THE INFLUENCE OF INTERACTION ON EXPORT IN NORTH SUMATERA

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Abstract

One of the requirements for strengthening national connectivity creates regional connectivity in Indonesia which is realized in the integration of national logistics systems, transportation nodes, enhancing connectivity and improving communication networks. The effect of the interaction of a variable that acts together and influences a relationship between variables. The interaction between ports in two countries has a significant impact on the export field which can be observed with a gravity model that shows the interaction between two particles that are influenced by mass and the distance between particles in analyzing social and economic interactions. The strength of communication between two different regions can be measured by considering the number of population factors and the distance between the two areas to measure the concentration of interaction between parts in the North Sumatra export sector. The use of communication is used to obtain export relations between North Sumatra and Malaysia / Singapore
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Keywords: *Gravity Model, Export, Interaction*

A. Introduction

Exports are part of a very important transactional economic system in a country which has the effect of generating foreign exchange from a cycle of export interactions to improve the economy to finance the development needs of a country. In the process of export sector economic transactions, regional interaction factors in export activities greatly affect the flow of foreign currency that will enter the country of Indonesia (Puspita, Hidayat, & Yulianto, 2015)

International trade is very era related to globalization, namely the reduction of boundaries between countries because of the ease of interaction between countries in various fields, including international trade with the aim of improving the economic development of a country with export activities (Puspita et al., 2015)

The Province of North Sumatra has several international trade gates, namely the Belawan port which interacts directly with the two countries of Malaysia and Singapore which have an impact on Indonesia's economic growth in export activities. To analyze the interaction between the belawan port and the klang port and Singapore port, it affects exports in North Sumatra Province (Muda et al., 2018)

The Gravity Model is used to show that the interaction relationship between two particles is influenced by the mass and distance between particles. Jan Timbergen (1962) and Pentti Poyhonen (1963) used the gravity model in international trade even without a strong theoretical basis. Reinert (2008) suggests that the use of the gravity model in international trade has several alternative developments from the basic form of Newton's gravitational theory that has been transformed into the following natural logarithms: (Sahat, Nuryartono, & Hutagaol, 2018)

$$\ln GFij = \ln Mi + \ln Mj - \ln Dij$$

One alternative form of development of the gravity model is to use GDP per capita of both countries as a mass representation of both particles (Mi and Mj), while gravitational power (Gfij) between the two particles is represented by the trade or export value from country i to country j, and the distance between the two particles (Dij) is represented by using the

great circle distance calculation, which is the closest distance from two points on the surface of the earth (Pradipta & Firdaus, 2014)

Expressing that there are activities that must be in a location without any other choice, for example if the activities are related to natural potential, such as tourism, mining, skiing, forest management, plantations and sea ports. One analysis tool that allows us to explain the existence of activities at these locations is the Gravity model (Tarigan, 2005)

The gravity model is the most widely used model to see the magnitude of the attraction of a potential that is in a location. This model is often used to see the relationship between the potential of a location and the size of the area of influence of that potential. In regional planning, this model is often used as a tool to see whether the location of various public interest facilities is in the right place (Sahat et al., 2018)

The gravity model began to be a concern as a tool for analyzing social and economic interaction after the results of Carey and Revenstain's research in the 19th century (Tarigan, 2005) Carey and Revenstein conducted research examining the origin of migrant residences that came to various major cities in America. The results of his research show that the number of migrants entering a city is influenced by the size of the population of the city visited, the size of the population of the origin of migrants, and the distance between the city of origin and the destination city. This connection follows Newton's Law of Gravity (Sir Isaac Newton) which reads, "Two adjacent masses will attract each other and the attraction of each mass is proportional to its weight." In the 20th century John Q. Stewart and his group at the School of Social Physics began to systematically apply gravity models to analyze social and economic interactions between locations.

This gravity model was initially used to calculate the number of vehicles (trip) between one place and another place in one system (interconnected where changes in one area will affect the other). The basic formula for calculating the number of trips (trips) between Pi and Pj, namely trips

originating from region i and choosing the destination of region j is T_{ij} =

$$G\frac{P_i P_j}{d_{ij}^{\ b}}$$

The basic functional approach of the gravity model was also put forward by Jan Tinbergen in 1962. This model is still relatively rough for use in the flow of international trade. However, the form of function that was put forward was widely applied so that it was called the function of "social interaction" because it included migration, tourism and direct investment. The general law of gravity of the social interactions expressed in a notation is stated as follows:

$$F_{ij} = G\frac{M_i \tilde{} M_j}{D_{ij}^{-}}$$

Gravitational equations in the form of multiplication means that natural log can be taken and a linear relationship between the log of trade flows and economic measures and distance is logically obtained. Thus the form is obtained:

$$ln\ F_{ij} = ln\ G + a\ ln\ M_i + \beta\ ln\ M_j - \theta\ ln\ D_{ij}.$$

Spatial interaction is a reciprocal relationship that influences each other between two or more regions that can cause new symptoms, appearances, or problems. The strength of interaction is strongly influenced by three main factors, namely the existence of complementary areas (regional complementary), the opportunity to intervene (intervening opportunity), as well as the ease of transfer or transfer in space (spatial transfer ability).

Newton's gravity model was then applied by W.J. Reilly (1929), a geographer to measure the strength of spatial interactions between two or more regions. Based on the results of his research, Reilly argues that the interaction power between two different regions can be measured by considering the factor of population and the distance between the two regions. To measure the strength of interaction between regions, the following formulations are used.

$$I_{A.B} = k.\frac{P_A P_B}{(d_{A.B})^2}$$

B. Method

Based on the theory review and review of the results of previous studies related to the purpose and focus of the research, the research concept that was built as follows:

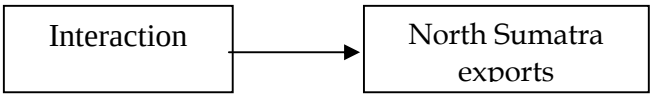

Figure 1 Research Conceptual Framework

This type of research is quantitative research. This research uses Data Panel, which is a combination of cross section data 2 (two) export destination countries of North Sumatra, namely Malaysia and Singapore. While time series data during the period 1983-2016. Based on this assumption many studies have been carried out using the gravity model. This basic model of gravity is stated as follows:

$$X_{ij} = a\frac{Y_i^{\ 1} Y_j^{\ 2} P_i^{\ 3} P_j^{\ 4}}{I_{ij}^{\ 5}}$$

C. Research Finding

Table 1 Economic and Population Development of North Sumatra Province 2000-2014

Year	Constant GRDP (Billion IDR)	Population (person)
2000	69.154,11	11.513.968
2001	71.908,36	11.718.395
2002	75.189,14	11.847.026
2003	78.805,61	11.890.399
2004	83.328,95	12.123.360
2005	87.897,79	12.450.911
2006	93.347,40	12.643.494
2007	99.792,27	12.834.371

2008	106.172,36	12.723.964
2009	111.559,22	12.858.574
2010	331.085,24	13.028.663
2011	353.147,59	13.220.936
2012	375.924,14	13.408.202
2013	398.779,25	13.590.250
2014	419.649,28	13.766.851

And vice versa, if the lower the population and GDP of the two countries, it will cause lower demand for goods and services purchased (exported) from the Province of North Sumatra to the destination country of export. For more details, the condition of the population and GDP of the countries of Malaysia and Singapore can be seen in the following table

Table 2 Population Data and Malaysia and Singapore GDP 1983-2016

Year	PDB of Malaysia (US $ Million)	Population of Malaysia (000)	PDB of Singapura (US $ Million)	Singapura Population (000)
1983	30.347	15.048	17.780	2.681
1984	33.944	15.450	19.740	2.732
1985	31.200	15.882	19.140	2.736
1986	27.735	16.329	18.570	2.733
1987	32.182	16.773	20.900	2.755
1988	35.272	17.219	25.340	2.846
1989	38.849	17.662	30.420	2.931
1990	44.024	18.103	36.152	3.047
1991	49.133	18.597	45.474	3.135
1992	59.151	19.087	52.156	3.230
1993	66.894	19.578	60.645	3.313
1994	74.480	20.079	73.778	3.419
1995	88.832	20.593	87.890	3.524
1996	100.851	21.125	96.404	3.670
1997	100.168	21.668	100.164	3.796
1998	72.175	22.214	85.708	3.927
1999	79.148	22.752	86.283	3.958

Year	PDB of Malaysia (US $ Million)	Population of Malaysia (000)	PDB of Singapura (US $ Million)	Singapura Population (000)
2000	93.789	23.420	95.833	4.027
2001	92.783	23.920	89.286	4.138
2002	100.845	24.401	91.941	4.175
2003	110.202	24.869	97.001	4.114
2004	124.749	25.332	114.188	4.166
2005	143.534	25.796	127.417	4.265
2006	162.690	26.263	147.797	4.401
2007	193.547	26.730	179.981	4.588
2008	230.813	27.197	192.225	4.839
2009	202.257	27.661	192.408	4.987
2010	255.016	28.119	236.421	5.076
2011	297.951	28.572	275.221	5.183
2012	314.442	29.021	289.268	5.312
2013	323.276	29.465	300.288	5.399
2014	338.068	29.901	306.344	5.469
2015	296.283	30.331	292.739	5.535
2016	375.630	30.800	297.960	5.607

From the table above it can be explained that the number of population and the amount of GDP for export destination countries during 1983-2016 shows an increase each year, especially the population. But it is very different for the data on the amount of GDP in the country, that it does not increase every year but it actually decreases in certain years.

The population growth of the Malaysian state on an annual basis is 2.2% and its GDP growth is 8.64%. While Singapore's population growth is 2.27% and its GDP growth is 9.37%. From these data it can be explained that the two countries whose population growth and GDP are still consistent, but population growth is greater than GDP growth. This reflects that not in both countries, all population numbers have played an

optimal role in increasing economic growth, but there is still a difference in growth rates. Thus in both countries there are still untapped economic sources, namely the existence of unemployment resources, including the population (labor).

D. Discussion

The independent variable observed in this study is interaction. Variables that are very important in the gravity function of North Sumatra's exports to Malaysia and Singapore are interactions. Based on the table of estimation results above, it can be seen that the t-statistic value is -3.133827 or Prob. amounting to 0.0026. This value indicates that the interaction variable has a negative effect and is statistically significant. The coefficient of -3.133827 means that if the interaction experiences an increase of one percent, the export of North Sumatra to Malaysia has decreased by 3.133827 percent assuming other variables are considered constant.

Statistical tests on the significance of all variables together are carried out using the F test. Based on data processing that has been collected in the time span of the specified study, the results obtained that the F-statistic is 11.77755 and Prob. (F-statistic) of 0.000003. Based on these results it can be stated that all independent variables significantly influence the export of North Sumatra to Malaysia and Singapore together. The influence of all these independent variables can be seen from the value of 0.355700 which means that variations in changes in exports are influenced jointly by the independent variable of 35.57 percent. Thus, there are still other variables not included in this analysis in determining North Sumatra exports to Malaysia and Singapore by 64.43 percent.

H_o: b = 0, There is no influence between the interaction of North Sumatra to Malaysia and Singapore to North Sumatra's exports to Malaysia and Singapore.

Ha: b ≠ 0, There is an influence between the interaction of North Sumatra to Malaysia and Singapore to North Sumatra's

exports to Malaysia and Singapore.

Based on the table above, the results of partial hypothesis testing showed that the stronger interaction between North Sumatra and Malaysia and Singapore would result in a decline in North Sumatra's exports to Malaysia and Singapore. The output results show that the prob value. amounting to 0.0026 or smaller than 0.05, so Ho is rejected.

When referring to the results of the study concluded that increased interaction will have an impact on the decline in exports to Malaysia and Singapore. If you look at Indonesia's export performance from 2014 to 2016 it continues to decline.

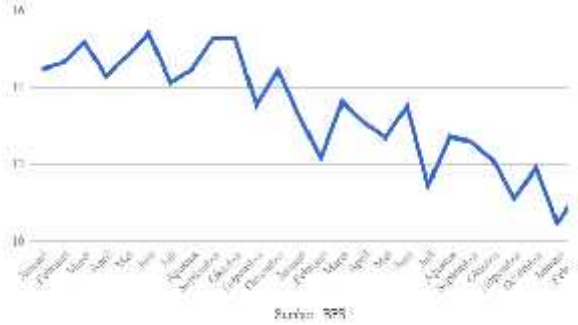

Figure 2 2014-2016 Indonesia's Export Value

Marta (2016) stated that the weakening of the global economy was accused of being the main cause of the decline of Indonesian exports. Referring to the weakening global economic conditions, of course, this is the reason why the results of this study indicate that the interaction has resulted in a decline in exports to Malaysia and Singapore. Global economic problems certainly cannot be a full reference to see why in this study an increase in interactions between North Sumatra and Malaysia and Singapore led to a decline in exports to these two countries

E. Conclusion

Based on the results of the analysis, there are a number of things that can be concluded from the results of this study, the interaction between the Belawan Port and the Port of Klang and Port of Singapore has a negative and significant effect on exports in North Sumatra Province.

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