THE IMPACT OF THE MINIMUM SEDIMENT LIMIT (MRL) ON VIETNAM'S AGRICULTURAL EXPORTS TO RUSSIA

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ABSTRACT

The study examines the impact of the MRL on Vietnam's agricultural exports in Russia. The empirical evidence is shown through an in-force model with data throughout the 2001-2019 period and is divided into eight specific categories of Vietnamese exports to Russia. The research model also controls factors to ensure the suitability of the model such as: the ability to meet the needs of domestic Russian agricultural products (domestic output), tariffs, and types of exports. The research results show that as expected, the MRL regulation is one of the important non-tariff barriers to restrict Vietnam's exports in Russia. The research also shows that exports of different agricultural commodities have a different effect, in particular coffee, tea, maté and spices are exchanged while fruit products; Citrus peels or melons are being exchanged for lower potencies under defined conditions.

Keywords: Food Safety Standard, Mrl, Chlorpiryfos, Non-Tariff Barriers, Gravity Model.

JEL Classifications: M50, M51

INTRODUCTION

With favorable tropical climate and fertile-soil deltas, Vietnam has great competitive advantages in agriculture sectors. Recently, agricultural products have been one of main exporting commodities of Vietnam. In 2016, export value of agricultural products increased sharply compared to that of the same period in 2015, particularly, the coffee export turnover is the highest with the increase of 700 million USD or 600 million USD for fruits and vegetables. Despite the high potential and competitiveness, Vietnam's agriculture products just account for a very modest share of the world market, especially in developed countries as Japan, the US or the EU. Moreover, Vietnam's fruits and vegetables are less competitive in term of quality or label compared to those of Thailand or Mexico, and obviously lower price.

To clarify the impact of the MRL regulation in Russia on Vietnam's agricultural exports, this study provides experimental evidence through a gravity model based on relativistic theory. Moreover, the study also highlights the differences in the export of agricultural products listed by different types, namely: (1) Edible vegetables and some tubers; (2) Edible fruits and nuts; peel of citrus fruit or melons; (3) Coffee, tea, mat and spices; (4) Cereals; (5) Oil seeds and

oleaginous fruits; other grains, seeds and fruits; industry or pharmaceuticals; (6) Lost; gums, resins and other vegetable packages and extracts; (7) Vegetable plaiting materials; vegetable products not elsewhere specified or included; (8) Preparations of vegetables, fruits, nuts or other parts of plants.

LITERATURE REVIEW

Mwebaze (2018) empirically evaluated the impact of the MRL - seen as a kind of non-tariff barrier in exchange - with data used at *"EU Pesticide Residue"*. According to the author's argument, the impact is different between types of agricultural products; therefore, the author simultaneously conducts regression by type of agricultural products such as: Legumes, Tomatoes, Onions, Potatoes, and Other Vegetables. , Citrus Melons, Misc. fruit. The results of the study show the most important theory that: The MRL is one of the important barriers to bilateral/multilateral trade.

In the international trade literature, the pioneers in applying gravity model to analyze bilateral international trade flows were (Tinbergen & Bos, 1962). A Dutchman economic analyst and Pöyhönen (1963). Tinbergen use trade flow from country A to country B as dependent variable and the independent variable are GDP, geographic distance of both countries. The research has shown that GDP variable had positive effect and geographic distance have negative effect. It proved that countries having larger economy and closer geographic distance have more frequent trade activities. After Tinbergen's research, other studies also apply gravity model to analyze international trade such as (Sohn, 2005). Use gravity model to analyze trade flow of Korea; (Ranajoy & Banerjee, 2006) - analyze trade trend in India. Also evaluate the compatible of this model in African to explain the export activities of this country.

Rahman (2009) used three equations (Export value, Import value, Total import export value) to study trade flow between Bangladesh and its main partners. This study that trade flow of Bangladesh is affected by scale of economy and GDP.

Erdem & Nazlioglu (2008) study about factors affecting export value of agricultural product of Turkey to EU by using gravity model in the period of 1996 to 2001 have shown that geographic distance has negative impact on export value.

The gravity model has also been use to evaluate the impact of product standard and food safety standard on trade flow.

Wei et al. (2012) studied China's tea export from 1996 to 2009. The new point of this research is the existence of dummy variable- food safety standard in gravity model in order to evaluate the impact of this factor to the exportation of tea in China. The result of this study shows that safety standard has impact on export value but not really significant due to the different standard in different market.

As in Wilson & Otsuki (2002) a gravity model is built to examine the impact of changing food safety standards on China's dairy imports. Another research conducted by Wilson et al. (2003) used the gravity model to examine the impact of drug residue standards on trade in beef and found that Tetracycline standard in beef has a negative and significant impact on world trade in beef.

Moenius (2001) used the gravity model to provide a framework for estimating the effect of product standards on trade flows. Otsuki et al. (2001) used it to estimate the impact of the EU's new aflatoxin standards on food imports from Africa. The study that the implementation of the new standard will have a negative impact on African exports of cereals, dried fruits and nuts to Europe.

Otsuki et al. (2001); Wilson & Otuski (2002) used fixed effects model with importing countries. On the other hand, Anders & Van Wincoop (2003) adopted random effects method. These authors argued that since the fixed effects model drops out all time-invariant variables, including distance between countries, it is inappropriate to examine bilateral trade relationship. However, Baier & Bergstrand (2001) pointed out that, using random effects, one needs to assume no correlation between gravity equation error term and policy which is less plausible.

To examine Japan's stricter homestead residue limit on vegetables exports from China and finally found that Japan's stricter Chlorpyrifos standard has a negative impact on China's vegetables export to Japan. MRL standard of homestead or vetenary as a variable to evaluate the homestead residue limit's impact on export and import tariff as resistance variable in gravity model.

Model Specification

In case of this paper and the context of Vietnam, I will apply the similar gravity equation of (Chen et al., 2008) with some modifications. Chen et al. (2008) measure the effect of food safety standards of China to large markets in the world, particularly the MRLs standard of vegetables and aquatic products. Among other study, this model is the most closed one to the requirement of this paper as well as suitable with the context of Vietnam. All the main variables still remain the same as GDPj, Outputi, Distance, etc. Besides, there some more new variables in gravity model in this paper such as population. As mentioned in literature review above population is also an important factor affecting the export value, especially it reflect the scale of demand in exporting market.

As refered above SPS can be measured as dummy variable. However, in this paper SPS will be measure through a particular MRL standard of homestead. To be precise, we will evaluate the impact of SPS through Clorpiryfos MRL standard. The model includes basic variables as Export value, Output, Distance, GDP, Tariff and the SPS.

The final equation is:

$$ln\ EXkijt = \beta_j + \beta_1\ ln\ OPTikt + \beta_2\ ln\ GDPjt + \beta_3\ ln\ POPjt + \beta 4\ ln\ DISTij\ (2) + \beta_5\ ln\ MRLkjt + \beta_6\ ln\ TRFjkt + \varepsilon kij$$

Where, k is commodity; i, j indicates exporter (Vietnam) and importer, respectively; t is the time indicator.

Dependent variable: EXkijt is the export value of commodity k from exporter i (Vietnam) to import j in year t.

Independent variables:

OPT is output of agriculture products of exporter (Vietnam) to importer;

GDP of importing country in year t;

POP is the population of importing country in year t;

DISTij is the geographic distance from exporting country i to importing country j;

MRL is Maximum Residue Limit of Clorpyrifos; TRF is import tariff of commodity.

Data

The data collected included Vietnam's agricultural exports to Russia during the period 2001-2019 listed into eight categories (according to the Trade map), including: (1) Edible

vegetables and some tubers; (2) Edible fruits and nuts; peel of citrus fruit or melons; (3) Coffee, tea, mat and spices; (4) Cereals; (5) Oil seeds and oleaginous fruits; other grains, seeds and fruits; industry or pharmaceuticals; (6) Lost; gums, resins and other vegetable packages and extracts; (7) Vegetable plaiting materials; vegetable products not elsewhere specified or included; (8) Preparations of vegetables, fruits, nuts or other parts of plants.

To model the study of data on GDP, population required and collected from the World Bank database, distance data were not used because they had no variation. The data on the imposition of relevant tariffs between the two countries to the eight categories of agricultural export products above was also collected to control related commodity tax issues. Agricultural production in Russia, and in particular grain production in Russia, as has been argued may affect import demand from Vietnam, collected from the World Food Organization (FAO). Finally, the minimum concentration limit data collected from the European Union is finally on the crops of this region, of which Russia is a direct influence country. Detailed data are described in the Table 1 below.

Table 1
DESCRIPTION OF RESEARCH & SOURCE DATA

Out	Describe	Source	Medium	Error	Minimum	Max
Export	Current value (US $)	Trade map	20711.77	35519.09	0.00	179222.00
Russian GDP		Worldbank database	1.33e +12	6.10e + 11	3.07e + 11	2.29e +12
GDP of Vietnam			1.29e +11	7.36e + 10	3.27e + 10	2.62e +11
Population of Russia	people		1.44e +08	898866.50	1.43e + 08	1.46e +08
Tax imposed in Vietnam (tariff_V)	Taxes are imposed in detail on the eight above agricultural products in Vietnam	Market access map	0.15	0.10	0.02	0.40
Tariffs imposed in Russia (tariff_R)	Taxes are imposed in detail for the eight above agricultural products in Russia		0.16	0.13	0.02	0.53
Cereal production in Russia (Yeild)	Production of cereals in Russia (ton unit)	Food and Agriculture of United Nations (FAO)	91159. 226	18860049	59619074	1.31e + 08
Classify	8 types of agricultural products are described	Classification by trade map	4.50	2.30	1.00	8.00
Minimum radical limit (MRL)	Minimum residue limits are listed by the EU	EU MRL database	0.03	0.02	0.01	0.10

Source: Author compiled

On the basis of the gravity model theory, it is clear that the impact of gross product (GDP) growth contributes to enhancing bilateral exchanges between Russia and Vietnam, in which agricultural products are not Exception. The variable distance is not taken into account in the bilateral relationship here because it is considered a fixed condition when only considered within two countries while the increase in the Russian population can positively affect the import of agricultural products from Vietnam due to high demand for use.

In fact, the demand for Russian agricultural products is met through domestic production and imports (which we are considering in Vietnam). In other words, the amount of agricultural products in Russia will have a negative impact on the country's imports, so exports in Vietnam will decrease. In addition to the impact of domestic consumption, agricultural exports in Vietnam to Russia are also pressured by tariff barriers. Higher tariffs in Russia on agricultural commodities, obviously, reduce Vietnam's exports to the country due to the effect of increasing product prices. By contrast, similar tariffs imposed on agricultural products in Vietnam could increase exports. This is easily explained by theories of protection.

Finally, minimum residue regulation is a central factor in this study. The minimum residue limit is seen as a significant non-tariff barrier for countries that specifically use many drugs (pesticides, plant protection, etc.) such as Vietnam. In fact, there are many cases where goods are returned to Vietnam due to failure to ensure these criteria. Therefore, raising the minimum sediment limit (MRL) will have a positive impact on Vietnam's agricultural exports to Russia. The expected impact of the variables is presented in the following Table 2:

Table 2
EXPECTED IMPACT OF VARIABLES

Variable	Expectation
Total grain production in Russia (yield)	-
Gross domestic product $GDP_{Vietnam}$*GDP_{Russia}	+
(pop)	+/-
(Tariff_V)	+
(Tariff_R)	-
(MRL)	+

RESEARCH RESULTS

Gravity model results are presented in the following Table 3: The results of all three models are consistent with the expectations set and the research theories. In which, in model (1) we use a simple gravity model with consideration of the impact of the most important factor, the Minimum Residue Limit (MRL) with control of 8 agricultural products is exported in Vietnam to Russia. In fact, an aggregate review of all agricultural production may lead to inaccurate results due to the lack of control for the individual characteristics of each of these crops.

However, the built-in model may lack important variables. Especially the size of the population, the size to meet the needs of domestic sources (domestic agricultural products of Russia) and the official tax rates for these 8 agricultural products. Model (2), after having more control for related factors, has the results as expected. Specifically: (i) In addition to the factors of gross product (GDP), type (type), the population size, domestic grain production of Russia, the tax rate in Vietnam have index value and statistical significance consistent with stated theoretical basis; (ii) Obviously, after controlling for other factors, the absolute impact of the MRL factor on Vietnam's agricultural exports shows signs of decrease. However, this value is relatively high and statistically significant.

Model (3) further controls Russian tariffs on eight agricultural exports. The model results are also consistent with discussed theory and expected value.

Table 3
RESEARCH MODELS

	(first)	(2)	(3)
VARIABLES	**OLS**	**OLS**	**OLS**
lngdp	0.439 ** (0.191)	1,336 *** (0.230)	0.969 *** (0.200)
lnpop_o		87.14 ** (39.71)	17.18 (33.55)
lnMRL	1,660 *** (0.367)	1.207 *** (0.241)	1,018 *** (0.236)
lntariff_russia			-1.671 *** (0.202)
lntariff_vietnam		3,655 *** (0.378)	4,400 *** (0.317)
lnyield		-2,696 * (1,505)	-3.876 *** (1,304)
type	-0.516 *** (0.126)	0.177 * (0.0906)	0.360 *** (0.0758)
Constant	-7,516 (10.36)	-1,640 ** (739.2)	-288.1 (625.8)
Observations	152	152	152
R-squared	0.225	0.635	0.733

Note: Robust standard errors in parentheses
*** p <0.01, ** p <0.05, * p <0.1

In order to recognize the important difference between the exports of eight agricultural commodities in Vietnam to Russia, the study examines the difference between actual exchange and model estimates. We are based on the assumption that, given the specific conditions related to growth of gross product (GDP), distance, tax imposed, the size of the Russian population, demand to meet Russia's domestic demand (yield), if there is a minimum residue limit (MRL) regulations, Vietnam's exports to Russia are effective when resources are evenly distributed. In other words, the difference between actual communication and model estimation is relatively uniform.

This result is presented in the Table 4 below:

Table 4
RESULTS BETWEEN DIRECT EXCHANGE DIFFERENCE WITH MODEL ESTIMATED VALUE

Type	Medium	Error	Standard error (TB)	p25	p50	p75	p90
1	177.52	480.59	110.26	-198.46	228.37	505.09	734.85
2	-18423.3	23602.72	5414.83	-40118.3	-21982.2	4048.81	6408.04
3	50384.97	114389	26242.64	-1033.41	12397.07	92134.69	173999.7
4	10593.19	40316.27	9249.19	-22875.4	-3289.73	37681.34	71024.22
5	-38.49	2422.82	555.83	-592.88	-161.37	-74.09	1141.52
6	35.36	188.97	43.35	-30.43	20.67	116.41	395.33
7	35.89	42.72	9.8	4.47	15.61	69.79	111.7
8	-11861.4	21239.75	4872.73	-26168.5	-14432.5	-6362.7	14820.3
Total	3862.97	47470.02	3850.33	-6085.97	1.58	627.14	21968.62

Source: Author's calculation

It is clear from the table that the mean value of this difference (actual exchange - estimated value from the model) is not uniform. Specifically, items of coffee, tea, maté and spices (3) were most exchanged and over model expectations. In contrast, the rows of fruit and almonds are

edible; the peel of a citrus fruit or melon (2) together with preparations of vegetables, fruits, almonds or other plant parts (8) is very limited. In other words, given the assumed conditions, these two agricultural products could significantly increase Vietnam's total exports to Russia. The remaining products are: (5) Oil seeds and oleaginous fruits; other grains, seeds and fruits; industry or pharmaceuticals; (6) Lost; gums, plastics and other plant packages and extracts have actual exchange very close to the model's predictions.

Besides considering the mean, the study also looked at the values in the accumulation functions p25, p50, p75 and p90. Research results have a general trend that: Positive values are stronger when accumulated at higher levels from` p25 to p90. This can be deduced that agricultural exports in Vietnam to Russia have not hit niche markets in Russia (with a small scale but with diverse needs). Instead, Vietnam mainly focuses on export shipments large aperture. Consequently, the difference between actual exchange and model estimates is higher at higher accumulation levels.

Finally, consider the difference above which is clearly shown in the Figure 1 below.

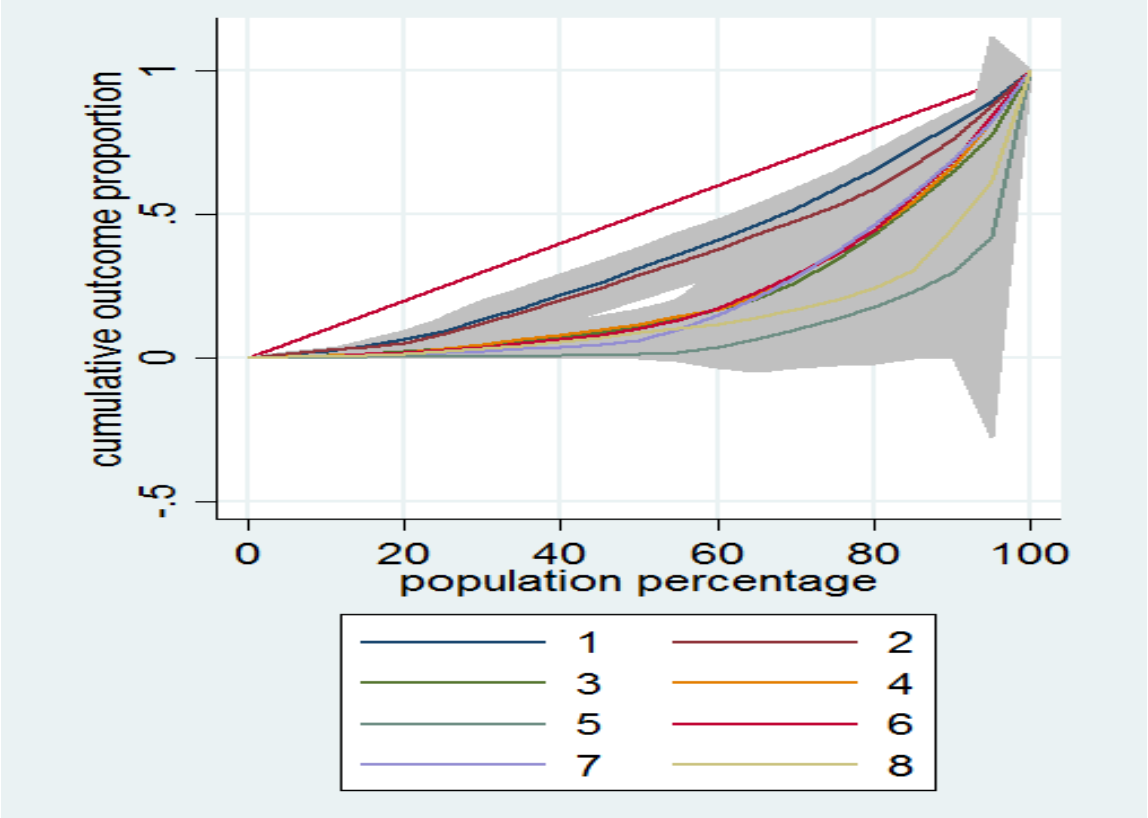

FIGURE 1
LOZENZ CURVE OF THE DIFFERENCE BETWEEN THE ACTUAL VALUES AND THE MODEL ESTIMATES

This lozenz curve demonstrates the cumulative distribution of the difference between actual exchanges and estimates from the partial model by eight types of agricultural exports. The red paddle demonstrates the absolute balance of distribution. Therefore, the distant position of the curves from this reference curve indicates an accumulation-based imbalance. This also

implies that: Exports (whose cumulative sugar is far from the standard line) only focus on large-scale exports and are very limited in niche markets. Specifically, the two sugars farthest from the standard sugar are (3) Coffee, tea, maté and spices and (4) Cereals. In contrast, types 1 and 2 have the closest distance to the baseline, demonstrating uniformity between the cumulative distributions.

CONCLUSION

Non-tariff barriers are one of the most serious problems especially for Vietnamese agricultural products. This study examines the impact of one of the ways of imposing non-tariff barriers, in particular the MRL on eight types of Vietnam's agricultural exports to Russia during 2001-2019. The empirical evidence confirms that the MRL has a great impact on agricultural exports in Vietnam. Moreover, the research model - the gravity model - has evaluated and controlled other related factors. In particular, the tax imposed in Vietnam and in Russia on these agricultural products had an expected impact; Russia's ability to meet domestic demand for agricultural products (grain output) has a negative impact on Vietnam's exports to this country.

One of the remarkable points is the difference between the exports of different agricultural products. This research provides empirical evidence that, the consideration of the gravity model in agricultural import and export needs to consider each type separately. Specifically, the items of coffee, tea, maté and spices are focused on exchange and are the strength of Vietnam in Russia while the fruits and almonds are edible; Citrus peels or melons are being exchanged for lower potencies under defined conditions.

ACKNOWLEDGEMENT

This study is the research result of the national topic *"Comprehensive economic cooperation between Vietnam and the Eurasian Economic Union in a new context"* under the Program KX01/16-20.

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