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ASSESSING THE IMPACT OF US' NON-TARIFF MEASURES ON VIETNAM'S AGRICULTURE AND FISHERIES EXPORT: A GRAVITY MODEL ANALYSIS

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SUMMARY

This article analyzes Vietnam's agriculture and fisheries export flow under the influence of US's non-tariff measures by using gravity model estimated by poisson pseudo maximum likelihood estimation. The research covers 4 major 4 digits agricultural and fisheries HS codes namely HS03 HS07 HS08 and HS09 during the ten-year period of 2009 and 2019. A significant negative effect can be observed through the estimation result of technical barriers and counter veiling measures but fail to show through the results related to sanitary and phytosanitary measures as well as quantitative restriction measures. A set of recommendations are also drafted based on the result with the aim of further enhance Vietnam's export ability

INTRODUCTION

[Douglas Irwin \(2002\)](#) shows that developed countries tend to use non-tariff measures instead of using tariff measures. These non-tariff measures, especially TBT and SPS measures, are often introduced with the goal of protecting consumers' health, as well as protecting the environment. However, a major problem raised by [Irwin \(2002\)](#) is that non-tariff measures which are often distorted and some specific regulations which are too strict are serving the purpose of trade protection rather than reaching the goal of protecting consumers and the environment. Therefore, according to Irwin, the fact that applied non-tariff measures will bring positive or negative impacts depends on the real purpose, as well as the method of application of each country. By setting reasonable standards for imported goods, non-tariff measures will play an important role in protecting consumers' health and the environment. This will also encourage the production and export development. However, if misused,

these non-tariff measures will serve as an “impossible” or unreasonable standard that hinders international trade.

Agricultural products are a sensitive goods, directly related to human health and safety, animal and plant life and the environment, etc., so they are always controlled by governments with technical measures, sanitary and phytosanitary measures, etc. According to UNCTAD's statistics on non-tariff measures, the prevalence of non-tariff measures for agricultural products is often very high. For example, the frequency ratio of non-tariff measures for agricultural products in the US or China is 100%, which means that 100% of agricultural products imported into these markets are subject to non-tariff measures. The coverage ratio of non-tariff measures for agricultural products in the United States and China also reached 100%, which means that 100% of the value of agricultural imports is affected by non-tariff measures. While these two rates in the European market are 98% and 98% respectively; in Japan are 97% and 99% respectively. The average number of non-tariff measures affecting an agricultural product (the prevalence score) is calculated in the United States, EU, Japan, and China respectively is 16.1; 15.5; 7.4 and 22.8. ([UNCTAD, 2020](#))

In recent years (2016-2020), the United States was continuously the third largest market in terms of export turnover of agricultural and aquatic products of Vietnam, of which the export turnover of Vietnamese agricultural products to the United States reached over 1.6 billion USD. The main agricultural products of Vietnam exported to the United States include rice, coffee, pepper, cashew nuts, and vegetables. However, the United States is also a market where there are many strict technical, sanitary and phytosanitary regulations for imported agricultural products. According to statistics of the World Trade Organization (WTO), as of June 2021, the United States has applied 613 TBT measures, 266 SPS measures, and 430 special safeguard measures for agricultural products imported from Vietnam. In addition, Vietnam's agricultural exports also face quantitative restrictions, tariff quotas and anti-dumping in the US market.

Therefore, studying the impact of non-tariff measures on Vietnam's agricultural exports is necessary and meaningful to find out how the US's non-tariff measures affect Vietnamese agricultural export which is competed by applying gravity model on data related to agricultural trade between Vietnam and the US. In addition to the introduction, this paper includes an overview of research on the impact of non-tariff measures on exports, research methods and data, the current situation of Vietnam's agricultural exports to the US market, evaluating the results of the impact of some US non-tariff measures on Vietnam's agricultural exports and some conclusions and proposals to promote the export of Vietnamese agricultural products to the US market.

LITERATURE REVIEW

There have been many studies using different research approaches and methods to assess the impact of non-tariff measures on international trade. In which, there are some studies that have used gravity model to determine the direction and extent of impact of some non-tariff measures (typically TBT, SPS, quantity restriction) on agricultural products export and import. Overall, studies show that the application of non-tariff measures on agricultural products in importing

countries can have short-term and long-term effects, either positive or negative for the exporting countries. For example, by using gravity model to study the influence of technical barriers of Japanese, US, and EU markets on Chinese vegetable exports, [Ling \(2013\)](#) announced that the pesticide restriction standards for vegetable products of Japan, the US, and the EU have limited China's vegetable exports. If pesticide residues are restricted by 10%, the value of vegetable exports will be reduced by 4.16%. However, that is only the immediate negative impact. In the long run, the very strict standards on pesticide limits for vegetables also have a positive impact on exports, forcing exporters to comply. When the standards are met, exports are increased, product quality and competitiveness are improved.

Another study by [Dong, Zhu \(2015\)](#) also shows that developed countries tend to use more rigorous technical measures, with higher requirements than developing countries. Therefore, agricultural products exported from developing countries to developed countries face many difficulties and obstacles in the process of market penetration. On average, the import value of goods can be reduced by about 12%, of which the value of agricultural products can be reduced by 8.42% if at least one non-tariff barrier is implemented, and the annual average bilateral trade value can be cut down about 11% if at least one non-tariff barrier is implemented. Subsidies measure restricts the international trade at the least amount, while TBT and SPS measures can reduce the value of trade by 10% on average ([Yalcin, Felbermayr, Kinzius, 2017](#)).

However, [Ghods, Gruber and Stehrer \(2016\)](#) show that TBT and SPS measures have both negative effects and positive effects on international trade, these effects depend on not only the country in which the measures are used but also the goods affected by these measures. Furthermore, the authors found that, although the number of TBT and SPS measures is larger than that of the quantitative restrictions, the quantitative restrictions have much greater impact on trade during the study period. In addition, the results also show that non-tariff measures have a positive impact on world imports. The authors explain that an exporting country will increase its exports if it has domestic policies and standards that are similar or nearly identical to the non-tariff measure applied by the importing country, while other exporting countries will have a decrease in export turnover. Similarly, according to the research of [Gao, Ito, Saito \(2018\)](#), Japanese technical measures (especially the use of "active list system" which is the list of agrochemicals and agricultural products that need to be inspected to ensure that harmful chemicals are not used in agricultural products) has significantly reduced China's exports to the Japanese market. However, if the quality of imported goods is strictly controlled by technical measures according to the positive list, the quality of fruits exported from China to Japan will be better improved, the consumption of fruits imported from China by the Japanese companies will be increased. [Shepotylo \(2016\)](#) also found that SPS measures affecting variable costs push up turnover extensively and decrease the turnover intensively. Conversely, TBT measures affecting fixed costs reduce the turnover extensively and increase the turnover intensively. Therefore, this author argues that non-tariff measures need to be evaluated and studied for each measure, since different measures will affect import and export turnover from different dimensions, as well as at the different level of economic growth.

Based upon the studies on the impact of some non-tariff measures on international trade in agricultural products, the authors also propose some solutions to promote agricultural exports in the situation of using a lot of measures such as TBT, SPS or quantitative restrictions in many countries. For example, in order to promote China's exports of tea and vegetables to developed markets, China needs to strengthen the control of pesticide residues and narrow the gap between Chinese standards and developed countries ones, implement harmonization with international standards, sign mutual recognition agreements with developed countries ([Dong & Yue Zhu, 2015](#)), or focus on technology development, strengthen inspection mechanism, and evaluate the product quality proactively to ensure that standards are met international standards, optimize the production process, strengthen input control, build a quality control system from the farm to the dining table to ensure safe and quality products ([Ling, 2013](#)). This article also uses gravity model to study the impact of some US non-tariff measures on Vietnam's agricultural exports, an issue for which no research has not been published up to now.

Data analysis

Current situation of Vietnam's agricultural exports to the US market

The most significant benchmark in the trade between Vietnam and the USA is the agricultural trade. For decades China had always been the biggest agricultural exporting market for Vietnam. However, the past few years have witnessed a tremendous growth in the agricultural values of exports from Vietnam to the USA, making US become the biggest importer for Vietnamese agricultures in 2020. This market is proving its great potential with increasing demand for Vietnamese goods in general and Vietnamese agricultural products in particular. Nevertheless, there are still remarkable challenges in the market access, especially the technical barriers to trade.

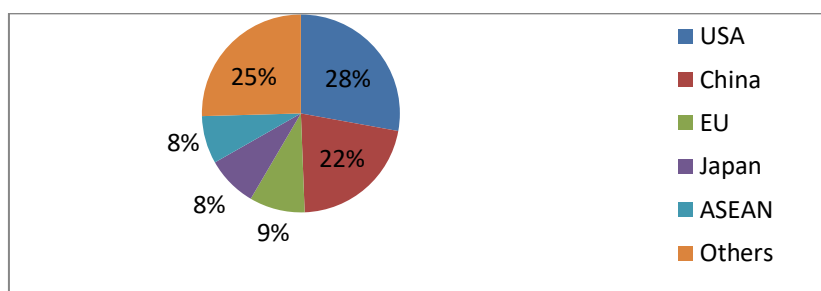
In 2020, despite facing many difficulties due to the outbreak of the Covid-19 pandemic which causing the disruption in the global supply chain, the agricultural export values of Vietnam to the US still kept its growth momentum by 23,2% comparing to 2019, exceeding 10,4 billion US dollars and accounting for 28% of the total agricultural export turnovers of Vietnam. With this result, the United States for the first time has become the largest agricultural, forestry and fishery export market of Vietnam, far exceeding the markets behind. The year 2020 also recorded the significant growth of some key export products in the US market such as: 17.1% for rice; 10.4% for seafood products; 12.5% for vegetables; 3.3% for coffee ([Ministry of Industry and Trade, 2021](#)).

The US market has great demand for agricultural products due to its large and diverse population. In recent years, the US market's demand for agricultural imports from Vietnam, especially fishery, fruit and vegetables products, has been constantly increasing. However, considering the export values by products categories, it can be seen that other than cashews, seafood..., the export turnovers of Vietnamese agricultural products such as rice, fruit and vegetables...are still limited, whereas they are the major export products of

Vietnam. It can be explained by the challenges in meeting market access requirements despite the huge demand and potential of the exporting market.

Table 1: Exports of Vietnamese agricultural product by main partners, 2020

Export market	Export turnovers (million US dollar)
USA	10.415
China	8.058
EU	3.391
Japan	3.103
ASEAN	2.921
Others	9.512



Note: Data collected from General Department of Vietnam Customs

Table 2
 Exports of Vietnamese agricultural products by product categories, 2010

No.	Category		2016	2017	2018	2019	2020
1	Rice	Turnover (million US dollar)	35.65	12.609	11.909		
		Growth (%)	21.74%	-64%	-5.55%		17.1%
2	Vegetables	Turnover (million US dollar)	84.5	102.1	113.901	150	168.8
		Growth (%)	44.20%	20.90%	37.10%	31.7	12.5
3	Pepper	Turnover (million US dollar)	342	221	207		
		Growth (%)	30.4	-35.4	-6.5		1.1

4	Coffee	Turnover (million US dollar)	449	407	340		
		Growth (%)	43.4	-9.4	-16.5		3.3
5	Seafood	Turnover (million US dollar)	1,435	1,407	1,627		
		Growth (%)	9.7	-1.9	15.7		10.4
6	Cashew	Turnover (million US dollar)					
		Growth (%)					

Note: Data collected from General Department of Vietnam Customs

Current situation of US non-tariff measures

Despite the tremendous growth in the agricultural exports to the US, Vietnamese exporters are facing significant obstacles from the increasing non-tariff barriers that the US's government is implementing, in which the most common ones are sanitary and epidemiological measures (SPS), technical barriers (TBT), anti-dumping (ADP), export subsidies (XS), special safeguards (SSG) and tariff quota (TRQ). As of June 30, 2020, the number of non-tariff measures applied by the United States is such significant with 3,178 sanitary and phytosanitary measures (SPS), 1,829 technical barriers (TBT).

The protectionist trend through the promulgation of new and complex regulations and standards has been also increasingly applied, namely: The Protection Program plant protection and quarantine (PPQ); The Plant Protection Act (PPA); Food Safety Modernization Act (FSMA); Food Quality Protection Act (FQPA) and other regulations. In particular, the US Plant Protection and Quarantine Program will monitor all imported plants (including fruits) to detect invasive species, insects, and foreign plant diseases that may pose a high risk to the agricultural industry of the United States. It means that all agricultural products imported into the US required a number of permit documents to be qualified for the market access. Concerning the Food Safety Modernization Act (FSMA), exporters must register their locations and representative agents in the United States. After every 2 years, foreign enterprises who exporting products to the US market must redo the process to be granted a new valid business code. It is notable that in February 2020, the US has restricted the trade preferences for Vietnam when removing Vietnam from the list of developing countries. Additionally, Vietnam is also on a watch list issued by the US for intellectual property violations, anti-counterfeiting and imitation goods

METHODOLOGY

Gravity model

The gravity model applied in this analysis stemmed from the research of [Anderson Van Wincoop \(2003\)](#) on building a structured gravity model which has solid theoretical foundation. The structured gravity function regarding bilateral trade between countries under the framework of [Anderson Vanwincoop \(2003\)](#) can be expressed as follow

$$X_{ij} = \frac{Y_i E_j}{Y} \left(\frac{t_{ij}}{\pi_i P_j} \right)^{1-\sigma}$$

In which Y , Y_i and E_j represent the GDP of the world, country i and country j respectively. t_{ij} serves as a proxy for international trade frictions between country i and j , σ denotes the substitution elasticity, and $\pi_i P_j$ represent country i and country j outward and inward multilateral resistance terms respectively. This function can also be expressed as log-linear as follow

$$\ln X_{ij,t} = \ln E_{j,t} + \ln Y_{i,t} - \ln Y_t + (1 - \sigma) \ln t_{ij,t} - (1 - \sigma) \ln \pi_{i,t} - (1 - \sigma) \ln P_{j,t} + \varepsilon_{ij,t}$$

The variable representing bilateral trade cost can be farther expressed as folow:

$$(1 - \sigma) \ln t_{ij,t} = \beta_1 \ln \text{DIST}_{ij} + \beta_2 \text{RTA}_{ij,t} + \beta_3 T_{ij,t} + \beta_4 \text{NTM}_{ij,t} + \beta_5 u_{ij,t}$$

However, as discussed, the analysis only concerns bilateral relationship between Vietnam and USA, hence, time-invariant variables like distance, border, or colonial relationship is excluded in order for the estimation to exist. As the result, the function for international trade cost can be minimized as follow:

$$(1 - \sigma) \ln t_{ij,t} = \beta_3 T_{ij,t} + \beta_4 \text{NTM}_{ij,t}$$

With $T_{ij,t}$ and $\text{NTM}_{ij,t}$ represent tariff and non-tariff barriers respectively.

Estimation method

The challenges in estimating the gravity model are prominent and plenty in number, however, two are most prominent, namely zero trade flow and heteroskedascity. A handful of methods have been recommended in order to efficiently estimate the gravity model and at the same time addressing the aforementioned challenges. In this research, a Poisson Maximum Likelihood (PPML) estimator suggested by [Silva and Tenreyro \(2006\)](#) in their famous paper "Log of gravity". Through a Monte Carlo simulation, PPML has been proven to be more efficient compared to simple OLS estimator, while also producing consistence results. Furthermore, PPML is able to solve the aforementioned problems by offering a method to allow the structural gravity model to be estimated in level-log form which reliably tackle heteroskedascity and zero trade flow issue.

RESULTS AND DISCUSSION

Table 1 shows the results of PPML estimation using bilateral agricultural trade data between Vietnam and the US in the period of 2009 to 2019. A set of dummy variables is also used in order to take into account fixed effect within different products line. Column (1) and (2) record the result of gravity model without and with fixed effect respectively. Fixed effect is represented through a set of dummy variables with the aim of taking into account the differences between separate group of products.

It is worth noticing that, in column 1, the coefficient generated by PPML for Vietnam GDP and US GDP is 0.72 and 10.78 respectively. Even though, these estimates are statistically insignificant according to the p-values, however, the magnitude of the coefficients is consistent with research by [Silvas and Tenrenyo \(2006\)](#) which suggest that the elasticity of importer and exporter's GDP is different from 1, due to the decreasing trade-to-GDP ratio when total GDP increases. Trade's resistance to change under the influence of increasing GDP reflects information related to Vietnam's development and US's consumption. The period of concern from 2009 and 2019 witnessed a heavy emphasis on the development of Vietnam's manufacturing sector, hence the growth in GDP is better associated with manufactured goods export and fail to show any relation to agriculture trade flow. When differences of products groups are taken into account through fixed effect, the coefficients associated with GDP dip slightly and remain insignificant, which suggests that GDPs do not have a meaningful effect on Vietnam export of agriculture products on average

Table 3:

PPML estimation of non-tariff barriers effect on Vietnam agricultural trade to the US

Variables	PPML (1)	PPML (2)
$\ln GDP_{VN}$	0.729 (0.968)	0.629 (0.778)
$\ln GDP_{USA}$	10.78 (0.830)	9.78 (0.62)
$\ln(1+Tariff)$	-0.353 (0.000)	-0.352 0.000
TBT	-.007 (0.036)	-.0066 (0.015)
SPS	-.042 (0.127)	-.054 (0.086)
CV	-1.603 (0.000)	-1.64 (0.000)
QR	.008 (0.895)	-.005 (0.939)
Fixed effect	No	Yes

Note: Column (1) and (2) record the result of PPML estimator with and without fixed effect respectively. P-values of each parameters are reported in parentheses. Authors's own calculations

The result shows a more exciting result on trade costs which are proxied through tariff and non-tariff related variables. Estimates of tariff variable show that, on average, export elasticity in relation with tariff change is -0.353. or in other words, if the level of tariff imposed on Vietnam's agriculture increase by 1%, the volume of export to the US will decrease by 0.353%. This result is consistent with trade theory as additional tariff increases overall price and as a result make the products less desirable, hence impede trade. The introduction of dummy variables into the model only present negligible change to the result.

The parameters of interest are related to the count variables representing the number of imposed non-tariff barriers on Vietnam agricultural. Only technical barriers (TBT) and counter-veiling measures (CV) show significant negative effect on trade. The estimates of CV measures are significantly larger compared to TBT which are at -1.603 and -0.007 respectively. These parameters suggest a higher restrictive power of CV measures due to their tariff-related nature. TBT measure's small negative effect shows that Vietnam agricultural products are still struggle in a certain degree to follow US technical requirements. These estimates dip slightly when fixed effects are included and stay statistically significant suggest that the differences among group of products are negligible.

SPS measure also show a negative correlation with agricultural trade, however not statistically significant at 95% confidence interval. This demonstrates the ability of Vietnam agricultural to meet US strict regulations related to sanitary and phytosanitary. However, the most surprising result is the insignificance of quantitative restriction measure effect on trade. Quantitative restriction is infamous for the ability to drastically hinder trade through direct constraint of import volume. The model used is unable to capture this theoretical based effect set which is due to the characteristics of the data set.

RECOMMENDATIONS

Based on the estimation result, it is necessary that Vietnam business and government should adopt suitable measures to promote agricultural trade to the US.

Recommendations for Vietnamese businesses

Vietnam's seafood processing and exporting enterprises need to continue to develop sustainable export product supply chain models in the direction of applying modern and environment friendly technology to improve the quality of their products, improving the ability of export markets to meet traceability, technical and sanitary regulations, as well as labor and environmental regulations. Enterprises are also more proactive and active in developing ecological and organic farming models in addition to good practice (GAP) farming models to create a source of products that meet increasing requirements of the US market. In addition, seafood exporters also need to learn and comply with regulations to ensure fair competition, work closely with related parties to respond to investigations applying anti-dumping and counter-veiling measures in the US market.

Recommendations for Vietnamese government

Vietnamese government should establish channels to provide businesses with information of non-tariff measures such as TBT, SPS measures in the US and support the businesses to promote trade. In other words, Vietnamese government should create the advantageous environment for businesses to improve production volume as well as diversity of the product. Furthermore, Vietnam government should also provide business with useful and accessible information related to US's trade regulations. Coordinating with relevant agencies to convince governments of other countries to recognize Vietnam as a market economy. This helps Vietnamese exporters reduce their losses in anti-dumping and counter-veiling lawsuits in foreign markets including the US.

Continuing to negotiate and sign agreements with the United States on market opening for seafood and agreements on mutual recognition on testing, quarantine, food hygiene and safety for various export seafood products.

CONCLUSION

The increase in number and importance of non-tariff barriers (NTB) invoke the need for research dedicated to solve the puzzle of quantifying effect of NTB. This issue is especially vital for the development of agriculture trade in developing countries which is exceptionally sensitive to NTBs. Through the application of gravity model and PPML estimation, this paper contributes to the field by estimating the effect of existing US's NTBs on Vietnam agricultural export. The results show the devastate effect of tariff, which raises the concern of high tariff barriers on agricultural products despite the rapid development of global free trade agreement (FTAs). However, variables related to non-tariff barriers show a more surprising results. Only TBTs and Counter-veiling measures show a negative and significant on trade, while SPS fail to show any significant impact. TBT measures hinder trade through the additional costs needed to comply with technical requirements, and CV measures increase price directly which makes Vietnam agriculture export less attractive. Based on the results of the estimation, the paper also suggests plausible recommendations for Vietnamese government and businesses in order to promote agriculture trade to the US.

REFERENCES

- Anderson, J. E., & Van Wincoop, E. (2003). Gravity with gravitas: A solution to the border puzzle. *American economic review*, 93(1), 170-192.
- Dong, Y., & Zhu, Y. (2015). Impact of SPS Measures Imposed by Developed Countries on China's Tea Export-A Perspective of Differences in Standards. *Applied Economics and Finance*, 2(4), 160-169.
- Gao, Q., Ito, S., & Saito, H. (2018). Measuring Japan's technical barriers to trade based on the China's fruit exports to Japan. *Agricultural Economics*, 64(3), 141-147.
- Ghodsi, M., Gruebler, J., & Stehrer, R. (2016). Estimating importer-specific ad valorem equivalents of non-tariff measures (No. 129). *wiiw Working Paper*.
- Irwin, D. A. (2020). *Free trade under fire*. Princeton University Press.

- Ling, J. I. A. N. G. (2013). Measurement of the Impacts of the Technical Barriers to Trade on Vegetable Export of China: An Empirical Study Based on the Gravity Model. *International Business and Management*, 7(2), 20-25.
- Ministry of Industry and trade of the Socialist Republic of Vietnam (2021). Report on Vietnam Industry and trade 2021, pp.17
- Shepotylo, O. (2016). Effect of non-tariff measures on extensive and intensive margins of exports in seafood trade. *Marine Policy*, 68, 47-54.
- Silva, J. S., & Tenreyro, S. (2006). The log of gravity. *The Review of Economics and statistics*, 88(4), 641-658.
- UNCTAD. (2020). Non-tariff measures. <https://unctad.org/topic/trade-analysis/non-tariff-measures>
- Yalcin, E., Felbermayr, G., & Kinzius, L. (2017). Hidden protectionism: Non-tariff barriers and implications for international trade. *ifo Center for International Economics*, 8-18.