

Factors affecting Vietnam's coffee exports to the EU market: A Gravity Model Approach

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Abstract: Vietnam is known as one of the biggest coffee exporters in the world. Vietnamese coffee is exported to over 80 countries and territories in the world. Among trade partners, the European Union (EU) is currently Vietnam's largest coffee import market. However, Vietnam's coffee export performance, a developing country, to the EU, including in highly developed countries, face many barriers such as the institutional quality, technology gap. This paper presents the using the gravity model to analyze the main factors influencing Vietnam's coffee exports to the EU for the period from 2005 to 2018. The estimation results shows that while the factors: the pooled GDP per capita, pooled population, pooled institutional quality and the "WTO" dummy have a positive impact, whereas the gap geography, technology gap have an impeding impact on coffee exports. Meanwhile, the agricultural land rate has no significant impact on coffee exports. Based on those results, the study proposes some recommendations to promote Vietnam's coffee export to the EU market.

Keywords: Export, coffee exports, Vietnam, the EU, the gravity model

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I. Introduction

The EU has been currently becoming one of the Vietnam's biggest trade partners. In the period 2005 - 2018, EU was the second trade partners of Vietnam behind China, with the average growth rate of nearly 12% per year. EU is also the second import market of Vietnam behind China. In 2005, the exports of Vietnam to the EU worth nearly USD 5.5 billion, this value worth USD 41.8 billion in 2018, nearly 7.5 times since 2005.

In recent years, coffee has been Vietnam's important export product. Especially; the EU is now Vietnam's largest coffee import market. On February 12, 2020, the European Parliament officially ratified the Free Trade Agreement between Vietnam and the European Union (EVFTA). The agreement is expected to bring huge export opportunities for Vietnam to this market. However, Vietnam's coffee export performance, a developing country, to EU, including in highly developed countries, still face many barriers, especially barriers on the institutional quality, technology gap. Therefore, it is essential to analyze the factors affecting Vietnam's coffee exports to the EU market in the current period.

The objectives of the paper are two fold: Firstly, it provides an overview picture of Vietnam's coffee export to the EU market. Secondly, it analyzes the factors affecting Vietnam's coffee exports to the EU market using the gravity model approach.

II. Research Method

2.1. Gravity model

The gravity model was firstly applied to examine international trade flows by Tinbergen (1962) and Poyhonen (1963). The model applies Newton's universal law of gravitation in physics, a famous British physicist, which states that the gravitational attraction between two objects is proportional of their masses and inversely relate to square of their distance.

Do Tri Thai (2006) (cited from Krugman et al, 2005) showed that the general gravity model applied in bilateral trade has the following form:

$$T_{ij} = A \frac{Y_i Y_j}{D_{ij}^2} \quad (1)$$

where:

A is a constant term

T_{ij} is the total trade flow from country i to country j

Y_i, Y_j are the economic size of two country i and j. Y_i, Y_j are usually gross domestic product (GDP) or gross national product (GNP).

D_{ij} is the distance between two country i and j.

The gravity model has long been criticized for lacking of theoretical foundation. Therefore in recent years there has been increasing interest in providing the theoretical support for the gravity model.

Rahman (2003) (cited from Evenett and Keller, 1998) showed that most economists derived gravity model from three international trade theories, which are the Ricardo theory, Hecksher-Ohlin theory and new trade theory. Some typical authors are: Linneman (1966), Anderson (1979), Bergtrad (1985), Bergtrad (1989), Eaton and Kortum (1997), Deardorff (1998) and Mathur (1999), etc.

Recently, the gravity model has been empirically successful. In particular, many authors have analyzed the actors affecting exports from developing countries to developed countries. For example, Eyayu (2014) analyzed the input quantity and the institutional quality of exporting countries; Filippini et al. (2003) analyzed the impact of "technology gap". Other authors studied the effects of "economic gap".

In Vietnam, there were a few studies such as Do Tri Thai (2006), Tu Thuy Anh et al. (2008), etc., used variable pooling techniques in the model (multiplying independent variables of exporting countries with corresponding factors of importing countries).

2.2. Estimation model

The gravity model used in this paper is presented in equation (2), in which almost variables are expressed in logarithms, except the variables TECHGAP and WTO.

$$\ln EX_{ijt} = \beta_0 + \beta_1 \ln(PGDP_{it} \times PGDP_{jt}) + \beta_2 \ln(POP_{it} \times POP_{jt}) + \beta_3 \ln(DIST_{ij}) + \beta_4 \ln(AGRIAREA_{it} \times AGRIAREAP_{jt}) + \beta_5 \ln(INST_{it} \times INST_{jt}) + \beta_6 \ln(TECHGAP_{ijt}) + \beta_7 \ln(WTO) + u_{ijt} \quad (2)$$

Where:

$i = 1$: exporting country (Vietnam)

$j = 1, 2, \dots, 26$: is the index for 26 importing countries (the EU member).

$t = 2005, 2006 \dots 2016, 2017, \text{ and } 2018$

EX_{ijt} : exports from country i to country j in year t

$PGDP_{it}, PGDP_{jt}$: GDP per capita of country i and country j in year t

POP_{it}, POP_{jt} : Populaion of country i and country j in year t

$DIST_{ij}$: geographical distance between country i and country j

$AGRIAREA_{it}, AGRIAREAP_{jt}$: Agricultural landrate of country i and country j in year t

$INST_{it}, INST_{jt}$: Institutional quality of country i and country j in year t

$TECHGAP_{ijt}$: Technology gap between country j and country i in year t

WTO : A dummy variable that has a value of 1 if country i and country j are members of the World Trade Organization.

U_{ijt} : The random error of the model

β : Parameters of the model

Research hypothesis:

The first variable is the pooled GDP per capita ($PGDP_{it} \times PGDP_{jt}$). GDP per capita represents for both the input resource and the customer income. The empirical study of Anh *et al* (2008) shown that the pooled GDP per capita has a positive effect on exports. In fact, the bilateral trade relationship between Vietnam and the EU is complementarily, uncompetitive, and agricultural products (coffee, fruit...) are Vietnam's advantage export goods to the EU market. Therefore, the coefficient of the pooled GDP per capital is expected to take a positive sign.

The second variable is the pooled population ($POP_{it} \times POP_{jt}$). The population represents for both the labor and market size. So, this variable can boost both the production and consumption. The empirical study of Do Tri Thai (2006) also point out that the pooled population have a positive effect on trade between Vietnam and the EU countries. Based on the bilateral trade relationship between Vietnam and the EU, the coefficient of the pooled population is expected to take a positive sign. The third variable is distance ($DIST_{ij}$). The distance is proxied for the transportation cost between Vietnam and EU countries. The larger the distance between countries, the higher the transport cost. This variable is expected to have a negative effect on coffee exports. The fourth variable is pooled agricultural land rate ($AGRIAREA_{it} \times AGRIAREAP_{jt}$). With favourable land, Vietnam has a lot of competitive in the commercial coffee industry. So, this variable is expected to have a positive effect on coffee exports. The fifth variable is the pooled institutional quality. This variable affects on national competitive capability and facilitates the export performance. Eyayu (2014) used the institutional quality in the model. It is assumed to have had a positive effect on exports. The sixth variable is the technology gap ($TECHGAP_{ijt}$). The TECHGAP variable is created by taking the technological index of the EU countries and subtracting the technological index of Vietnam. Because some technology gaps are less than 1, thus logarithms can't be taken. According to Filippini *et al* (2003), the technological gap has the negative effect on agricultural exports from country i to country j , where i is a developing country and j is a developed country. In the study, this variable is expected to have a positive effect on coffee exports.

2.3. Data source

The study uses panel data of twenty six countries in European Union namely: Austria, Belgium, Bulgaria, Cyprus Republic, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Litva, Latvia, Malta, Netherlands, Poland, Portugal, Romania, Spain, Slovak Republic, Slovenia Republic, Sweden, United Kingdom for the time period from 2005 to 2018¹.The data is obtained from United Nations Commodity Trade Database, World Bank, etc.

The exports are obtained from United Nations Commodity Trade Database. Gross domestic product, population, agricultural land area of EU and Vietnam are obtained from World Bank. Data on distance (in kilometer) between Hanoi (the capital of Vietnam) and other capital cities of EU countries is collected from website <http://www.timeanddate.com>. Data on the institutional quality, technology gap is collected from World Economic Forum.

The estimation Method

The author uses Stata 14 software and the panel data estimation model. Panel data contain many model that can be estimated. These model are pooled (OLS), fixed (FEM) and random (REM) effect models. Firstly, Breusch-Pagan Lagrange (LM) test is applied to determine which of the models, the OLS or panel effect model more appropriate is. Secondly, Hausman test is applied to determine which of the models, FEM or REM is the most appropriate. In particular, the study of Kaise et al. (2014) upgraded the panel effect models to the Robust-Cluster models. These models can automatically detect and overcome all the fundamental defects of the model.

III. Analysis

3.1. Overview Vietnam's coffee exports to the EU market

Vietnam has now become the second largest coffee export country in the world after Brazil. Especially for exporting Robusta, Vietnam is the leading exporter in the world. Among Vietnam's trade partners, the EU market is the largest import market of Vietnamese coffee. In the period between 2005 and 2018, the coffee exports of Vietnam to the EU increased by nearly 4.4 times from 315 million USD up to 1386 million USD. Average growing rate of coffee exports in this period is nearly 12%. Especially, coffee is the most important export agricultural product of Vietnam in the EU market. In 2005, coffee exports accounted for 47% the total amount of agricultural exports. In the year 2018, coffee exports are approximately 46%. The information about coffee exports of Vietnam to the EU has been illustrated as figure 1:

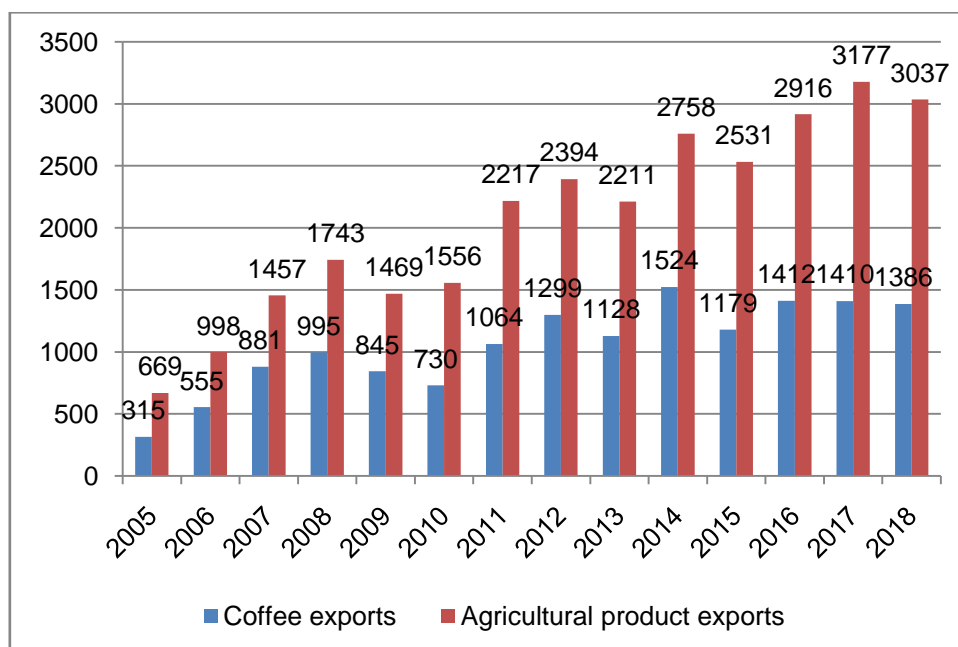


Figure 1: Coffee exports of Vietnam to the EU

(Unit: million USD)

Source: UN Comtrade, 2020

¹Croatia and Luxembourg weren't considered in this study because Croatia joined the EU in 2014 and Vietnam's coffee exports to Luxembourg were very small in the 2005-2018.

However, Vietnam's coffee exports in the EU have had a big difference. From 2005 to 2018, the five largest coffee importers of Vietnam were Germany, Belgium, Spain, United Kingdom and Italia, respectively. These five countries accounted for over 99% of Vietnam's coffee exports in the EU in that period. Among these five countries, Germany was the largest coffee importer of Vietnam, with the imports being 502 million USD in 2005 and 459 million USD in 2018, accounting for 33% and 33,1% of Vietnam's coffee exports in the EU. Oppositely, the remaining countries only accounted for less than 1%. This result shows that the EU market has been a potential market for Vietnam in the coming time.

The Top 5 EU countries importing Vietnam's coffee is shown as follow:

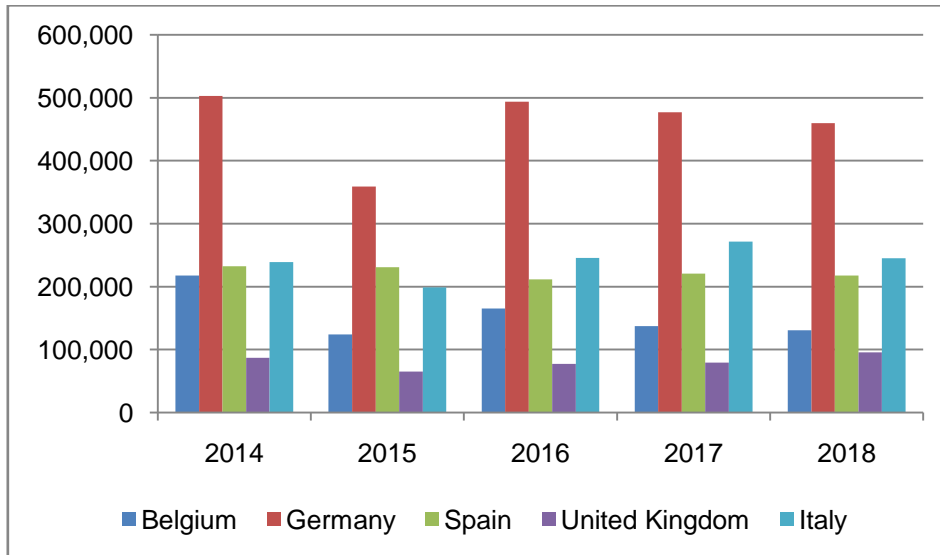


Figure 2: Top 5 EU countries importing Vietnam's coffee

(Unit: million USD)

Source: UN Comtrade, 2020

Despite having relatively impressive export results, most of Vietnam's exported coffee to the EU market has been raw coffee. In the 2005-2018 periods, the percentage of Vietnam's raw coffee exported to the EU market remained over 90%. In 2005, the result was 99.5%, by 2020 this result was 94.9% (Figure 3). Although the result has been decreased, the improvement is small.

Thus, in the period from 2005 to 2018, Vietnam's coffee export performance to the EU market have achieved certain results but still have some limitations: the exports has a big difference between member countries, the added value of coffee is not high, etc.

The figure 3 graph illustrates raw coffee exports of Vietnam to the EU as follow:

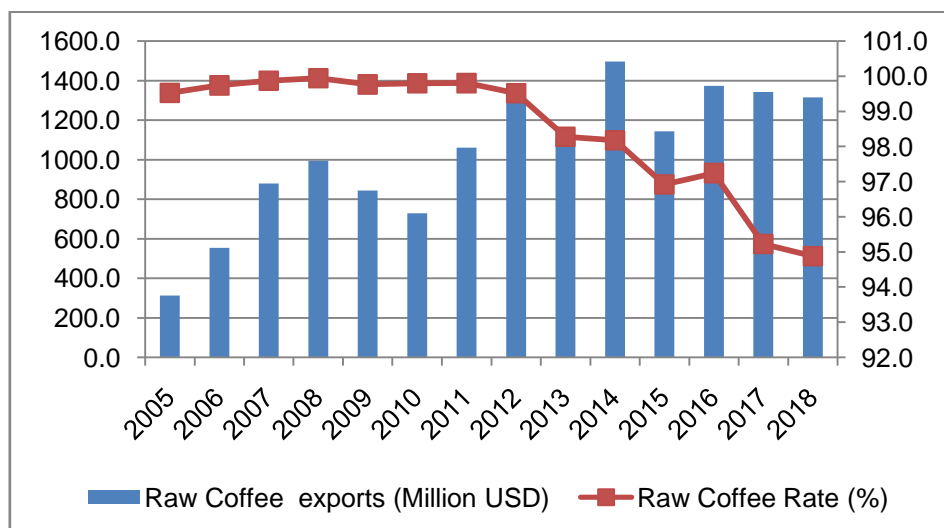


Figure 3: Raw coffee exports of Vietnam to the EU

(Unit: million USD)

Source: UN Comtrade, 2020

3.2. Results and Discussion

The LM test shows that p - value less than 0.05, so that the panel effect model is used. Similarly, the Hausman test shows that p – value more than 0.05, so that REM is used. When the Robust-Cluster REM model is applied, we have the following results (Table 1).

Table1. Results for the Robust-Cluster REM model

Variable	Coefficient	Std.error	z	P> z
Const	-24.81073**	8.034781	-3.09	0.002
Ln(PGDP _{it} *PGDP _{jt})	0.0676242**	0.3278146	0.21	0.037
Ln(POP _{it} *POP _{jt})	1.193216***	0.2293132	5.20	0.000
LnDIST _{ij}	-0.6130484**	0.2918206	-2.10	0.036
Ln(AGRIAREA _{it} * AGRIAREA _{jt})	0.787 1922	0.599825	1.31	0.189
Ln(INST _{it} * INST _{jt})	2.050918*	1.954559	1.05	0.094
TECHGAP _{ijt}	-0.6066385**	0.3064513	-1.98	0.048
WTO	0.602758**	0.301198	2.00	0.045
Number of observations	364			
Adjusted R-squared	0.5190			

Note: *, **, *** are statistically significant at the 10%, 5% and 1% level, respectively

As we can see, R² of the model is 0.519, which means that the dependent variables explain nearly 52% of the independent in coffee export from Vietnam to EU.

Firstly, the pooled GDP per capita has a positive impact on coffee exports. If the pooled GDP per capita increased by 1%, coffee exports will increase by 0.067%. This result is consistent with the research hypothesis. Considering PGDP as input resources, the appropriate solution is that Vietnam needs to invest capital in the agricultural sector. Considering PGDP as the customer's income, this result reflects that if the income of consumers' increases, the coffee exports also will increase. So, Vietnam should boost export to high developed countries.

Secondly, the pooled population has a positive impact on coffee exports. If the pooled population increased by 1%, coffee exports will increase by 1.19%. This factor affects strongly on coffee exports. According to the author, the cause may be that the population represents both market size and size of labor.

Considering the population as input resources, Vietnam' labor force is now relatively abundant and stable but most of them have not been vocational trained. Therefore, this force is very difficult to apply new scientific advances in agricultural production. So, the appropriate solution is that Vietnam needs to improve the labor quality.

Considering the population as the consumers, in order to promote coffee exports, Vietnam should expand the market size because the export performance currently has a large imbalance among countries.

Thirdly, the geographical distance has a negative impact on the coffee exports. This result is in line with many studies and reaffirms the importance of reducing transportation costs in the export performance because Vietnam' transportation cost is currently quite high. On the other hand, the agricultural product weight (such as coffee, fruit, etc.) is often great, while the price is not high.

Fourthly, the institutional quality has a positive impact on coffee exports. If the institutional quality increases by 1%, coffee exports will increase by 2.05%. We can see, this factor affects most strongly on coffee exports. The reason is that the institutional quality influences strongly on the nation competitiveness.

Currently, Vietnam' institution quality has not been improved highly, such as: The people rights have not been given adequately and the accountability of the state agencies has not been appropriated; the governance agency capacity has been poorly improved; the burden of government regulation is high, the efficiency of legal framework is low, etc.

In fact, institutional quality is also one of the important reasons why the EU has not recognized Vietnam as a market economy. This has impacted on Vietnam's export. Vietnam's exports have ever been investigated by the EU in anti-dumping. In these surveys, Vietnam is disadvantage because the non-market

economy has a strong impact on the calculation of dumping margin because the EU will choose a third country to calculate the price of goods. This calculation is not accurate for Vietnam because countries have different natural and social conditions so production costs are not the same.

Therefore, if Vietnam's institutional quality is improved, it will boost Vietnam's export to the EU market.

Fifthly, the technological gap has a negative impact on coffee exports. This result is line with the study of Filippini *et al* (2003). If the technological gap increases by 1 unit, the coffee exports will decrease by 60.7%. For the period from 2005 to 2018, the EU countries' technology index increased rapidly, while its Vietnam only increased slightly. Therefore, the technology gap between Vietnam- EU members, especially the highly developed countries, is still quite large. The estimation results confirm the necessity of high technology application, especially the achievements of the 4.0 industrial revolution in the coffee sector. Therefore, modernizing production and processing technologies is the important solution to improve coffee exports.

Sixthly, the "WTO" dummy variable has a positive impact on coffee exports. If being a member this organization, coffee exports will increase by 60.3%. This result implies that being a member of WTO and FTAs will boost Vietnam's coffee exports. The EVFTA was officially signed. Therefore, exploiting the advantages of EVFTA is the important solution to promote coffee export to the EU market.

IV. Conclusions and Recommendations

In this paper, the gravity model has been employed with panel data and the random effect model covering the period of four teen years from 2005 to 2018 for Vietnam' coffee exports to the EU market. The estimated results show that Vietnam 'coffee exports to the EU market is determined by the pooled GPD per capital, the pooled population, the geography distance, the institutional quality, the technological gap and the "WTO" dummy variable. The agricultural area factor is statistically insignificant.

The study proposes some recommendation to promote Vietnam's coffee export to the EU market.

Firstly, the government focuses on improving the competitiveness of Vietnam's coffee industry by solutions: expanding investing capital in the coffee industry, improving the quality of labor resources, reducing transportation costs, actively applying advance technology and achievements of the Industrial revolution 4.0 in the coffee processing and production performance.

Secondly, improving the institutional quality. Vietnam needs to improve the government policy quality, the governance agency capacity, the efficiency of legal framework. Those solutions will fasciculate the international trade performance.

Thirdly, take advantage of the benefits of WTO and FTAs. EVFTA is about to officially take effect. Therefore, the Government and exporters need to take full advantage of the Agreement such as reducing tax, etc, to expand Vietnam's coffee exports to the EU market.

Finally, *expanding* the potential exporting markets. Currently, the coffee export in some EU members is still very low. Therefore, promoting coffee export to these countries is also the effective solution.

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