# Determinants of Vietnam's textile exports:
## An analysis by gravity model

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### ABSTRACT

This study investigates the patterns and factors influencing Vietnam's textile exports following its accession to the World Trade Organization (WTO). The analysis employs the gravity trade model and utilizes panel data from 2007 to 2019, focusing on Vietnam's textile export flow to its primary trading partners. The findings reveal that various factors, including the size of the economy, per capita income disparity, the presence of free trade agreements (FTAs), labor force participation rate, logistics performance, and foreign direct investment (FDI) inflows, influence Vietnam's textile exports. All these variables, except FDI, have a positive impact on Vietnam's textile exports. The study fills an existing research gap regarding the factors affecting Vietnam's textile exports and contributes to the existing literature. Additionally, it provides policy recommendations for the development of Vietnam's textile industry, emphasizing the importance of maintaining a skilled labor force amidst population aging, improving logistics quality, and leveraging FTAs to boost textile exports in the future.

### ملخص

تستعرض هذه الدراسة الأنماط والعوامل التي تؤثر على صادرات المنسوجات في فيتنام بعد انضمامها إلى منظمة التجارة العالمية (WTO). يستخدم التحليل نموذج الجذب الاقتصادي ولوحة البيانات خلال الفترة الممتدة من 2007 إلى 2019، مع التركيز على تدفق صادرات المنسوجات في فيتنام إلى شركائها التجاريين الأساسيين. تكشف النتائج أن عوامل مختلفة، بما في ذلك حجم الاقتصاد، وتفاوت دخل الفرد، ووجود اتفاقيات التجارة الحرة (FTAs)، ومعدل مشاركة القوى العاملة، والأداء اللوجستي، وتدفقات الاستثمار الأجنبي المباشر (FDI) ، تؤثر على صادرات المنسوجات في فيتنام. وتبين أن كل هذه المتغيرات لها تأثير إيجابي على صادرات المنسوجات في فيتنام، باستثناء الاستثمار الأجنبي المباشر. تسد الدراسة فجوة بحثية فيما يتعلق بالعوامل التي تؤثر على صادرات المنسوجات في فيتنام وتساهم في الأدبيات القائمة. بالإضافة إلى ذلك، يقدم البحث توصيات متعلقة بالسياسات لتطوير صناعة النسيج في فيتنام، ويؤكد على أهمية الحفاظ

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على قوة عاملة ماهرة في ظل تقدم شيخوخة السكان، وتحسين جودة الخدمات اللوجستية، والاستفادة من اتفاقيات التجارة الحرة لتعزيز صادرات المنسوجات في المستقبل.

**RÉSUMÉ**

Cette étude examine les modèles et les facteurs influençant les exportations textiles du Vietnam après son adhésion à l'Organisation mondiale du commerce (OMC). L'analyse utilise le modèle commercial gravitationnel et des données de panel de 2007 à 2019, en se concentrant sur les flux d'exportation de textiles du Viêt Nam vers ses principaux partenaires commerciaux. Les résultats révèlent que divers facteurs, notamment la taille de l'économie, la disparité du revenu par habitant, la présence d'accords de libre-échange (ALE), le taux de participation de la main-d'œuvre, la performance logistique et les flux d'investissements directs étrangers (IDE), influencent les exportations de textiles du Viêt Nam. Toutes ces variables, à l'exception de l'IDE, ont un impact positif sur les exportations textiles du Viêt Nam. L'étude comble une lacune dans la recherche sur les facteurs affectant les exportations textiles du Viêt Nam et contribue à la littérature existante. En outre, elle fournit des recommandations politiques pour le développement de l'industrie textile vietnamienne, en soulignant l'importance de maintenir une main-d'œuvre qualifiée dans un contexte de vieillissement de la population, d'améliorer la qualité de la logistique et de tirer parti des accords de libre-échange pour stimuler les exportations de textiles à l'avenir.

**Keywords**: Textile, Export determinants, Export Performance, Panel data, Vietnam

**JEL Classification:** F14, F40, C23

## 1.   Introduction

Since Vietnam reformed its economy in the early 1990s, textile manufacturing has been one of the key industries. Vietnam's textile industry has created millions of jobs for rural workers, meeting both domestic and international demand. Since joining the WTO nearly fifteen years ago, textile exports have surged by more than four times, accompanied by a remarkable sixfold increase in the value of locally produced textiles. With around three million industrial workers employed, this industry constitutes over 10% of the national industrial labor force and contributes 10-15% to the country's GDP. In 2019, Vietnam earned about $39 billion from exporting textile products, thus, surpassing Bangladesh to become the world's third-largest textile exporter (GSO, 2020).

Vietnam's textile and garments industry consists of three sub-sectors: fiber production, fabrics and dye, and garments manufacturing. Garment production represents about 70% of Vietnam's apparel and textile sector, and cut-make-trim (CMT) contributes approximately 65% to total exports (VIR, 2021). From 2007 to 2019, textile exports experienced an average annual growth rate of 13.5%, while maintaining a relatively stable export structure. Notably, categories such as clothing, fabrics, underwear, workwear, sweaters, and swimwear showed significant growth rates. Vietnam's textile products have successfully reached over 200 countries, with the United States serving as the primary export market in 2019. The US accounted for $15.6 billion, representing 41.5% of the total export turnover. The EU is the second-largest market which accounts for about 14%, followed by Japan (11.8%), China (10.9%), and South Korea (10.7%), respectively. However, Vietnam's textile industry still has limitations. The number of laborers in the textile industry is decreasing, and the average wage is meager. In terms of productivity management, labor quality in textile is still lower than in other countries in the region. In addition, the industry lacks good designers and information about customer demand. The development of the supporting industries is still sluggish; thus, more than 70% of textile materials in Vietnam are still imported (Nhung & Thuy, 2018)

Because of the importance of the textile industry in the economies, there have been many studies on this industry around the world (e.g., Dhiman et al. 2020; Maqbool et al. 2020; Baiardi et al. 2019; Bao et al. 2017; Falco & Simoni, 2014; Serra & Abdou, 2012; Tsang & Au, 2008; Chan & Au, 2007). These studies mainly analyzed the influence of several factors on the competitiveness and export of the textile industry in particular countries. Other studies explore the impact of free trade agreements on the textile industry (Tsang & Au, 2008) or textile exports of developed and developing countries (Au & Wong, 2007). Many studies have also been carried out for the world's leading textile exporters, for example, China (Chan & Au, 2007), Bangladesh (Alam et al. 2017; Rahman et al. 2019), or India (Dhiman et al. 2020, Dhiman et al. 2019).

In the case of Vietnam, study on the textile industry is limited. A couple of studies are: Hoa et al. (2020) investigated the relationship between knowledge sharing and innovation in garment and textile enterprises; Le et al. (2019) attempted to find the perceived impacts of China's Belt and Road Initiative (the BRI) on the garment and textile industry of Vietnam.

Lu (2018) evaluates the potential effects of CPTPP and EVFTA on exported textiles; Huong (2017) measures the impact of transportation costs on exported textiles; Goto (2014) describes the development of the textile and garment export market. Although the above studies have analyzed Vietnam's textile export performance, they have not considered relevant macroeconomic factors and their impact on textile exports. In addition, these studies mainly use survey data and focus on the enterprise level rather than the industry.

The investigation into Vietnam's textile exports subsequent to its accession to the World Trade Organization (WTO) reveals significant patterns and influencing factors on textile exports to primary trading partners. The findings from the study collectively illuminate the intricate web of factors shaping Vietnam's textile exports. The study not only fills a gap in the existing literature but also provides actionable insights for policymakers and industry stakeholders. As Vietnam's textile industry continues to evolve, addressing these factors could pave the way for sustained growth and competitiveness in the global market.

The paper structure is as follows. Section 2 analyzes the pattern of Vietnam's textile exports ; section 3 provides the literature review; section 4 present the research methodology; the estimation results and discussion are presented in section 5, and section 6 concludes the paper.

## 2.    Vietnam Textile Trade Pattern

Vietnam's textile export value surged from $8.6 billion in 2007 to almost $40 billion in 2019, reflecting an impressive annual growth rate of approximately 13.5% during this period. The US is the largest market, accounting for 41.5% of Vietnam's total textile export value in 2019 (Table 1). Following closely are Japan, China, and South Korea, contributing to a total share of more than 30%. Consequently, Vietnam's textile exports heavily rely on the US and Northeast Asia markets. Europe also emerges as a significant partner for Vietnam's textile exports, with most EU members holding market shares of about 1-3%. In 2019, Vietnam's textile export value was primarily driven by the total import value from its top 27 partners, accounting for over 95% of the total.

**Table 1:** Vietnam's Major Textile Export Partners in 2019

| No | Country | Value ($mil) | % | No | Country | Value ($mil) | % |
|----|---------|--------------|-----|----|---------|--------------|-----|
| 1 | USA | 15,619.8 | 41.50 | 15 | Belgium | 374.2 | 0.99 |
| 2 | Japan | 4,447.1 | 11.81 | 16 | India | 337.6 | 0.90 |
| 3 | China | 4,095.3 | 10.88 | 17 | Italy | 335.0 | 0.89 |
| 4 | Korea | 4,035.0 | 10.72 | 18 | Australia | 301.4 | 0.80 |
| 5 | Germany | 901.8 | 2.40 | 19 | Russian | 293.1 | 0.78 |
| 6 | Canada | 862.8 | 2.29 | 20 | Malaysia | 203.3 | 0.54 |
| 7 | United Kingdom | 829.9 | 2.20 | 21 | Brazil | 182.8 | 0.49 |
| 8 | Cambodia | 721.9 | 1.92 | 22 | Turkey | 182.0 | 0.48 |
| 9 | Netherlands | 720.6 | 1.91 | 23 | Philippines | 176.8 | 0.47 |
| 10 | France | 637.0 | 1.69 | 24 | Chile | 170.9 | 0.45 |
| 11 | Spain | 473.2 | 1.26 | 25 | Mexico | 169.8 | 0.45 |
| 12 | Indonesia | 468.5 | 1.24 | 26 | Bangladesh | 165.1 | 0.44 |
| 13 | Thailand | 409.1 | 1.09 | 27 | Singapore | 123.3 | 0.33 |
| 14 | Hong Kong | 404.2 | 1.07 | | **Total** | **3,7641.4** | **95.48** |

Source. Authors' calculation from UN Comtrade data

For exports by sub-sectors (HS chapters), table 2 shows the shares of each chapter over the period of 2007-2019. According to the data, Textile, Apparel, and clothing accessories (HS 61-63) dominate the total export value, comprising over 80% of it. However, over time, this proportion gradually declines. Meanwhile, the Cotton and Fabrics (HS 58-60) proportion increased from approximately 2% to 5% over the corresponding period. It indicates that Vietnam has been more proactive in producing and exporting intermediate products for the textile industry. Overall, Vietnam's textile export structure has changed slowly for years. It would be a significant obstacle to Vietnam's textile industry development in the future.

**Table 2:** Vietnam's Textile Exports by Chapters 2007-2019

*Unit: %*

| Chapter Name | | HS code | 2007 | 2010 | 2015 | 2019 |
|---|---|---|---|---|---|---|
| Silk | | 50 | 0.4 | 0.3 | 0.2 | 0.3 |
| Wool, fine or coarse animal hair; | | 51 | 0.1 | 0.0 | 0.0 | 0.0 |
| Cotton | | 52 | 1.1 | 5.1 | 6.3 | 7.7 |
| Vegetable textile fibres; | | 53 | 0.3 | 0.3 | 0.2 | 0.1 |
| Man-made filaments; | | 54 | 3.0 | 3.8 | 2.9 | 2.9 |
| Man-made staple fibres | | 55 | 3.3 | 3.7 | 1.7 | 1.6 |
| Wadding, felt and nonwovens, special yarns; | | 56 | 0.9 | 0.9 | 1.0 | 1.0 |
| Carpets and other textile floor coverings | | 57 | 0.2 | 0.2 | 0.1 | 0.4 |
| Fabrics; | | 58 | 0.3 | 0.2 | 0.3 | 0.3 |
| Textile fabrics; | | 59 | 0.8 | 2.2 | 1.9 | 1.8 |
| Fabrics; knitted or crocheted | | 60 | 0.9 | 1.2 | 1.8 | 3.0 |
| Apparel and clothing accessories; knitted or crocheted | | 61 | 35.3 | 36.8 | 37.1 | 37.8 |
| Apparel and clothing accessories; not knitted or crocheted | | 62 | 48.5 | 39.2 | 41.5 | 38.4 |
| Textiles, made up articles; | | 63 | 5.2 | 6.1 | 5.0 | 4.6 |

Source: Authors' calculation from UN Comtrade data

Table 3 presents the calculation of the Revealed Comparative Advantage (RCA) for various product groups within the textile industry, classified by HS code. The findings indicate that the group comprising apparel and clothing accessories (HS codes 61-63) holds the highest RCA value. This suggests that Vietnam possesses a significant competitive edge in the global market for these specific products. Next, the silk and cotton products (HS codes 50 and 52) have shown an improvement in RCA from 2007 to 2019. This signifies a positive trend in the textile industry, indicating that Vietnam is gradually gaining initiative in producing these product groups to meet the industry's input demand.

For the remaining product groups, RCA values are relatively low or indicate a disadvantage (RCA < 1). Regarding trends, although apparel

and clothing accessories maintain a comparative advantage in the global market, this advantage has seen little change and shows signs of decreasing over time. This result suggests that Vietnam's textile industry is facing challenges in maintaining competitiveness, attributed to high production costs and increasing competition worldwide in this sector.

**Table 3.** The revealed comparative advantage of Vietnam's textile products: 2007-2019

| Product Description | HS code | 2007 | 2010 | 2015 | 2019 |
|---|---|---|---|---|---|
| Silk | 50 | 3.06 | 2.77 | 2.89 | 3.72 |
| Wool, fine or coarse animal hair; | 51 | 0.21 | 0.09 | 0.04 | 0.04 |
| Cotton | 52 | 0.56 | 2.51 | 3.17 | 3.84 |
| Vegetable textile fibres; | 53 | 1.65 | 1.95 | 0.89 | 0.57 |
| Man-made filaments; | 54 | 1.74 | 2.53 | 1.7 | 1.5 |
| Man-made staple fibres | 55 | 2.62 | 3.13 | 1.26 | 1.23 |
| Wadding, felt and nonwovens, special yarns; | 56 | 1.18 | 1.29 | 1.1 | 1.04 |
| Carpets and other textile floor coverings | 57 | 0.28 | 0.32 | 0.22 | 0.77 |
| Fabrics; | 58 | 0.46 | 0.58 | 0.58 | 0.66 |
| Textile fabrics; | 59 | 0.94 | 2.74 | 2.22 | 1.89 |
| Fabrics; knitted or crocheted | 60 | 0.86 | 1.22 | 1.49 | 2.19 |
| Apparel and clothing accessories; knitted or crocheted | 61 | 4.99 | 5.73 | 4.63 | 4.82 |
| Apparel and clothing accessories; not knitted or crocheted | 62 | 6.97 | 6.52 | 5.23 | 5.03 |
| Textiles, made up articles; | 63 | 3.07 | 3.48 | 2.25 | 1.92 |

Source. Authors' calculation from UN Comtrade data

## 3. Literature Review

Research on the textile industry has become the subject of interest of many researchers, which is divided into two trends: at the firm level and the industry level. At the firm level, studies focus on analyzing the comparative advantage and competitiveness of the textile industry in specific economies or across countries. At the industry level, identifying factors that influence industry exports is the primary purpose of the studies. Most of the studies for these two trends focus on similar factors,

such as labor costs, productivity, lead time, quotas, tariff, and exchange rates (Wang, 2013).

According to M. Lim (2003), the economic development and the changes in resource endowments worldwide have led to differences in specialization in textile products. Capital-abundant countries specialize more in producing and exporting products of upstream textile sectors and declining leadership in the world textile trade. Labor-abundant countries specialize more in labor-intensive goods of downstream textile sectors with growing global textile trade leadership.

Population ageing is a significant global demographic phenomenon that has far-reaching implications for economies, societies, and policies. Vietnam, like many other countries, is experiencing a rapid shift in its age structure, with a growing proportion of elderly individuals. According to General Statistics Office (GSO) of Viet Nam, the older population increased from 7.45 million in 2009 to 11.41 million in 2019, or from 8.68 to 11.86 per cent of the total population. The increase in the older population accounted for about 40 per cent of the increase in the total population in this period (Nam & Duc, 2021). The ageing population poses several challenges to the labour force in Vietnam. A shrinking working-age population, coupled with a growing elderly population, can lead to potential labour shortages and reduced economic productivity. Research (e.g., World Bank, 2021; ILO, 2021) has shown that the labour force participation rate of elderly individuals is relatively low, which can further exacerbate the labour market challenges. In addition, Vietnamese textile companies employ huge number of laborers with low education (Huynh, 2022).

Regarding factors affecting textile exports at the industry level, Maqbool et al. (2020) assessed Pakistan's textile sector's export competitiveness using Revealed Comparative Advantage indices and confirmed its comparative and competitive advantage. Dhiman et al. (2020) examined the relationship between the textile industry's export competitiveness index, exchange rate, and real effective exchange rate, concluding that the exchange rate significantly influences textile export competitiveness. Dad & Karim (2019) conducted a literature review on internal factors impacting the export performance of textile weaving factories in Pakistan, including product types, innovations, energy cost, inventory, and green textile concepts. These factors were found to affect the weaving industry's

export performance. Rahman et al. (2019) analyzed the determinants of Bangladesh's textile and clothing exports, identifying gross domestic product (GDP), real exchange rate, and per capita GDP of importers as significant factors. Chen et al. (2017) established associations between trade, distance, cultural linkage, tariffs, and non-tariff barriers. Akhuand & Abbas (2021) explored the economic determinants of Pakistan's textile sector's international competitiveness using three-panel models spanning from 2003 to 2019. The results indicated that the sector's competitiveness was positively influenced by the growth rate of world per capita income, domestic income, domestic expenditure on research and development, financial development, and domestic infrastructure development.

Research by Jaussaud (2012) on the factor affecting exports at the industry level of Japan to China and the US shows that exchange rate and GDP greatly influence the export of studied industries, including textiles. Wu et al. (2012) and Chan & Au (2007) analyzed the factors influencing China's textile exports, such as GDP, GDP per capita, geographic distance, FDI outflows and inflows, trade openness, and bilateral investment. These factors demonstrated significant statistical significance in relation to China's textile exports. Similarly, Siddiqi et al. (2012) conducted a comparable study and found that real per capita GDP, exchange rate, CPI of the textile sector, and trade openness are crucial determinants of Pakistan's textile exports. As in a literature review of textile export determinants by Sharma & Dhiman (2016), most studies have investigated the relationship between the major macroeconomic variables and textile export performance. Most researchers found a positive relationship between the variables above and textile exports (Yoganandan et al., 2013).

Regarding the model of the textile trade, while many studies use variables commonly seen in the gravity model, few studies add factors directly related to exports, such as income gap, labor force, or logistics. In addition, Vietnam is the third-largest exporter of textiles globally; however, studies on Vietnam's textiles are limited. As far as we know, there is no study on the determinants of Vietnam's textile exports. Therefore, this study will fill a significant research gap on the determinants of Vietnam's textile industry exports.

## 4.   Research Method

The gravity equation was first introduced by Tinbergen (1962) in analyzing international trade flows. Since then, the gravity model has been widely used in empirical foreign trade analysis. According to the standard model, bilateral trade between countries i và j over time (t) is explained by their economic sizes (GDP), populations (POP), and geographical distances (DIST). Later on, numerous studies added a number of variables to the standard gravity model to test whether they are relevant in explaining trade, e.g., foreign direct investment (FDI), per capita incomes (INCOME), exchange rates (EXR)... (see more on Martínez-Zarzoso & Nowak-Lehmann, 2003). It is the so-called augmented gravity model, which has the following form:

$$
\begin{aligned}
\log(Trade_{ijt}) = {} & \beta_0 + \beta_1 \log(GDP_{ijt}) \\
& + \beta_2 \log(POP_{ijt}) \\
& + \beta_3 \log(DIST_{ijt}) + \beta_n \log(FDI, EXR, INCOME \dots) \\
& + \varepsilon_{ijt}
\end{aligned}
$$

This study also applies an augmented gravity model to measure the impact of factors on Vietnam's textile exports. The dependent variable is the volume of Vietnam's textile exports with its 27 major partners. The explanatory variables are average GDP, GDP per capita gaps, labor participation rate, foreign direct investment (FDI), logistics performance, exchange rate, distance, and FTA dummy variable. In this model, I added the income gap and labor participation rate instead of the income level and labor cost, which are widely used in previous studies. The logistics performance index is also added to the model. The reasons for adding these variables are explained below. The equation of the model is as follows:

$$
\begin{aligned}
\log(Export_{ijt}) \\
= {} & \beta_0 + \beta_1 \log(AGDP_{ijt}) \\
& + \beta_2 \log(DGDP_{ijt}) \\
& + \beta_3 \log(LPR_{ijt}) + \beta_4 \log(FDI_{it}) + \beta_5 \log(LGT_{ijt}) \\
& + \beta_6 \log(EXR_{ijt}) + \beta_7 \log(DIST_{ijt}) + \beta_8 FTA + \varepsilon_{ijt}
\end{aligned}
$$

where *i* and *j* denote Vietnam and its trade partners, *t* denotes time, $\varepsilon_{ijt}$ is an error term, and the variables are defined as :

Average GDP (*AGDP*) represents the combined economic size of two countries and serves as an indicator of their production capacity and market size. Larger economies typically have the ability to generate more exports and accommodate greater imports. Consequently, it is anticipated that average GDP will have a positive impact on Vietnam's textile exports. GDP per capita (*DGDP*) measures the disparity in GDP per person between Vietnam and its trading partners. The difference in per capita income is related to the production and consumption of textiles. Specifically, because textiles are labor-intensive thus, a country with a low per capita income is likely to produce and export more textiles owing to low labor costs, while a country with high GDP per capita will import more textiles instead of making them by themselves due to high costs (according to Heckscher-Ohlin theory). The previous study shows a unique long-run equilibrium relationship between the import quantity demand, the import price, and the GDP per capita (Lau & Bilgin, 2010). Thus, the greater the difference in GDP per capita, the larger the textile export, and vice versa.

Labor (*LPR*) is the absolute difference between Vietnam's and its partners' labor force participation rate. As explained above, the labor force participation rate implies whether a country has an advantage in textile production or not. If Vietnam has a higher ratio than its partners, Vietnam will tend to produce more textiles than its partners. Therefore, the difference in labor force participation rate is expected to be positively correlated with exports of textiles. Foreign Direct Investment (FDI) denotes the amount of foreign investment entering Vietnam. Many FDI projects in developing countries are in the textile industry because multinational companies in the textile industry invest in countries with a large and cheap labor force to cut production costs. Thus, FDI inflow will stimulate the production and export of textiles in the host countries (Haque & Thaku, 2015).

Logistics (*LGT*) is the two countries' average logistics performance index (Quality of trade and transport-related infrastructure). Since logistics is directly related to export performance, its quality positively influences export values (Töngür et al., 2020). Furthermore, infrastructure is proven to significantly affect the export of garments and textiles by developing countries (Mottaleb & Kalirajan, 2014).

The exchange rate (*EXR*) refers to the nominal exchange rate between two countries. When the exchange rate rises, it indicates a devaluation of the domestic currency, resulting in increased costs for imports and lower prices for exports. The relationship between exchange rate and textile export is explained in many previous studies, e.g., the exchange rate volatility significantly affects textile export in Thailand, and higher exchange rate volatility can cause decreasing in export quantity (Jantarakolica & Chalermsook, 2012). The exchange rate is a vital determinant of textile export competitiveness, and exporters can sustain competitiveness in global markets (Dhiman et al., 2020). Therefore, it is anticipated that the exchange rate will have a positive impact on trade between Vietnam and its trading partners.

Distance (*DIST*) is the distance from Vietnam's capital to major partners' capitals. Geographical distance plays a central role in trade due to its impact on transportation costs. Trade involves the movement of goods across borders, and the physical distance between trading partners affects the time and expenses required for shipping and logistics. Limão and Venables (2001) highlight that varying trade costs contribute to location disadvantage, affecting trade patterns between countries. Anderson and van Wincoop's (2003) empirical analysis reveals a strong negative relationship between distance and trade flows, emphasizing the significant role of distance-related frictions. Redding and Venables (2004) extend this analysis to incorporate the interaction between geographical and economic factors, providing insights into how distance contributes to international trade inequality. Helpman, Melitz, and Rubinstein (2008) emphasize that shorter distances reduce transportation costs, enabling countries to engage in more frequent and larger-volume trade. Thus, this variable is expected to impact trade flows between parties negatively.

The FTA dummy variable represents the influence of free trade agreements between Vietnam and its major partners. It is expected that the FTA dummy variable will have a positive value as it signifies the elimination of trade barriers between Vietnam and its trading partners.

Most of the variables data are taken from the World Bank's database (*GDP, LPR, FDI, LGT,* and *EXR*). The calculation of the variables is as follows: average GDP is the average GDP (current US$) of two countries. The difference between GDP per capita is the absolute value between the

partner's GDP (PPP, current US$) and Vietnam. Similarly, LBR is the absolute value, and LGT is the average LPR and LGT of Vietnam and its partner, respectively. Distance between Vietnam and other countries are taken from CEPII (Centre d'Etudes Prospectives et d'Informations Internationales). The nominal exchange rate is the price of the trade partners' currency in terms of Vietnamese currency. Regarding the trade data, Vietnam's textile export data is extracted from the UN-COMTRADE at the HS 2-digit level, from chapters 50 to 63 (textile sector). All data are from 2007 to 2019, the most recent year currently available. The dataset consists of yearly and bilateral flows, with detailed descriptions of the variables provided in Table 4.

**Table 4.** The description of variables and data sources

| Variable name | Variable description | Expected sign | Data sources |
|---|---|---|---|
| AGDP | Average GDP (in current USD) of two countries | + | World bank data |
| DGDP | The difference in GDP per capita (PPP, in current USD) of two countries | + | World bank data |
| LBR | The difference in Labor Participation Rate of two countries | + | World bank data |
| FDI | Vietnam's FDI net inflows (% of GDP) | + | World bank data |
| LGT | Average of Logistics performance index of two countries: Quality of trade and transport-related infrastructure (1=low to 5=high) | + | World bank data |
| EXR | The Nominal Exchange Rate between Vietnam and its partners | + | World bank data |
| DIST | Distance between Vietnam and partners | - | CEPII |
| FTA | The dummy variable taking the value of 1 if two countries are in the same FTA; otherwise, FTA equal to 0 | + | WTO center |

A panel framework was used to analyze textile export variations between Vietnam and its major partners from 2007 to 2019. Panel estimation controls for individual heterogeneity, time series, and cross-section effects, offering advantages over cross-section and time series data. The three main estimators for panel data, namely pooled OLS (POLS), random

effects (RE), and fixed effects (FE), were employed in this study to estimate the proposed model. The study also conducted Redundant fixed effects and Hausman tests to assess the efficiency of FE compared to POLS or RE. Although the test results indicate a preferred estimator, the study reports the results of all three models to compare the impacts of factors influencing Vietnam's textile exports.

## 5.   Results and discussion

Table 5 and 6 presents the descriptive statistics, correlation matrix, and results of panel pooled OLS, REM, and FEM regression for the proposed model. The correlation matrix in table 5 reveals several significant relationships among variables. Notably, average GDP and exports show a strong positive correlation, while exchange rate and export exhibit a strong negative correlation.

Models in table 6 show a notably high R-squared value ($> 0.75$), indicating a strong fit. Moreover, a significant majority of the explanatory variables demonstrate a high level of significance, suggesting that the gravity model effectively explains Vietnam's textile exports. The suitability of the Fixed Effects (FE) model for this particular data is established through the Redundant Fixed Effects and Hausman tests, as depicted in table 6. Therefore, the FEM is selected, and the focus of interpretation will be placed on the estimation results derived from this model. However, the results of all models are presented in order to offers a comprehensive view, enhancing analysis depth and reliability. It enables differentiation between these effects, robustness assessment, and evaluation of effect magnitudes, and provides a nuanced understanding of relationships between time-invariant and time-varying factors.

As indicated in Table 5, the average GDP of Vietnam and its key trading partners exhibits a reasonable pattern and aligns with the expected direction. These findings imply that Vietnam's textile exports to the chosen markets are projected to increase by 1.693 percent for every 1 percent rise in the average GDP between the two countries. Consequently, the market size of trading partners plays a crucial role in influencing Vietnam's textile exports. This outcome remains consistent with the gravity model theory and aligns with the findings of previous studies conducted in this field.

The estimated results are in line with theoretical expectations regarding the variable firstly added to the model, the income gap between exporting and importing countries. The income dissimilarity reflects the favorable production conditions for the exporting country's textile industry (labor costs) and the demand for textiles in the importing country. Therefore, the disparity in income significantly influences the textile trade flows between the two countries, with a magnitude of 0.161. It means that when the income gap rises, Vietnam tends to produce and export more while its partners' textile imports will increase due to increased demand.

**Table 5.** Descriptive Statistics and Correlation Matrix for Sample Variables

| | Mean | Std. Deviation | EXPORT | AGDP | DGDP | FDI | EXR | LABOUR | LOGISTICS | DIST | FTA |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **EXPORT** | 769.51 | 1968.52 | 1 | .882** | .261** | -0.093 | .124* | -.182** | .310** | .142** | .246** |
| | | | | 0 | 0 | 0.082 | 0.02 | 0.001 | 0 | 0.008 | 0 |
| **AGDP** | 1.20E+12 | 1.79E+12 | .882** | 1 | .189** | -0.059 | .194** | -.308** | .323** | .193** | .170** |
| | | | 0 | | 0 | 0.269 | 0 | 0 | 0 | 0 | 0.001 |
| **DGDP** | 25407.56 | 18887.27 | .261** | .189** | 1 | -0.065 | .614** | -0.008 | .790** | .140** | -.229** |
| | | | 0 | 0 | | 0.225 | 0 | 0.879 | 0 | 0.009 | 0 |
| **FDI** | 6.49 | 1.31 | -0.093 | -0.059 | -0.065 | 1 | -0.059 | -0.027 | -.244** | 0 | -0.098 |
| | | | 0.082 | 0.269 | 0.225 | | 0.266 | 0.612 | 0 | 1 | 0.067 |
| **EXR** | 10656.66 | 11102.44 | .124* | .194** | .614** | -0.059 | 1 | -.148** | .635** | .398** | -.539** |
| | | | 0.02 | 0 | 0 | 0.266 | | 0.006 | 0 | 0 | 0 |
| **LABOUR** | 15.78 | 8.33 | -.182** | -.308** | -0.008 | -0.027 | -.148** | 1 | -0.071 | -.253** | 0.057 |
| | | | 0.001 | 0 | 0.879 | 0.612 | 0.006 | | 0.184 | 0 | 0.29 |
| **LOGISTICS** | 3.10 | 0.35 | .310** | .323** | .790** | -.244** | .635** | -0.071 | 1 | .153** | -.235** |
| | | | 0 | 0 | 0 | 0 | 0 | 0.184 | | 0.004 | 0 |
| **DIST** | 6952.36 | 5100.43 | .142** | .193** | .140** | 0 | .398** | -.253** | .153** | 1 | -.551** |
| | | | 0.008 | 0 | 0.009 | 1 | 0 | 0 | 0.004 | | 0 |
| **FTA** | 0.50 | 0.50 | .246** | .170** | -.229** | -0.098 | -.539** | 0.057 | -.235** | -.551** | 1 |
| | | | 0 | 0.001 | 0 | 0.067 | 0 | 0.29 | 0 | 0 | |

*Notes: *, ** Correlation is significant at the 0.05 and 0.01 level (2-tailed), respectively*

**Table 6.** Regression Analysis Results

| Explanatory Variable | POLS | FEM | REM |
|---|---|---|---|
| AGDP | 0.961*** | 1.693*** | 1.455*** |
| DGDP | 0.257*** | 0.161*** | 0.205*** |
| FDI | -0.810*** | -0.244* | -0.369*** |
| EXR | -0.137*** | -0.081ns | -0.120** |
| LPR | 0.037ns | 0.173*** | 0.170*** |
| LGT | 2.951*** | 3.010*** | 3.179*** |
| DIST | -0.321*** | - | -0.472*** |
| FTA | 0.224** | 0.494*** | 0.472*** |
| Cross-section F (fixed effects test) | 55.751 (p = 0.000) | | |
| Cross-section Chi-square (fixed effects test) | 602.975 (p = 0.000) | | |
| Cross-section random (Hausman test) | | 20.508 (p = 0.005) | |
| Adjusted R-squared | 0.75 | 0.94 | 0.77 |
| Observations | 351 | 351 | 351 |
| SE of regression | 0.696610 | 0.318889 | |
| F-statistic | 127.2669 | 187.0779 | |
| Prob(F-statistic) | 0.000000 | 0.000000 | |
| Notes: ns-not significant; ***, ** and * mean significant at 1%, 5% and 10% level, respectively. | | | |

Regarding labor force participation, the result is as expected. An increase in Vietnam's LPR by 1 percent will expand its textile exports by 0.173 percent because it is one of the main factors of textile production. The positive coefficient of logistics performance on exports aligns with established theory and exhibits the highest magnitude among the variables (3.010), suggesting that the quality of logistics significantly affects Vietnam's textile exports. These results imply that Vietnam should maintain the textile industry workforce and improve the quality of the logistics to boost the industry's exports. Although the exchange rate is not statistically significant in the FE model, it carries a negative sign (in all three models). This result contradicts the theory that the appreciation of the exchange rate will reduce the export price advantage to reduce

exports. The positive influence of local currency depreciation on exports could be explained that, in the long run, depreciation may be favorable for gaining competitiveness in the international market, thereby encouraging exports. In cases of diminished export demand, the devaluation of currency can have an adverse effect on exports, particularly when economies of scale fail to mitigate the impact. This finding supports previous research on the relationship between exchange rates and textile exports (Su, 2017; Jantarakolica & Chalermsook, 2012; Beena & Mallick, 2011).

While the coefficient is statistically significant for FDI, it has an unexpected sign. The data properties can explain this outcome. FDI to Vietnam decreased gradually over the period 2007-2020. Furthermore, foreign direct investment (FDI) capital in the textile industry has constituted a relatively minor share and has exhibited a consistent decline over time, with a cumulative registered capital amounting to merely $428 million (Huong, 2020).

Geographical distance, a key variable in the gravity model, is worth noting. Although it was not estimated in the Fixed Effects (FE) model, it displayed the anticipated sign and showcased a significant impact on Vietnam's exports to its primary partners in the Pooled OLS and RE models. Moreover, the dummy variables representing Free Trade Agreements (FTAs) were found to be statistically significant in all three models. This highlights the substantial influence of FTAs between Vietnam and its trading partners on bilateral trade between the two parties.

In summary, Vietnam's textile exports are significantly affected by the quality of logistics and the size of the economies of the two sides. Next is the impact of the FTA, labor force, and income gap between Vietnam and its trade partners. This finding is consistent with previous studies on textile exports of the world's top textile exporters such as China, India, Bangladesh, and Pakistan.

## 6.   Conclusion

Recent studies on the textile industry identified a relationship between the factors (GDP, income, tariff, etc.) and textile export but did not consider relevant macroeconomic factors. In addition, studies on Vietnam's textiles are pretty limited. For this reason, this study analyzes the pattern and

factors affecting textile exports, a key industry in Vietnam. The estimated findings obtained from the panel data analysis, encompassing Vietnam's textile exports with 27 key partners during the period of 2007-2019, indicate that the majority of the explanatory variables in the model exhibit statistical significance and align with the expected sign. The determinants such as the average size of the economy, per capita income gap, labor force, logistics performance, and FTA all positively affect Vietnam's textile exports. The economy's average size and logistics quality have the most significant impact. As for the effect of FDI, the estimated results contradict the hypothesis that FDI will promote exports. This finding is consistent with the current situation in Vietnam because FDI inflows into the textile industry are pretty small. The exchange rate coefficient is not statistically significant; thus, there is no impact on Vietnam's textile exports.

The policy implications derived from this study highlight the significance of maintaining a skilled workforce in Vietnam's textile industry to enhance textile exports. Presently, the industry faces hurdles in expanding production due to issues concerning human resource development and low productivity. In comparison to neighboring Southeast Asian economies such as Thailand and Singapore, Vietnam's labor productivity is relatively lower. Additionally, Vietnam confronts the challenges of an aging population and a slow growth rate in the number of available workers. Furthermore, competition from Myanmar, Bangladesh, and Laos intensifies as they offer lower labor costs.

Vietnam has built an essential infrastructure for a manufacturing base that has significantly facilitated trade performance over the past decades. However, Vietnam's logistics performance includes inventory carrying costs, transport and handling delays, logistics management, and customs processing in international trade, below that of developing countries in Asia. Therefore, by decreasing logistics costs and enhancing the quality of logistics services for exports, Vietnam can bolster the competitiveness of its traded products, particularly in the textile sector.

Among the established Free Trade Agreements (FTAs), the markets of CPTPP and EVFTA member countries hold substantial importance, accounting for more than two-thirds of Vietnam's annual textile exports. However, for textile products to enjoy preferential duties, they must meet the criteria of "originating" defined by the rules of origin specified in these

agreements. To effectively capitalize on these FTAs and boost exports, it is essential to make additional enhancements in strategic investment promotion, administrative procedures, and the development of local enterprises' capacities.

The study's limitation lies in its inability to incorporate factors beyond the scope of the model, specifically industry-specific variables. Furthermore, exploring alternative estimation methods could enhance the study's findings. These aspects highlight potential avenues for future research to delve into and expand upon the current study.

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