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The Impact of Global Value Chain Participation on Trade Balance: *Evidence from Heterogeneous Emerging Countries*[1]

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ABSTRACT

This paper investigates the impact of participation in global value chains (GVCs) on the trade balance of six middle-income emerging countries—Colombia, Indonesia, Vietnam, Egypt, Turkey, and South Africa (CIVETS)—from 1995 to 2020. The study employs heterogeneous panel models, including the Augmented Mean Group (AMG) and Cross-Sectionally Augmented Autoregressive Distributed Lag (CS-ARDL) models to address heterogeneity and cross-sectional dependence. In addition, robustness checks utilize the Dynamic Common Correlated Effects Mean Group (DCCE-MG) and Group-Mean Fully Modified Ordinary Least Squares (GM-FMOLS) estimators. The findings of the paper show that disaggregating GVC participation into backward and forward participation unveils contrasting effects. Backward GVC participation affects the trade balance of CIVETS countries negatively in both the short and long run, likely due to increased import dependency on capital-intensive inputs. Conversely, forward GVC participation positively affects trade balance, indicating potential benefits from moving up the value chain. By comparing the effects of the two GVC participation forms, the positive effects of forward GVC dominate. Country-specific results show that backward participation has a negative effect on the trade balances of Colombia, Indonesia, Vietnam, and South Africa, while forward participation contributes positively to the trade balance in Colombia, Indonesia, Vietnam, and Egypt. The results of this paper offer important insights for policymakers seeking to strategically position their economies within GVCs to maximize trade benefits.

Keywords: *Global Value Chain, Trade Balance, CIVETS, Heterogeneous Models, Cross-sectional Dependence*

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1. INTRODUCTION

Global value chains (GVCs) have become a pivotal element in the modern global economy, reshaping how countries engage in international trade. In the traditional models of international trade, countries exchange finished and intermediate goods for domestic production and consumption. However, the landscape of global trade has evolved significantly since 1990 due to increased globalization, reduced trade barriers, and technological advancements (United Nations Conference on Trade and Development [UNCTAD], 2013). These changes have given rise to large trade networks in which firms and countries participate in various stages of production of final products, leading to a wide exchange of intermediate goods, referred to as GVCs (World Bank, 2020). Thus, a GVC implies that the added value in each production stage takes place in different countries. GVCs have changed the nature of trade, where traditional trade decreased by 12.5% and GVC trade increased by 24% from 1995 to 2020 (see Figure 1).

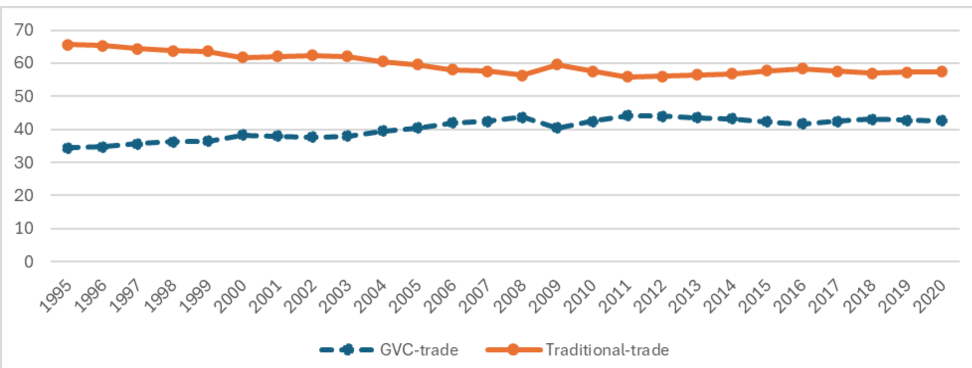

Figure 1: Gross Trade Breakdown (% of Gross Trade)

Source: World Integrated Trade Solution (2024).

Participation in GVCs takes two main forms, backward and forward, depending on exports and imports of intermediate goods. The export content of a country can be broken down into domestic value-added (DVA) and foreign value-added (FVA). Backward GVC (BGVC) participation is related to the import content, i.e. FVA, in countries' exports, while forward GVC (FGVC) is related to the DVA content in the exports of the importing country to third countries (World

Bank, 2020). A country which imports (exports) a relatively larger share of intermediate goods is said to be more specialized in downstream (upstream) activities (Van der Marel, 2015). Hence, a country's overall participation rate in GVC is measured through its backward and forward GVC participation (UNCTAD, 2013).

The economic impacts of GVCs on productivity, economic growth, and employment have been widely investigated. The bulk of the literature has shown that participation of developing countries in GVCs tends to enhance productivity (De Marchi, Giuliani, & Rabellotti, 2018; Halpern, Koren, & Szeidl, 2015; Raei, Ignatenko, & Mircheva, 2019; Timmer, Erumban, Los, Stehrer, & de Vries, 2014). This is achieved by allowing countries to specialize in specific tasks or stages of production, leveraging their comparative advantages. Moreover, it leads to a wider accessibility of inputs that increases competition, and facilitates the transfer of knowledge and technology, thereby upgrading production and exports. Besides, numerous studies have revealed that the integration of countries into GVCs raises employment levels and leads to significant job creation (Banga, 2016; dine, 2019; Hollweg, 2019). Despite the important and new implications of GVCs on trade, few studies have explored the impact of participation in GVCs on the trade balance.

By changing the nature of trade, GVCs have altered the interaction between exports, imports, and a country's trade balance. FGVC participation enhances export growth by granting access to global markets, enabling economies of scale, and diversifying export products (Raei et al., 2019), all of which have positive effects on the trade balance. However, the trade impacts of BGVC participation are less straightforward. For example, BGVC participation boosts exports by using imported intermediate goods to enhance firms' competitive position (Felice & Tajoli, 2021). However, this implies that a country may export a product with a high import content. Hence, while gross exports increase, the trade balance may not improve proportionally due to the high value of imports. Therefore, even though exports may rise, the imports required to support that production also increase, potentially affecting the trade balance. Specifically, countries that are heavily reliant on imported inputs may see their import levels rise significantly, potentially offsetting gains in export levels (López-Villavicencio & Mignon, 2021). This complexity challenges the traditional view that rising exports will automatically improve the trade balance. On a bilateral level, while greater participation in GVCs might affect trade balances positively, it does not necessarily improve the overall trade balance of a country (World Bank, 2020).

From another perspective, GVC participation can reduce the sensitivity of trade balance to exchange rate changes. In economies integrated into GVCs, the use of imported inputs means that changes in exchange rates affect both export prices and import costs simultaneously. This can lead to a muted response in export volumes to currency depreciation, which traditionally would improve the trade balance. On the other hand, when the domestic currency appreciates, it not only raises the cost of exports but also lowers the price of imported intermediate goods, thereby alleviating the impact of relative price changes on the trade balance (Koopman, Powers, Wang, & Wei, 2010).

Emerging countries are significant players in GVCs, and have been an important source of exports, where their export shares increased from 25% in 1996 to 45% of global exports in 2010 (Reyes-Heroles, Traiberman, & Van Leemput, 2020). Some countries such as China and Mexico emerged as significant exporters of intermediate and final manufactured goods, while Brazil, Russia, and South Africa became major exporters of primary products during the 2000s (Gereffi, 2019; Gereffi & Sturgeon, 2013). Due to the significant role played by these countries in GVCs, this paper aims to investigate the impact of GVC participation on the trade balance of six middle-income emerging countries, known as CIVETS.

The term "CIVETS" was coined by the Economist Intelligence Unit (EIU) in 2009 to refer to six emerging countries, namely Colombia, Indonesia, Vietnam, Egypt, Turkey, and South Africa, as the next generation of promising economies after the BRICS (Korkmaz, Çevik, & Atukeren, 2012). CIVETS economies belong to multiple regions like Latin America, Asia, and Africa. They were grouped based on their youthful, expanding populations and dynamic economic growth, and collectively represent a significant share of global population and economic activity (Vadra, 2018).

By asking whether and how the participation of CIVETS countries in GVCs affects their trade balances, this paper contributes to the literature in several ways. First, it focuses on a group of emerging countries that is rarely examined compared to other emerging countries like the BRICS. This gives new insights about the impacts of their integration into various stages of production. Second, due to the heterogeneous nature of this panel, this paper uses a class of heterogeneous panel models, some of which capture both short-term and long-term effects of GVC participation on trade balance. Third, the paper distinguishes between the effects of forward and backward GVC participation on the trade balance. By analyzing these two dimensions separately, the paper sheds light on the complex trade-offs that countries face when integrating into GVCs. This helps to understand how participation in different activities of GVCs affects trade performance.

This paper employs the AMG and the CS-ARDL model to estimate the impact of backward and forward participation in GVCs on the trade balance. Moreover, DCCE-MG and MG-FMOLS methods are used to check the robustness of the results. The findings show that although FGVC participation improves the trade balance of CIVETS countries, BGVC has negative effects in both the short and long run. However, the positive effects of FGVC outweigh the negative effects of BGVC, suggesting positive impacts of GVC on trade balance.

The remainder of the paper is organized as follows: Section 2 is a literature review. Section 3 presents the data and a descriptive analysis. Section 4 and 5 cover the methodology and provide the results. Section 6 is the conclusion and recommendations.

2. LITERATURE REVIEW

2.1 Theoretical Background

Standard trade theory offers three primary approaches to understanding the key determinants of a country's trade balance. First, the elasticity approach focuses on the responsiveness of trade volumes to changes in exchange rates, particularly through the lens of price elasticities of demand for exports and imports. This approach is rooted in the Marshall-Lerner condition, which states that a devaluation/depreciation of a country's currency will improve the trade balance if the sum of the price elasticities of demand for exports and imports is greater than one. A critical extension of the elasticity Approach is the J-Curve effect, which highlights the importance of considering both short-term and long-term elasticities when analyzing the impact of exchange rate changes on trade balance (Magee, 1973). Initially, the trade balance may worsen after a depreciation because the prices of imports rise immediately, while the volumes of exports and imports adjust more slowly. Over time, as export and import volumes adjust to the new exchange rate, the trade balance begins to improve (Bahmani-Oskooee & Ratha, 2004).

Second, the absorption approach links the trade balance to national income and expenditure. It focuses on the relationship between a country's domestic economic activity (absorption) and its trade balance (Alexander, 1952). It states that the trade balance improves when national income exceeds domestic absorption (spending on consumption and investment). A country with a trade deficit must either reduce absorption or increase production to improve its balance. Third, the Monetary Approach, which is grounded in the quantity theory of money and assumes that trade imbalances are fundamentally monetary phenomena (Johnson, 1977). This approach asserts that trade imbalances result from disequilibria in the money supply and demand. A country running a trade deficit is likely experiencing excess money supply, leading to inflation and current account deterioration. Conversely, contractionary monetary policies can help correct trade deficits.

Traditional trade theories mentioned above often focused on the trade of finished goods, implying a direct relationship between exports, imports, and trade balance. However, GVCs involve exchanging intermediate goods and services, leading to new trade patterns and flows. According to the World Trade Organization (2024) countries participate as buyers by importing intermediate goods to produce their exports (backward participation) or as sellers by selling their DVA to be processed and sold by other countries (forward participation).

The impact of GVCs on trade balance is complex and ambiguous due to the intertwined nature of exports and imports, making it difficult to determine a clear-cut impact on trade balance. According to existing literature, GVCs can influence a country's trade balance through various channels. Most of the studies agreed that competitiveness gains from relatively cheaper foreign intermediate goods have a positive impact on the trade balance (Brumm, Georgiadis, Gräb, & Trottner, 2019; Felice & Tajoli, 2021; López-Villavicencio & Mignon, 2021). By analyzing the impact of GVCs on current account balances, Brumm et al. (2019) argued that high levels of GVC participation may indicate that an economy has a temporary technological edge, enhancing its competitiveness and subsequently improving its current account balance. When domestic firms substitute cheaper imported intermediate goods for more expensive domestic products, they increase their BGVC participation, which enhances their competitiveness compared to firms in other countries. However, the increased foreign intermediates usage not only benefits the importing country but also creates a positive demand shock for the exporting countries of those intermediates. This results in an increase in their FGVC participation, as they benefit from higher demand for their exports. Besides the "competitiveness channel", Felice and Tajoli (2021) added two channels through which GVC participation can affect a country's trade balance. The "accounting channel" arises because a higher share of imported intermediates in exports means that a country imports more relative to its exports. This can lead to a trade deficit as the value of imports increases alongside exports. The GVCs also affect income distribution both within and between countries. This "income channel" can influence consumption patterns and, consequently, trade balances.

GVCs also affect the trade balance indirectly through the exchange rate channel, i.e. by influencing the impact of the exchange rate on exports. Without GVCs, the traditional hypothesis is that real depreciation of currency affects exports positively and hence improves trade balance. This is confirmed in particular in developing countries (Freund & Pierola, 2012). However, with GVC participation and when a country's currency depreciates, it may enhance competitiveness by lowering the price of exports, but this effect can be offset by the increased costs of imported inputs. Thus, the positive effect of currency depreciation on export volumes might be weakened, especially for countries with high import intensity in their exports. (Adler, Meleshchuk, & Buitron, 2023; Ahmed, Appendino, & Ruta, 2017; Hannan, Appendino, & Ruta, 2015; Tan, Trieu Duong, & Chuah, 2019).

2.2 Empirical Literature

This paper is related to two strands of literature. The first strand examines the indirect economic effects of GVCs on trade balance through productivity, output, and exports. Several studies have focused on the impact of importing intermediate goods, i.e. related to the backward side of GVC participation. Using firm-level data, the findings of Goldberg, Khandelwal, Pavcnik and Topalova (2010) on India, Bas and Strauss-Kahn (2014) on France, and Castellani and Fassio (2019) on Sweden, suggest that importing intermediate goods increases productivity and domestic production, and also boosts export growth and diversification. Importing new intermediate inputs has also been shown to raise productivity levels and stimulate the production of new products in European countries (Colantone & Crinò, 2014) as well as enhance export diversification in low-income countries (Benguria, 2014). Feng, Li and Swenson (2016) show that imported intermediate goods can have a significant impact on the level of exports. Using a greater variety and higher quality of imported inputs can enhance the overall quality of exports, leading to an increase in demand for those exports. For a selected sample of emerging countries, Jangam and Rath (2021) utilized the panel feasible generalized least square method and found that both backward and forward GVC participation improved the domestic value-added content in exports over the period 1995-2011. However, some studies have found that backward GVC participation has a larger effect. For example, Constantinescu, Mattoo and Ruta (2019) concluded that backward GVC participation has a more significant and positive impact on domestic productivity than forward GVC participation. Similarly, Veeramani and Dhir (2022) found that greater backward GVC participation in India stimulates DVA, gross exports, and employment.

The second strand of literature delves into the direct effects of GVC on trade or account balance. Using the IMF External Balance Assessment model, Brumm et al. (2019) applied their study to a sample of 29 advanced and emerging countries to investigate the impact of GVC participation on current account imbalances over the period 1995-2011. Their findings revealed that GVC participation positively affected the current account by enhancing countries' trade balance. By focusing on backwards GVC participation only, Felice and Tajoli (2021) extended Brumm et al. (2019) analysis by including more countries, particularly European countries and only four emerging ones, and a longer timeframe (2000-2014). Similarly, they discovered that backward GVC participation has a positive impact on trade balance, resulting in greater exports than imported goods. However, this study also examined the role of trade partners, revealing that FVA from low-income trade partners has a negative impact on the trade balance. In contrast, López-Villavicencio and Mignon (2021), which also concentrated on backward participation but encompassed a larger set of advanced and emerging nations, found that BGVC had a negative effect on the current account balance. This indicated that the competitiveness gains achieved from imported intermediate goods did not offset their negative effects on the trade balance. Likewise, but considering also FGVC, Gabsi and Bousnina (2022) found, using the system generalized method of moments (GMM), that BGVC has a negative impact while FGVC has positive impacts on the current account balance of focused on the Middle East North African (MENA) countries.

This paper contributes to the above literature by focusing on CIVETS countries as a diverse sample of emerging middle-income countries, reflecting diverse geographic regions. In addition, different from the above studies, we adopt a heterogeneous panel dynamic approach to account for heterogeneity and cross-sectional dependence across countries.

3. DATA AND DESCRIPTIVE ANALYSIS

This study uses data for CIVETS countries, including Colombia, Egypt, Indonesia, Vietnam, Turkey, and South Africa. Data are annual, covering the period 1995-2020 for data availability.

3.1 Trade Balance Figures

The trade balance (TB) is defined in this paper as the ratio of gross exports (EXGR) to gross imports (IMGR), EXGR/IMGR. this ratio is also referred to as the foreign trade coverage ratio and serves as an indicator of a country's foreign trade balance, where it shows the position of the balance of trade in terms of its components rather than their difference (Organisation for Economic Cooperation and Development [OECD], 2023a). A ratio greater than 1 signifies a foreign trade surplus, while below 1 indicates a foreign trade deficit. Besides, this ratio is suitable for comparison both between countries and within the same country.

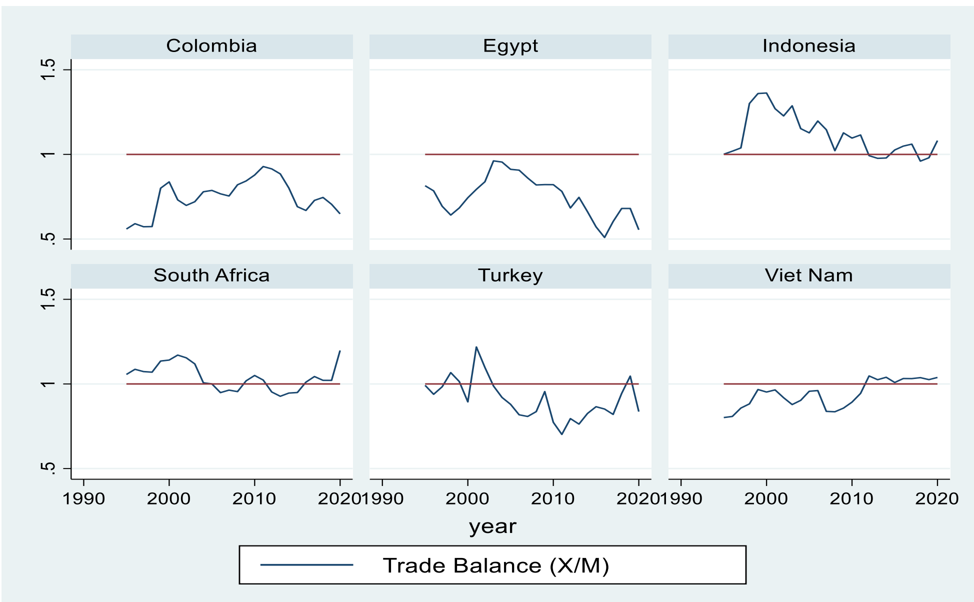

Figure 2: Trade Balance of CIVETS Countries over the period (1995-2020)

Source: Author's work based on OECD-TiVa data (OECD, 2023c).

Figure 2 illustrates the evolution of trade balances of CIVETS countries, around the balance line (represented by the red horizontal line at 1) during the period (1995-2020). The blue lines depict each country's trade balance trajectory, with values above 1 indicating a trade surplus and below 1 a trade deficit. There is significant variability in trade balance patterns across countries. Egypt and Colombia showed consistent trade deficits, suggesting structural trade imbalances driven by import dependence. Vietnam and South Africa exhibited improving or near-balanced trade positions, where Vietnam has displayed gradual improvements in its trade positions since 2012. Indonesia and Turkey displayed significant volatility, with trade balance positions shifting over time.

By disaggregating trade balance into imports and exports, and distinguishing between final and intermediate products, Figure 3 illustrates the shift in the composition of trade for each country over this 25-year period. For instance, Indonesia showed a marked increase in the proportion of intermediate goods exports in 2020 compared to 1995, suggesting a deeper integration into trade as a supplier of intermediate products. Similarly, Vietnam's exports transitioned significantly towards intermediate products, indicative of its growing role in manufacturing and assembly within GVCs. The general trend across countries is the increasing share of intermediate goods imports in 2020 compared to 1995. However, final goods exports remain a substantial component of overall imports in Egypt.

Despite the significant share of intermediate product imports, only a small portion is re-exported as part of the country's exports. In 2020, Colombia, Indonesia, and Egypt embodied just 12–20% of their total intermediate goods and services imports in exports. Turkey and South Africa had a higher share of imported intermediates contributing to exports, with 29% and 39%, respectively. Vietnam recorded the highest share, incorporating 60.8% of its imported intermediate goods into its exports, reflecting its deep integration into global manufacturing and export-oriented production networks (OECD, 2023b).

Figure 3: Trade Balance Disaggregation (1995 and 2020)

Source: Author's work based on OECD-TiVa data (OECD,2023c).

3.2 GVC Participation Measures

To examine the impact of GVC participation on the trade balance, the paper utilizes the OECD-TiVA database (OECD, 2023c). Koopman, Wang and Wei (2014) laid the groundwork for measuring GVC participation, distinguishing between backward and forward participation. Gross exports can be broken down into two main components: the FVA embedded in a country's gross exports, and the DVA in exports. The latter part is further divided into exports consumed in the destination country and those further used as intermediate inputs for exports to third countries.

Based on this decomposition, and according to the OECD TiVa database, backward and forward GVC participation are defined as (OECD, 2023a):

Backward GVC participation (BGVC): is defined as foreign value-added (FVA) embodied in gross exports (EXGR) as a percentage of total gross exports, i.e. $\frac{\text{FVA}}{\text{EXGR}} \times 100$.

Forward GVC participation (FGVC): is defined as the domestic value-added (DVA) embodied in foreign exports as a percentage of EXGR of the valued-added source country, i.e. $\frac{\text{DVA}}{\text{EXGR}} \times 100$.

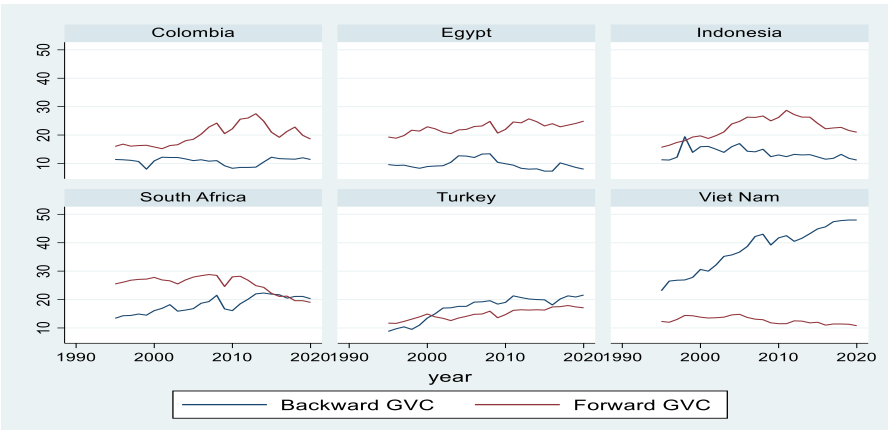

Figure 4: Development of GVC Participation in CIVETS Countries

Source: Author's work based on OECD-TiVa data (OECD, 2023c).

Figure 4 illustrates the development of the BGVC and FGVC participation rate of CIVETS countries over the period 1995 to 2020. The figure reveals distinct patterns of GVC participation across the CIVETS countries. Forward participation is the main form of GVC integration in Colombia, Indonesia, Egypt, and South Africa, while backward participation dominates in Turkey and Vietnam, which showed a relatively more stable increase in their BGVC participation. The observed patterns likely reflect differences in economic structures and comparative advantages. That is, FGVC is the dominant form of participation in resource-rich countries, such as Indonesia and Colombia, which are known for supplying raw materials. Similarly, Egypt's FGVC participation demonstrates its advantage in exporting raw materials and intermediate goods, whereas its weak performance in BGVC participation indicates its low import content in its exports.

As illustrated in Figure 5, Vietnam has achieved its highest rank in the GVCs due to its effective backward participation in the electronics sector, where its participation in this sector witnessed significant growth, rising from 47% in 2000 to 67% in 2010 (World Bank, 2020). This suggests Vietnam's heavy reliance on imported inputs for its export production, consistent with its role as a manufacturing hub in global supply chains. Turkey and South Africa also show notable backward participation, though at lower levels than Vietnam. Colombia, Indonesia and Egypt exhibit relatively lower BGVC participation rates, with Egypt being the lowest. This can be attributed to the nature of their exports, such as natural resources and services, which necessitate less imported content or FVA. For the two African countries in the sample, South Africa, considered as Africa's leading value chain hub (OECD, 2021), demonstrated a considerably greater degree of BGVC participation compared to Egypt in 2020. In terms of FGVC participation, Vietnam, though had the highest rate of BGVC participation, recorded the lowest FGVC participation rate across CIVETS in 2020. A country specializing in the assembly and processing of intermediate products, subsequently exporting these goods, will exhibit a strong backward participation index but a weak forward participation index (Cadestin, Gourdon, & Kowalski, 2016). In contrast, Egypt, with the lowest BGVC, had the highest FGVC rate across CIVETS in 2020.

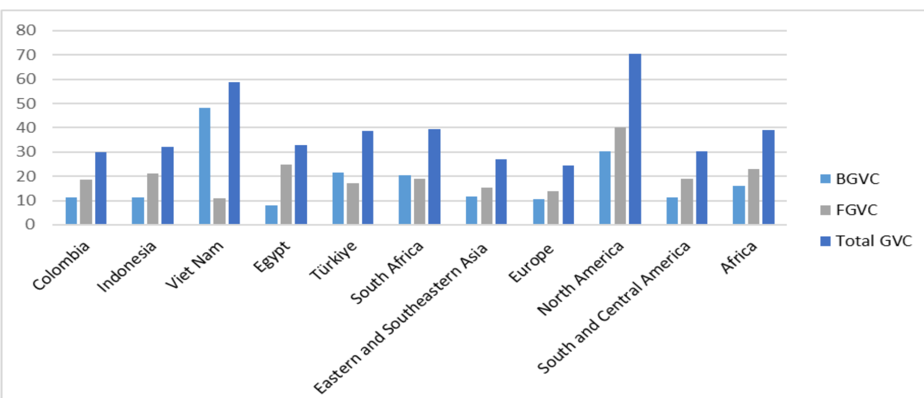

Figure 5: GVC Participation of CIVETS Countries vs other Regions, 2020

Source: Author's work based on OECD-TiVa data (OECD, 2023c).

Similar to regional patterns, FGVC participation dominates in CIVETS countries. North America recorded the highest forward and total GVC participation in 2020, with forward integration exceeding backward integration, highlighting its role as a key supplier of inputs to global markets. Colombia follows a similar pattern, with a FGVC comparable to the South and Central American regional average. Among the CIVETS economies, Indonesia's GVC participation mirrors that of Eastern and Southeastern Asia, though at a higher level than the regional average. In contrast, Vietnam exhibits a distinct pattern, with forward participation below the regional average but backward participation significantly above it, reflecting its strong reliance on imported inputs for export production. In Africa, FGVC participation generally exceeds backward participation, reinforcing the region's role as a supplier of raw materials and intermediate goods rather than a hub for import-dependent manufacturing. Egypt's participation aligns with Africa's overall trends, though its backward GVC share falls below the regional average. In 2020, South Africa stood out, with a backward participation rate exceeding the African average, indicating a relatively higher reliance on imported inputs for its export sector.

Table 1: GVC Participation Figures of CIVETS Countries in 2020

	Backward GVC Participation		Forward GVC Participation	
	FVA contents in Exports	**Imports VA**	**Share of DVA by foreign demand**	**Final destination for DVA**
Colombia	**Total 11.4%** Transport equipment (40.6%) Machinery and equipment (39.7%) Motor vehicles (39.4%)	US (25.8%) China (21.6%) EU (15.1%)	**Total: 11.9%** Minning and quarrying (61%) Basic metals (49%) Accommodation and food services (3.3%)	US (34%) EU (13.5%) China (8.1%)
Indonesia	**Total: 11.2%** Transport equipment (32.7%) Machinery and equipment (29.9%) Fabricated metal products (28.5%)	China (25.3%) EU(10.3%) US(8.3%)	**Total 15.6%** Basic metals (56.4%) Minning and quarrying (46.5%) Accommodation and food services (3.2%)	China (18.6%) US (15.5%) Japan (9.3%)
Viet Nam	**Total: 48%** Machinery and equipment (70.4%) Basic metals (63.4%) Electrical equipment (60.7%)	China (25%) EU (9.2%) Korea (8.5%)	**Total: 51.3%** Textiles and apparel (92.9%) ICT and electronics (90.8%) Accommodation and food services (15.2%)	US (24.1%) China (20%) EU (9.2%)
Egypt	**Total: 8%** ICT and electronics (30.7%) Electrical equip. (24.5) Motor vehicles (24.3%)	EU (24.6%) China (13.6%) US (8.9%)	**Total: 9.3%** Chemicals and pharmaceuticals (28%) ICT and electronics (27.9%) Transport equipment (0.9%)	EU (24.7%) US (14%) China (6.3%)
Turkey	**Total: 21.6%** Coke and refined petroleum products (69.5%) Motor Vehicles (38.5%) Electrical equip. (34.1%)	EU (32.8) China (12.9%) US (7.6%)	**Total: 21.3%** Basic metals (49.6%) Motor Vehicles (46%) Food and beverages (14.1%)	EU (34.7%) US (9.8%) UK (5.8%)
South Africa	**Total: 20.3%** Coke and refined petroleum products (42.8%) Motor Vehicles (40.3%) Chemicals and pharmaceutical 28.5%	EU (24.1%) China (20.3%) US (8.2%)	**Total: 22.7%** Minning and quarrying (73.6%) Motor Vehicles (71%) Accommodation and food services (7.4%)	EU (17.9%) China (15.8%) US (8.7%)

Source: Compiled by the author based on data from OECD, 2023b.

Table 1 provides an overview of some indicators of GVC participation of CIVETS countries, detailing their backward and forward participation, and highlights key sectors as well as their main trade partners.[1] From BGVC side, most CIVETS economies rely heavily on FVA in sectors such as transport and electrical equipment, machinery, and refined petroleum products. Countries like Vietnam and Egypt, for instance, depend on high-tech imports (ICT, electronics), indicating a reliance on foreign inputs for industrial production. On the other hand, FGVC participation is concentrated in resource-based industries, especially in mining, basic metals, and motor vehicles. This pattern is particularly strong in South Africa, Indonesia, and Colombia, reflecting their roles as exporters of raw materials or semi-processed goods. Despite that DVA driven by foreign demand in Egypt is concentrated in chemicals, ICT and transport equipment, only 9.3% of Egypt's DVA was driven by foreign demand, compared for example to 51.3% in Vietnam.

Across the 76 countries included in the OECD-TiVA database, the European Union, China, and the U.S. emerge as dominant trade partners in both backward and forward participation. China is a major supplier of intermediate inputs, particularly in Vietnam, Indonesia, and Egypt. The destination for a country's DVA indicator shows that the U.S. and EU are key markets, especially for Vietnam, Egypt, and Turkey, suggesting strong linkages with developed economies.

4. METHODOLOGY

4.1 Model Specification

This paper provides an empirical investigation of the effect of GVC participation on trade balance, as shown in Eq. (1):

$$TB_{it} = f(GVC_{it}, X_{it}) \qquad (1)$$

[1] The sectors and countries in Table1 are based on the OECD-TIVA database which comprises 76 economies and 45 industrial sectors.

where the subscript i denotes country and t is year.

$\mathrm{TB_{it}}$ stands for trade balance or foreign trade coverage ratio of country i in year t. $\mathrm{GVC_{it}}$ represents the GVC participation rate. However, two equations using two forms of GVC participation will be considered: backward $\mathrm{BGVC_{it}}$ and forward $\mathrm{FGVC_{it}}$. $\mathrm{X_{it}}$ is a vector of other explanatory variables, selected based on the literature, including real gross domestic product per capita ($\mathrm{GDP_{it}}$) referring to the country's level of development. Real effective exchange rate ($\mathrm{REER_{it}}$) is a measure of a country's international price and cost competitiveness and is calculated by averaging a country's bilateral exchange rates against its major trading partners, considering price levels. An increase in the REER indicates appreciation of the home currency against the basket of trading partners' currencies (Darvas, 2021). Money supply ($\mathrm{MS_{it}}$) is measured by broad money as a percentage of GDP. Gross capital formation ($\mathrm{GCF_{it}}$), measured as a percentage of GDP, is a proxy of domestic investment expenditure which is expected to affect the trade balance by influencing demand for imports and the productive capacity for exports. GDP, GCF and MS are obtained from the World Bank Development Indicators (WDI), whereas REER is obtained from the Brugel dataset (Darvas, 2012, 2021). All variables are transformed into natural-log forms. Eq (1) can be therefore re-written as follows:

$$lnTB_{it} = \beta_0 + \beta_1 lnBGVC_{it} + \beta_2 lnGDP_{it} + \beta_3 lnREER_{it} + \beta_4 lnMS_{it} + \beta_5 lnGCF_{it} + \varepsilon_{it} \quad (2)$$

$$lnTB_{it} = \beta_0 + \beta_1 lnFGVC_{it} + \beta_2 lnGDP_{it} + \beta_3 lnREER_{it} + \beta_4 lnMS_{it} + \beta_5 lnGCF_{it} + \varepsilon_{it} \quad (3)$$

4.2 Econometric Techniques

To estimate the above equations, four steps are followed. First, since macroeconomic shocks affecting one country may also affect other countries in the panel, cross-sectional dependence (CSD) is tested. CSD is common in panel data and occurs due to the correlation between error terms across cross-sectional units. In this paper, CSD might arise due to trade relations between countries and other forms of globalization, resulting in the existence of spillover effects or common shocks (R. Ahmad, Sharif, Ahmad, Gul, & Abdirasulovna, 2024). If CSD is ignored, it can lead to biased, inconsistent, and inefficient estimates of the model's parameters (Pesaran, 2006, 2007), since the correlation between error terms can create spurious relationships between the dependent and independent variables. In this paper, three statistical tests are used to detect CSD. The Breusch-Pagan LM Test (Breusch & Pagan, 1980), scaled LM test (Pesaran, 2004), and Pesaran (2004) CD test. The test statistics of the three tests are presented in the following equations (Pesaran, 2015) :

$$CD_{LM} = T \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \hat{\rho}_{ij}^2 \qquad (4)$$

$$CD_{Scaled\ LM} = \sqrt{\frac{1}{N(N-1)}} \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} (T\hat{\rho}_{ij}^2 - 1) \qquad (5)$$

$$CD_{Pesaran} = \sqrt{\frac{2T}{N(N-1)}} \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \hat{\rho}_{ij}^2 \qquad (6)$$

Where T and N denote time and cross-section, respectively, and $\hat{\rho}$ denotes the correlation coefficient between residuals and can be written as:

$$\hat{\rho}_{ij}^2 = \hat{\rho}_{ji}^2 = \frac{\sum_{t=1}^{T} e_{it} e_{jt}}{(\sum_{t=1}^{T} e_{it}^2)^{1/2} (\sum_{t=1}^{T} e_{jt}^2)^{1/2}}.$$

Second, a test for slope heterogeneity is performed. A heterogeneous panel is a common issue in panel data analysis and can result in biased and inefficient estimates if not appropriately addressed (Swamy, 1970). Thus, it is crucial to ascertain whether the relationship between the dependent and independent variables remains consistent across all countries in the sample. Pesaran and

Yamagata (2008) slope homogeneity test is used, which is based on two test statistics: $\tilde{\Delta}$ for large samples and $\tilde{\Delta}adj$ for small samples.

$$\tilde{\Delta}= \sqrt{N}\left(\frac{N^{-1}\tilde{S}-k}{\sqrt{2k}}\right)$$
$$\tilde{\Delta}adj = \sqrt{N}\left(\frac{N^{-1}\tilde{S}-k}{\sqrt{Var(\tilde{Z}_{iT})}}\right) \qquad (7)$$

where $\tilde{S} = \sum_{i=1}^{N}(\hat{\beta}_i - \tilde{\beta}_{WFE})' \frac{X_i' M_\tau X_i}{\tilde{\sigma}_i^2}(\hat{\beta}_i - \tilde{\beta}_{WFE})$ refers to a modified version of Swamy's statistics and $Var(\tilde{Z}_{iT}) = \frac{2k(T-k-1)}{T+1}$ (Pesaran & Yamagata, 2008), and k denotes regressors.[1]

Third, unit root tests are utilized to assess the stationarity of variables in panel data analysis, which encompasses time series characteristics. Panel unit root tests are classified as first and second-generation tests. First-generation panel unit root tests such as Augmented Dickyey-fuller (ADF), the Levin-Lin-Chu test and the Im-Pesaran-Shin test assume cross-sectional independence. Using these tests in the presence of CSD may lead to inconsistent results (De Silva, Hadri, & Tremayne, 2009). To tackle the CSD issue, a cross-sectionally augmented ADF (CADF) test was developed by Pesaran (2007). This test involves augmenting the standard ADF regression for each series with the cross-section averages of lagged levels and first-differences. Then the CADF statistics are used to develop the cross-sectionally augmented IPS (CIPS) test. The CADF test is based on the following regression:

$$\Delta Y_{it} = a_i + b_i Y_{i,t-1} + c_i \bar{Y}_{t-1} + d_i \Delta\bar{Y}_t + \mu_{it} \qquad (8)$$

Where $\bar{Y}_t = N^{-1}\sum_{j=1}^{N} Y_{jt}$ and $\Delta\bar{Y}_t = N^{-1}\sum_{j=1}^{N}\Delta Y_{jt}$.

In addition, CIPS test statistics can be derived as follows:

[1] The reader is referred to Pesaran, M. H., & Yamagata, T. (2008). for the details of $\tilde{S}$.

$$CIPS = N^{-1} \sum_{i=1}^{N} CADF_i \tag{9}$$

Fourth, the existence of cointegration between the variables is verified. Pedroni residual-based panel cointegration test (Pedroni, 1999, 2004) is used. Pedroni developed seven test statistics to handle both homogenous and heterogeneous panels. These tests can be divided into two groups: panel statistics, derived from the pooled coefficients of unit root tests on the residuals across different countries, and assume identical autoregressive (AR) parameters for all cross-section units, and group statistics, obtained by averaging individually estimated coefficients for each country and allow the AR parameter to vary across units (Lazăr, Minea, & Purcel, 2019; Neal, 2014). To address the CSD issue, cross means are subtracted, i.e. demeaning the data, in the second-generation Pedroni test to remove common factors in the panel (Cihan & Değirmenci, 2024). The study also uses Westerlund (2005) panel cointegration test. Westerlund proposes variance ratio tests for cointegration, which assess whether the residuals from an estimated panel regression contain a unit root. The test includes two types: Panel variance ratio, which tests whether all panel members share a common cointegrating relationship, and Group variance ratio, which allows for the possibility that only some panel members are cointegrated while others are not. The tests can account for cross-sectional dependence using techniques like subtracting the cross-sectional mean of the residuals before performing the tests.

Drawing from the data characteristics and test results that are thoroughly examined in Section 5, this study implements two primary estimation methods: the Augmented Mean Group (AMG) approach (Eberhardt & Bond, 2009; Eberhardt & Teal, 2010) and the Cross-Sectionally augmented ARDL (CS-ARDL) estimator by Chudik and Pesaran (2015). To ensure the reliability of the results, additional robustness tests using the Dynamic Common Correlated Effects Mean Group (DCCE-MG) estimator alongside the mean-group versions of Fully Modified OLS (MG-FMOLS) will be conducted.

The AMG and the CS-ARDL estimator are both designed to handle panel data with CSD and heterogeneity across units. However, they differ in their approach to modeling the relationship between variables and accounting for common factors. Starting with the simple model in Eberhardt (2012)

$$y_{it} = \beta_i x_{it} + \mu_{it} \quad (10)$$

To deal with heterogeneity, the mean group (MG) estimators generally take the average of individual slopes of each cross-sectional unit in the panel (Pesaran & Smith, 1995), the MG estimator is given by $\beta^{MG} = \frac{1}{N}\sum_{i=1}^{N} \beta_i$.

Introducing CSD in both observables and unobservable can be written as stated in (Eberhardt, 2012; Eberhardt & Teal, 2010):

$$\mu_{it} = \alpha_{1i} + \lambda_i f_t + \varepsilon_{it} \text{ and } x_{it} = \alpha_{2i} + \lambda_i f_t + \gamma_i g_t + e_{it} \quad (11)$$

Where α_{1i} and α_{2i} are group fixed effects, f_t and g_t are unobserved common factors with country-specific factor loading, ε_{it} and e_{it} denote white noise.

Different estimators address CSD in distinct ways. For instance, the CCE-MG estimator (Pesaran, 2006) consider CSD by including cross-sectional means of both dependent ($\bar{y}_t$) and independent variables ($\bar{x}_t$) into the regression equation, serving as proxies for unobserved common factors. However, the AMG estimator by Eberhardt and Teal (2010) takes a different approach by introducing a common dynamic process (CDP) in the cross-section unit equation. The AMG estimator follows a two-step process: it initially estimates the common factor through first-difference pooled regressions, then embeds this extracted factor into the estimation of each unit-specific regression as follows:

$$\Delta y_{it} = \beta \Delta x_{it} + \sum_{t=2}^{T} c_t \, \Delta D_t + e_{it} \quad (12)$$

where $\hat{c}_t \equiv \hat{\theta}_t$ denotes the year dummy coefficient. The $\hat{\theta}_t$ is then included in each cross-section unit regression which also includes trend term:

$$y_{it} = \alpha_i + \beta_i x_{it} + c_i t + d_i \theta_t + e_{it} \quad (13)$$

Where $c_i t$ refers to the deterministic trend and θ_t is common factor or unobserved shock affecting all units . The mean group estimator is calculated by averaging the coefficients across the units: $\beta^{AMG} = \frac{1}{N}\sum_i \beta_i$.

The CS-ARDL model, on the other hand, is designed for estimating dynamic long-run and short-run relationships in panel data by modeling both the dynamics and cross-sectional dependence explicitly. CS-ARDL is similar to CCE-MG in how to address CSD, where it extends the traditional ARDL model by augmenting cross-sectional averages which capture CSD due to common shocks (Chudik & Pesaran, 2015). The CS-ARDL can be written as:

$$y_{it} = \alpha_i + \sum_{j=1}^{py} \varphi_{ij} y_{i,t-j} + \sum_{j=0}^{px} \beta_{ij}\, x_{i,t-j} + \sum_{j=0}^{p} \gamma_{ij} \bar{z}_{t-j} + e_{it} \qquad (14)$$

where $\bar{z}_{t-j}$ are cross-sectional averages of dependent and independent variables. The long-run coefficients are calculated as $\hat{\theta}_i = \frac{\sum_{j=0}^{px} \hat{\beta}_{ij}}{1-\sum_{j=1}^{py} \hat{\varphi}_{ij}}$. The estimated coefficients can be obtained by mean group or pooled mean group according to the expected heterogeneity across the units.

5. RESULTS

5.1 Properties of the Data

As mentioned in the previous section, the analysis started by checking for CSD across countries. The statistics and significance of the three tests used are presented in Table 2, where the null hypothesis is that there is no CSD or cross-section independence. The results revealed that the null hypothesis is rejected, hence the existence of CSD. However, in case of conflict results, LM test is more reliable in the case T >N (Belaïd & Zrelli, 2016).

Table 2: Cross-Sectional Dependence Tests

Variable	Pesaran CD	Pesaran scaled LM	Breusch-Pagan LM
$lnTB$	0.623	6.73***	51.87***
$lnBGVC$	3.25***	10.28***	71.34***
$lnFGVC$	3.60***	20.87***	129.33***
$lnGDP$	18.56***	60.26***	345.06***
$lnREER$	1.44	3.099***	31.97***
$lnMS$	1.78*	26.82***	161.92***
$lnGCF$	3.92***	9.78***	68.58***

*** , **, * indicates significance at 1%, 5% and 10%, respectively.

Next, the slope homogeneity test was performed, where the null hypothesis states that slope coefficients are homogeneous. Based on Table 3, the null hypothesis of slope homogeneity can be rejected in the two models where the p-value is significant at the 1% level. Therefore, coefficients are heterogeneous, implying the use of heterogeneous panel models.[1]

Table 3: Slope Homogeneity test (Pesaran, Yamagata (2008)

	BGVC		FGVC	
	Delta	p-value	Delta	p-value
	7.733***	0.000	7.289***	0.000
adj.	9.046***	0.000	8.526***	0.000

*** , **, * indicates significance at 1%, 5% and 10%, respectively.

The analysis continued by checking the stationary properties using the second-generation unit root tests (CADF and CIPS) in Table 4. The null hypothesis assumes the series is nonstationary. Results show that all variables are stationary at first difference I (1) in both constant and trend.

[1] The test was conducted also by adding cross-sectional variables list to account for CSD. The results also lead to the rejection of the null hypothesis of slope homogeneity.

Table 4: CADF and CIPS Unit root tests

	CADF				CIPS			
	Level		First difference		Level		First difference	
	C	C & T	C	C & T	C	C & T	C	C & T
$lnTB$	-1.863	-1.949	-3.613***	-3.870***	-1.783	-1.794	-3.927***	-3.914***
$lnBGVC$	-2.059	-3.309***	-3.717***	-3.930***	-1.728	-2.543	-4.421***	-4.510***
$lnFGVC$	-0.915	-1.941	-3.087***	-3.392***	-0.751	-1.460	-4.266***	-4.509***
$lnGDP$	-1.519	-1.953	-2.063	-2.976**	-1.211	-1.523	-2.929***	-3.370***
$lnREER$	-2.285*	-3.351**	-3.768***	-4.182***	-2.21	-2.387	-4.080***	-4.389***
$lnMS$	-1.956	-1.918	-3.017***	-3.210***	-1.643	-1.921	-3.520***	-3.659***
$lnGCF$	-1.757	-2.329	-2.978***	-3.129**	-1.999	-2.288	-4.352***	-4.453***

*** , **, * indicates significance at 1%, 5% and 10%, respectively.

C denotes Constant, C & T denotes constant and trend. *Maximum lags are set to 1,* lag criterion decision: general to particular based on F joint test; critical values (CADF and CIPS) with constant: 10% (-2.21), 5% (-2.33), 1% (-2.57); critical values with constant and trend: 10% (-2.73), 5% (-2.86), 1% (-3.1).

Given the above results that variables are nonstationary at level, we proceeded for testing cointegration. Based on the results that indicated the presence of heterogeneity and CSD, panel cointegration tests by Pedroni (1999, 2004) and Westerlund (2005) are performed to address these issues. The first seven rows (a) in Table 6 report the panel (within-dimension) and group (between-dimensions) statistics of the Pedroni cointegration test. Since the group statistics are calculated by averaging individually estimated coefficients for each country, they capture the heterogeneity of countries. However, these statistics do not take CSD into account. Thus, to address interdependencies among countries, the removal of cross sections (demeaned data) is implemented and subsequently reported in the next seven rows (b). Additionally, Westerlund group and panel cointegration test statistics (c) are presented as an alternative approach of testing cointegration. For both tests, the group mean statistics are more relevant due to the presence of slope heterogeneity. The results largely indicate that there is evidence to support the presence of a cointegrating relationship among the variables. In other words, rejection of the null hypothesis of group-mean statistics suggests that cointegration exists in one or more of the individual units within the cross-sectional data.

Table 5: Results of Cointegration Tests

		BGVC		FGVC	
Pedroni Panel statistics (within-dimension) [a]		**Statistic**	**p-value**	**Statistic**	**p-value**
Modified Variance ratio	C C&T	-0.19 -0.62	0.424 0.267	-0.42 -0.466	0.334 0.320
Modified Phillips–Perron t	C C&T	0.59 1.54*	0.276 0.061	1.59* 1.77**	0.055 0.037
Phillips–Perron t	C C&T	-2.73*** -2.11**	0.003 0.017	-0.29 -0.94	0.386 0.173
Augmented Dickey–Fuller t	C C&T	-2.74*** -2.42***	0.003 0.007	-0.97 -1.74**	0.164 0.040
Pedroni group mean statistics (between-dimension) [a]		**Statistic**	**p-value**	**Statistic**	**p-value**
Modified Phillips–Perron t	C C& T	1.49* 2.43***	0.067 0.007	2.25** 2.55	0.012 0.005
Phillips–Perron t	C C&T	-2.86*** -2.64***	0.002 0.004	-0.72 -0.95	0.234 0.169
Augmented Dickey–Fuller t	C C&T	-2.82*** -2.34***	0.002 0.009	-1.40* -1.62*	0.079 0.051
Pedroni Panel Statistics [b] **Cross-section removed**		**Statistic**	**p-value**	**Statistic**	**p-value**
Modified Variance ratio	C C &T	-0.99 -1.56*	0.161 0.059	-0.60 -1.37*	0.272 0.084
Modified Phillips–Perron t	C C &T	1.03 1.69**	0.149 0.044	0.73 1.70**	0.230 0.044
Phillips–Perron t	C C &T	-1.25* -2.00**	0.105 0.022	-2.43*** -1.39*	0.007 0.082
Augmented Dickey–Fuller t	C C &T	-2.31** -3.85***	0.010 0.000	-3.451*** -2.86***	0.000 0.002
Pedroni group Statistics [b] **Cross-section removed**		**Statistic**	**p-value**	**Statistic**	**p-value**
Modified Phillips–Perron t	C	1.94**	0.025	1.77**	0.038
	C&T	2.60***	0.004	2.58***	0.004
Phillips–Perron t	C	-1.16	0.123	-2.00**	0.022
	C&T	-3.71***	0.000	-0.98	0.161
Augmented Dickey–Fuller t	C	-2.61***	0.004	-3.37***	0.000
	C&T	-3.58***	0.000	-2.61***	0.004

Westerlund Statistics[c]		Statistic	P-value	Statistic	P-value
Variance ratio (Panel)	C	-0.915	0.179	-0.864	0.193
	C&T	-1.348*	0.088	-1.053	0.146
Variance ratio (Group)	C	-1.427*	0.076	-1.388*	0.082
	C&T	-1.423*	0.077	-1.221	0.111

***, **, * indicates significance at 1%, 5% and 10%, respectively.

a. Panel statistics: Ho: No Cointegration Ha: All panels are cointegrated. AR parameter : Same

Group mean statistics: Ho: No cointegration Ha: individual AR coefficient. AR parameter: Panel specific.

b. Cross-section means are removed , i.e. demeaning process to account for CSD.

c. Panel Statistics: Ho: No cointegration. Ha: All panels are cointegrated. AR parameter: Same.

Group Statistics: Ho: No Cointegration Ha: Some panels are cointegrated. AR parameter: Panel Specific

5.2 Results and Discussion

The long results of the AMG and CS-ARDL models are reported in Tables 6. The results of both methods show that GVC participation rate demonstrates contrasting effects: backward participation exhibits a negative impact, while forward participation shows a positive influence on trade balance. More specifically, a 1% increase in BGVC participation reduces the trade balance (exports to imports ratio) by 0.77% (0.25%) under CS-ARDL (AMG) at a 1% (5%) significance level. In contrast, a 1% increase in FGVC participation improves the trade balance by 1.07% (0.34%) under CS-ARDL (AMG) at a 1% (5%) significance level. Under both models, the positive effect of FGVC is larger than the negative impact of BGVC, suggesting a positive impact of GVC on trade balance of CIVETS countries.

The short-run results under CS-ARDL, displayed in Table 7, align with the long-run findings, demonstrating that backward participation exert negative pressure on trade balance, whereas forward participation has positive effects. A 1% increase in BGVC reduces the trade balance by 0.5%, while a 1% increase in FBVC raises the trade balance by 0.8% at 1% significance level in the short run. Similar to the long run results, the positive impact of FGVC on the trade balance outweighs the negative effect of BGVC.

The above results align with the static estimates of Brumm et al. (2019) that showed a positive impact of overall GVC participation on the trade balance. By focusing only on BGVC participation, the findings of this paper are consistent with Gabsi and Bousnina (2022) and López-Villavicencio and Mignon (2021) who found that BGVC affects the current account negatively. An increase in intermediate imports outweighs the trade balance impact of the resulting boost in the competitiveness of domestic exports. That is, the surge in imports is not counterbalanced by a corresponding rise in exports. This is more profound if the country is only adding minimal value, such as assembling imported parts. In such cases, the export price will reflect mostly the value of the imported inputs rather than a significant new added value from domestic activities. This again depresses the export-to-import ratio. Referring to Table 1 in Section 3, while most of the FVA content of exports is concentrated in capital-intensive and high-tech industries such as machinery, electronics, and transport equipment, DVA driven by foreign demand is concentrated in low VA industries such as Minning and quarrying, and basic metals. In addition, higher BGVC participation raises the reliance of countries on foreign inputs, which expose these countries to fluctuations in global demand. When demand for final products from trade partners drops, their exports fall, but they still may need to continue importing intermediate goods to sustain production processes. This dynamic can further worsen the trade balance during periods of global economic downturns.

Table 6: Long -Run Results

	CS-ARDL		AMG	
	BGVC	FGVC	BGVC	FGVC
$lnBGVC$	-0.777*** (0.003)		-0.257** (0.035)	
$lnFGVC$		1.076*** (0.001)		0.340** (0.030)
$lnGDP$	1.204*** (0.007)	-1.691*** (0.000)	-0.088 (0.703)	-0.151 (0.500)
$lnREER$	-0.685*** (0.003)	-0.565** (0.019)	-0.260*** (0.000)	-0.145** (0.011)
$lnMS$	0.577 (0.411)	-0.369 (0.338)	-0.041 (0.718)	0.061 (0.641)
$lnGCF$	0.121 (0.840)	-0.704* (0.095)	-0.467*** (0.003)	-0.535*** (0.000)

	CS-ARDL		AMG	
	BGVC	**FGVC**	**BGVC**	**FGVC**
Constant	/	/	3.925** (0.010)	2.157 (0.177)
CDM[a]	/	/	0.787** (0.022)	1.202** (0.050)
R-squared (MG)	0.94	0.96	/	/
Root MSE	0.03	0.02	0.038	0.037

*** , **, * indicates significance at 1%, 5% and 10%, respectively.

a. CDP refers to the common dynamic process.

Country specific coefficients using AMG are reported in Table A.1 in the Appendix. The findings align with the overall group results. On the one hand, group-specific coefficients reinforce the negative impact of BGVC participation on trade balances in several CIVETS countries. Specifically, BGVC exerts a statistically significant negative effect on the trade balances of Colombia, Indonesia, and South Africa. This suggests that the import costs associated with BGVC participation outweigh the benefits of exports that rely on foreign value-added content, leading to a deterioration in trade balances. However, Egypt's trade balance remains unaffected by BGVC participation, as its relatively low backward integration limits the extent to which imported intermediates influence export performance. on the other hand, FGVC participation contributes positively to trade balance outcomes in Colombia, Vietnam, and Egypt. The significant positive coefficients indicate that these countries benefit from exporting intermediate goods and raw materials, which are absorbed in the production processes of other economies, thereby strengthening their trade balances.

Table 7: Short- Run Results of CS-ARDL

	BGVC	FGVC
$L.\ lnTB$	0.261** (0.019)	0.079 (0.572)
$lnBGVC$	-0.498*** (0.004)	
$L.\ lnBGVC$	0.009 (0.928)	
$lnFGVC$		0.815*** (0.000)
$L.\ lnFGVC$		0.040 (0.883)
$lnGDP$	-0.448 (0.592)	-0.908 (0.432)
$L.\ lnGDP$	1.267 (0.928)	-0.692 (0.398)
$lnREER$	-0.386*** (0.000)	-0.375** (0.013)
$lnMS$	0.137 (0.660)	-0.201 (0.553)
$lnGCF$	-0.128 (0.648)	-0.596** (0.030)
Adjust. Term (ECT)	-0.738*** (0.000)	-0.920*** (0.000)

*** , **, * indicates significance at 1%, 5% and 10%, respectively.

The results of other explanatory variables in the model were consistent with prior expectation. Mean-group results under the two estimation methods in Table 6 and 7 show that an increase in REER (i.e. exchange rate appreciation) has a significant negative impact on trade balance in both the short and long run. Table A.1 confirms this result for most of the CIVETS countries except Vietnam in which the exchange rate has statistically insignificant effect on its trade balance. This was also confirmed by Nga (2020). GDP per capita has opposite results under CS-ARDL, but not significant under AMG. By looking at the country-level results, Table A.1 demonstrates that GDP has a positive effect on the trade balance of Colombia and Vietnam, which is consistent with the absorption approach if the country's total output surpasses its expenditures. In contrast, GDP has a negative effect on the trade balance of Indonesia, Egypt and South Africa. For instance, this result is consistent with Yol and Baharumshah

(2007) for the case of Egypt. As GDP per capita increases, individuals and households tend to have more income, resulting in greater consumption of both domestically produced goods and imported goods. Moreover, rising GDP per capita can lead to changes in consumption patterns, with a greater preference for high-quality imported goods and luxury goods.

Regarding money supply, the results show that it has statistically insignificant impact on trade balance under all models either in the long run (Table 6) or short run (Table 7). However, the specific results show that, following the monetary approach, money supply affects the trade balance of Colombia, and Turkey negatively. In contrast, money supply has a positive impact on the trade balance of Indonesia and Vietnam. This aligns with the results on Vietnam in Dao, Nguyen and Dinh (2020). Finally, the AMG results show that GCF has a negative effect on trade balance of CIVETS countries as a group but also for the specific countries. This might be due to the lack of domestic capacity of countries to produce the advanced machinery, technology, and equipment necessary for large-scale infrastructure projects. As a result, countries rely heavily on importing capital goods to support investments. This leads to an increase in imports, which worsens the trade balance.

Two terms are worth commenting on. First, the common dynamic process (CDP) under the AMG results. This term is positive and significant at 1% level (in Table 6), suggesting that unobserved factors such as common trade policies, and regional and international integration affect trade balance positively. Second, the speed of adjustment to equilibrium in the long run is known as the error correction term (ECT) under the CS-ARDL. In the two estimated equations (in Table 6), this term is found to be both negative and significant with a quick convergence towards the long-run equilibrium.

5.3 Robustness Check

To ensure the robustness of the results, two additional estimation techniques were employed: Mean Group Fully Modified OLS (MG-FMOLS), and Dynamic Common Correlated Effect Mean Group Estimator (DCCE-GE). Regarding addressing CSD issue, AGM and CS-ARDL explicitly model CSD through common factors (AGM) or cross-sectional averages (CS-ARDL).

Similar to CS-ARDL, DCCE-MG explicitly models CSD through averaging the individual-specific estimates across all cross-sectional units (Pesaran, 2006). While MG-FMOLS do not directly model CSD, MG-FMOLS, developed by Pedroni (2001), consider heterogeneity across countries, and corrects for endogeneity and serial correlation.[1]

Results reported in Table 7 reveal that the core findings from AGM and CS-ARDL estimations remain largely consistent across these alternative techniques. The negative impact of BGVC participation on the trade balance and the positive impact of FGVC are confirmed by the two models, albeit with some variations in magnitude. In addition, the effects of the other explanatory variables are almost similar to the findings in Table 6. Only under the MG-FMOLS, money supply tends to have a negative impact on the trade balance of the group of CIVETS countries.

Similarly, the group-specific results were checked using DCCE-MG methods and reported in Table A.1 in the Appendix. In addition to the AMG results, the results under the DCCE-MG show that BGVC has a negative effect on the trade balance of Vietnam, and FGVC has a positive effect on the trade balance of Indonesia. Regarding other explanatory variables, the specific results were also confirmed. However, the DCCE-MG results show that MS and GCF affect Egypt's trade balance negatively, and GDP per capita has a positive effect on the trade balance of Vietnam.

[1] The MG-FMOLS is based on the 'between dimension' of the panel. As mentioned in Pedroni (2001) when the slope coefficients are heterogeneous, group mean estimators provide consistent point estimates of the sample mean of the heterogeneous cointegrating vectors, while pooled within dimension estimators do not.

Table 8: Results of DCCE-MG and Mean Grouped FMOLS Methods

	DCCE-MG		MG-FMOLS	
	BGVC	FGVC	BGVC	FGVC
$lnBGVC$	-0.503*** (0.000)		-0.115** (0.028)	
$lnFGVC$		0.655*** (0.007)		0.333*** (0.000)
$lnGDP$	0.158 (0.709)	-1.072** (0.045)	0.226*** (0.000)	-0.007 (0.903)
$lnREER$	-0.397*** (0.000)	-0.245* (0.055)	-0.227*** (0.000)	-0.188 (0.063)
$lnMS$	0.063 (0.734)	0.0138 (0.956)	-0.215*** (0.000)	-0.014 (0.841)
$lnGCF$	-0.324** (0.034)	-0.550*** (0.006)	-0.560*** (0.000)	-0.504*** (0.000)
$L.lnTB$	0.173*** (0.001)	0.131 (0.354)	/	
Constant	3.782*** (0.006)	0.247 (0.935)		

***, **, * indicates significance at 1%, 5% and 10%, respectively.

6. CONCLUSIONS

This paper provides empirical evidence on the impact of GVC participation on the trade balance of the CIVETS countries during the period (1995-2020), with a particular focus on the distinct effects of backward and forward participation. The paper used several heterogeneous panel data models that consider cross-sectional dependence. The main results rely on the AMG and CS-ARDL methods, and a robustness check was employed using the DCCE-MG and GM-FMOLS methods.

The results reveal a clear dichotomy: backward (forward) participation affects the trade balance negatively (positively). The negative impact of backward GVC participation on trade balance emphasizes the double-edged nature of relying on imported inputs for exports. While this strategy may enhance export competitiveness, it also raises the imports bill. This potentially worsens trade balances if the value of imported inputs exceeds the value of final exports, especially when these countries are involved in low-value-added stages of production. Conversely, the positive effect of forward GVC participation, where countries export intermediate goods or raw materials for use in global production networks, on trade balance is encouraging, suggesting benefits from moving up the value chain.

The country-specific results were consistent with the group results. The findings show that BGVC participation negatively affects the trade balance in Colombia, Indonesia, Vietnam, and South Africa, as the high import dependency of intermediate inputs outweighs the benefits of export expansion. Conversely, FGVC participation positively influences trade balance in Colombia, Indonesia, Vietnam, and Egypt, where they gain from exporting DVA to other economies.

The heterogeneous results highlight that the structure of GVC participation matters, as excessive reliance on imported intermediates without sufficient value addition can lead to trade imbalances. At the same time, forward integration into GVCs, where countries export intermediate goods and raw materials, presents opportunities to strengthen trade positions. These insights emphasize the need for targeted policy interventions to enhance the benefits of GVC participation while mitigating its potential drawbacks. For instance, T. Ahmad (2021) suggests that Indonesia should focus on improving foreign direct investments (FDI) policies, lowering logistics costs, easing trade restrictions, and eliminating inefficient barriers like import licensing. Similarly, Egypt should lower non-tariff barriers that hinder regional integration and limit the involvement of domestic firms in regional and international GVC (OECD, 2021). In Turkey, encouraging more FDI and strengthening economic and regulatory stability, along with adopting a collaborative approach to business, can attract more FDI and other GVC-related investments (World Bank, 2022).

In summary, the findings of this study highlight several policy implications to maximize the benefits while minimizing the trade-offs associated with different forms of GVC participation. First, CIVETS countries can enhance their GVC participation by upgrading their position within value chains and increasing DVA in exports. Countries should strive to move up the value chain by producing more technologically sophisticated and higher-value products. This can be achieved by encouraging R&D investments, fostering public-private partnerships to drive innovation, and offering incentives for firms that focus on developing higher-end products. By upgrading their role within GVCs from simple assembly to higher-value stages, countries can increase the positive impact of GVC participation on their trade balance. Second, the positive impacts of forward GVC participation have to be leveraged. Thus, countries that benefit from FGVC, like Egypt, Colombia and Indonesia, need to avoid over-reliance on exporting raw materials or low-value intermediate goods. Diversifying export portfolios by developing more complex and refined products will enhance the economic benefits of GVC participation. Countries should design trade and investment policies that attract foreign direct investment into sectors where they can gain the most from GVC participation, particularly in higher-value activities such as advanced manufacturing and technology development. Third, offering fiscal incentives, improving the ease of doing business, and creating special economic zones can help attract multinational corporations that bring technological know-how and higher-value operations to these countries.

Future research could explore the impacts of GVCs participation on sectoral trade balances. Additionally, investigating the interaction between GVC engagement and other economic factors such as exchange rate, and foreign direct investment could provide a more comprehensive understanding of how emerging economies can optimize their participation in GVCs. Finally, this paper assumes a linear relationship between GVC participation and trade balance. However, one could explore the nonlinear relationship between these two variables.

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APPENDIX

Table A.1. Group-specific coefficients

	AMG		DCCE-MG	
	BGVC	FGVC	BGVC	FGVC
Colombia				
$lnBGVC$	-0.555*** (0.000)		-0.902*** (0.000)	
$lnFGVC$		0.773*** (0.000)		0.807*** (0.000)
$lnGDP$	0.552* (0.056)	0.183 (0.457)	0.101 (0.863)	-0.427 (0.373)
$lnREER$	-0.037 (0.781)	-0.000 (0.999)	-0.543*** (0.000)	-0.656*** (0.000)
$lnMS$	-0.455** (0.012)	-0.326** (0.037)	-0.084 (0.759)	-0.818*** (0.003)
$lnGCF$	-0.209*** (0.009)	-0.507*** (0.000)	0.041 (0.867)	0.169 (0.246)
Indonesia				
$lnBGVC$	-0.627*** (0.000)		-0.678* (0.052)	
$lnFGVC$		0.202 (0.125)	0.038	0.708* (0.062)
$lnGDP$	-0.178** (0.027)	0.058 (0.457)	-1.438** (0.037)	-2.001*** (0.009)
$lnREER$	-0.522*** (0.000)	-0.113 (0.202)	-0.439 (0.138)	0.249*** (0.008)
$lnMS$	0.259 (0.280)	0.595** (0.021)	0.359 (0.538)	0.849*** (0.000)
$lnGCF$	-0.270** (0.021)	-0.295*** (0.009)	0.070 (0.833)	-0.376 (0.192)
Vietnam				
$lnBGVC$	-0.067 (0.799)		-0.879** (0.021)	
$lnFGVC$		0.405*** (0.001)		0.912 (0.138)
$lnGDP$	-0.017 (0.912)	0.075 (0.398)	1.699* (0.087)	-0.964 (0.604)
$lnREER$	-0.177 (0.256)	-0.030 (0.801)	-0.465 (0.135)	-0.486 (0.286)
$lnMS$	0.2249*** (0.000)	0.162*** (0.000)	0.115 (0.444)	0.118 (0.689)
$lnGCF$	-1.001*** (0.000)	-0.870*** (0.000)	-0.686** (0.022)	-1.130* (0.060)

	AMG		DCCE-MG	
	BGVC	FGVC	BGVC	FGVC
Egypt				
$lnBGVC$	0.100 (0.669)		0.176 (0.775)	
$lnFGVC$		0.781*** (0.002)		1.525** (0.024)
$lnGDP$	-1.105*** (0.000)	-1.122*** (0.000)	-0.571 (0.759)	-3.101 (0.165)
$lnREER$	-0.262 (0.104)	-0.365*** (0.000)	-0.156 (0.670)	-0.222 (0.243)
$lnMS$	-0.135 (0.494)	0.047 (0.338)	-0.714* (0.061)	0.061 (0.641)
$lnGCF$	-0.045 (0.766)	-0.704* (0.780)	-0.186 (0.636)	-0.483* (0.092)
Turkey				
$lnBGVC$	-0.039 (0.687)		-0.199 (0.465)	
$lnFGVC$		-0.131 (0.438)	0.038	-0.069 (0.800)
$lnGDP$	-0.292*** (0.002)	0.357*** (0.003)	0.369 (0.761)	0.655 (0.450)
$lnREER$	-0.297*** (0.000)	-0.259*** (0.000)	-0.292 (0.229)	-0.239 (0.297)
$lnMS$	-0.220*** (0.005)	-0.219*** (0.007)	0.056 (0.876)	0.210 (0.425)
$lnGCF$	-0.874*** (0.000)	-0.906*** (0.000)	-0.833** (0.011)	-1.102*** (0.000)
South Africa				
$lnBGVC$	-0.355*** (0.002)		-0.535** (0.041)	
$lnFGVC$		0.012 (0.852)	0.038	0.045 (0.908)
$lnGDP$	-0.072 (0.698)	-0.457*** (0.003)	-0.353 (0.497)	-0.596 (0.445)
$lnREER$	-0.264*** (0.001)	-0.103* (0.077)	-0.490*** (0.009)	-0.116 (0.314)
$lnMS$	0.053 (0.569)	0.112 (0.260)	0.650 (0.101)	0.303 (0.669)
$lnGCF$	-0.404*** (0.000)	-0.429*** (0.000)	-0.349** (0.039)	0.381 (0.112)

***, **, * indicates significance at 1%, 5% and 10%, respectively.

أثر المشاركة في سلاسل القيمة العالمية على الميزان التجاري:
أدلة من دول ناشئة غير متجانسة

د. نهى ناجي البغدادلي

ملخص البحث باللغة العربية

تتناول هذه الورقة البحثية تأثير المشاركة في سلاسل القيمة العالمية على الميزان التجاري لست دول ناشئة متوسطة الدخل - كولومبيا وإندونيسيا وفيتنام ومصر وتركيا وجنوب إفريقيا (مجموعة CIVETS) خلال الفترة من 1995 إلى 2020 . تستخدم الدراسة نماذج السلاسل الزمنية المقطعية (Panel) غير المتجانسة، بما في ذلك نماذج Augmented Mean Group (AMG) ونموذج الانحدار الذاتي ذو الفترات المُوزعة المُعزز عبر المقاطع (CS-ARDL) لمعالجة عدم التجانس والارتباط بين المقاطع العرضية. بالإضافة إلى ذلك، تستخدم فحوصات الحصانة Dynamic Common Correlated Effect Mean Group (DCCE-MG) والمربعات الصغرى المعدلة بالكامل للمجموعة المتوسطة (GM-FMOLS). تُظهر نتائج الورقة أنَّ فصل المشاركة في سلاسل القيمة العالمية إلى مشاركة خلفية وأمامية يكشف عن تأثيرات مُتباينة. تؤثر المشاركة الخلفية في سلاسل القيمة العالمية سلبًا على الميزان التجاري لدول CIVETS على المديين القصير والطويل، ويرجع ذلك على الأرجح إلى زيادة الاعتماد على الواردات من المدخلات كثيفة رأس المال. على العكس من ذلك، تؤثر المشاركة الأمامية في سلاسل القيمة العالمية إيجابًا على الميزان التجاري، مما يشير إلى فوائد محتملة من الارتقاء في سلسلة القيمة. من خلال مقارنة تأثيرات شكلي المشاركة في سلاسل القيمة العالمية، فإن التأثيرات الإيجابية للمشاركة الأمامية في سلاسل القيمة العالمية هي المهيمنة. تُظهر النتائج الخاصة بكل دولة أن المشاركة الخلفية لها تأثير سلبي على الميزان التجاري لكولومبيا وإندونيسيا وفيتنام وجنوب إفريقيا، بينما تُساهم المشاركة الأمامية إيجابًا في الميزان التجاري في كولومبيا، وإندونيسيا، وفيتنام، ومصر. تقدم نتائج هذه الورقة رؤى مهمة لصانعي السياسات الذين يسعون إلى وضع اقتصاداتهم بشكل استراتيجي داخل سلاسل القيمة العالمية لتعظيم الفوائد التجارية.

الكلمات الدالة: سلسلة القيمة العالمية، الميزان التجاري، مجموعة سيفيتس، نماذج غير متجانسة، الارتباط بين المقاطع العرضية.

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