Eastern Journal of European Studies
DOI: 10.47743/ejes-2026-0106 • JUNE 2026 • VOLUME 17, ISSUE 1

The analysis of Georgia's participation in Global Value Chains

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Abstract: The paper aims to study Georgia's positions in global value chains (GVCs), which represents a connecting channel to international markets and sources of productivity improvement. It analyzes backward and forward linkages and value-added trade to identify the main determinants of GVC integration. The structural gravity model for exported value-added is applied to the panel of 26 countries over 1997-2022, incorporating standard gravity components and additional policy-related and sector-specific regressors. The results show that Georgia's overall position in GVCs is weak and is under the influence of short-term factors rather than deep integration forces. The analysis of the determinants of value-added trade has demonstrated that larger GDP and the quality of human capital are powerful drivers of Georgia's participation in GVCs. The findings suggest that Georgia's priorities should involve industrial policies targeted at high value-added creation, investments in skills development and industrial upgrading for enhanced GVC integration.

Keywords: global value chains, Georgia, structural gravity model, trade integration

Introduction

Global value chains (GVCs) play an increasingly important role in trade and economic interdependences across countries. The traditional view of international trade in which countries produce finished goods to export gives only a partial account of the nature of global trade. Actually 70% of world trade involves trade in parts, components and intermediate products within GVCs (OECD, 2020). GVCs encompass organization of fragmented production processes that spread across different regions, countries, industries and firms (Borin et al., 2021). They enable countries to specialize in narrow tasks rather than entire industries (World Bank, 2019). Liberalization policies over recent decades, together with technological transformations, particularly digitalization, automation, and advanced data systems, have reinforced international specialization in tasks and business functions by reducing transaction costs and improving the coordination of cross-border activities. Consequently, GVCs have become the backbone of modern trade, investment, and

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HOW TO CITE: Jamagidze, L., & Lekashvili, E. (2026). The analysis of Georgia's participation in Global Value Chains. *Eastern Journal of European Studies, 17*(01), 135-158. https://doi.org/10.47743/ejes-2026-0106

production (Kaur et al., 2025). They affect not only geographic and sector patterns of trade and investments, but also economic structures, productivity and incomes. GVC participation is associated with greater specialization and access to more diversified foreign inputs, technologies and knowledge (Taglioni & Winkler, 2016) and therefore has development implications. According to the World Bank (2020), the benefits of participation in GVCs involve productivity growth, technological spillovers, and effective structural transformation. However, these gains strongly depend on a country's ability to improve productivity, strengthen supportive institutions and move up the value chain to ensure resilient economic outcomes.

Since gaining its independence in 1991, Georgia has undergone significant economic and institutional transformation. Its effort has been aimed at opening trade regime, attract foreign direct investments, and pursue deeper integration with the European Union (EU). Simultaneously, Georgia has been trying to position itself within other regional and global partnerships through extending its trade relations with China, Russia and Central Asia. Strategic geographic location and trade liberalization reforms can be considered strengths on the path to economic integration. However, it still takes relatively modest positions in global competitiveness and is weakly represented in GVCs (Asian Development Bank, 2024). Free trade agreements (FTAs) with key partners, including the EU, China, Türkiye, and countries within the Commonwealth of Independent States (CIS), notably, the Deep and Comprehensive Free Trade Area (DCFTA) with the EU, in force since 2016, has enhanced Georgia's global market access and trade growth. The FTA with China, effective since 2018, has opened ways to increased exports, which roughly tripled during 2016-2024, from 2.1 billion to 6.5 billion US dollars. However, such an impressive export expansion remains concentrated in a few commodity categories (such as cars, which are actually re-export), low or medium technology manufactures such as mineral products, particularly copper ores and ferro-alloys. While there has been growth in sectors like processed agricultural goods and light manufacturing, overall export complexity is limited. Georgia's exports geography is also highly concentrated. Based on the data from Georgia's National Statistics Office in 2024, the top ten export partners accounted for approximately 81.5% of total exports.

Given its small market size, economic structure and development objectives, Georgia is highly dependent on global markets integration. Therefore, understanding and managing GVC participation is critically important. The goal of the present paper is to study its participation in GVCs by analyzing backward and forward linkages and value-added trade. It enables us to explore its engagement in international value creation and exchange, identify main drivers and impediments to those activities and provide policy recommendations to achieve greater diversification and resilience in GVCs. The study seeks to identify key forces and policy options that affect the patterns and depth of GVC participation. By focusing on Georgia, this paper contributes to the empirical GVC literature on small

peripheral middle-income countries as to how they can build and manage regional and global value-chain linkages, respond to external drivers and obstacles in order to ultimately meet their export diversification and structural transformation goals.

The vast majority of empirical studies on Georgia's trade and economic integration rely on conventional measures based on gross exports and imports (Dilanchiev, 2012; Jamagidze, 2022; Papachashvili et al., 2018; Veshapidze et al., 2024). Such an approach is subject to the problem of double counting of intermediate goods (Koopman et al., 2012) and thus distorts the assessment of trade patterns. We apply the value-added trade framework and the analysis of forward and backward linkages in order to capture domestic and foreign contributions to trade, and also track the determinants that affect value-added trade.

The period under analysis is 1997-2022, chosen to capture long-term trends and structural developments in Georgia's external economic integration since gaining its independence. This time span allows us to focus on stable relationships rather than short-term fluctuations. The end year, 2022, precedes the phase when the Russia–Ukraine war began to exert profound effects on global supply chains, regional trade flows and Georgia's trade positions. Up to this point, Georgia's foreign economic policy orientation was comparatively clear, and the country's integration with global and regional markets had reached its peak. Subsequent years are characterized by war-related disruptions in the region, trade flow reorientations and increasingly ambiguous policy positions with regard to integration priorities. These developments are largely driven by temporary shocks rather than structural fundamentals. Since the objective of the study is to identify stable, long-run relationships, these later developments are intentionally excluded. Data availability also plays a decisive role in defining the sample period: global value chain indicators are consistently available for Georgia and its leading partner countries only up to 2022. Although there are data gaps for certain countries in 2016–2017, the Poisson pseudo-maximum likelihood (PPML) estimator for the structural gravity model is well suited to handling omitted observations and zero trade flows, ensuring the reliability of the empirical results.

The paper is organized in the following way: the first part reviews the available scholarly literature on GVCs, then we analyse the structure and the main developments in Georgia's engagement in value chains since the 1990s. The next part develops a methodological approach and builds a structural gravity model for value-added trade. Final parts offer results, findings and conclusions.

1. Literature review

The analytical foundation of value chains originates in the conceptualization of firm-level value creation by Porter (1985) and global commodity chain framework by Gereffi (1994, 1995). This early literature highlighted the social and economic dynamics of production and trade, emphasizing institutional underpinnings and

power asymmetries embedded in global commodity systems. The GVC perspective that emerged in the early 2000s broadened this approach by focusing on fragmented international production and the value created at each stage, shifting attention from simple commodity exchange toward value-added creation and distribution across borders. Thus, GVC analysis provides important insights into diverse aspects of trade patterns, specialization, and competitiveness, which explain why the value-added perspective has growing relevance for the analysis of international trade integration and economic development strategies (Kulmer et al., 2015). Conceptually, we encounter two types of definitions: a broad definition of GVCs refers to any cross-border fragmentation of production, whereas a narrow definition entails highly coordinated, multi-stage global production systems (Antràs, 2020). Baldwin and Venables (2013) differentiates between two archetypes of production sharing: "spiders," where multiple parts are assembled into a single product, and "snakes," where production stages form a sequential chain from upstream to downstream.

GVCs emerge as a result of the fragmentation of production and trade in tasks (Antràs & Chor, 2021; de Vries & Timmer, 2026; Grossman & Rossi-Hansberg, 2008; 2012). Falling trade costs have enabled firms to unbundle production into narrower tasks performed across locations, which leads to reshaping countries' roles in global trade (Coe et al., 2004; 2008). The internationalization of R&D further reinforces this tendency, constituting another major driver of GVC deepening (OECD, 2008). Fernandes et al. (2022) highlight factor endowments, geography, political stability, trade policy, FDI, and domestic industrial capabilities as GVC determinants. Trade facilitation, logistics, infrastructure quality, intellectual property protection, and institutional strength are also critical for deeper integration into GVCs (Nasser & Ouerghi, 2024; Raei et al., 2019).

The most widely used and standard measure to quantify GVC involvement for a country is GVC participation index, which consist of forward and backward linkages. Forward participation measures domestic value-added embodied in foreign exports, while backward participation measures the share of foreign value-added in a domestic country's exports (OECD, 2017). Evidence shows that small, open economies tend to rely more heavily on foreign intermediates than larger economies (ECLAC, 2014). Moreover, strong backward linkages often coincide with weaker forward linkages. These differences have implications for policy priorities depending on the nature of GVC engagement (Kowalski et al., 2015). Other commonly used GVC positioning indicators stem from vertical specialization (Hummels et al., 2001) and upstream and downstream participation (Antràs, 2020), which decompose GVC participation for a country along its positions in the production stages (Borin et al., 2021).

Among the quantitative frameworks used to analyse GVCs, gravity models are widely used (Taglioni & Baldwin, 2014; Guilhoto et al., 2015; Johnson, 2017; Noguera, 2012). Modern structural gravity models by Anderson and van Wincoop (2003), Head and Mayer (2014) have been extended beyond traditional trade flows

and incorporate trade in intermediates and value-added flows. They represent theoretically well-founded and empirically robust tools for analysing GVC participation. Johnson and Noguera (2012) demonstrate that value-added trade flows obey a gravity structure, while Antràs (2016) as well as Costinot and Rodríguez-Clare (2014) provide micro-founded models of multi-stage production in which gravity arises naturally.

Pieces of research that touch specifically upon Georgia's engagement in GVCs include World Bank (2022) report, which places Georgia in the "low participation" group with stagnated backward participation and low forward participation. Babych et al. (2020) analyse Georgia's GVC links in the context of CAREC region. The majority of existing studies about Georgia focus on aggregate trade and investment flows and few examine systematically how its participation in GVCs has evolved over time and how key determinants have affected its forward and backward linkages. The present paper aims at narrowing this gap. The analytical framework relies on trade and GVC literature and the analysis of the macro level determinants such as geography, market size and degree of trade freedom and the availability of trade agreements as policy-related factors. This approach enables us to develop a broad country-level perspective on the international forces which influence trade integration and international specialization patterns. Engagement in GVCs has national and international externalities, it affects the entire economic structure and productivity, therefore the evidence on Georgia's GVC participation has significant implications in terms of the overall performance and resilience of the economy.

2. Patterns and dynamics of Georgia's GVC participation

During the last two decades, Georgia's export sector became more outward-oriented, geographically diversified, and internationally integrated. With average annual growth rate of 13.84% since 1999, export had accounted 6.559 billion US dollars in 2024. Today, Georgia is reaching more destinations and supplying a wider range of products abroad. It saw a rise in its export penetration index from 1.69 to 3.46 during 1999-2021. The number of export partners increased from 68 to 130 and the number of goods exported has doubled from 1219 to 2502 according to WITS data. As Georgia's National Statistics Office shows, the share of exports in GDP changed from 19.06% to 42.67%, which indicates to the economy's high reliance on external demand supposedly as a result of greater trade openness, increased specialization and enhanced economic integration efforts. China, the Russian Federation, and Türkiye were the fastest growing export markets.

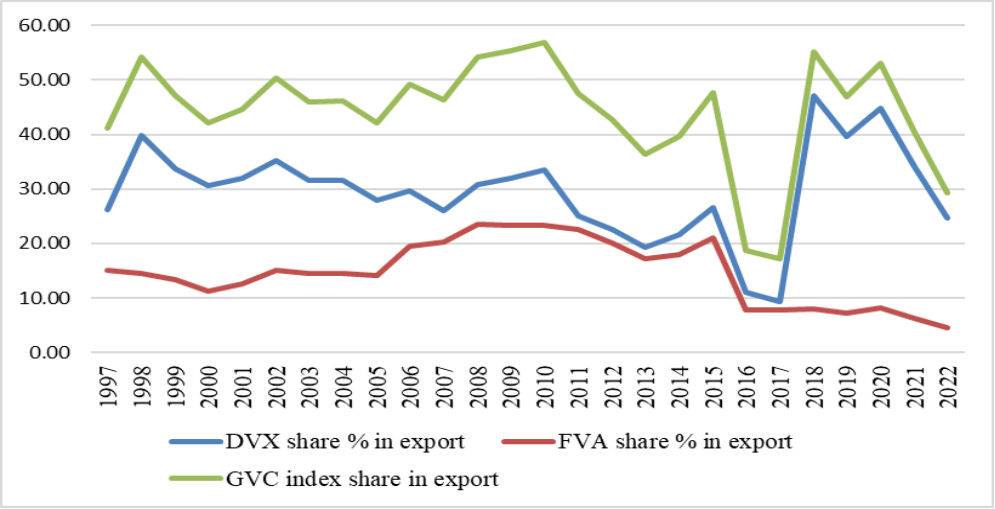
Participation in GVCs enables companies and economies to access the international markets and seize the opportunities of increased productivity. To capture the extent of a country's integration into international production and trade, the GVC index is commonly used. We calculated it according to UNCTAD-Eora

Global Value Chain methodology (Casella et al., 2019) as the percentage share of the sum of backward and forward integration components for the sample of 25 major export partner countries. The backward participation component represents foreign value-added (FVA), which is embodied in Georgia's exports and the forward participation is domestic value-added (DVX) embodied in partner countries' exports. The value-added and export indicators are given in current US dollars. As shown, GVC integration was highly volatile during 1997-2022 (see Figure 1). In the late 1990s and early 2000s, there was a decline in the index, which can be explained by the early post-Soviet transition, characterized by under-developed industrial capacity, inadequate trade infrastructure and low productivity. In 2016-2017, it reached the bottom around 17%. Such a decline may be partly linked to regional political and economic shocks, and partly to the internal determinants such as impeded industrial development and incomplete structural transformation of the economy. Interestingly, the index showed recovery in 2018 and maintained stability in the following years. Obviously, under COVID-19, the reduction of total exports played a role in its improvement. The post-2020 trend has shown another drop, indicating the absence of a well-defined and sustained development process of GVC engagement.

The analysis of forward and backward participation components separately shows weak downstream and evolving upstream positions of Georgia. The FVA share shows a persistent decline after 2015. By 2022, the FVA share had reached a historically low level with the sample partners, at 4.6%. This trajectory suggests a significant reduction in Georgia's reliance on foreign intermediate goods and services in its export production, potentially reflecting a move away from downstream activities in GVCs. Except for vehicles which is re-export, the potential degree of fragmentation of top export categories: ores and concentrates, spirits and beverages and ferro-alloys is extremely low.

The general trend of GVC share in exports against the background of the overall export expansion enables us to conclude that forward and backward linkages has diverged since 2018 by their contribution to exports. Georgia has appeared relatively better integrated as a supplier of intermediates into other countries' exports than as a user of foreign inputs in its own export production. GVC index is at a lower level today than it was in the 1990s. It reflects the fragile nature of the country's positions in international value creation, rather shaped by short-term factors than by deep structural integration forces. The dominant positions of re-export and low value-added activities cannot lead the country to resilient international positions. Increased export has not been translated into the development of more complex production processes in trade-oriented industries.

Figure 1. The dynamics Georgia's GVC participation index and its components



Source: authors' representation based on UNCTAD-EORA GVCs dataset and the National Statistics Office of Georgia

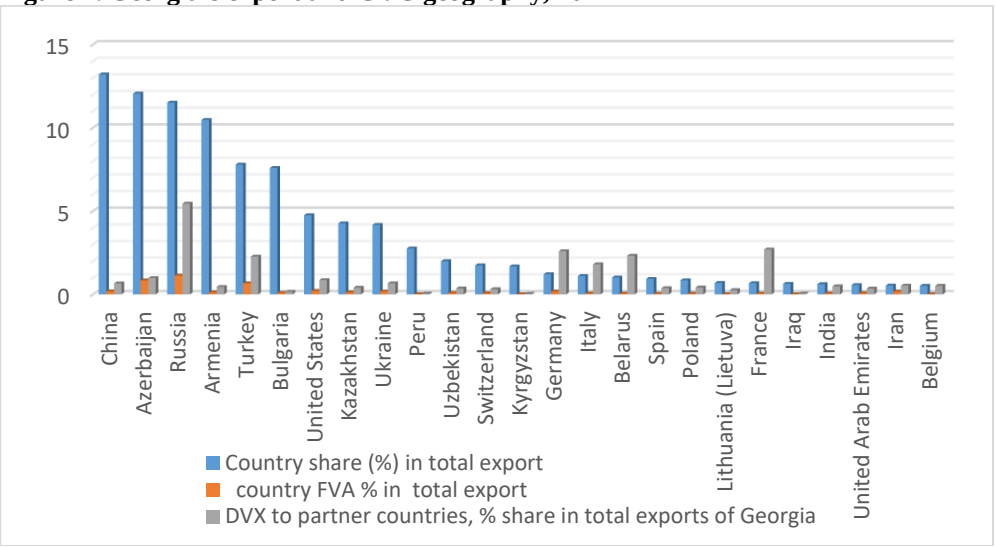
To some extent, Georgia's evidence is counter to the theory which suggests that forward participation is higher in large resource rich economies, while small open countries are better represented in backward participation (Raei et al., 2019). Therefore, the underlying causes that hinder Georgia from developing processing trade need further analysis. Among those causes, the structural characteristics and geographic positions of the economy are important.

Figure 2 represents the geography of GVCs. Backward integration measured as partners' FVA share in total Georgian export is largest with Russia (1.13%), Azerbaijan (0.8%) and Türkiye (0.7%). This highlights the importance of geographical proximity and regional economic ties. In forward linkages, again, Russia takes the largest share, but the geography goes beyond neighbouring countries and spans to the EU countries as well, such as France and Germany, with higher than 2% shares.

Alongside geographic distribution of GVCs, an equally important question is through which sectors value-added is generated and supplied. There is evidence that the domestic industrial capacity is one of the significant determinants of GVC participation (Fernandes et al., 2022). We analyze manufacturing and services due to their strong capacity to facilitate both fragmentation and integration in international production and trade. Manufacturing generates intensive international input-output linkages, while services act as an enabling factor for GVC development. Baldwin and Ito (2022) find that, across almost all exporting sectors and countries, the value-added to exports has shifted decisively from manufacturing to service sectors. Recent findings confirm that manufacturing tasks in a supply chain now

account for a smaller share of exports, while services tasks tend to take a growing share.

Figure 2. Georgia's export and GVC geography, 2022



Source: authors' representation based on National Statistics Office of Georgia and UNCTAD Eora GVC database

It is noteworthy that these two sectors differ markedly in their role in forming separate GVC components, in terms of their reliance on foreign intermediates and contribution to domestic value creation. To evaluate these differences, we analyze the relationship of sectoral GDP contributions and separate GVC component export contributions. In the Georgian context, the overall changes in manufacturing value-added (MVA) share in GDP confirm the declining contribution of this sector to the economy in recent years. It dropped from 15% in 1997 to around 9% in 2023, according to the World Bank data. However, in absolute terms, in 2020, the manufacturing output in Georgia (1.51 billion US dollars) held the leading position among all economic activities, indicating its central role in production-based growth. Manufacturing was an important driver of boosting export in the post-pandemic period as well.

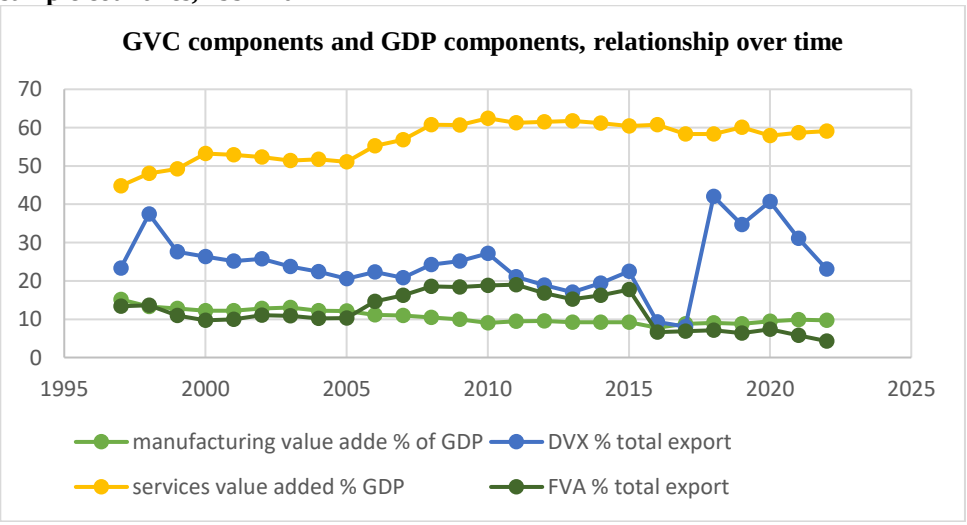
Employment data add another layer to the above picture. The employment share in industry rose during 1995–2006. It increased from 49% to 54%, but fell steadily thereafter. Manufacturing-specific employment dropped to 8% in 2002, followed by a gradual recovery, reaching around 14% by 2019 (Lekashvili & Gvelesiani, 2023). However, that increase was insufficient and failed to respond to broader structural challenges of the economy. Structural weaknesses tend to appear when we put Georgia in cross-country context. Georgia's share in world

manufacturing exports and the global MVA index remains negligible, around zero percent. Similarly, the country's industrialization index has declined from 0.26 to 0.19 since 2014 (Lekashvili & Gvelesiani, 2023). These are preconditions to Georgia's weak position in global manufacturing trade and further back up the above pattern observed in the GVC index: absence of sustained positions in international production networks.

Despite the pitfalls, the process of structural transformation and shift from manufacturing to services has been under way in Georgia. As an evolving sector, services represent a big contributor to economic growth and exports. For the last two decades, structural transformation has been service-oriented with 33% increase in services employment. However, the highest productivity sub-sectors are not those which attract the majority of the labour force (Jamagidze, 2023). In 2024, wholesale and retail trade, education and public administration, traditionally represented as low value-added sub-sectors in Georgia, employed the largest numbers of workers. Despite this, according to the World Bank data, services value-added (SVA) per employee has shown a persistent upward trend, reaching 20.5 US dollars in 2023.

In order to gain insight into the comparative roles of services and manufacturing sectors in Georgia's GVC engagement with our sample of export destinations, we analyse the relationship between Georgia's domestic value-added (DVX) and foreign value-added (FVA) for the sample partners as shares in Georgia's total exports and the respective sector shares in GDP during 1997-2022. Figure 3 represents the relationships, with dots corresponding to years.

Figure 3. Manufacturing and services value-added relationship with GVC components, sample countries, 1997-2022



Source: authors' representation based on UNCTAD-EORA GVCs dataset and Word Bank WDI

These results suggest that, over the period under analysis, the value-added composition of Georgia's exports does not show systematic association with the sectoral structure of the domestic economy, indicating that the links between Georgia's GVC participation and domestic productive capacity development remain weak. The main disadvantage of this is that it implies less access to foreign technologies and know-how, which are indispensable for upgrading in domestic value-added creation and exporting capabilities. These capabilities are also highly important to ensure quality supplies to importing and exporting industries. Access to foreign inputs in services sector should be used effectively for learning and skill development in its major sub-sectors in order to increase productivity and ensure faster integration in international markets. In the next sections, we will further investigate how GDP components affect value-added exports in the context of multiple determinants and cross-country variation.

3. Methodology and data

In order to analyse the determinants of Georgia's GVC participation, we use the structural gravity model by Anderson and Van Wincoop (2003). We observe the value-added traded between Georgia and its partner countries to capture the demand-side and supply-side determinants of intermediate trade. The research applies a panel analysis based on a structural gravity model over the period from 1997 to 2022. We include Georgia's 25 main export destinations, which account for more than 90% of Georgia's export, in the analysis. For each country, we apply the minimum threshold of 0.5% share in total exports. Countries below this threshold are excluded from the analysis because very small flows could distort the estimation. GVC participation data are taken from the UNCTAD-Eora GVC database. This is the comprehensive dataset with more than 180 countries coverage, including Georgia's uninterrupted data for the observed period.

Gravity models of trade enable us to identify both the economic, structural and policy-related characteristics that affect export flows. In our model, the dependent variable is the value-added exported by each country to Georgia and by Georgia itself. Therefore, we get a Georgia-centred gravity dataset. Exported value-added reflects each country's contribution embedded in a partner's export flows and gives understanding of participation in production sharing. As Johnson and Noguera (2012) confirm, value-added flows could be used to calibrate gravity-style trade models. Moreover, Noguera (2012) shows that bilateral value-added exports depend on the same bilateral gravity variables as bilateral gross exports. Thus, the methodological validity of using value-added export as a dependent variable in a structural gravity model is supported by the empirical and theoretical literature. The explanatory variables in the model are exporter GDP and importer GDP, geographic distance, shared border, availability of regional free trade agreements, the education

index as a proxy for human capital quality and also manufacturing and services value-added indicators as sector contribution measures that affect exports.

GDP data are collected from World Bank Development Indicators. MVA and SVA data of several post-Soviet countries are absent from the World Bank dataset, therefore we preferred alternative sources, such as Asian Development Bank for SVA and Unido National Accounts statistics for MVA data. The measures of geographic distance are taken from Centre D'études Prospectives et D'informations Internationales CEPII gravity database (Mayer & Zignago, 2011).

Trade freedom index as a regressor is taken from Heritage Foundation. Trade freedom measures incorporate trade costs, which include geographic frictions, as well as policy-related and regulatory barriers. It captures these policy-related frictions in a single composite measure. We apply the indicator of education index published by the United Nations Development Programme (UNDP). It is a proxy of human capital related determinants of participation in GVCs. The causal relationship between human development and export upgrading is empirically validated (Bayar & Diaconu (Maxim), 2022). The education index evaluates the long-term, structural quality of a nation's educational system by measuring the average educational achievement of its population and ranks countries from 0 (lowest) to 1 (highest). In our gravity dataset, the index is rescaled to a 1–100 range to ensure comparability across variables. It captures the role of knowledge and skills in shaping a country's export performance. The Education Index for Georgia is missing in 1997-1998. We assumed it constant at 2000 level, as no major reforms or setbacks occurred in that period.

The sectoral characteristics of Georgia's participation in GVCs are evaluated based on MVA and SVA indicators. These variables represent GDP components. Considering this, we estimated two different specifications of the model: one with exporter and importer GDPs to capture overall country-size effects, and others with substitution of GDPs with sectoral value-added variables to assess sector-specific effects.

The theoretical structural gravity model, by Anderson and Van Wincoop (2003) is as follows:

$$X_{ij} = \frac{Y_i Y_j}{Y}\left[\frac{t_{ij}}{\Pi_i P_j}\right]^{1-\sigma} \quad (1),$$

where: Y_i and Y_j are country GDP, t_{ij} is bilateral trade costs of j country while importing from i country, $\sigma > 1$ represents the elasticity of substitution, while Π_i *and* P_j are internal and external multilateral resistance terms.

A general specification, where the value-added exported is a dependent variable, is as follows:

$$VA_{ijt}=exp(\beta_1 lnGDP_{it}+\beta_2 lnGDP_{jt}+\beta_3 lndist_{ij}+\beta_4 border_{ij}+\beta_5 RTA_{ijt}+ +\beta_6 edu_{it}+\beta_7 edu_{jt}+\beta_8 tradefree_{jt}+ \beta_9 tradefree_{it} + a_{ij}+\beta_{ij} + \lambda_{ij})\varepsilon_{ijt} \quad (2),$$

Where:

- VA_{ijt} stands for value-added exported from i country to partner j in year t;
- Y_{it} is exporter's GDP in t year;
- Y_{jt} denotes importer country GDP in year t;
- $Border_{ij}$ is a dummy variable equal to 1 if countries i and j share a common border, 0 otherwise;
- RTA_{ijt} – Dummy variable equal to 1 if country j is in a regional trade agreement at time t, 0 otherwise;
- Edu_{it} and Edu_{jt} – education index for exporter i and importer j. It reflects the role of skilled labour in producing value-added;
- $TradeFree_{it}$ and $TradeFree_{jt}$ – Trade freedom index for exporter and importer countries;
- a_{jt} – importer-time fixed effects, controlling for time-invariant importer characteristics;
- β_{it} - exporter-time fixed effects, controlling for time-invariant exporter characteristics;
- λ_{ij} – country-pair fixed effects, controlling for time-invariant bilateral characteristics.
- ε_{ijt} – error term.

In structural gravity models fixed importer-time, exporter-time and country pair effects reflect multilateral resistance terms, which implicitly control for multilateral resistance on trade costs across all possible suppliers (Shepherd et al., 2019). In order to capture two distinct dimensions of GVC participation, two separate gravity equations are estimated. The first equation estimates the determinants of foreign value added absorbed by Georgia from partner countries. That represents Georgia's backward GVC linkages, where Georgia is fixed as the importing country and partner countries vary as exporters (origin countries). The second equation estimates the determinants of domestic value added supplied by Georgia to partner countries. This is Georgia's forward GVC linkages, where Georgia is fixed as the exporting country and partner countries vary as importers. In each equation, partner-country and time fixed effects are included to absorb multilateral resistance and common shocks, respectively. Thus, for our sample, in the case of Georgia and its export partners, we get the following specifications:

$$VA_it = \exp(\beta_1 lnGDP_{it} + \beta_2 lndist_i + \beta_3 border_i + \beta_4 RTA_{it} + \beta_5 edu_{it} + \beta_6 tradefree_{it} + a_j + \lambda_t)\varepsilon_{it} \quad (3)$$

Since Georgia is fixed as either exporter or importer. country-pair fixed effects cannot be identified due to insufficient within-pair variation. Therefore, time fixed effects (λ_t) are applied instead. Also, we have relied on the following specification for the import partners of Georgia:

$$VA_j^t = \exp(\alpha_1 \ln GDP_j^t + \alpha_2 \ln dis_j^t + \alpha_3 border_j + \alpha_4 RTA_j^t + \alpha_5 edu_j^t + \alpha_6 tradefree_j^t + \beta_j + \delta_t)\varepsilon_j^t \quad (4)$$

Poisson pseudo-maximum likelihood (PPML) estimation is employed (Santos Silva & Tenreyro, 2006), which allows us to properly cope with zero and omitted values and heteroskedasticity issues.

4. Results and discussion

The descriptive statistics of the model variables are given in appendix, Table 9. First, we estimated importer and year fixed effects model of Georgia's value-added export to partner countries. The estimation results are given in Table 1. After that, we substituted GDP with its components, MVA and SVA to capture the role of sectoral determinants in value-added trade (Table 2).

Table 1. Georgia's value-added exported, GDP model

Poisson estimation, Dep. Var.: va_exported Observations: 594 Fixed-effects: importer: 25, year: 26; Standard-errors: Clustered (year)

	Estimate	Std. Error	z value	Pr(>|z|)
ln_GDP_imp	0.250	0.051	4.830	< 0.001***
ln_edu_imp	1.685	0.369	4.564	< 0.001***
ln_trfree_imp	0.054	0.159	0.342	0.732
RTA	-0.459	0.057	-8.051	< 0.001***
Signif. codes: 0 '*' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1**				
Log-Likelihood: -312,038,958.6 Adj. Pseudo R2: 0.975				
BIC: 624,078,262.1 Squared Cor.: 0.978				

Source: authors' representation

The estimation results reveal that the partner's economic size and the quality of human capital are powerful drivers of value-added exports from Georgia. The coefficient on importer GDP is positive and statistically significant, indicating that increases in economic size are associated with higher value-added exports to partner countries even after controlling for time-varying importer-specific shocks. This result is consistent with structural gravity predictions and suggests that large destination markets remain an important driver of value-added export performance, when importer-year heterogeneity is fully absorbed. RTA dummy is negative and significant. Importer-side regulatory impact is negligible. Trade freedom enters with statistically insignificant coefficient, indicating no robust independent effect once importer and year shocks are controlled for. In contrast, the education index is positive and statistically significant, providing evidence that improvements in human

capital in partner countries can enhance Georgia's ability to generate and export value-added. This finding supports the view that demand-side structural factors, rather than market-access conditions alone, play a critical role in shaping value-added export performance. Overall, these results emphasize the significance of labour force quality and partner size in shaping Georgia's exported value-added.

The effects of changes in sectoral production capacity and partner characteristics on value-added trade are presented in Tables 2 and 3. We replaced country GDP with MVA and SVA variables in the estimation.

Table 2. Georgia's value-added exported, MVA sector effects

Poisson estimation, Dep. Var.: va_exported
Observations: 594
Fixed-effects: importer: 25, year: 26; Standard-errors: Clustered (year)

	Estimate	Std. Error	z value	Pr(>|z|)
ln_mva_imp	0.337	0.041	8.192	< 0.001***
ln_trfree_imp	0.042	0.072	0.582	0.561
ln_edu_imp	1.339	0.214	6.250	< 0.001***
RTA	-0.437	0.056	-7.764	< 0.001***

Signif. codes: 0 '*' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1**

Log-Likelihood: -302,582,563.5 Adj. Pseudo R2: 0.976

BIC: 605,165,471.9 Squared Cor.: 0.979

Source: authors' representation

Table 3. Georgia's value-added exported, SVA sector effects

Poisson estimation, Dep. Var.: va_exported
Observations: 591
Fixed-effects: importer: 25, year: 26; Standard-errors: Clustered (year)

	Estimate	**Std. Error**	**z value**	**Pr(>|z|)**
ln_sva_imp	0.250	0.037	6.786	< 0.001***
ln_trfree_imp	0.049	0.090	0.547	0.584
ln_edu_imp	1.728	0.178	9.693	< 0.001***
RTA	-0.443	0.057	-7.846	< 0.001***

Signif. codes: 0 '*' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1**

Log-Likelihood: -309,846,639.9 Adj. Pseudo R2: 0.975

BIC: 619,693,624.4 Squared Cor.: 0.978

Source: authors' representation

As expected, partner-country manufacturing and service-sector capacities, as well as human skills remain strong determinants of Georgia's exported value-added.

Similar estimations were conducted for value-added originated in partner countries and imported into Georgia. The results are given in Tables 4, 5 and 6.

Table 4. Value-added originated in partner countries imported by Georgia, GDP model

Poisson estimation, Dep. Var.: va_imported
Observations: 629
Fixed-effects: exporter: 25, year: 26; Standard-errors: Clustered (year)

	Estimate	Std. Error	z value	Pr(>|z|)
ln_GDP_exp	0.447	0.087	5.130	< 0.001***
ln_trfree_exp	0.167	0.082	2.039	0.041 *
ln_edu_exp	0.931	0.277	3.365	< 0.001***
RTA	-0.316	0.090	-3.516	< 0.001***

Signif. codes: 0 '*' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1**

Log-Likelihood: -137,951,927.8 Adj. Pseudo R2: 0.975

BIC: 275,904,203.5 Squared Cor.: 0.980

Source: authors' representation

Partner economic size remains a strong and significant driver, with GDP coefficient of 0.447, which is notably larger than in the case of exported value-added. While trade freedom has been insignificant across all exported value-added specifications, here, it enters as a positive and statistically significant determinant with the value of 0.167 ($p<0.05$). When Georgia sources intermediates and inputs from partner countries, the regulatory environment of the suppliers determines the ease with which those inputs cross borders. Lower barriers, more transparent customs procedures and open trade regimes reduce transaction costs and facilitate the transfer of intermediates. In the case of exported value-added, structural factors of destination countries, such as economic capacity and skills, play more important role.

Table 5. Value-added originated in partner countries imported by Georgia, MVA model

Poisson estimation, Dep. Var.: va_imported
Observations: 629
Fixed-effects: exporter: 25, year: 26; Standard-errors: Clustered (year)

	Estimate	Std. Error	z value	Pr(>|z|)
ln_mva_exp	0.525	0.083	6.314	< 0.001***
ln_trfree_exp	0.261	0.072	3.645	< 0.001***
ln_edu_exp	0.550	0.242	2.276	**0.023 ***
RTA	-0.301	0.080	-3.750	< 0.001***

Signif. codes: 0 '*' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1**

Log-Likelihood: -133,561,564.4 Adj. Pseudo R2: 0.976

BIC: 267,123,476.8 Squared Cor.: 0.979

Source: authors' representation

Table 6. Value-added originated in partner countries imported by Georgia, SVA model

Poisson estimation, Dep. Var.: va_imported
Observations: 626
Fixed-effects: exporter: 25, year: 26; Standard-errors: Clustered (year)

	Estimate	Std. Error	z value	Pr(>|z|)
ln_sva_exp	0.413	0.078	5.269	< 0.001***
ln_trfree_exp	0.226	0.078	2.903	0.004 **
ln_edu_exp	1.132	0.285	3.971	< 0.001***
RTA	-0.290	0.090	-3.219	0.001**

Signif. codes: 0 '*' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1**

Log-Likelihood: -138,773,626.0 Adj. Pseudo R2: 0.975

BIC: 277,547,599.8 Squared Cor.: 0.980

Source: authors' representation

The comparison of the results in Tables 5 and 6 shows that the explanatory role of trade freedom and education index depend on how partner economic size is measured. When we evaluate supplying country's goods-producing capacity, trade freedom emerges as a relatively stronger determinant. When partner size is instead proxied by service value-added, human capital becomes stronger, suggesting that the educational endowment of the supplying country is especially critical when Georgia's imported value-added originates from large service-sector economies.

The negative coefficients on RTA, which appear robust with all models, needs further careful analysis. The dominant empirical and theoretical literature does not support a negative relation between free trade agreements and value-added exports. Yang and Liu (2024) finds significant trade creation effects on domestic value-added in exports. Although the effect varies by country and region, it is positive on the average. Also, broad cross-country evidence given by IMF and World Bank consistently shows that more liberal trade regimes increase bilateral trade flows. Since value-added exports are a component of gross exports, this would usually translate into higher value-added trade.

However, there are several reasons through which trade agreements can actually lead countries to lower value-added exports. Considering the fact that Georgia tends to have RTAs with those partners, which are larger (EU, China) and geographically proximate (Russia, Türkiye, Azerbaijan, etc.), we see no additional value-added export growth as a result of enforcement of RTAs. Moreover, the literature confirms that RTAs do not necessarily increase value-added export as the effects depend on the type and depth of a free trade agreement. Depending on RTAs design and implementation, they can have positive or negative trade effects. The positive effect is larger for deep agreements, whereas the shallow agreements do not seem to increase bilateral trade flows (Díaz-Mora et al., 2024). RTA, which lacks investment, services, or intellectual property provisions may simply not generate the GVC enhancing effects. There is also empirical evidence that RTAs can localize

purchases and exert a negative impact on international production networks (Hayakawa, 2020). Another reason behind negative coefficients can be sector complexity and fragmentation. When countries mainly specialize in simple and low value-added tasks within GVCs, gross exports can grow, but the domestic value-added content may decline. The above results call for further analysis of RTA effects in Georgia. First of all, research at the sub-sectoral level is needed to test what the role of sector complexity in GVC participation is.

The limitation of the present study is that it focuses on within importer variation in the case of Georgia's value-added and within exporter variation in the case of partner countries' value-added. It captures partner country characteristics as determinants of Georgia's value-added flows, while Georgia's characteristics are reflected in an aggregate and implicit manner. Future research questions can potentially cover trade diversion effects within GVCs; Georgia's comparison with other economies is also important in order to explain why some countries see rising value-added export with trade liberalization, while others do not. Evidence suggests that barrier elimination often raises trade flows, even between developing countries; so, in the case of value-added trade, the divergence likely lies in specific domestic forces, that deserve further analysis. Additionally, a sub-sectoral decomposition of manufacturing and services value-added flows would provide a more in-depth picture of which specific sub-sectors drive production and trade integration.

Conclusion

The results indicate that Georgia's overall position in GVCs is weak. The GVC index to total exports ratio lacks stable and sustained dynamics. It reflects the influence of short-term factors rather than deep structural integration moves. Georgia's geography of GVCs reveals the leading role of neighbouring and larger countries. Backward integration is greatest with proximate countries such as Russia, Azerbaijan and Türkiye. The partner which mostly pulls Georgia to the global markets is Russia but, in the case of forward integration, the geography goes beyond neighbouring countries and spans to the EU countries, as well.

The analysis of the determinants of value-added exports has demonstrated that larger GDP, and the quality of human capital are powerful drivers of GVC participation of Georgia. Country-size effects measured by GDP or, alternatively, by manufacturing value-added, or service value-added, are positive and significant. RTA does not generate additional value-added export effects beyond those already embedded in importer-specific conditions. Market-access conditions at the destination do not independently drive Georgia's value-added export performance. On the import side, the economic size and human capital of supplying countries remain significant, but trade freedom of the exporting partner now enters positively and significantly across all three models. Trade freedom acts as a stronger predictor in the SVA specification while we see a stronger role of education in the MVA

specification. The negative and significant RTA coefficients call for a more detailed assessment of Georgia's trade agreement depth and features and their implications for trade performance and export upgrading.

Participation in GVCs is critically important for Georgia as it can open greater opportunities for trade benefits, technology adoption, and productivity gains. The above results give a pathway to specific development strategies and policy directions that should be prioritized. Given the strong role of market size in value-added export, policy should be oriented on developing linkages with large markets, not only with separate countries, but also with regional markets through deepening regional production and trade linkages (primarily through economic integration with the EU). Engagement with large economies (for instance, the USA, China and India) will help overcome the limitations of Georgia's small internal market, diversify exports, and gain from the increased presence in global production networks.

The significance of the education index implies that Georgia can benefit from strengthening GVC linkages with leading developed economies characterized by advanced skills and high-quality human capital. However, in order to reap related benefits, intensive investments in domestic education and skill development should be a policy priority. That is indispensable to facilitate technology adoption, provide access to diverse skill development sources and enhance inter-firm and inter-sectoral linkages by eliminating skill mismatch. Under the circumstances, formal trade agreements appear insufficient and complementary industrial policies, targeted at high value-added sub-sectors, investments in skills development and industrial upgrading will be necessary for enhanced GVC integration.

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Appendix

Table 7. List of countries

Armenia	Iran	Poland
Azerbaijan	Iraq	Russian Federation
Belarus	Italy	Spain
Belgium	France	Switzerland
Bulgaria	Kazakhstan	Türkiye
China	Kyrgyz Republic	Ukraine
Georgia	Lithuania	United States
Germany	Uzbekistan	United Arab Emirates
India	Peru	

Source: authors' representation

Table 8. Variable description

Variable	Description	Data source
GDP_exporter and GDP_importer	Gross domestic products of the exporter and importer countries in current US dollars	World Bank Development Indicators
dist	Geographical distance measured as distance between capital cities, kilometers	Centre D'études Prospectives et D'informations Internationales CEPII gravity database
RTA	Regional trade agreement dummy	WTO Regional Trade Agreements Database
border	Shared border dummy	
va_exported	Value-added that is exported bilaterally between Georgia and the partner countries, current US dollars	UNCTAD-Eora Global Value Chain Database
trfree_exp and trfree_imp	Index of trade freedom of the exporter and the importer	Heritage Foundation Index of Economic Freedom, Trade Freedom
edu_exp and edu_imp	Index of education of the exporter and the importer	UNDP Human Development Index, Education Index
mva_exp and mva_imp	Manufacturing value-added of the exporter and importer countries, in current US dollars	UNIDO National Accounts Statistics
sva_exp and sva_imp	Services value-added of the exporter and importer countries, in current US dollars	Asian Development Bank

Source: authors' representation

Table 9. Variable Summary statistics

	Mean	Median	Standard Deviation	Min	Max	N
va_exported	0.021	0.006	0.041	0.000	0.327	616.00
va_imported	0.009	0.003	0.017	0.000	0.138	643.00
GDP_exporter	1502.540	259.119	3580.000	1.250	26000.000	650.00
GDP_importer	11.516	12.611	6.390	2.800	25.000	650.00
dist	2982.207	2139.727	2783.505	172.722	13540.200	650.00
RTA	0.47	0.00	0.50	0.00	1.00	650.00
border	0.16	0.00	0.37	0.00	1.00	650.00
trfree_exp	74.70	78.80	13.68	13.20	90.00	629.00
trfree_imp	79.67	84.30	9.77	64.80	89.40	650.00
edu_exp	73.64	75.00	12.52	34.80	95.70	650.00
edu_imp	81.08	80.05	5.04	74.30	88.90	650.00
mva_exp	254.75	37.55	656.00	0.09	4850.00	637.00
mva_imp	0.68	0.65	0.43	0.10	1.80	650.00
sva_exp	970.30	144.72	2520.00	0.41	18100.00	647.00
sva_imp	6.75	7.76	3.99	1.38	14.80	650.00

Note: GDP, va_exported, va_imported, mva_exp, mva_imp, sva_exp, sva_imp are reported in billions of US dollars. All other variables are in their original values.

Source: authors' representation