

# Factors influencing Vietnam's handicraft export with the gravity model

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## Abstract

**Purpose** – The purpose of this paper is to investigate the factors that affect handicraft export from Vietnam to trading partners in the period 2007–2017, and how those factors influence the export of handicraft products of Vietnam.

**Design/methodology/approach** – The research uses the approach of gravity model based on panel data to evaluate the export of Vietnamese handicraft to 50 main trading partners, covering the period from 2007 to 2017.

**Findings** – The estimated results reveal that Vietnam's GDP, importer's GDP, trading partner's population, Vietnam's inflation, the economic distance between Vietnam and importer, the openness of Vietnam, importing country's common language and the issue that both Vietnam and importer are member of APEC are the main factors affecting Vietnamese handicraft export.

**Research limitations/implications** – This study also has some limitations. It is limited in the data, as some other areas in the world have not been observed and included in the research. In the future, a study with large-scale data of space and time should be conducted, which will certainly give a universal result and fewer errors. However, this paper, in our opinion, provides a significant result and may help the government and policy makers to undertake appropriate measures to improve and promote the export of Vietnamese handicrafts to the world markets.

**Practical implications** – The research describes the current situation, and it studies factors influencing Vietnam's handicraft export using the qualitative analysis. The result should be useful for the policy maker and enterprises to promote export activities of Vietnamese handicrafts to international markets.

**Social implications** – Handicraft export of Vietnam plays an important part in retaining the culture value and social development as well as encouraging sustainable development for the rural poor within the country.

**Originality/value** – The past research related to Vietnamese handicraft export almost analyzed the situation to promote export handicrafts. This research is based on the study of factors affecting trade and the gravity model to elaborate and supplement the factors that affect the export of handicraft in accordance with the actual conditions of Vietnam.

**Keywords** Panel data, Export, The gravity model, Vietnamese handicrafts

**Paper type** Research paper

## 1. Introduction

Handicrafts stand out as an important part of Vietnam's cultural heritage; the industry is a source of productive activities, incomes and livelihoods in rural areas throughout the country, with women and ethnic minorities among the greatest beneficiaries. Such development has been rapid with the availability of resources: skilled labor, quality raw materials, designs and markets. The investment costs are also low, relative to other industrial sectors. Labor-intensive and often highly dispersed handicrafts provide additional incomes in times of low labor demand in agriculture, whose exports can also be an important source of foreign earnings (Wong, 2013). Vietnam is one of the many



developing countries experiencing success in the handicraft exporting market (Szydłowski, 2008). Moreover, handicraft is considered as one of the top 10 largest export values of Vietnam. Vietnamese-made handicrafts, which include handcrafted, semi-handcrafted and machine-made goods, highly appreciated by customers, are handicrafts made from bamboo, rattan, seagrass, lacquer and silk. Fine-art handicrafts of Vietnam are now available in 163 countries and territories around the world.

According to Vietnam Association of Craft Villages, currently, there are 1,864 craft villages and 115 kinds of traditional crafts in Vietnam, with around 1.4mn households and 1,000 enterprises engaged in production or export directly. Unlike other sectors, for instance, the apparel industry that relies on imported materials and handicraft manufacturers can develop adequate supplies of local materials. Local materials have met up to 95–97 percent of the materials needed for exports. This is also an advantage for the development of this sector.

Vietnam exports handicrafts to most countries and regions in the world; the major export markets for Vietnamese handicrafts are Japan, the USA, the European Union (EU), Russia and some countries of Association of Southeast Asian Nations (ASEAN). Canada, Middle East countries and new EU members are also the potential markets for Vietnamese handicrafts. Considering the USA (34 percent), Japan (11 percent) and EU (13 percent) to be the three biggest export markets, the potential of these three markets is huge, because Vietnamese handicraft accounts for a tiny share in their import values; currently, Vietnam accounts for 1.5 percent in the USA, 1.7 percent in Japan and 5.4 percent in EU.

On January 11, 2007, Vietnam officially became a member of the World Trade Organization. This event made an increase in export revenues and export handicraft turnover also. Besides, on January 14, 2019, Vietnam successfully negotiated The Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP). Joining the CPTPP is viewed as a favorable playground, thus creating great opportunities. Additionally, CPTPP would improve Vietnam's competitiveness in the global market by solidifying its participation in lucrative trading blocks.

However, the export turnover of the handicraft industry, despite its growth, has not been corresponding with the rich source of materials and potential of handicraft products in Vietnam, and some categories have still exposed weaknesses. Recently, in some countries such as Thailand, The Philippines and Indonesia, the handicraft export is increasing day by day. This also results in big challenges for a Vietnamese enterprise to find out the solution of promoting export to increase their business. Hence, the following question arises: which factors affect Vietnamese handicrafts export in order to exploit the comparative advantages of the country and contribute to the growth of export handicrafts of Vietnam?

The rest of the paper is structured as below. Section 2 presents the literature review for the gravity model and relating to handicrafts research. Section 3 gives an overview of Vietnamese handicraft export. Section 4 provides research methodology including the present approach, definition and the source of the data. Section 5 outlines the results of the empirical analysis. Section 6 addresses the conclusion.

## 2. Literature review

The gravity model has been used extensively in the international trade literature over the past 50 years (Van Bergeijk *et al.*, 2011). The model has been successfully applied to study flows of various types, such as migration, foreign direct investment and especially international trade flow. This model is based on the performance of the law of gravity, with origin discovered by Sir Isaac Newton, to guess the trade depending on the distance among countries and the interaction of countries. Tinbergen (1962) and Pöyhönen (1963) were the first authors applying the gravity equation to analyze international trade flows. Since then, the gravity model has become a popular instrument in empirical foreign trade analysis.

The equation is then applied to international trade (Anderson, 2010):

$$F_{ij} = G \frac{M_i \times M_j}{D_{ij}^2}, \quad (1)$$

where  $G$  is the constant of proportionality;  $F_{ij}$  is value of bilateral trade between country of origin and destination  $j$ ; the variable  $D_{ij}$  denotes the geographical distance between countries' capital;  $M_i$  and  $M_j$  are country  $i$ 's and country  $j$ 's gross domestic product (GDP), respectively.

Timbergen is a Dutch economist who first applied gravity model to analyze foreign trade flows in 1962. In his model, whereas dependent variable is the trade flow between country A and B, GDP and geographical distance are independent variables. The final estimated results showed that as opposed to distance, the GDP variable has a positive effect on the trade flow between two countries, which means countries with larger economic sizes and closer distance tend to trade with each other more.

Krugman (2005) also utilized gravity model for trade activities and provided a common model as follows:

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

where  $T_{ij}$  is the total trade flow from origin country  $i$  to destination country  $j$ ;  $Y_i$  and  $Y_j$  are the economic sizes of two countries  $i$  and  $j$ .  $Y_i$  and  $Y_j$  are usually GDP or gross national product;  $D_{ij}$  is the distance between two countries  $i$  and  $j$ ; and  $A$  is a constant term.

For the estimation purpose, this relationship can be expressed as follows:

$$T_{ij} = \beta_0 \frac{Y_i^{\beta_1} Y_j^{\beta_2}}{D_{ij}^{\beta_3}}, \quad (3)$$

where  $\beta_0$ ,  $\beta_1$ ,  $\beta_2$  and  $\beta_3$  are the parameters to be estimated. Using natural logarithm, the interpretation of parameter is coefficient of elasticity of trade volume with regard to the explanatory variable. The linear equation can be expressed as follows:

$$\ln T_{ij} = \beta_0 + \beta_1 \ln Y_i + \beta_2 \ln Y_j + \beta_3 \ln D_{ij} + \varepsilon_{ij}, \quad (4)$$

where  $\varepsilon_{ij}$  is the error term of the model. In general,  $\beta_1, \beta_2 > 0$  and  $\beta_3 < 0$ , as per gravity theory.

Theoretical support of the research in this field was originally very poor, but since the second half of the 1970s, several theoretical developments have appeared in support of the gravity model. Anderson (1979) was, perhaps, the first to give the gravity model a theoretical legitimacy. He derived the gravity equation from expenditure systems where goods are differentiated by origin (Armington preferences) and all transport costs are proxied by distance, that is he made the first formal attempt to derive the gravity equation from a model that assumed product differentiation.

Regarding the empirical economic literature, there are a number of empirical approaches that have used the gravity model to explain the trade flow between countries. Ozdeser (2010) applied a gravity equation in estimating parameters of explanatory variables for "eurozone" countries by using panel data, and then these estimated parameters are employed to project trade potentials for Turkey. Elshehawy (2014) did work on the gravity model to research the factors affecting Egypt's exports, leading to a result that Egypt's GDP, importer's GDP, importer's population, regional trade agreements and the border between Egypt and its trading partner are the main factors affecting Egypt's exports to its main trading partners.

Wang (2015) analyzed the factors affecting China's export, which are GDP, distance, the borderline, language and joining the free trade area. By an augmented gravity model, Koh (2013) used panel data and stochastic frontier methods to investigate the determinants of Brunei Darussalam's trade and also estimate its trade potential. El-Sayed (2012) studied the economic effects of trade flow between Egypt and some economic blocs such as ASEAN Free Trade Area, Common Market for Eastern and Southern Africa and EU. Troy (2014) concluded that GDP, distance, official language, exchange rate and history of international trade affect Cricum's trade.

Many researchers used the gravity model to investigate export of specific commodity, such as Ebaidalla (2015) explained the factors' impact on agricultural export of Sudan by the gravity model. The result estimated that the agricultural export of Sudan is not only affected by GDP, population, distance and exchange rate but also by the government's policy and whether the importing countries are using the Arabic language or not. Dlamini (2016), researching the sugar export of Swaziland, has concluded that the factors affecting export are population, exchange rate, economy openness, language and production area. Khiyavi (2013) concluded that GDP, exchange rate, distance and joining in the trade organization are the main factors affecting agricultural export of developing countries by applying the gravity model.

In Vietnam, there exist a number of studies that analyzed the factors affecting export by the gravity model. For instance, Dao (2013) studied influence of factors on the flow of goods import and export between Vietnam and Trans-Pacific Partnership (TPP) countries show the impact factors including GDP, population, gap between countries, exchange rate, import/export tariffs among countries and level of the openness of TPP countries. Tran *et al.* (2017) pointed out that only exporter's GDP, economic and development gap, inflation, agricultural area and population of the importing country are the factors affecting rice export of Vietnam to the ASEAN countries. Ngo (2016) used the gravity model to study the factors affecting Vietnamese agricultural export.

Many empirical studies have been conducted to analyze handicraft export topic around the world as well as in Vietnam, such as Khan (2012) researched the impact of economics slowdown on carpet business in India, showing the role of handicraft business in economic development as to how the handicraft sectors can foster economic growth. This study stressed that the level of economic slowdown affected the life of people who were basically dependent on carpet business at Bhadohi, suggesting that there has already been a sharp fall in employment in the export-oriented sectors like handicraft sectors in India. Achmad (2016) researched the factors affecting rattan export of Indonesia with the Gravity model and ratio of potential trade to know which countries can be expanded for export. Roostika *et al.* (2015) analyzed the factors of clusters competitiveness developed from the Porter Diamond model, in order to see the effect on handicrafts clusters competitiveness in Bantul. Nguyen (2009) analyzed the situation of Vietnam's export of handicrafts to propose solutions for promoting the export of Vietnamese handicrafts to the Japanese market. Tran (2012) focused on the current status of handicraft export of Vietnam and then suggested the solutions to promote export of handicrafts from Vietnam, focusing on the US market. Nguyen (2010) studied the development of craft villages and handicraft villages to promote export of handicrafts in the context of international economic integration. Nguyen (2015) used synthesis, evaluation, Strengths, Weaknesses, Opportunities and Threats (SWOT) method to analyze the handicraft export activities of Nhat Thang Company Limited to Europe market, and the result offered the solutions to promote handicraft export of company to Europe market. Cao (2018), analyzing the export situation of Vietnam during the period 2011–2016, had figured out the main features regarding export turnover and key groups of handicrafts.

In summary, the gravity model has been widely applied to evaluate the factors influencing the international trade flow as well as the trade of specific commodity. For the

handicraft export studies approaching from gravity models, there are studies and have shown the factors of the economic size of exporting countries and imports, economic distance, real exchange rate, price, and government policy will affect handicraft exports. However, to the authors' best knowledge, there is no full quantitative study of the factors that influence the export of handicraft to international market based on gravity model to clarify the factors appropriate to the situation in Vietnam so far. In this context, this study uses gravity model to explain the factors' impact on Vietnamese handicraft export by the independent variables, which are Vietnam's GDP, importer's GDP, Vietnam and trading partner's population, Vietnam's inflation, the economic distance between Vietnam and importer, the openness of Vietnam, common language of importing country or both Vietnam and importer are members of APEC by collecting panel data of 50 trading partners in period from 2007–2017.

### 3. Vietnamese handicraft export – an overview

In the year 1986, Vietnam began to reform the economy from a centrally planned to a market economy. The most important aims of the reform were to encourage the development of private economic sector as well as to push up international trade activities of domestic firms with foreign partners. In Vietnam, the handicraft industry is one of the oldest traditional industries, also creating the export value. The handicraft sector starting from traditional villages located in suburban and rural, the development of craft village along with the development of culture, society, Vietnam in general agriculture and history. Almost all craft villages are concentrated in the Red River Delta such as Hanoi, Bac Ninh, Thai Binh, Nam Dinh, etc. Some villages are located in Plateau, Central plains and South. In addition, in the craft village, the production of handicrafts and supply materials making handicraft items takes place.

Vietnam is one of the largest exporters of furniture art and handicraft in Asia. Vietnamese handicraft is exported to 163 countries and territories. There are many categories of handicrafts in Vietnam such as pottery, weaving bamboo, rattan, water hyacinth, seagrass, silk, red paper, etc. To conduct the study, the handicraft will be classified by the harmonized system code showed in Table I.

In the period 2011–2018, the handicraft industry has made positive changes, especially since policies to encourage the development of large-scale industries – the handicraft industry – have been launched: Decision No. 11/2011 /QD-TTG of the Prime Minister on policies to encourage the development of rattan and bamboo industry and Decision No. 11119/QD-BCT issued in 2014 approving the master plan for ceramic industry development – Vietnam industrial glass to 2020, vision to 2030.

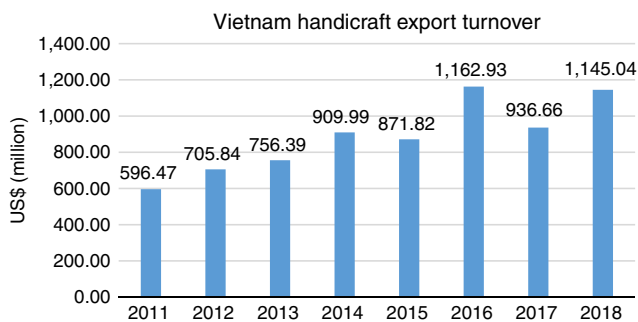
According to UN Comtrade Statistics (from the Online Database of the International Trade Centre (ITC)) (Figure 1), in the period from 2011 to 2018, Vietnam exported handicrafts to many countries, with total exports of all commodities rising from the US \$96.9bn in 2011 to the US\$243.48bn in 2018, which means an increase of 151 percent over the period. Compared to the total export turnover, in general, export turnover of handicraft products is not really high. The highest share of handicraft export in value of total export value was 0.95 percent in 2016 and 0.47 percent in 2018.

Although the contributions to the overall export turnover of the country are still not high, the export turnover of commodities in this category tends to increase over the years. According to Figure 1, about Vietnam's export of handicraft products in the period 2011–2018, there was a slight decrease in turnover compared with the previous year in 2015 (down by 4.12 percent), in 2017 (down by 19.4 percent), and in 2018, it recovered by 22.2 percent. The export turnover in this industry increased continuously. Specifically, despite the impact of the debt crisis in Europe, export turnover of this item still increased by US\$109.37m in 2012 (equivalent to 18.3 percent) compared to the previous year.

Group of product	HS code and description
Plaiting material of rattan, bamboo, seagrass, water hyacinth	Chapter 46: Manufactures of straw, of esparto or of other plaiting materials; basket ware and wickerwork
Ceramics	Chapter 69: ceramic products
Hand-woven textile and embroidery	Chapter 57: carpet and other textile floor covering Group: 5805 – hand woven tapestries, etc. 5808 – braids of textile materials, in the piece; ornamental trimmings of textile materials, etc. 5809 – woven fabrics of metal thread and woven fabrics of metallized yarn 5810 – Embroidery in piece, strip or motifs
Wood marquetry	Group 44.20: wood marquetry and inlaid wood; caskets and case for jewelry or cutlery and similar article of wood. Statuettes and other ornaments of wood, wooden articles of furniture not falling in Chapter 94
Stone statuary	HS Code: 9702.0000 original engraving, prints and lithographs 9703.0000 original sculpture and statuary in any material
Hand-made paper	HS Code: 4802.10.00 handmade paper and paper board
Lacquer painting	Group: 9701 painting, drawing and pastel, executed entirely by hand, other than drawings of heading 49.06 and other than hand-painted or hand-decorated manufactured articles; collages and similar decorative plaques
Other	Group 50.07: woven fabrics of silk or silk waste Group 71.14: articles of goldsmiths' or silversmiths' wares and parts thereof, of precious metal or of metal clad with precious metal. Group 71.17: imitation jewelry

**Table I.**  
The main commodity groups of handicrafts in Vietnam classified by harmonized system (HS) code

**Source:** Section list in Vietnam Import and Export Nomenclature



**Source:** ITC

**Figure 1.**  
Export turnover of handicraft products of Vietnam in the period of 2011–2018

The growth rate of turnover has increased from 2011 to 2014, with a turnover of over US \$909.9m (up by 52.5 percent compared to 2011). It increased sharply in 2014, with a turnover of over US\$1.16bn (up by 33.38 percent compared to 2015), reaching the highest value in this period.

Table II showed that ceramic products and plaiting material of rattan, bamboo, seagrass and water hyacinth are the two highest values in total turnover of Vietnamese handicraft export. The ceramic products export turnover in the period 2011–2018 accounts for about 40–60 percent of the total handicraft export of the country, and plaiting material of rattan, bamboo, seagrass and water hyacinth contributes to about

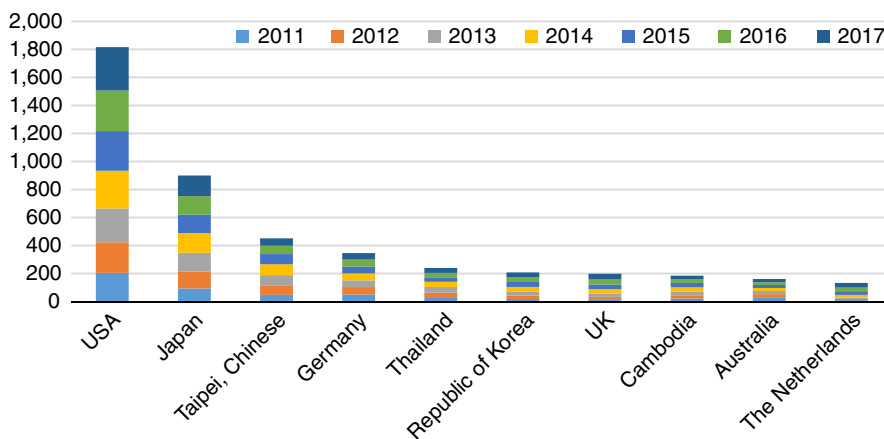
**Table II.**  
Export turnover of  
handicraft products  
of Vietnam in the  
period 2011–2018

Commodity group	HS code	2011	2012	2013	2014	2015	2016	2017	2018	Total
Ceramic products	69	359.24	440.48	471.08	514.35	477.03	431.35	437.67	525.65	3,656.85
Plaiting material of rattan, bamboo, seagrass, water hyacinth	46	156.19	162.72	178.32	193.84	197.49	195.96	205.66	252.23	1,542.41
Other	50.07 71.14 71.17	31.01	38.48	41.33	113.04	114.87	443.45	172.88	229.22	1,184.28
Hand-woven textile and embroidery	57 5805 5808-10	28.47	34.83	41.28	57.42	51.68	51.56	63.48	73.99	402.71
Wood marquetry	4420	17.25	19.24	19.91	27.7	26.27	32.15	27.43	46.31	216.26
Hand-made paper	4802	3.56	9.15	3.68	2.83	3.43	6.76	27.1	10.35	66.68
Lacquer painting	9701	0.55	0.74	0.63	0.73	0.67	1.05	2.14	2.97	9.48
Stone statuary	9702 9703	0.21	0.21	0.17	0.11	0.37	0.68	0.32	4.3	6.37

Source: ITC

17–26 percent. The significant contribution of these two merchandise groups to the handicraft export sector is due in part to the development policies issued during this period: Decision No. 11./2011/QĐ-TTĐ of the Prime Minister on policies to encourage the development of rattan and bamboo industry and Decision No. 11119/QĐ-BCT issued in 2014 approving the master plan for the development of ceramic industry – Vietnamese industrial glass South to 2020, vision to 2030. According to statistics of ITC (2018), Vietnam’s export represents 10.1 percent of world export for the straw, esparto or other plaiting material, basket ware and wickerwork falling in Chapter 46, and it ranks second in world exports for these products. For ceramic products falling in Chapter 69, Vietnam exports account for less than that mentioned in Chapter 46, representing 0.9 percent of world exports and ranking 20th in the world export.

Figure 2 shows export turnover into the ten largest import markets of Vietnamese handicrafts in the period 2011–2018. These markets include the USA, Japan, Taiwan,



**Figure 2.**  
Top 10 largest  
import markets  
of Vietnamese  
handicrafts

Source: ITC

Germany, Thailand, Korea, UK, Cambodia, Australia and the Netherlands. It can be seen that all ten markets have a total turnover of over US\$100m in this period, of which four markets (USA, Japan, Taiwan and Germany) have a market value over US\$200m.

#### 4. Research methodology

##### 4.1 Approach of model and variables

The gravity is considered suitable to analyze the factors that affect Vietnamese handicraft export. We apply a variation of gravity model given by Krugman (2005) using Equation (4). In the original model, only two independent variables are introduced including GDP and distances. The model in this paper also considers that the dependent variable is traded flow (export) of Vietnamese handicrafts. The research is further enhanced by adding the variables population, inflation, the openness of Vietnam, economic distance and the exchange rate between Vietnam and trading partner, and the dummy variables: Vietnam and trading partner are members of APEC and whether the common language of importing country is English or not. Then, the equation of model can be expressed as follows:

$$\ln \text{EXPORT}_{ijt} = \beta_0 + \beta_1 \ln \text{GDP}_{it} + \beta_2 \ln \text{GDP}_{jt} + \beta_3 \ln \text{POP}_{it} + \beta_4 \text{POP}_{jt} + \beta_5 \ln \text{INF}_{it} + \beta_6 \ln \text{DIS}_{ij} + \beta_7 \ln \text{EDIS}_{ijt} + \beta_8 \ln \text{ER}_{it} + \beta_9 \ln \text{OPEN}_{it} + \beta_{10} \text{APEC}_{ij} + \beta_{11} \text{LANG}_{jt} + u_{ijt}, \quad (5)$$

where  $\text{EXPORT}_{ijt}$  is the value of Vietnamese handicraft export to country  $j$  in year  $t$  (USD),  $\beta_0$  is the coefficient of attractive or barrier between Vietnam and country  $j$ ,  $\text{GDP}_{it}$  is GDP of Vietnam in year  $t$ , measured in US dollar,  $\text{POP}_{it}$  is population of Vietnam in year  $t$ ,  $\text{OPEN}_{it}$  is trade openness of Vietnam in year  $t$ ,  $\text{GDP}_{jt}$  is GDP of country  $j$  in year  $t$ , measured in US dollar,  $\text{POP}_{jt}$  is population of country  $j$  in year  $t$ ,  $\text{INF}_{it}$  is inflation of Vietnam in year  $t$ ,  $\text{DIS}_{ij}$  is the geographical distance between the capital of Vietnam and country  $j$ , which is measured in kilometer,  $\text{EDIS}_{ijt}$  is the distance of economic development between Vietnam and country  $j$  in year  $t$  (calculated by the difference of GDP per capita between countries),  $\text{ER}_{it}$  is the real exchange rate (USD/VND) in year  $t$ ,  $\text{APEC}_{it}$ : This is a dummy variable, that denotes both the country import handicraft from Vietnam joined APEC or not (equal to 1 if it is a member of APEC, equal to 0 if it is not a member of APEC) in year  $t$ ,  $\text{LANG}_{jt}$  is a dummy variable, which denotes whether the main language of trading partner is English or not (equal to 1 if the country's language is English and equal to 0 otherwise),  $u_{ijt}$  is error term,  $\beta_i$  denotes the coefficients that present the impact of factor  $i$  in this model (Table III).

Variable	Description	Source	Expected sign
$\text{EXPORT}_{ijt}$	Export value from Vietnam to country $j$ in year $t$	UN comtrade	
$\text{GDP}_{it}$	Vietnam's gross domestic product in year $t$	World Bank	+
$\text{GDP}_{jt}$	Trading partner's gross domestic product in year $t$	World Bank	+
$(\text{POP}_{it} \times \text{POP}_{jt})$	The population in year $t$	World Bank	+
$\text{INF}_{it}$	Vietnam's inflation in year $t$	World Bank	+/-
$\text{DIS}_{ij}$	Distance between Hanoi and trading partner's capital	Free Map Tools	-
$\text{EDIS}_{ijt}$	Distance of economic development between Vietnam and trading partner	Calculated from World Bank data	+
$\text{ER}_{it}$	The exchange rate (USD/VND)	Vietnam State bank	+
$\text{OPEN}_{it}$	Vietnam's openness in year $t$	Calculated from World Bank data	+
$\text{LANG}_{jt}$	Dummy variable, take value 1 if trading partner country speaks English, take value 0 otherwise	www.google.com	+/-
$\text{APEC}_{ij}$	Dummy variable, take value 1 if both trading partner and Vietnam are member of APEC, take 0 if not	www.apec.org	+/-

**Table III.**  
Summary of independent variables used in gravity model

#### 4.2 Definition of data

The export value of Vietnamese handicrafts becomes the dependent variable in the model, which is the total value of prospective Vietnamese handicraft exports to the importing country in a year, which is expressed in USD and obtained from ITC database.

GDP of Vietnam and partner countries is the measurement of total GDP in a year, which is expressed in USD. These two variables are expected to have a positive impact on trade flow.

Population (POP) is the people living in a country, which reflects the production and consumption of the country. The population (POP) in this model is calculated as the population of the import and export country. The POP variable is expected to have a positive impact on the trade flow.

Inflation (INF) is a quantitative measure of the rate at which the average price level of goods increases over the year. It is a constant rise in the general level of prices where a unit of currency buys less than it did in the previous year. It is often expressed in percentage. This variable could be positive or negative. It is expected to have a positive sign.

Geographic distance (DIS) is an approach that represents the cost of transportation between Vietnam and the destination country, which is the distance from Vietnam's capital to the import country's capital. The farther the distance between the two countries, the greater is the cost of transportation as needed. This variable is expected to cause a negative impact on trade flow.

The distance of economic development (EDIS) is the gap in per capita income between Vietnam and import countries. This variable could get a negative or positive sign. The hypothesis is that distance of economic development has a positive impact on Vietnamese handicraft export.

The real exchange rate (ER) (VND/USD) reflects the general price of goods as well as Vietnamese handicrafts of import countries. This variable is expected to have a positive impact on Vietnamese handicraft exports.

The openness of the economy (OPEN) is the ratio between the value of imports and exports of a country and the GDP of a country. The greater the openness of the economy, the stronger is the trade activity of a country. Therefore, the hypothesis is that Vietnam's openness is positively correlated with Vietnam's handicraft exports, thus calculated by the following equation:

$$OPEN = \frac{\text{Export} + \text{Import}}{\text{GDP}}. \quad (6)$$

APEC is a dummy variable, denoting whether Vietnam and the importing country both are members of APEC or not. This variable could be positive or negative. It is expected to have a positive sign.

LANG is a dummy variable, denoting whether the trading partner mainly speaks English or not. This variable is expected to have a positive impact on trade flow.

There are three main models that can be used to estimate in panel data: pooled model, random effect model (REM) and fixed effect model (FEM). In order to decide which model should be chosen, we need to consider the properties of the data as well as the results of test.

Each entity has its individual characteristics that can affect its explanatory variables, called the individual effects. For example, the factor of preference or infrastructure, though not being mentioned in the model, will still affect trade flows of each country. If individual effects do not exist, the pooled model will be the best choice. However, if they exist and must be reflected in the model, the FEM and REM will be more preferred.

According to the theory of Gujarati (2003), FEM will be selected if there is a correlation between individual effects and explanatory variables. Meanwhile, the regression model will

be able to control over and separate the impact of individual effects from explanatory variables so that we can estimate the net effects of explanatory variables on dependent variable. But if individual effects of the entities are random and not correlated with explanatory variables, REM will be more effective. REM considers the residual of each entity (which is not correlated with explanatory variables) as a new explanatory variable, and it can estimate the invariant factors such as gender, distance, etc.

The main problem of FEM is that the variables that do not change over time cannot be estimated directly in this model. So variables such as distance and language in Equation (5) will not be supported in FEM. To solve this problem, the better choice is using REM.

In this study, we decide to use pooled model and random effects model for estimation. Equation of Vietnamese handicraft export will be estimated by two models. Then, Breusch-Pagan LM test (xttest0) will be applied in order to select the most appropriate model for interpreting the estimate results.

### 5. Empirical results

Table IV shows the result of of Breusch-Pagan LM test for random effects model. The test result indicates that the hypothesis "individual effects from the entities do not exist" has been rejected, which shows the low effectiveness of pooled model.

We perform some diagnostic tests to relax the assumptions of random effects model. The result shows that there exist multicollinearity, heteroscedasticity and autocorrelation (see also Appendix). Multicollinearity can be explained by the high correlation of two variables: Vietnam's GDP, Vietnam's population and the exchange rate (VND/USD). However, this is a common statistical phenomenon of gravity model estimation. In the case of large sample size in our study, the impact of multicollinearity on estimated result can be controlled. For heteroscedasticity and autocorrelation, we use feasible generalized least squares (FGLS) regression for heteroskedastic panel to resolve this phenomenon. Table V presents estimation results using Equation (5) after resolving defects.

**Table IV.**  
Breusch-Pagan  
Lagrangian multiplier  
test for random  
effects model

Null Hypothesis: there is no significant difference across unit Model	$\chi^2$	p-value
Random effects model	365.35***	0.0000

**Note:** \*\*\*Significant at 1 percent level

**Table V.**  
Estimation results

Independent variables	Coefficient (z-statistics)
Constant	-24.970 (-0.98)*
LnGDP <sub>it</sub>	0.718 (0.61)
LnGDP <sub>jt</sub>	6.64 (17.51)*
Ln(POP <sub>it</sub> )	0.002 (0.99)**
Ln(POP <sub>jt</sub> )	0.225 (6.77)**
LnDIS <sub>ij</sub>	-0.006 (-5.77)***
LnEDIS <sub>ijt</sub>	0.233 (5.20)**
LnINF <sub>it</sub>	-0.360 (-0.34)
LnER <sub>it</sub>	-0.096 (-0.75)*
LnOPEN <sub>it</sub>	4.919 (0.51)
APEC <sub>ijt</sub>	5.581 (3.79)**
LANG <sub>jt</sub>	0.526 (0.47)***

**Notes:** Value in () indicates z-statistics. \*, \*\*, \*\*\*Significant at 10, 5 and 1 percent levels, respectively

The variable GDP of Vietnam has a positive effect, but it has a low significance for export handicraft products from Vietnam: a 1 percent point increase in Vietnam's GDP will result in 0.718 percent in Vietnamese handicraft export. However, an increase of 1 percent of trading partner's GDP will result in 6.64 percent of the total Vietnamese handicraft export value. This means that when the economy size of Vietnam increases, then the government would invest more in the handicraft industry as well as the infrastructure, thereby increasing the export value. When the trading partner's GDP increases, the demand for handicrafts products also is higher, which leads to an increase in Vietnam's export turnover.

Whereas population of Vietnam does not have a significant impact on export of handicrafts from Vietnam, population of trading partner is statistically significant with a positive impact. If population of partner country increases by 1 percent, the Vietnamese handicraft export value will step up by roughly 0.225 percent.

The effect of geographical distance variable has a negative sign as expected by theory, but it has no significance in explaining the export of Vietnamese handicrafts.

The variable economic distance (EDIS) between Vietnam and trading partner shows that the coefficient is 0.233, with the positive sign; this result is the same as expected by hypothesis. This is evident that a 1 percent point of economic distance decrease will result in an equally 0.233 percent increase in the export of Vietnam's handicraft products when holding constant for other variables. We can see that the gap in economic development between the two countries would be considered as an advantage for exchanging goods, so the export would be promoted and this makes an increase in export value from Vietnam to trading partners.

The effect of Vietnam's inflation ( $INF_{it}$ ) was found to be negative and statistically significant at the 1 percent level in all estimated models. This implies that 1 percent of inflation, with other variables being equal, leads to a decrease of Vietnamese handicraft export by 0.36 percent. This means if the inflation increases, the prices of handicraft will increase. It reduces the competitiveness of Vietnam handicraft compared with other countries, so the export rate of handicraft will be decreased. This result is not corresponding with the hypothesis, but it is consistent with the general trend of the globalization process in recent years.

The estimated result shows that the exchange rate ( $ER_{it}$ ) in (VND/USD) does not show a significant coefficient, thus it is not an explanatory variable in the flow of Vietnamese handicraft export.

The variable openness of Vietnam ( $OPEN_{it}$ ) has a positive effect on the export of Vietnamese handicrafts. In reality, when a country has a higher level of openness, it means that it has more opportunities to trade goods with other countries. This result shows that a high significance with 1 percent up in Vietnam economy's openness will make the export of Vietnamese handicraft increase by 4.919 percent, when holding other variables constant.

The dummy variable that the trading partner's common language is English otherwise presents the positive impact on Vietnamese handicraft export, which is consistent with the hypothesis of expected sign. This means when trading partner country speaks English, Vietnam will have more advantages in exchanging goods as well as handicraft products.

The dummy variable that the trading partner and Vietnam both are members of APEC or not ( $APEC_{ijt}$ ) has a positive impact on Vietnamese handicraft export, which is consistent with the hypothesis of the expected sign. The results indicate that if two countries (Vietnam and the importing country) are members of APEC, it would be more favorable for exchanging goods.

## 6. Conclusion

The main purpose of this research was to identify and evaluate the main factors that affect Vietnamese handicraft exports. The analytical procedure included the gravity model as one

of the best theoretical frameworks to estimate the export by using panel data. Breusch–Pagan LM test shows that the most efficient model is the random effect model. However, there exist multicollinearity, autocorrelation and heteroscedasticity, so we use the feasible general least squares to solve the phenomenon.

Factors influencing the value of Vietnamese handicraft exports, such as Vietnam's GDP, import country's GDP, trading partner's population, the economic distance between Vietnam and importer, the openness of Vietnam, trading partner's language and the condition that both Vietnam and importer are members of APEC, have a positive influence on Vietnamese handicraft export. Vietnam's inflation has a negative influence on the export of handicraft products from Vietnam. The geographical distance and exchange rate are estimated to have a negative impact on Vietnamese handicrafts export, but with an insignificant level. Vietnam's population does not affect the export Vietnamese handicrafts.

This study also has some limitations. It is limited in the data, as some other areas in the world have not been observed and included in the research. In the future, a study with large-scale data of space and time should be conducted, which will certainly give a universal result and fewer errors. However, this paper, in our opinion, provides the significant result and may help the government and policy makers to undertake appropriate measures to improve and promote the export of Vietnamese handicrafts to the world markets.

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### Appendix 1

**Table A1.**  
List of top 50 trading partners of Vietnam's handicraft export

Japan	Germany	Brazil	Ireland	Greece
The USA	France	Spain	Poland	Pakistan
Thailand	Malaysia	Singapore	Romania	Croatia
UK	Lao	India	South Africa	Slovenia
Cambodia	China	Sweden	Bangladesh	Mexico
Republic of Korea	Indonesia	Argentina	Turkey	Portugal
United Arab Emirates	Myanmar	The Netherlands	Panama	Sri Lanka
Australia	Belgium	Russian	Kuwait	Switzerland
The Philippines	Denmark	New Zealand	Colombia	Austria
Italy	Canada	Chile	Saudi Arabia	Finland

Appendix 2. Descriptive statistics of variables

Variable	Obs	Mean	Std. Dev.	Min	Max
EXPORTijt	550	12.80909	25.83277	.03	310.8
GDPit	550	151779.5	46055.49	77414.43	223779.9
GDPjt	550	1283004	2651919	4222.96	1.95e+07
POPit	550	89.88818	2.925314	85.42	94.6
POPjt	550	105.1639	254.8496	2.02	1386.4
DISij	550	7664.812	4700.005	480.29	18588.7
EDISijt	550	23825.53	20874.76	-1115.79	86890.51
INFit	550	8.746364	7.236906	-.19	22.67
ERit	550	19894	2340.872	16105	22680
OPENit	550	1.532727	.1819291	1.2	1.9
APECijt	550	.28	.4494076	0	1
LANGjt	550	.1636364	.370282	0	1

Appendix 3. Breusch and Pagan Lagrangian test

Breusch and Pagan Lagrangian multiplier test for random effects

$$EXPORTijt[country1,t] = Xb + u[country1] + e[country1,t]$$

Estimated results:

	Var	sd = sqrt(Var)
EXPORTijt	667.332	25.83277
e	212.9518	14.59287
u	144.7983	12.03322

Test: Var(u) = 0

chibar2 (01) = 369.35  
Prob > chibar2 = 0.0000

Appendix 4. Correlation coefficient in the data set

. corr GDPit GDPjt POPit POPjt DISij EDISijt INFit ERit OPENit APECijt LANGjt  
(obs=550)

	GDPit	GDPjt	POPit	POPjt	DISij	EDISijt	INFit	ERit	OPENit	APECijt	LANGjt
GDPit	1.0000										
GDPjt	0.0465	1.0000									
POPit	0.9954	0.0452	1.0000								
POPjt	0.0117	0.4386	0.0117	1.0000							
DISij	0.0000	0.0643	-0.0000	-0.2136	1.0000						
EDISijt	0.0011	0.1934	-0.0036	-0.2658	0.1906	1.0000					
INFit	-0.6459	-0.0212	-0.6678	-0.0077	0.0000	0.0298	1.0000				
ERit	0.9575	0.0474	0.9543	0.0112	0.0000	0.0054	-0.5602	1.0000			
OPENit	0.8546	0.0394	0.8604	0.0099	-0.0000	0.0040	-0.4480	0.7885	1.0000		
APECijt	-0.0000	0.3508	-0.0000	0.2017	-0.0819	-0.0912	0.0000	0.0000	0.0000	1.0000	
LANGjt	-0.0003	0.2707	0.0004	-0.0412	0.0278	0.3539	-0.0026	-0.0021	0.0074	0.3262	1.0000

Appendix 5. Variance inflation factor (VIF) of independent variables

```
. vif
```

Variable	VIF	1/VIF
POPit	148.34	0.006741
GDPit	123.24	0.008114
ERit	15.14	0.066044
OPENit	5.07	0.197388
INFit	2.67	0.374047
GDPjt	1.67	0.599568
POPjt	1.56	0.643037
EDISijt	1.44	0.693102
LANGjt	1.36	0.733992
APECijt	1.33	0.751670
DISij	1.10	0.908174
Mean VIF	27.54	

Appendix 6. Breusch-Pagan test for heteroskedasticity

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of EXPORTijt

chi2(1)      =    309.03
Prob > chi2  =    0.0000
```

Appendix 7. White's test for heteroskedasticity

```
White's test for Ho: homoskedasticity
against Ha: unrestricted heteroskedasticity

chi2(65)     =    103.44
Prob > chi2  =    0.0017
```

Appendix 8. First-order autocorrelation (AR1) test for autocorrelation

rho_ar	.165601	(estimated autocorrelation coefficient)
sigma_u	10.707136	
sigma_e	14.39179	
rho_fov	.35629192	(fraction of variance due to u <sub>i</sub> )
theta	.56934548	

Appendix 9. Estimated result by feasible generalized least squares (FGLS) regression

```

Coefficients:  generalized least squares
Panels:       homoskedastic
Correlation:  no autocorrelation

Estimated covariances =      1      Number of obs =      550
Estimated autocorrelations =    0      Number of groups =     50
Estimated coefficients =     12      Time periods =      11
Log likelihood = -2377.685      Wald chi2(11) =    550.08
                                      Prob > chi2 =     0.0000
    
```

EXPORTijt	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
GDPit	.7181154	.5971877	0.61	0.539	.6314834	.7142526
GDPjt	6.64e-06	3.79e-07	17.51	0.655	5.90e-06	7.38e-06
POPit	.002625	.042758	0.99	0.023	.053065	.058315
POPjt	.2257967	.0138112	6.77	0.046	.0332664	.0183269
DISij	-.0060037	.0001739	-5.77	0.000	-.0013446	-.0006629
EDISijt	.2331331	.0026448	5.20	0.062	.0461453	.015321
INFit	-.3605672	.1759718	-0.34	0.731	-.4054655	.2843312
ERit	-.096817	.0012947	-0.75	0.055	-.0035055	.0015696
OPENit	4.919534	9.636003	0.51	0.610	-13.96669	23.80575
APECijt	5.581052	1.998964	3.79	0.050	3.663154	11.49895
LANGjt	0.526939	0.455165	0.47	0.001	3.33897	0.714903
_cons	-24.97035	25.51402	-0.98	0.328	-74.9769	25.03621

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