exchange rate of rupiah was compared with the currency of the Indonesian shrimp importing countries [12]. Currencies used as a comparison were US Dollar, Euro, Pound Sterling, Hong Kong Dollar, Yuan, and Dong. The result indicated that exchange rate had a significant effect at a confidence level of 1 percent; therefore, strengthening and weakening the value of rupiah would affect the value of export from importing countries.

Coefficients of estimation of rupiah exchange rate obtained from both models respectively were -1.77 and -1.75 which means that exchange rate had a negative influence on Indonesian shrimp exports. Interpretation of the coefficient of the exchange rate is that an increase in the Indonesian rupiah exchange rate of 1 percent will lower the Indonesian shrimp exports to 1.77

and 1.75, respectively. The reason is that when there is an increase in exchange rate or strengthening of rupiah against foreign currencies, importing country should pay more than the usual value; thus impacts on the aggregate demand for Indonesian shrimp. In addition, strengthening of Indonesia's currency could also illustrate that there is Indonesian economic improvement or weakening economies of importing countries; hence, if the importing countries experience weakened economy people will automatically reduce the consumption of both domestic and imported products [13].

3.1.5. Population of importing country

A population of importing country is able to explain the level of consumption of a country. Consumption level will illustrate how big the demand for Indonesian shrimp product in the market of importing countries. Estimation results of the model indicated that the population of the importing country does not significantly affect Indonesia's shrimp exports. This indicates that Indonesia's shrimp products can be considered as lux/prestige goods. This statement is supported by the data of Indonesian shrimp product elasticity which has value than 1. Therefore, as a product is classified as lux product in the major importing countries, increase in the number of the population does not significantly influence the demand of shrimp import.

3.1.6. Impact of SPS and TBT policy

In this study, two indicators were used to change the qualitative data of NTM into quantitative data by using inventory approach. This approach used two schemes namely frequency index and coverage ratio. The result indicated that the two policies, both SPS and TBT, do not influence the Indonesian shrimp exports in the international market [14]. This is because the SPS and TBT policies applied by Indonesian shrimp importing countries were still relatively low during 2004-2013.

In addition, by observing the list of SPS and TBT policies applied by the government of importing countries, the policy is still relatively easy to be adjusted by business actors of Indonesian shrimp which mostly are already in the form of company. SPS policies applied by importing countries are more focused on the process of assessing food safety and health of the shrimp imported. Similarly, TBT policies implemented by importing countries are more focused on standardization, certification and labeling requirements. All of those policies usually have been able to be fulfilled by exporting countries even before the trade is conducted. However, the application of SPS and TBT policy will increase the competitiveness of Indonesian shrimp product in the international market. Implementation of this policy will necessarily improve the quality of the product so that Indonesia can develop broader market than before.

4. Conclusion

Estimation result using the gravity model to estimate factors affecting Indonesia's shrimp exports in the international market such as country's GDP and an exchange rate of exporter was found to have a negative coefficient on Indonesian shrimp exports. GDP of importing countries and trade cost have a positive influence on Indonesian shrimp trade. According to the estimation result, population and application of SPS and TBT policies do not significantly affect the trade flows of Indonesia. This indicates that Indonesian shrimp exporters are able to quickly adjust the SPS and TBT policies applied by importing countries.

REFERENCES

[1] B. Bora, A. Kuwahara, and S. Laird, *Quantification of non-tariff measures*. United Nations Publications, 2002.

[2] P. R. Krugman, M. Obstfeld, *International Economics: Theory and Policy.* Sixth Edition. United States of America (US): Pearson Education International, 2003.

[3] V. Oguledo and C. R. MacPhee, "Gravity models: a reformulation and an application to discriminatory trade arrangements," *Applied Economics,* vol. 26**,** no. 2, pp. 107-120, 1994.

[4] C. Wang, Y. Wei, and L. Xiaming, "Determinants of bilateral trade flows in OECD countries: evidence from gravity panel data models, *The World Economy*, vol. 33, no. 7, pp. 894- 915, 2010.

[5] J. Tinbergen and A. Hekscher, *Shaping the world economy, suggestions for an international economic policy.* Twentieth Century Fund, 1962.

[6] P. Pöyhönen, *A tentatative model for the volume of trade between countries*, Weltwirtschaftliches, 1963*,* pp. 93-100.

[7] E. Telaumbanua, "Analisis determinan ekspor Povinsi Sumatera Utara: Pendekatan gravity model," *Quantitative Economics Journal,* vol. 2, no. 235-52, 2012.

[8] G. Mankiw, *Teori Ekonomi Makro (Edisi Ke-5)*. Jakarta: Erlangga, 2003.

[9] O. I. Kareem, "Food safety regulations and fish trade: Evidence from European Union-Africa trade relations," *Journal of Commodity Markets,* vol. 2, no. 1, pp.18-25, 2016.

[10] H. Bassiony, "Impact of non-tariff barriers on Egyptian agricultural trade," *Menia International Conference for Agriculture and Irrigation in the Nile Basin Countries*, 2012

[11] L. Dou, K. Yanagishima, X. Li, P. Li, and M. Nakagawa, "Food safety regulation and its implication on Chinese vegetable exports," *Food Policy*, vol. 57, pp. 128-134, 2015.

[12] X. Clark, D. Dollar, and A. Micco, "Port efficiency, maritime transport costs, and bilateral trade," *Journal of development economics,* vol. 75, no. 2, pp. 417-450, 2004.

[13] K. N. Rahmah, *Trade Flows Analysis and The Role of Standards on Canned Tuna Trade.* Thesis, Institut Pertanian Bogor, Bogor, 2016.

[14] E. Ferro, T. Otsuki, J. S. Wilson, The effect of product standards on agricultural exports, *Food Policy.* vol. 50, pp. 68-79, 2015.