Interest trade in agriculture sector between Vietnam and some WTO member countries

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Abstract. Based on secondary data from Uncomtrade, the article uses a gravity model to assess intra-industry trade of agricultural products between Vietnam and some WTO member countries. Research results show that in the period 2009-2018 Intra-agricultural trade between Vietnam and WTO member countries tends to increase over time as shown by the infra-agricultural trade index of agricultural products IIT. Productivity between Vietnam and China, Indonesia, Japan, Singapore, and Thailand were higher than other countries and relatively stable in the period 2009-2018. In addition, the results of quantitative analysis model show economic scale factors, per capita income, geographical distance, extent of economic openness, population size, and agricultural land area have a positive impact on intra-agricultural trade of Vietnam and some WTO member countries.

1 Introduction

Vietnam is a country with developed agriculture and has achieved rapid and stable growth over the past four decades. The structure has shifted towards more efficiency, especially since Vietnam actively integrates into the world economy with the participation of large economic organizations like the WTO. Despite the impact of the economic recession, agriculture was still the industry with higher export turnover than imports in the 2011-2018 period. Among the 10 items with turnover of over 1 billion USD, including: rice, coffee, rubber, cashew, pepper, cassava, vegetables, shrimp, pangasius, and forest products, they are mainly agriculture. Other economic sectors are still affected by the economic recession, the agricultural sector has overcome many difficulties, achieved quite comprehensive results, the industry growth has reached a relatively high rate. In the current context of globalization and international integration, there are new manifestations of the role of international trade.

This process has had a huge impact on the world economy and especially facilitated the development of trade in both width and depth. In fact, the share of intra-industry trade between countries in the same affiliated bloc, countries with similar income levels or between countries with overlapping demand are often greater than the corresponding shares of non-linked countries by taking advantage of economies of scale.
There have been many studies on intra-industry trade, collectively divided into two groups: (i) Focusing on explaining the existence of intra-industry trade in theory; (ii) Focus on empirically measuring and analyzing intra-industry trade. The second approach towards modern trade practice, this topic is conducted to identify the nature and trend of intra-industry trade activities between Vietnam and some typical countries in commercial relations on agricultural products, that is to identify the factors and the extent to which they affect intra-industry trade. The analysis helps to see more clearly the export and import of agricultural products between Vietnam and the world in the context after Vietnam joined WTO.

2 Overview of theory and research methods

Hatab et al [1] research on "Gravity Model Approach to Identify Egyptian Exports". Through the use of gravity model to analyze the main factors affecting agricultural exports of Egypt for the period 1994-2008, the study clearly states the theoretical basis of the proposed research model, the data.

Research results show that GDP, transportation costs, distances between countries, market size, and exchange rates contribute to agricultural exports. Ismail et al research on "The impact of the ASEAN Free Trade Area on intra-industry trade, period 1986-2010", research on using gravity model to find the decisive factor on trade bilateral trade of ASEAN including GDP, population, supporting capital, gap between countries [2].

The model includes the dependent variable which is the sum of exports at a time; the independent variable is the GDP of countries' exports and imports at a time, the population of exporting and importing countries at a time.

Absolute timing differences between GDP ratios of exports and imports between countries, distance between countries, dummy variable dummy = 1 if two countries are on the same border and vice versa. The study uses table data for 25 years (1986-2010) to analyze and discuss research results. [3,4] "Vietnam's export positioning, approach by gravity model", the author uses the gravity model to analyze the determinants of Vietnam's exports to 40 major export markets in the period from 1995-2011.

The study stated the theoretical basis for the model, the dependent variable and the independent variables, specifying the data source to collect and describe the variables in the model. The results show that factors such as GDP, transportation costs, geographical distance, income of the population and exchange rate have a certain impact on Vietnam's internal exports of processed goods with other countries. members of APEC. Tran Nhuan Kien and Ngo Thi My research on "Factors affecting agricultural exports of Vietnam: analysis by gravity model" [3].

The study used gravity model to analyze the factors affecting Vietnam's agricultural exports in the 2007-2013 period. Based on the existing studies, the study inherited some elements from previous studies and added a number of new factors consistent with current Vietnamese practices such as agricultural land area, how does Vietnam become a member of the WTO affect the export of agricultural products? Research results have shown that exchange rate factors, economic size, population, gap in economic development level and Vietnam's implementation of international commitments have a strong impact on exports. agricultural products of Vietnam [5]. This is the basis for proposing a number of measures for Vietnam's agricultural exports to grow stably and sustainably.

This study uses the study of Grubel and Lloyd [6] with a set of G-L indicators to help assess trade structure at a period of time.

This metric is calculated using the following formula:
\[ IIT_{ijk} = 1 - \frac{|X_{ijk} - M_{ijk}|}{X_{ijk} + M_{ijk}} \]  

(1)

In which:
IIT is the index of intra-industry trade;
Xi is export and Mi is import;
i denote the commercial item; j is country j; k is country k.

The IIT index has a value of 0 to 1, IIT = 0 represents the trade between country j and country k is a purely interdisciplinary trade; IIT = 1 denotes trade between country j and country k purely intra-industry trade. A value of IIT \geq 0.5 shows that trade between country j and country k is mainly caused by intra-industry trade. IIT <0.5 or less is mainly due to the impact of interagency trade.

Equation (1) only measures intra-industry trade between country j and country k for each commodity, but cannot measure the total intra-industry trade between the two countries (total value of all items that the 2 countries trade with each other). To calculate intra-industry trade between the two countries, we use the weighted average method according to the formula:

\[ IIT_{ijk} = \sum_{i=1}^{n} W_{ijk} \left[ 1 - \frac{|X_{ijk} - M_{ijk}|}{X_{ijk} + M_{ijk}} \right] \]  

(2)

In which: IITjk is the index of IIT between country j and country k
Xi is the export value of good i from country j to country k
Mijk is the import value of good i from country j to country k
n is the number of commodities in which two countries trade
wijk is the proportion of imports and exports of commodity industry i in the total import-export turnover
Wijk: is the weight and is calculated as follows:

\[ W_{ijk} = \frac{X_{ijk} + M_{ijk}}{\sum_{i=1}^{n} (X_{ijk} + M_{ijk})} \]  

(3)

Therefore, the formula for measuring intra-industry trade between the two countries is calculated as follows:

\[ IIT_{ijk} = \frac{\sum_{i=1}^{n} (X_{ijk} + M_{ijk}) - \sum_{i=1}^{n} |X_{ijk} - M_{ijk}|}{\sum_{i=1}^{n} (X_{ijk} + M_{ijk})} \]  

(4)

IIT index can be calculated on the basis of bilateral relations between two countries or between a country and a group of other countries in the world. Most studies on IIT are calculated on bilateral relations with the exports and imports of the research country and trading partner.

Based on the scientific basis of IIT, HIIIT, and VIIT of agricultural products, combined with the review and reference of related research projects, plus the reality in Vietnam is a
developing country, has advantages in agricultural products and is in the process of opening up the economy to integrate deeply into the regional and global economy.

Therefore, in this study, the dependent variables include: IIT, HIIT and VIIT calculated according to the Grubel and Lloyd index (G-L). Values following the built G-L formula run from 0 to 1. Using this value in the regression would violate the assumption that the error portion will follow the normal distribution rule.

So, this study applies the log conversion of IIT according to [7,8]:

$$\ln IIT_{ij} = \ln (IIT/(1 - IIT))$$  \hspace{1cm} (5)

In which:

$\ln IIT_{ij}$ is the level of IIT (total intra-industry trade, vertical trade, horizontal intra-industry trade) between Vietnam and another WTO member country.

The explanatory variables include: Gross domestic product (GDP), difference in gross domestic product (DGDP), income per capita (PCI), difference in per capita income (DPCI), geographic gap (DIST), Economic Openness (OPEN), Foreign Direct Investment (FDI), volatility in exchange rates (EXCH), Trade imbalance (TIMB), Population Size (POP), Agricultural Land Area (AGRILAND). All variables except DGDP, DPCI, TIMB, OPEN, FTA, BOR are in natural log form. Based on the analysis of theoretical and experimental studies, the topic of building the analytical model is presented in the following form:

Factors affecting IIT of agricultural products

$$\ln IIT_{ij} = \beta_0 + \beta_1 \ln GDP_i \cdot GDP_j + \beta_2 \ln PCI_i \cdot PCI_j + \beta_3 \ln DPCI_{ij} + \beta_4 \ln DIST_{ij} + \beta_5 \ln FDI_i \cdot FDI_j + \beta_6 \ln EXCH_{ij}$$

GDPi is Vietnam's gross domestic product
GDPj is the gross domestic product of each member of the WTO (j = 1 - 8).
PCIi is Vietnam's per capita income
PCIj is the per capita income of each WTO member (j = 1-8).
DGDPij is the difference in GDP between Vietnam and individual WTO members.
DPCIij is the difference in per capita income between Vietnam and individual WTO members.
DISTij is the geographical distance between Vietnam and each WTO member
POPi is the population of Vietnam
POPj is the population of each WTO member
OPENi is the openness of the Vietnamese economy
OPENj is the openness of the economy of each WTO member
TIMBi is the level of trade imbalance in Vietnam
TIMBj is the level of trade imbalance of each WTO member
FDIj is the value of foreign direct investment in Vietnam
FDIR is the value of foreign direct investment in each WTO member
EXCHij is the exchange rate fluctuation between Vietnam and each WTO member
AGRILANDi is the agricultural land area of Vietnam
AGRILANDj is the agricultural land area of each WTO member
uijt is the specific regression coefficient
(DPCI), Economic openness (OPEN), Foreign direct investment (FDI), exchange rate volatility (EXCH), Trade imbalance (TIMB), Population size (POP), Area of agricultural land (AGRILAND). Bilateral trade data, import and export data between Vietnam and WTO members are collected from the United Nations Consumer Trade Statistics Database (UN Comtrade); Data on GDP, PCI, FDI, exchange rates and population size were collected from the IMF and the World Bank; The geographical distance between Vietnam and its trading partners is obtained from the websiteIndo.com. The agricultural land area data is derived from the official FAO data report.

3 Research results and discussion

The level of intra-industry trade of agricultural products of Vietnam and some WTO member countries was included in the study in the period 2009 - 2018, the results are as follows:

Table 1. Intra-agricultural trade volume between Vietnam and WTO member countries (million USD) (Source: Calculated from UN Comtrade data).

| Nation   | 2010   | 2011   | 2012   | 2013   | 2014   | 2015   | 2016   | 2017   | 2018   |
|----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Australia| 482    | 467    | 577    | 675    | 717    | 755    | 885    | 983    | 1074   |
| Canada   | 226    | 85     | 133    | 196    | 380    | 451    | 495    | 546    | 652    |
| China    | 1149   | 1252   | 1355   | 1557   | 1828   | 2961   | 3111   | 3978   | 4231   |
| Indonesia| 184    | 207    | 970    | 1113   | 1171   | 521    | 709    | 784    | 821    |
| Japan    | 360    | 240    | 325    | 425    | 428    | 1553   | 2175   | 2759   | 2910   |
| South Korea| 368 | 400    | 536    | 822    | 886    | 1540   | 1500   | 1578   | 1593   |
| Malaysia | 935    | 858    | 993    | 1407   | 1503   | 380    | 403    | 503    | 567    |
| Singapore| 313    | 159    | 308    | 342    | 440    | 641    | 860    | 904    | 958    |
| Thailand | 300    | 246    | 351    | 561    | 768    | 739    | 955    | 987    | 1076   |
| U.S.A    | 1828   | 1730   | 2816   | 3451   | 3151   | 5719   | 6726   | 7304   | 8296   |

The above table shows that the volume of intra-industry trade of agricultural products between Vietnam and the WTO member countries tends to increase over the years. In particular, the volume of intra-agricultural trade between Vietnam and the United States, China, Japan, South Korea, and Thailand is noticeably higher than that of other countries. In addition, we also base on the intra-industry trade index (IIT) to examine the level of intra-industry trade in agricultural products between Vietnam and some WTO member countries, which are shown in the following table:

The table above shows that the IIT index of agricultural products between Vietnam and China, Indonesia, Japan, Singapore, and Thailand is higher than other countries and is relatively stable in the period 2009 - 2018. In particular, the IIT index between Vietnam and Indonesia is the highest. In 2009, the IIT index of Vietnam and Indonesia reached 0.127, but by 2018, the IIT index of agricultural products of Vietnam and Indonesia reached 0.441.

Table 2. Intra-commodity trade index (IIT) of agricultural products between Vietnam and WTO member countries (Source: Calculated from UN Comtrade).

| Nation   | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|----------|------|------|------|------|------|------|------|------|------|
| Australia| 0.081| 0.09 | 0.07 | 0.057| 0.069| 0.072| 0.081| 0.079| 0.076|
| Canada   | 0.104| 0.156| 0.188| 0.173| 0.193| 0.126| 0.126| 0.135| 0.147|
| China    | 0.247| 0.273| 0.281| 0.216| 0.204| 0.216| 0.234| 0.224| 0.237|
| Indonesia| 0.25 | 0.31 | 0.233| 0.179| 0.354| 0.478| 0.427| 0.438| 0.441|
| Japan    | 0.187| 0.117| 0.124| 0.135| 0.123| 0.123| 0.11 | 0.124| 0.127|
| South Korea| 0.27 | 0.237| 0.235| 0.303| 0.277| 0.211| 0.17 | 0.205| 0.218|
This is the partner with the largest intra-industry trade relationship with Vietnam, the average IIT in the period 2009-2018 is 0.3237. The index of IIT in agricultural products was followed by China, Singapore, Thailand, and Korea. This shows that these are important trading partners within the agricultural sector of Vietnam, due to the advantage of geographical distance with these countries all in Asia, so they have similar cultural and Lower transportation and other costs. different trends in consumption. similar goods create the maintenance and growth of IIT.

To consider the level of intra-agricultural trade in Vietnam in more detail, we calculate the horizontal and vertical IIT of agricultural products (Tab. 3).

The table above shows that between Vietnam and China, Canada, Indonesia, and Malaysia, there is a tendency to increase VIIT of agricultural products. The horizontal trade index of agricultural products (VIIT) between Vietnam and Thailand is the largest, averaging 11.91% in the 2009-2018 period. This shows that the exported goods between Vietnam and Thailand are mainly different in quality. Followed by the index of VIIT of agricultural products between Vietnam and China reached an average of 8.48% in the 2009-2018 period. In recent years, China has traded agricultural products with Vietnam, mainly products of different quality, to meet the diversification of consumer tastes [9].

In general, in the period of 2009 - 2018, the index of VIIT of agricultural products between Vietnam and the WTO member countries remained stable [10]. Due to the modest level of production and processing of agricultural products in Vietnam and low agricultural processing technology. product quality is not competitive with other countries. Vietnam mainly exports low quality products and imported high quality agricultural products [11].
mainly exports low quality products and imported high quality agricultural products.

Processing technology between Vietnam and the WTO member countries remained stable in the 2009-2018 period. In recent years, Vietnam's HIIT in the period 2009-2018 averaged 11.91%. The main reason is that the quality of Vietnam's agricultural products has gradually improved, more diversified in types, designs, and product differentiation. An understanding of this has been paid more attention to create more competitiveness for Vietnamese agricultural products. Some favorite markets. At the same time, many imported agricultural products were present on the Vietnamese market and favored by Vietnamese consumers.

Results of IIT calculation of agricultural products between Vietnam and WTO members (10 countries) from 2009 to 2018 give 110 observations. On that basis, the author implements the REM model to quantify the impact of these factors on intra-industry trade of Vietnam's agricultural products. The results of the model are presented in the following tables.

Table 4. Vertical trade index of agro-commodity sectors between Vietnam and WTO member countries (Source: Calculated from UN Comtrade).

| Nation      | 2010  | 2011  | 2012  | 2013  | 2014  | 2015  | 2016  | 2017  | 2018  |
|-------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Australia   | 0.045 | 0.06  | 0.044 | 0.034 | 0.036 | 0.039 | 0.038 | 0.037 | 0.038 |
| Canada      | 0.064 | 0.105 | 0.092 | 0.043 | 0.053 | 0.000 | 0.045 | 0.044 | 0.047 |
| China       | 0.165 | 0.201 | 0.206 | 0.167 | 0.165 | 0.167 | 0.175 | 0.176 | 0.178 |
| Indonesia   | 0.164 | 0.16  | 0.153 | 0.122 | 0.296 | 0.42  | 0.359 | 0.411 | 0.416 |
| Japan       | 0.095 | 0.045 | 0.061 | 0.088 | 0.076 | 0.075 | 0.063 | 0.068 | 0.072 |
| South Korea | 0.2   | 0.161 | 0.254 | 0.233 | 0.199 | 0.141 | 0.091 | 0.178 | 0.185 |
| Malaysia    | 0.09  | 0.11  | 0.097 | 0.072 | 0.076 | 0.094 | 0.133 | 0.121 | 0.129 |
| Singapore   | 0.131 | 0.085 | 0.062 | 0.032 | 0.035 | 0.137 | 0.073 | 0.089 | 0.094 |
| Thailand    | 0.146 | 0.102 | 0.143 | 0.146 | 0.242 | 0.142 | 0.097 | 0.134 | 0.137 |
| U.S.A       | 0.083 | 0.077 | 0.076 | 0.074 | 0.096 | 0.045 | 0.047 | 0.047 | 0.049 |

The table above shows the highest vertical trade index of agricultural products (HIIT) with Vietnam being Indonesia, China, South Korea, and Thailand. In recent years, the HIIT index with some countries has a higher proportion such as China, Thailand, Singapore, Indonesia, Malaysia. The main reason is that the quality of Vietnam's agricultural products has gradually improved, more diversified in types, designs, and product differentiation has been paid more attention to create more competitiveness for Vietnamese agricultural products. Some favorite markets. At the same time, many imported agricultural products were present on the Vietnamese market and favored by Vietnamese consumers.

Results of IIT calculation of agricultural products between Vietnam and WTO members (10 countries) from 2009 to 2018 give 110 observations. On that basis, the author implements the REM model to quantify the impact of these factors on intra-industry trade of Vietnam's agricultural products. The results of the model are presented in the following table.

Table 5. Estimation results of factors affecting intra-industry trade in agricultural products between Vietnam and some WTO member countries (Source: Results of data processing on Eviews 8.0).

| Independent variables | IIT   | HIIT  | VIIT  |
|-----------------------|-------|-------|-------|
| Intercept factor      | -205.12 (0.000)** | 10.732 (0.103) | -274.375 (0.013)** |
| Size of the economy   | 3.764 (0.000)** | 1.023 (1.103)** | 5.374 (0.026)** |
| Economic scale difference | -0.043 (0.076)* | -0.276 (0.068)* | 0.048 (0.103)* |
| Per capita income     | 5.418 (0.000)** | 0.056 (1.052) | 6.087 (0.016)** |
| The difference in income per capita | -0.162 (0.105)* | -0.501 (1.322)** | 0.496 (0.000)** |
| Geographical distance between trading partners | -0.231 (0.061)* | -0.327 (0.104)* | -0.223 (0.097)* |
| Openness of the economy | 0.534 (0.003)** | 0.627 (0.103)* | 0.072 (0.758) |
| Population size       | 5.107 (0.000)** | 0.774 (0.106) | 7.032 (0.013)** |
The results in the table above show that the model is consistent with the data, explaining most of the variation in intra-industry trade. Basically, the coefficients of the variables are of the expected value. Most of the coefficients of the variables are statistically significant, except for trade imbalances, foreign direct investment and exchange rate fluctuations. This shows that the research results of factors affecting intra-industry trade in agricultural products of Vietnam with some WTO member countries are consistent with the hypothesis.

The economic scale factor has a great influence on IIT, HIIT and VIIT. The estimated results in the table above show that the economic scale of Vietnam and trading partners increases by 1%, the level of IIT. HIIT and VIIT of Vietnam's agricultural products and trading partners will increase by an average of 3.764 respectively, %; 1.023% and 5.374%. This result is also consistent with the hypothesis set out.

The difference in economic size between Vietnam and its trading partner has a negative effect on IIT, HIIT and VIIT. The estimated results in the table above show that the difference in economic scale increases by 1%. the level of IIT. HIIT of Vietnamese agricultural products and trading partners will decrease by an average of 0.043%; 0.276% and VIIT level increased by 0.048% on average.

Per capita income factors have a positive effect on IIT, HIIT and VIIT. This is explained when people's income increases. they will increase their spending needs. increase consumption of commodities in general and agricultural products in particular. The estimated results in the table above also show that the per capita income of Vietnam and trading partners increases by 1%. the level of IIT. HIIT and VIIT of Vietnam's agricultural products and trading partners will increase on average. 5.418% respectively; 0.056% and 6.087%.

The estimation results in the table above show that the difference in per capita income between Vietnam and other countries has a negative effect on IIT. HIIT. and VIIT in particular. The difference in income per capita between Vietnam and other countries increases by 1%, the average level of VIIT increase is 0.496% and the level of IIT. HIIT of agricultural products will decrease on average by 0.162% and 0.501%. respectively. Due to the differences in per capita income between countries, the demand for agricultural products is also different. This result is also consistent with the hypothesis set out.

For the geographical distance variable. the estimation results in the above table show an inverse correlation with IIT. If the geographical distance between Vietnam and trading partners is close by 1%. the level of IIT. HIIT. and VIIT of agricultural products will increase on average by 0.231%. respectively; 0.327% and 0.223%. The closer the geographical distance between countries. the more convenient the trade is due to the reduction of costs such as transportation costs. information costs, other expenses and exchange of goods with each other.

The favourable way because the countries close to each other will have many similarities in goods consumption.

For the degree of openness of the economy. the estimation results show that this factor has a positive relationship with IIT and HIIT. The higher the openness of the economy. the higher the level of economic integration with the outside. the trade in goods is encouraged to expand. limit trade barriers. so domestic trade. industry with development conditions.
For VIIT, the estimation results show that there is no positive impact between economic openness on this factor. This shows that a larger open economy can lead to an imbalance in the balance of trade.

Population size factors have a positive effect on HIIT and VIIT. The estimated results in the table above show that when the population size increases by 1%, the level of IIT, HIIT and VIIT increases on average by 5.107%, 0.774% and 7.032%. The larger the population size, the more likely it is to consume agricultural products. Therefore, the level of intra-industry trade in agricultural products is higher [12].

Agricultural land area factors have a positive effect on IIT and HIIT. Agricultural land is an important resource factor of the agricultural sector. So countries with a lot of agricultural land will have development of agricultural production activities, leading to the development of intra-agricultural trade [13]. Although agricultural land has a positive impact on Vietnam's agricultural trade, it is not much. The reason is that Vietnam's agricultural exports are mainly raw, freshly processed, low added value and imported from other countries with high added value.

The estimation results of the factors of trade imbalance, factors of foreign direct investment and the fluctuation of exchange rate to IIT. HIIT and VIIT are not statistically significant. showing the impact of These factors are not apparent up in IIT. HIIT and VIIT. This can be explained by the fact that these factors can affect a country's IIT level. In this study, only IIT of agricultural products is calculated, so it may not reflect correctly with theory. In addition, the factor of the level of trade imbalance can imbalance between exports and imports between Vietnam and WTO member countries. So it can affect the IIT of the economy, but in a sector.

There may not be an imbalance between exports and imports in agricultural products. so this factor may not have an impact on IIT. As for the variable FDI can be explained that as FDI inflows to a country increase, that capital can be attracted to other more attractive fields than into agriculture. Thus. FDI can contribute to an increase in one-way trade between the exporting and importing countries. Therefore, although the scale of FDI increases, it also has a unclear effect on IIT.

4 Conclusion

In order to promote intra-agricultural trade. Vietnam needs to develop a consistent and stable policy mechanism in the long run. focusing on quality to help businesses build investment orientation and develop; need direct support for the implementation of export targets in terms of commodities and markets; incentive policies must reach the right people. focus on the right products. the right market and the right subjects to be encouraged; to formulate policies to encourage the development of key export products. commodities with small turnover, potential and high growth rates. In order for the border trade economy to develop sustainably. in addition to increasing the competitiveness of export goods by enterprises. it is very necessary to support the State in mechanisms and policies.

Exported goods must be competitive enough to penetrate through official channels to enter the WTO market. Only to improve the trade balance and avoid the risks of the current asymmetric economic relationship.

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