The Importance of Quality in Explaining Trade Flows: A Gravity Analysis of Pangasius Export from Vietnam

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Abstract: Gravity models identify drivers of trade flows and thereby provide knowledge on the types of quality of market products to export to. The existing literature, however, does not consider quality of a market product differentiation that might be driven by different factors and that targets a specific type of market product. The purpose of this study is to identify the importance of a product quality and its influential drivers for international trade. The gravity model was separately applied in two different quality products using the price of transactions for pangasius between two countries relative to the average yearly export price as an indicator of a quality product. Export data from Vietnam to 46 countries during the period of 2007-2013 were used to identify the drivers and the results indicate that gross domestic product and population of importing countries are the most influential drivers for pangasius export. Results also indicate that the importing countries have a preference for high-quality product. In that case, distance and tariff rate are also influential drivers for high-quality product. This study may guide the potential exporting countries to identify which market to penetrate for higher profit.

Keywords: Drivers of export, gravity model, panel data, quality products, Vietnam.

Introduction

Fish constitutes an integral part of human diet and generates incomes for millions of people across the world especially in developing countries. This can be partly attributed to the growth in aquaculture production by 6.2% annually between 1996 and 2016 (FAO, 2019a; see also appendix 1(a)). Due to mismatch between fish demand and supply at national level, international trade of aquaculture products has also increased during the last decades (Asche and Khatun, 2006). Globally, trade in fish and fish products represent more than 11% of total agricultural export in 2018. World trade in fish and fish products also grew from 8 billion to 164 billion US$[1] from 1976 to 2018, with an annual growth rate of 8% in nominal and 4% in real terms (FAO, 2020).

Vietnam export more than 7 billion US$ in 2016 and most of its export value come from farmed pangasius (FAO, 2018). The export value of fishery products accounted for 23% of the total export value of agricultural products in 2017 (Do and Park, 2020). The country export 1.5 billion US$ with 0.5 million MT pangasius in the same year for which the country ranked as the world's largest producer and exporter in the world (FAO, 2019b; see also appendix 1(b)). This explosive

[1] The monetary value is measured in US dollar in the whole paper.

growth raises various sustainability issues like safety and quality of fish for which the profits margins became low or negative as the cost of inputs increased and market prices decreased. The most important challenge is product risks which need to be overcoming for ensuring the product quality and safety (Khoi *et al*., 2008). Blaha (2008) also stated that there is no way of international trade without food safety in the developed country markets such as EU and US markets. Many pangasius shipments from Vietnam were sent back or destroyed as a result of the strict import quality controls in the EU and the USA (VASEP, 2005). Do and Park (2020) stated that the current policies of fishery sub-sector of Vietnam only focuses on production and the processing sides with a number of supporting programs. However, the policy lacks the proper attention to the market requirements. Therefore, the quality of product is necessary to export in the world market, this study analyzes the effects of quality market products on global fish trade using gravity model. The reason is that gravity model is used to predict the bilateral trade flows and the predictions come from different drivers associated with country specifications.

The quality of a market product is important because it helps explain the trade flows of a country. A country having quality product can create long-term profitable relationship with the importing countries since it meets the country's requirements and ultimately make them loyal by repeated purchase. As a result, the exporting country can charge higher price for the high quality product. The measurement of quality is a difficult task because it is often an unobserved characteristic of a product. Quality can be defined as the characteristics or attributes of a product that satisfy customer needs (Kotler and Armstrong, 2018). On the other hand, a number of studies showed that high prices are the indicators of better quality (Gabor and Granger, 1966; Leavitt, 1954; McConnell, 1968; Tull *et al*., 1964). Furthermore, it is positively correlated with quality and also a symbol of prestige of a product (Leavitt, 1954). Dey *et al.* (2005) identified that the developed countries i.e. EU countries, USA and Japan import products from the country which have quality and safety compliances. They also stated that it ultimately increases the price of the product may be treated as high quality product. Since, it is very difficult to collect the information related to product attributes such as ingredients, style, design, packaging, brand name etc. from each of the producer countries, that is why, we measure quality in terms of price and also readily available over the periods because consumers ultimately purchase the product according to its price.

The purpose of this study is therefore, twofold; (1) to identify the importance of quality of a market product e.g. high or low quality of a market product, and (2) to identify which drivers positively and negatively explain the Vietnamese pangasius export. Since an exporting country can charge higher price for its higher quality products and ultimately increase its revenue and profits, that's why, the quality of a market products are categorized into high and low quality of a market products in this study.

The high quality of a market product is defined as the destination that offers higher than average export price per kg, while the low quality of a market product is defined as the destination offering lower than the average export price per kg. Though price can be reflected by the

unavailability of the substitutes of the products, consumer's income, preferences and tastes of different countries, we argued that it is very difficult to consider all these criteria because of difficulties in collecting the data for cross country differences. Akerlof (1970) argued that the quality of a product would fall as the price go down. Rich countries generally consume products of higher quality than other countries (Hallak, 2006; Hummels and Klenow, 2005; Linder, 1961; Montanari, 2005; Rahman, 2003) whereas Shepherd (2013) stated that countries with higher GDP tend to purchase more. This study confirms that countries with higher GDP import more pangasius from Vietnam. The study identifies that there is an impact of quality products to trade. The study also identifies that rich countries purchase high quality products, but, the export earnings from these countries is not easy because of considering a number of drivers that influence the export of a country. Therefore, the gravity model is used to identify the drivers that affect a country's export for both high and low quality of a market product, and, thereby providing knowledge about the best destinations of the products.

In the next section, literature review is elaborated followed by methodology in section 3, data and descriptive statistics in section 4. The results are discussed in section 5 and finally conclusions are given in section 6.

Literature Review

The gravity model has been extensively used in analyzing international trade patterns and performances in recent years. Tinbergen (1962) first applied this model to analyze international trade flows in 1962 and many others since then followed this model to measure bilateral trade flows. Feenstra (2015) provides a general introduction to the theoretical foundation as well as the empirical implementation of the gravity model. In most cases, GDP of both exporter and importer countries and distance are the influential drivers for determining trade flows of a country (Blomqvist, 2004; Krugman and Maurice, 2005; Tinbergen, 1962).

According to Tang (2003), all gravity models share some common features. First, when a gravity model is used to explain bilateral trade, the dependent variable of the gravity equation is always trade flows. Second, the independent variables are the economic mass of exporting and importing countries is measured by gross domestic product (GDP) or GDP per capita, gross national product (GNP) or GNP per capita. Third, distance, a proxy for transportation cost, is used as an independent variable, and is measured between the countries' economic centers (usually capitals between the countries). Finally, dummy variables are always included to investigate the qualitative variables such as common borders, languages, colonial history and trade agreements etc.

However, different studies tend to implement the gravity model in different ways to explain international trade including Anaman and Al-Kharusa (2003), Montanari (2005), Rahman (2003) and Tang (2003). Anaman and Al-Kharusa (2003) found that bilateral trade flows were driven by population and historical relationship between the trading partners. On the other hand, Sohn (2005) stated that South Korea has a great trade potentiality due to the advantages of FTA. GDP per capita was also found as an important driver for measuring the trade value of a country by Rahman (2003), Montanari (2005), Kristjánsdóttir (2012), Nankwenya *et al.* (2018), and

Sitompul *et al.* (2018). Tang (2003) applied the model to explain the effect of EU integration on trade with APEC countries and found regional dummies and trend are important for EU integration. Fatema and Islam (2020) stated that marine fisheries export is negatively influenced by HACCP principle whereas RTA is positively influenced for both marine and seafood exports of Bangladesh. Chen *et al.* (2008) found tariff rate, GDP and distance are important for measuring China's agricultural export whereas Thapa (2012 stated that the size of two countries are positively and distance is negatively influential to trade between pairs of countries. Disdier and Marette (2010) used distance, language, colony and border of the countries for their gravity model and found as significant for evaluating nontariff measures. Anderson and Van Wincoop (2003) found border reduces trade between the countries. Hallak (2006) added a preferential trade agreement and Grant and Anders (2011) added land-lockedness, Free Trade Agreement, and GDP to Disdier and Marette's (2010) model.

A few studies are available on gravity model for seafood products (Asche *et al*., 2019; Natale *et al*., 2015) and on trade and quality (Auer *et al.*, 2018; Feenstra and Romalis, 2014; Manova and Zhang, 2012). Natale *et al.* (2015) stated that products from aquaculture are less preferred than the trade for re-processing of aquaculture products. They also argued that seafood trade is attracted by both seafood preferences and low labor cost of the countries whereas Asche *et al.* (2019) inferred that competition is typically weaker for small and distant markets. Manova and Zhang (2012) argued that quality upgrade and higher price impose can be possible for richer, larger and more distant markets. Feenstra and Romalis (2014) argued that average quality and price may be lower for larger markets if they attract more heterogeneous firms. Hallak (2006), Hummels and Klenow (2005) and Linder (1961) stated that quality plays an important role as a determinant of the global patterns of bilateral trade (direction of trade).

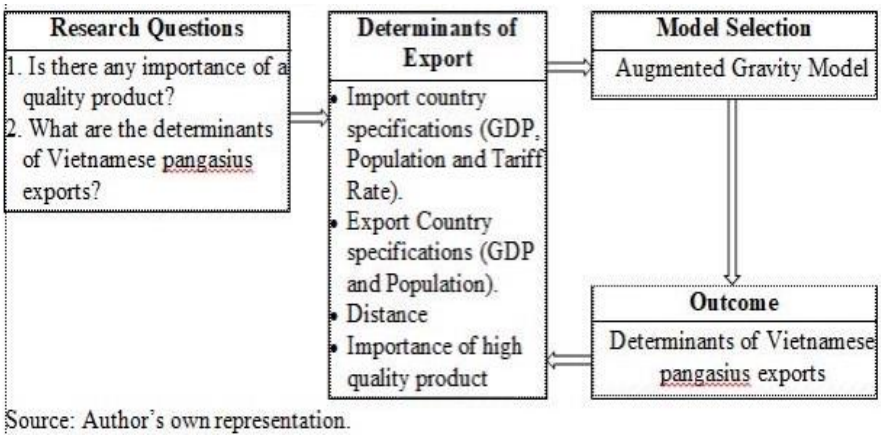

Figure 1. Conceptual Framework of the Study

Source: Author's own representation.

Auer *et al.* (2018) stated that customers with differ in their income and willingness to pay varied with heterogeneous quality for the quality increments. They also argued that rich countries tend to import relatively more from the countries that produce high-quality goods than from the countries that do not. However, they didn't illustrate the contribution of the different quality market products and its influential drivers in together. This paper illustrates the contribution of a quality market product and its drivers, which are important for exporting different qualities of market products of a country.

From the above circumstances, we used GDP, population, distance and tariff rate (independent variables) for our gravity model to explain Vietnamese pangasius export (dependent variable) and the importance of its drivers. The study is important because most of the drivers were found as influential for Vietnamese pangasius export like GDP and population of importing countries, distance and tariff rate etc. Through this model, we were able to identify different drivers that influence trade flows of pangasius with different qualities and, consequently, the study profiles some guidance on quality differentiation in relation to different destination markets. The following conceptual framework outline an overview of the study.

Materials and Methods

The gravity concept originates from Newton's law of gravitation in 1687, which states that two objects are subjected to a force attraction that depends positively on the product of their masses and negatively on their distance (Abidin and Sahlan, 2013; Esmaeili and Pourebrahim, 2011). The general form of Newton's gravity model is as follows:

$$F = g\frac{M_1 M_2}{D^2} = gM_1 M_2 D^{-2} \qquad (1)$$

Where F indicates gravitational force, M_1 and M_2 are the objects' mass, D refers to the distance between the two objects and g is a gravitational constant depending on the unit of measurement for mass and force.

A few centuries later, this model was applied to social phenomena like surveying human attitude, measuring migration or movement of international travelers and tourists etc. In 1840, Carey (1860) applied this model for the first time in measuring human attitude. In the early of 1960s, The Dutch Nobel prize winner Jan Tinbergen (1962), at first, changed the understanding of newly established economics of international trade by applying Newton's gravity model to bilateral trade flows. Tinbergen discovered that the same functional form can be applied to international trade flows. Based on the Newton theory, the gravity model of trade predicts that international trade (gravitational force) between two countries (objects) is directly proportional to the product of their sizes (masses) and inversely proportional to the trade frictions (the square of distance) between them.

Later, Pöyhönen (1963) used the model to measure the size of economies by their national income. In 1966, Linnemann added populations to his model. Wall (2002) proposed that the volume of trade could be estimated to increase according to the sizes of the trading economies and decrease according to the distance between them. As a general specification, the equation

captures trade flows between two trading partners as a function of gravity factors. The general specification can be presented as the following (Anderson, 1979):

$$T_{ij} = f(Y_j, POP_j, D_{ij}) \qquad (2)$$

In equation 2, the dependent variable *Tij* represents trade flows from country *i* to country *j*, *Yj* is the GDP of country *j* and *POPj* denotes the population of country *j*. The variable *Dij* represents the geographic distance between the economic centers of country *i* and country *j* is used as a measure for the transportation costs.

From equation (2), we also interested in identifying what else influences the export of a country. To identify the drivers of export earnings of a country, we also included several country specific variables in the model, as stated in equation (3). In practice, equation (3) regresses the natural logarithm of the monetary value of trade between two (or more) countries to the log of their respective GDP, population, distance; and tariff rate in level form because the variable is already in percentage form. The specifications allow an easy interpretation of the estimated parameters. The parameters of an equation estimated in logarithm are elasticities. In our case of estimating the determinants of Vietnamese pangasius export, we replace the dependent variable in equation (2) with X_{jt}, (which denotes Vietnamese pangasius export to country *j* in year *t*) to obtain the augmented gravity model as follows:

$$LnX_{jt} = \beta_0 + \beta_1 LnY_t + \beta_2 Lny_{jt} + \beta_3 LnP_t + \beta_4 Lnp_{jt} + \beta_5 LnD_j + \beta_6 T_{jt} + \beta_7 D + U_{jt} \qquad (3)$$

Where β_0 is the constant. LnX_{jt} is the dependent variable, logarithm of export earnings of Vietnam from importing country *j* in the year *t*. β_i are the parameters to be estimated for the independent variables namely; LnY_t and Lny_{jt} are the logarithm of Vietnamese and importing countries (*j*) GDP in the year *t*, LnP_t and Lnp_{jt} are the logarithm of Vietnamese and importing countries (*j*) population in the year *t*, D_j is the distance between the capitals of the two countries (importing and exporting), T_{jt} is the tariff rate for the distance between the countries. *D*, the dummy variable is used to see the effect of quality product where the value of *D*=1 indicates high quality product means that the export price is above the average and 0, otherwise. U_{jt} are the unobserved characteristics of Vietnamese pangasius export to importing country *j* in the year *t*. The ordinary least square method was applied to find out the impact of each of the determinants of Vietnamese pangasius exports to the countries following log-log regression model. In addition, serial correlation and heteroscedasticity were checked and found no errors with the help of Breusch-Godfrey and Breusch-Pagan tests. The log-log regression model explains how dependent variables are fluctuated with the changes of independent variables in percentage.

Data and Descriptive Statistics

The monthly export value of Vietnamese pangasius for the period 2007-2013 retrieved from the Trade Map website (2016). The pangasius product, in the form of frozen fillets, is classified into

two separate six-digit Harmonized Systems codes: HS030429 (frozen fish fillets) for the period 2007 to 2012 and HS030462 (frozen fillets, pangasius species) for 2013.

Data for GDP in US$ and population of the countries for the same period were collected from the World Bank website (2016ab). Distance between the capitals from Vietnam and the importing countries were collected from CEPII website (2016). Tariff rate, in percentage were collected from the World Trade Organization website (2016). The applied tariff rate for European countries and the Most Favored Nation (MFN) rate for other counties were cross-checked with the rate retrieved from the website of Market Access Map (2016).

Export values, in US$ of Vietnamese pangasius to 46 different importing countries for the period of 2007-2013 were used in this study. Vietnam is the major producer of pangasius, representing more than 75 % of the global production, both for local consumption and export. According to the most recent available data at the time of writing, Vietnam remained the world's top exporter of pangasius (Trade Map, 2018).

Table 1. Market Share of Vietnamese Pangasius as Export earnings for the year 2007-2016

Year / Export	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Vietnam *(Million US$)*	930	1,403	1,208	1,403	1,950	1,619	1,584	1,610	1,422	1,530
% Share	99	99	97	90	92	94	94	93	94	94
Total *(Million US$)*	934	1,405	1,245	1,552	2,119	1,730	1,693	1,730	1,513	1,627

(Source: Author's calculation based on data retrieved from FAO (2019b).

Table 1 shows export earnings of Vietnamese pangasius over the period of 2007-2013 and its yearly market share. The table also shows that Vietnam contributes almost 94% of the world's total pangasius export with 1.58 billion US$ till 2013. Vietnam exported to 153 countries in the world till 2016.

Figure 2 represents the monthly export earnings and quantities of Vietnamese pangasius for the year between 2007 and 2013.

Figure 2. Monthly export earnings and quantities of Vietnamese pangasius for the year between 2007 and 2013.

Source: Author's representation based on data retrieved form Trade Map (2016).

The Figure shows that both the volume (quantities) and earnings (exported value) increased over the period. The highest quantity exported was in December 2011, followed by a decrease in the next three months and with an upward trend again until 2014. This decrease resulted in the production of Vietnamese pangasius which can be explained by the lack of demand from importing countries due to low quality in terms of environmental and safety issues (Dao, 2018). In this study, the quality of a market product is proxied by the average yearly export price of Vietnamese pangasius to the importing countries. Though quality of a market product can be measured by its ingredients, style, design and packaging, it is not possible to define quality in this study by these attributes because the country has no such information of each of the producers. That's why, the high quality of a market product is classified as exporting pangasius with higher than the average yearly export price, and the low quality of a market product is classified as exporting pangasius with lower than or equal the average yearly export price.

Table 2. Descriptive Statistics of the Different Quality Market Products and Independent Variables included in the Gravity Models

Variables	Data period	Average Value	Minimum Value	Maximum Value	Standard Deviation
Dependent Variables (1000 US$):					
Low-quality market product*	Monthly 2007-2013	16,554	34	138,694	28,832
High-quality market product*	Monthly 2007-2013	34,025	48	360,808	62,486
All market product	Monthly 2007-2013	23,251	34	360,808	45,520
Independent Variables:					
Vietnamese GDP (millions US$)	Annual 2007-2013	124,564	77,414	171,222	30,285
Importing countries GDP (millions US$)	Annual 2007-2013	987,451	3,019	16,663,160	2,435,634
Vietnamese Population (million)	Annual 2007-2013	87	84	90	2
Importing countries Population (million)	Annual 2007-2013	32	0.41	316	57
Distance (kilometers)	Annual 2007-2013	9779	4850	17207	3121
Tariffs Rate	Annual 2007-2013	6%	0%	15%	4%

* The categories are defined in Appendix 2. Source: Author's calculation based on data retrieved from Trade Map (2016).

Table 2 shows the descriptive statistics of both dependent and independent variables. From the table it is seen that the average exported value of high quality products is higher than the low quality products. It is also inferred that the highest export earnings come from high quality of a market product, even though the quantity sold is lower than the low quality of a market product (see Appendix 2). The reason is that the price of pangasius in high quality of a market product is higher than price in low quality of a market product.

Table 2 also shows that the average GDPs of Vietnam and the importing countries of Vietnamese pangasius are 124 and 987 billion US$ for the period of 2007-2013. The average Vietnamese and the importing countries population are 87 and 32 million for the same period.

The average distance between two (Vietnam and Importing) countries is 9779 kilometers. Finally, the average tariff rate is 6% indicating that Vietnam had to pay at least 6% tariff on its pangasius export. If the tariff rate were to increase further, it would become a financial barrier for Vietnamese pangasius export. From the above measurements, a lot of variations in the variables are observed making regression estimations meaningful.

Results and Discussion

We have converted the all monthly exported value into yearly series due to lack of monthly data on some of the variables namely, GDP and population of both Vietnam and importing countries and tariff rate imposed on Vietnamese pangasius export. The study used an unbalanced panel data because of having no imports of some countries in different years. The study used three different augmented gravity models to see the impact of the specific drivers. The ordinary least square regression models were estimated using R software to identify the specific drivers and found that the results are suitable for interpretation because of having no serial correlation and heteroscedasticity tested by Breusch-Godfrey and Breusch-Pagan tests.

Table 3. Summary of the models used for the different qualities of a market product

Drivers	All products		High-quality products		Low-quality products	
	Coefficients	p-value	Coefficients	p-value	Coefficients	p-value
Constant	15.269	0.942	161.174	0.612	127.960	0.630
Log of importing countries GDP	0.194 *	0.078	0.407 **	0.028	0.649 **	0.000
Log of Vietnamese GDP	0.300	0.905	1.723	0.650	-1.111	0.726
Log of importing countries population	0.818 ***	0.000	1.569 ***	0.000	0.370 ***	0.037
Log of Vietnamese population	-2.255	0.940	-21.442	0.635	17.656	0.641
Distance	-0.435	0.334	-2.290 **	0.018	-0.825	0.122
Tariff rate	-0.049 ***	0.001	-0.097 ***	0.000	0.008	0.693
Dummy for high quality product	0.082 *	0.098				
	n=46, T=1-7, N=287		n=25, T=1-7, N=110		n=36, T=1-7, N=177	
	R-Squared: 0.538		R-Squared: 0.595		R-Squared: 0.553	
	F-statistic: 46.38***		F-statistic: 25.24***		F-statistic: 35.03***	

Note: ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels. Source: Author's estimations.

At first, Table 3 illustrates the model fitness of the data for two different quality market products including all the dataset. The value of R^2=0.538 for all quality market products which indicates that the explanatory variables account 54% of the observed variation in export earnings. The model of all quality market products performed relatively well because the F-statistic (46.38) is

highly statistically significant (p-value=0.000) rejecting the null hypothesis of all the coefficients not jointly being zero at 1% level of significance. The similar conclusion may be drawn for both high (R^2=0.595 and p-value of F-statistic=0.000) and low-quality products (R^2=0.553 and p-value of F-statistic=0.000).

Secondly, the different qualities of market products were analyzed in relation to their coefficients and their predicted signs. All the three models are suitable to interpret since the sign of all the included variables are the similar to each other and even, all the variables included in the three different gravity models have the predicted signs. The variables included in the models have explained the major amount of variation in each of the models. In case of full sample size, it is seen that pangasius export are significantly affected by GDP and population of the importing countries, and tariff imposed on imports from Vietnam if all things being equal. The categorization of the products (high and low quality of market products) is meaningful since the dummy variable representing quality is significant with positive sign as expected. In case of high quality products, distance is also influence the Vietnamese export of pangasius if other things remain constant. Only a few variables are significantly affecting the pangasius export of Vietnam for low quality products namely, GDP and population of the importing countries keeping all things being equal.

Table 3 also shows that the coefficients of GDP of the importing countries are also positive as expected and significant for *all products* together. It indicates that the countries with higher GDP (the size of the economy) tend to increase the pangasius imports from Vietnam. The similar results were found in the case of Chen *et al.* (2008) and Shepherd (2013). The estimated coefficient of the importing countries population has also positive sign and statistically significant. This is consistent with a priori expectation. The coefficient indicates that the increase in population of the importing countries will also tend to increase pangasius imports from Vietnam. Distance and the exporting country's GDP and population are insignificant and have not found any significant effect for pangasius export from Vietnam. The coefficient of the tariff rate was negatively correlated with export values of all market products which indicate that higher tariff rates decrease the pangasius export of Vietnam. The similar results were found for catfish (Duval-Diop and Grimes, 2005) and basa and tra (Hong, 2008) imports from Vietnam. Rabbani *et al.* (2011) also found that tariff reduces the imports from Vietnam.

In *high-quality market products,* the countries with higher GDP tend to increase pangasius imports from Vietnam. The population of importing countries also increases the pangasius imports from Vietnam. Distance, in addition, found statistically significant for this product as expected and indicates that the higher the distance between two countries the lower the pangasius imports from Vietnam. Alchian and Allen (1964) also stated that countries closer together normally trade more than the countries apart. Moreover, Zahidi (2012), Ayuwangi (2013), and Sihombing (2017) found that increasing economic distance reduced the exports of a country. The tariff rate also decreases the export of high-quality market products (Chen *et al.*, 2008; Hummels and Skiba, 2004; Rabbani *et al.*, 2011).

The results of the drivers for *low-quality market products* are quite interesting. The only two variables namely, GDP and population of the importing countries have positive signs and are statistically significant for pangasius imports. The results indicate that these two variables are positively influencing the pangasius imports from Vietnam for low-quality market products. It means that with the increases of economy size of the importing countries, they will be able to import more pangasius from Vietnam. At the same time, population increases in the importing countries tend to increase pangasius imports from Vietnam.

As the discussion shows, the model describes the direction of trade according to the quality of a market product. In this study, it is shown that low-quality market products are easy to target due to minimum number of influencing drivers. The similar conclusion has been drawn in Iran's agricultural export from the study of Esmaeili and Pourebrahim (2011). High-quality market products take more pangasius imports but the exporter country can do well exporting elsewhere if the importer countries have larger GDPs and higher population. This study shows that it is important for an exporter country to choose suitable market for it products export.

In this study, we found that GDP, population, tariff rate and distance were significant and influential drivers of Vietnamese pangasius export. The focus of these drivers on the different qualities of the market product had not been studied a lot for a developing country like Vietnam. We conclude that countries should consider these important drivers when exporting their products to the world markets, especially to the market of a specific quality product. Countries having lower tariff and minimum distance may tend to import high quality of a market product whereas low quality of a market product is highly determined by the higher GDP of the importing countries. The importance of these drivers can manifest in various ways: higher GDP and population have a positive influence on exporting more the products while distant markets and higher tariff rate may discourage to export the products and ultimately, reduce the profit of the exporter. It is a good idea for a developing or less-developed country like Bangladesh to keep these drivers under consideration for fluent and easy export of a product in a particular market.

Conclusions

This study illustrated that quality of a market product played an important role as a determinant of the direction of trade. We found that export to high quality of a market product contribute more to a country than export to low quality of a market product. Moreover, we found that countries with higher GDP and population tend to import more whereas import can be restricted due to larger distance and higher tariff rate.

The GDP of the importing countries should be considered for all potential export markets. If the exporter country is going to export its product to low quality of a market product, then the prices will go down and it will face only a few challenges–an act of subject to a few influential drivers. The evidence presented in this study shows that export depend partly on tariff rate, so a country can export more if tariff rate is considered under its exporting policy. The findings of this study can be applied to products that have huge production and minimal cost, like convenient goods.

Similarly, this model can be applied to products that can be graded into different categories and aquaculture products of a country like Bangladesh.

The study illustrated that a developing or less developed country like Bangladesh would be able to export its low quality products well because there is less pressure on a variety of drivers. The country can also export high quality products if the country gives more emphasis on the closer markets with higher GDP and population. The reverse study-where a variety of different influential drivers needs to be considered–is suggested for developed countries. However, it is difficult for developing and less developed countries to export to richer countries because of a number of influential drivers. The developed countries even set some quality requirements for importing the products from developing countries such as Vietnam, Bangladesh, and India etc. (Dey *et al.*, 2005). The government of the exporter country, therefore, may lobby the countries with higher GDP and lower tariff rate. If the importing countries have higher tariff rate then both countries' governments can discuss the issues and reduce the tariff rate which might help to export products more. We also suggest that a country can even segment all markets for export if there is a good governance and mutual understanding among the importing and exporting countries.

The study is conducted considering the differences in quality in terms of differences in price. The study may provide different knowledge if the quality can be measured in terms of other criteria i.e. product attributes, variations, style, design and its packaging information as well. The study did not cover all the importing countries of Vietnamese pangasius because the data were not available for the studied period 2007-2013.

The study may be different if shipping connectivity index[2] would be taken to measure the effects of trade because the export value will increase with the increases of the index and vice-versa. In both Cheng and Wall (2001, 2002) and Hummels and Skiba (2004) stated that transportation costs raise the relative demand for high quality products because of higher logistics support. It means that the greater the logistical support, the more the transactions between the countries. Bilateral resistance term can also be taken to measure the effects of trade. The results of the study may also be different again if per capita GDP were used rather than the straight GDP of a country.

[2] The shipping connectivity index is calculated considering five components of the maritime transport sector. The components are: (1) number of ships, (2) container of the ships, (3) maximum vessel size, (4) number of services, and (5) number of companies that deploy container ships in a country's ports. It is measured based on the United Nations Conference on Trade and Development (UNCTAD). For each component, a country's value is divided by the maximum value of each component in 2004, and then the components are averaged for each country. Finally, the average is divided by the maximum average for 2004 and multiplied by 100 which generates a value of 100 for the country with the highest average index in 2004.

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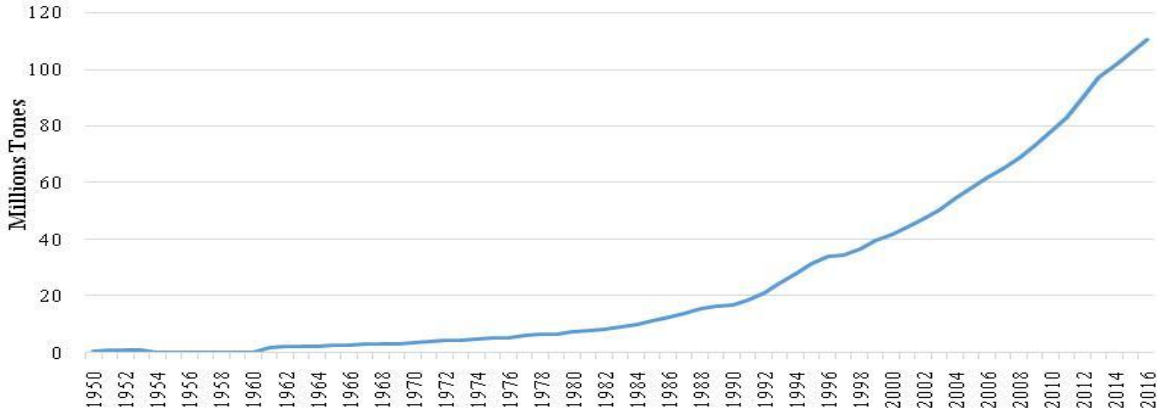
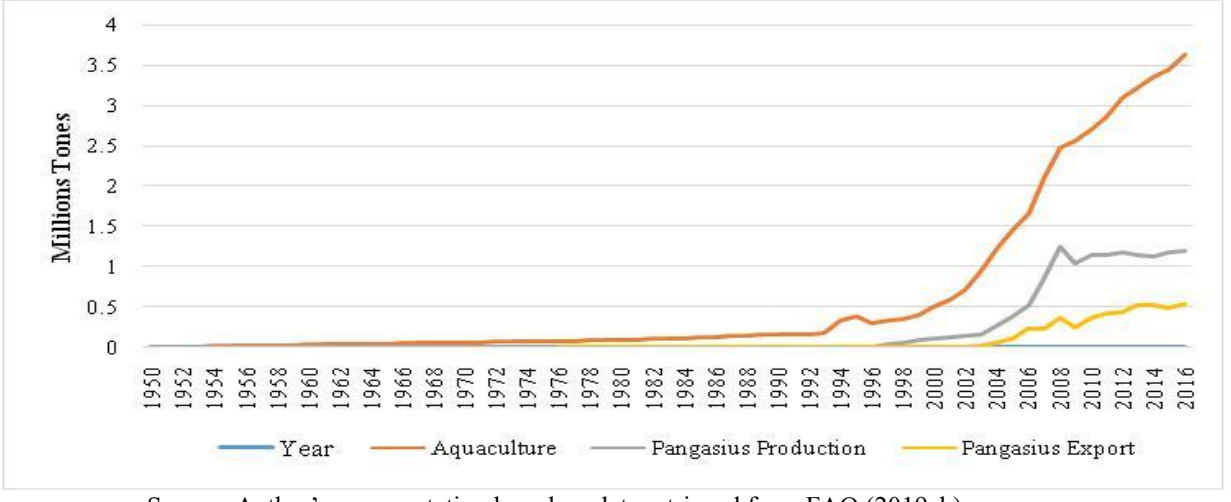
Appendix-1

(a) Global Aquaculture Production for the year 1950-2016



(b) Vietnamese Aquaculture and Pangasius Production with Pangasius Export for the year 1950-2016



Source: Author's representation based on data retrieved from FAO (2019ab).

Appendix-2

Definition of Quality of a Market Product according to Per Kg Pangasius Export Price

Dependent variable	Data period	Value (millions USD)	Quantity (million tons)	Price (USD) per kg.
Low-quality market product*	Monthly 2007-2013	2,930	1 ,266	2.31
High-quality market product*	Monthly 2007-2013	3,742	1 ,140	3.28
All market product	Monthly 2007-2013	6,673	2 ,406	2.77

Source: Author's calculation based on data retrieved from Trade Map (2016).