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## Reconfiguring Growth Through Global Value Chains: Participation, Positioning, and Policy Lessons from Pakistan and Its Regional Competitors

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### Abstract

*This paper examines how a country's integration into global value chains (GVCs) influences its economic growth. GVCs have transformed international trade by shifting the focus from final goods to fragmented production networks across countries. Using panel data from 2000 to 2022 and employing the generalized method of moments (GMM) approach, we separate traditional and GVC-led trade to evaluate their differential impacts on multiple macro indicators, including gross domestic product (GDP) per capita, total factor productivity, export intensity, and others. We distinguish between the dual dimensions of GVCs—participation and positioning, where participation constitutes forward/backward (F/B) trade ratios as critical determinants of long-term competitiveness. We find that forward linkages tend to hinder growth in low-income countries, while backward linkages enhance the export-to-GDP ratio. For middle-income nations like Pakistan, enhancing forward linkages is the most effective way to improve export performance and boost economic growth. We then assess Pakistan's position within the GVC, as reflected in measures of upstreamness and downstreamness. Our comparison of Pakistan with other countries finds that it lags behind India, Bangladesh, and China, as it is characterized by strong downstream and weak forward linkages that limit value-added exports. A sectoral comparison, particularly between India's and Bangladesh's textile industries, further contextualizes Pakistan's structural limitations. Policy strategies are proposed to deepen value addition and move Pakistan up the GVC ladder.*

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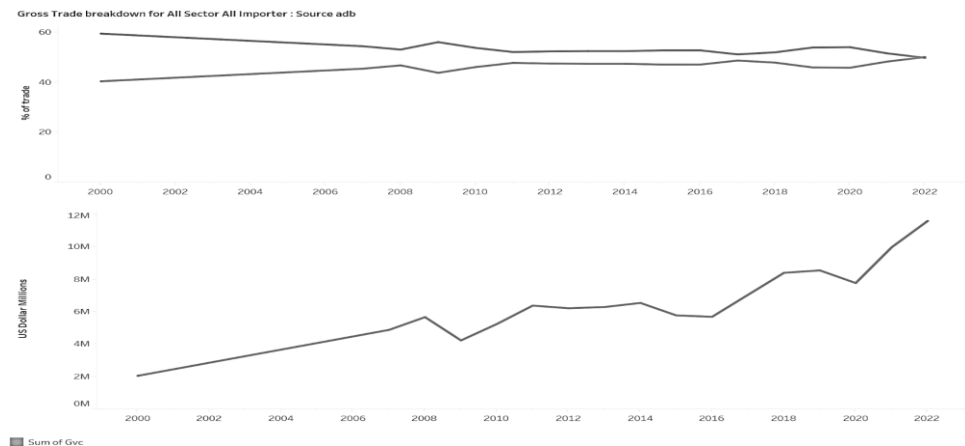
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## Introduction

Global value chains (GVCs) have transformed international trade by breaking production across borders, enabling countries to specialize in specific tasks rather than producing final products—a shift from traditional comparative advantage to ‘competitive advantage.’ For a developing economy like Pakistan, the challenge is to participate in GVCs and secure a strategic position that enhances domestic value addition. Doing so would lead to higher gross domestic product (GDP) per capita and total factor productivity (TFP), thereby promoting export growth.

The global economy has undergone a fundamental shift over the last few decades, transitioning from traditional trade patterns to complex, interdependent chains of production, also known as GVCs.<sup>3</sup> Unlike traditional trade, in which final products are shipped out of countries once produced, GVCs break production into specialized tasks across multiple countries rather than producing entire products. This development, usually referred to as the ‘second unbundling’ of globalization, was proposed by Baldwin (2013). Japanese, Korean, and Taiwanese parts are ultimately assembled in China or Vietnam. The end product is shipped across borders multiple times through multiple stages of production, thereby creating complex webs of value addition that are not captured in traditional trade statistics.

**Figure 1: Global trade redefined: The fall of the traditional and the rise of GVCs (2000–2022)**



Source: World Integrated Trade Solutions (2024).

<sup>3</sup> A global value chain, therefore, refers to a production sequence for a final consumer good, with each stage adding value (e.g., production, processing, marketing, transportation, distribution) and with at least two stages taking place in different countries (Gereffi & Fernandez-Stark, 2011).

Figure 1 illustrates that globally, GVC-related trade has steadily increased in both share and value, whereas traditional trade has declined, particularly after 2020.

While the shift toward GVCs has reconfigured the factors of production, numerous factors have contributed to the increase in GVC-related trade in recent years. Notably, enhanced global communication, reduced transportation costs, and lesser asymmetry in information from modern technologies have effectively reduced the cost of geographic coordination. Meanwhile, efforts to liberalize trade and proliferate multilateral agreements have also reduced both tariff and non-tariff restrictions, thereby enhancing the significance and viability of cross-border production networks and integration (Taglioni & Winkler, 2016). These factors have also led to the rise of multinational corporations, which utilize these changes to capture comparative advantages at different stages of production through their global operations (Ye et al., 2015).

GVCs have two primary components. First, GVC participation measures the extent to which a country participates in GVCs, determined by forward and backward linkages with other countries. It is a quantitative measure that uses the volume of the product embedded in the GVC. This assesses openness, dependency on foreign inputs, and export integration. Second, GVC positioning refers to a country or firm's relative location within a GVC, based on its 'upstreamness' and 'downstreamness' scores. This component is based on the qualitative nature of information and the value-added depth of participation. GVC positioning assesses a country's technological sophistication, upgrade potential, and strategic role within a GVC.

Figure 2 shows a weak but positive correlation between GVC participation and GDP per capita across countries for 2022–2023. It shows that while GVC participation is associated with economic development, the connection is complex. Countries differ significantly in the value they derive from GVCs. Advanced economies achieve high per-capita income by occupying higher-value roles in the GVC, while some developing nations, despite their heavy involvement in GVCs, remain at lower income levels.

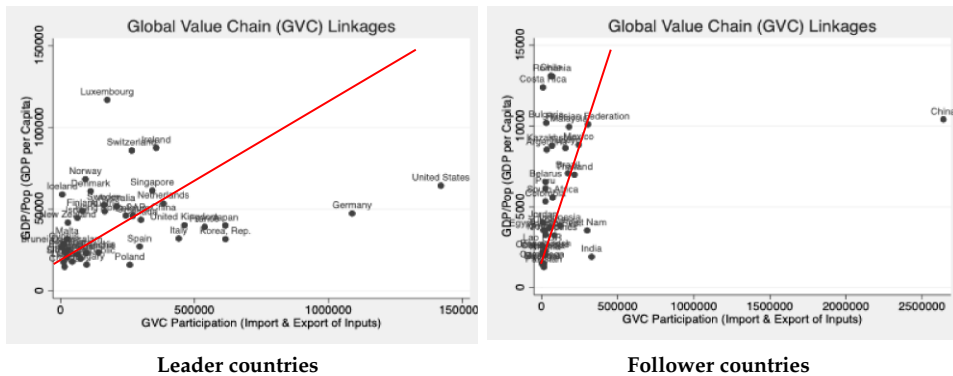
Figure 2: Positive correlation: GDP per capita and GVC participation



Source: Authors' calculations.

Next, we divide overall GVC participation into leader and follower countries. Figure 3 shows that leader countries exhibit slower increases in GDP per capita than followers, reinforcing the convergence theory and suggesting that imitators can achieve faster growth through GVC participation.

Figure 3: GDP per capita and GVC participation by leader and follower countries



Source: Authors' calculations.

A country's ability to integrate into these value chains depends on various economic and institutional factors, including comparative advantage, infrastructure quality, trade policies, and contract enforcement mechanisms, as suggested by Johnson and Noguera (2012). GVCs have also significantly altered how nations progress through various stages of economic development, as they [GVCs] provide opportunities to industrialize without creating entire supply chains locally—a

phenomenon often referred to as 'industrialization through integration' (Baldwin & Lopez-Gonzalez, 2015). Developing nations can specialize in specific production phases where they possess comparative strengths (typically labor-intensive production) and enjoy global market access and opportunities for previously unavailable technology transfers. In developed economies, GVCs have facilitated high-value-added specialization in activities such as research and development, design, branding, and high-value-added services. This specialization enables developed countries to reap a competitive edge in knowledge-intensive activities and outsource low-cost production to low-cost countries.

Despite the theoretical benefits of GVC participation, empirical evidence on how it interacts with economic development remains unexplored, particularly how different forms of participation affect countries at different stages of development. This research aims to address this gap.

First, we empirically demonstrate that traditional trade has diminishing effects on growth, whereas GVC-related trade is positively associated with macroeconomic indicators.

Second, we move beyond measuring only the extent of GVC participation by analyzing how Pakistan and peer economies participate (in volumes) and are positioned (based on quality) in value chains through forward/backward (F/B) linkages and upstreamness/downstreamness.

Third, we analyze how Pakistan's sectors are positioned in the GVC.

Fourth, we present a comparative analysis of Pakistan's textile industry relative to India and Bangladesh, highlighting that Pakistan is constrained by low downstreamness and limited value addition, which hinders technological upgrading and branding potential.

Fifth, we propose a 'balanced GVC growth strategy' focused on strengthening backward linkages through industrial development. Similarly, we propose enhancing forward linkages through research and development, branding, and innovation, and shifting from downstream assembly to upstream integration within longer, high-value production chains.

The remainder of this paper is structured as follows: the next section reviews literature on GVCs and economic growth, discussing theoretical models and recent empirical evidence. This is followed by our methodology, including data sources,

variables, estimation methods, and empirical results. Next, we present a comparative analysis of GVC participation and positioning in the global economy, an analysis of Pakistani sectors' positions in GVCs, and a more specific examination of Pakistan's textile sector. We conclude with policy implications and implications for achieving the maximum growth gains from GVC participation.

## **Literature Review**

Recent research has highlighted the importance of GVCs in enhancing productivity, facilitating technology transfers, and promoting export sophistication. However, studies also warn that simply participating, primarily through backward linkages, could reinforce dependency unless paired with upgrading strategies. Distinguishing between GVC participation (level of involvement) and positioning (place in the value chain) has become a vital analytical perspective. Our study contributes by combining macro-level generalized method of moments (GMM) estimation with sectoral and regional comparative analysis.

The theoretical foundations of GVCs can be traced to several traditions in economics, including international trade theory, industrial organization, and development economics. The early explanations of trade in intermediate goods were derived from extensions of Ricardian and Heckscher-Ohlin classical models, considering the likelihood that nations might specialize in parts rather than final products (Dixit & Grossman, 1982; Feenstra & Hanson, 1996). These theoretical contributions form the foundation of 'vertical specialization,' whereby production activities are broken into fragmented tasks spread across nations based on comparative advantage. The GVC concept later gained prominence following work by Gereffi et al. (2005), who present a governance perspective on the analysis of GVC organization and coordination. The governance perspective distinguishes between producer-driven chains (in which large producers organize networks, e.g., automobiles) and buyer-driven chains (in which brand owners and retailers lead networks without direct production, e.g., apparel).

Subsequent development added intermediate forms of governance, reflecting interdependence between lead firms and suppliers. Then Baldwin (2006) and Baldwin and Lopez-Gonzalez (2015) situated the rise of GVCs as the 'second unbundling' of globalization, where the development of information and communication technology enabled the spatial dislocation of production tasks that had previously required collocation. This highlights how declining coordination costs have reconfigured international trade from finished goods trade to task trade,

thereby redrawing development opportunities and challenges. From a development economics perspective, GVCs are a possible industrialization path alongside conventional import-substituting or export-promoting approaches. Milberg and Winkler (2013) described this as 'industrialization through integration,' whereby developing countries can be integrated into the GVC without the initial need to build up complete domestic value chains. The approach enables nations to specialize in certain activities based on available capabilities while building up technology and capability for the gradual upgrading of these activities. Furthermore, Kummritz (2016) applied Trade in Value-Added database data to demonstrate that backward and forward GVC involvement are positively correlated with domestic added value in exports and GDP per capita. Likewise, the World Bank (2020) provides extensive evidence that GVC involvement is correlated with more rapid income and productivity growth than traditional trade.

The distinction between different types of GVC involvement has been emphasized in research as well. Based on firm-level data, Constantinescu et al. (2019) find that backward linkages have greater productivity implications for developing-country firms, while forward linkages are more pronounced as countries advance to higher incomes. Similarly, Taglioni and Winkler (2016) find that GVC participation effects on growth vary across countries' development levels and industrial capabilities. Javorcik (2004), who studied the channels through which GVC participation affects growth, shows evidence of foreign direct investment generating productivity spillovers to domestic upstream suppliers through backward linkages as a technology transfer mechanism. Confirming this, Halpern et al. (2015) demonstrate that intermediate goods imports enhance firm productivity through variety and quality effects, providing micro foundations for the benefits of backward GVC participation. Several studies also examine the differentiated effect of country group participation in GVCs. Kowalski et al. (2015) argue that the relationship between GVC participation and per-capita GDP growth is positive for both developed and developing economies but differs in magnitude. Initial participation through backward linkages will most likely yield high growth returns for low-income economies, while advancement toward forward linkages is crucial for the sustainable growth of middle-income economies.

In addition to the intensity of participation, researchers have turned their attention to the positioning of countries in GVCs and its effect on economic upgrading. Antràs and Chor (2013) formulated a framework for analyzing the position of industries in GVCs, separating upstream (earlier-stage) and downstream (later-stage) activities. Based on this framework, Fally (2012) and

Miller and Temurshoev (2017) built measures of 'upstreamness' and 'downstreamness' to measure industries' positions in production chains. Criscuolo and Timmis (2018) find that upstreamness is generally associated with higher productivity, particularly in industries with a high knowledge orientation. Similarly, Rungi and Del Prete (2018) demonstrated that upstream positioning is associated with the value-added shares of exports, and that nations with higher upstream positions are more likely to receive higher value. The theory of economic upgrading in GVCs, developed by Humphrey and Schmitz (2002), explains how countries move up and down over time. They developed four upgrading routes: process upgrading (improving production methods), product upgrading (producing more valuable products), functional upgrading (increasing the skill intensity of operations), and chain upgrading (transitioning to higher-value chains). Subsequent studies, e.g., by Gereffi and Lee (2012), explain how specific countries and sectors navigate these upgrading routes, viewing them as both opportunities and constraints.

Recent research has emphasized the balance between forward and backward linkages as a strategic metric for evaluating countries' development paths. Wang et al. (2017) developed improved measures of forward and backward participation that more accurately reflect countries' positions in high-order GVCs, enabling a more precise analysis of participation patterns. Drawing on this research, Pahl and Timmer (2019) examined the evolution of the forward-to-backward linkage ratio as countries develop. They find systematic patterns that align with industrial capabilities and economic structure. Several studies identify strategic shifts in this ratio that are associated with successful development. Concentrating on East Asian economies, Ignatenko et al. (2019) find that rapid industrializers South Korea and Taiwan initially engaged through deep backward linkages before increasing forward linkages and building technological capabilities in the long run. The same trends have been observed in China, which sequentially evolved from assembly (high backward linkages) to manufacturing intermediate inputs (increasing forward linkages) as local capabilities increased.

The relationship between F/B ratios and income levels is non-linear. Growth at lower income levels is generally associated with increasing backward linkages as countries become integrated into labor-intensive assembly operations. For middle-income countries, transitioning to greater forward linkage intensity is necessary to escape the 'middle-income trap' and move toward higher-value-added activities. In developed economies, maintaining strong forward linkages

through innovation and technological leadership helps sustain competitive advantages amid rising labor costs.

Despite growing literature on GVCs and economic growth, several gaps remain. Most previous studies have addressed either positioning or participation intensity, but few have examined the dynamics of both components separately.

First, using the GMM framework, we estimate the impact of traditional and GVC-related trade on macroeconomic variables across a panel of 65 countries from 2000 to 2022.

Second, we provide an in-depth conceptual framework for Pakistan's participation in GVCs and its position in the GVC. We analyze how F/B linkages and upstreamness-to-downstreamness (U/D) ratios have changed in Pakistan and other relevant countries (potential competitors) to recommend policies that ensure a positive impact on macroeconomic indicators.

Third, we propose a clear transition mechanism that enables nations to gradually shift their positions in GVCs to achieve value-added growth. Next, we provide an overall sector positioning comparison for Pakistan to analyze which sector should be prioritized to move up the GVC. In addition, we discuss the specific comparative case study of Pakistan's textile sector to understand its relative position among competitors.

## **Empirical Evidence for Traditional Versus GVC Trade**

### *Methodology*

We employ GMM estimation to address potential endogeneity using a global panel of over 65,000 observations from 2000 to 2022. The dependent variables include GDP per capita, GDP per employee, TFP, and trade ratios. Key regressors include GVC-related trade and traditional trade, as well as forward and backward linkage metrics. Income group-specific regressions allow us to explore heterogeneity in GVC effects.

Our data comes from a variety of sources. The Trade in Value-Added database, created by the Organisation for Economic Co-operation and Development, offers detailed decompositions of gross export measures into foreign and domestic value-added components. The World Development Indicators of the World Bank are our primary source for economic outcome variables, such as GDP per capita, productivity and employment indicators, and control variables like human capital,

infrastructure quality, and institutions. As a complement to our analysis, the Penn World Table provides alternative productivity indicators, such as TFP and GDP values in purchasing power parity-adjusted terms. Our sample comprises 65 countries from various regions and income groups spanning over 20 years. It creates an unbalanced sample of approximately 60,000 country-year-sector observations. Since we must control for cross-sectional heterogeneity by country development levels, we categorize countries into four income groups based on the World Bank's classification: low-income, lower-middle-income, upper-middle-income, and high-income countries.

#### *Econometric Specification*

Our primary econometric approach employs a panel regression model to analyze the relationship between GVC participation and economic outcomes. The baseline specification is as follows:

$$Y_{it} = \alpha + \beta_1 \text{Traditional\_Trade}_{it} + \beta_2 \text{GVC\_Output}_{it} + \gamma X_{it} + \delta_i + \theta_t + \epsilon_{it}$$

$Y_{it}$  represents the economic outcome variables for country  $i$  in year  $t$ . We consider several key indicators to assess the economic impact of GVC engagement. TFP captures general productive efficiency, while GDP per capita is an economic development indicator. This study uses GDP per worker to measure labor productivity and the unemployment rate to represent labor-market impacts. The export-to-GDP ratio and import-to-GDP ratio are also used to determine a nation's trade orientation and degree of dependency.  $X_{it}$  denotes the vector of control variables.

We control for confounding effects by including the human capital index (which captures educational attainment and quality) and infrastructure quality (which captures the state of transportation and communication networks). We also control for institutional quality using governance indicators such as regulatory effectiveness and the rule of law, as well as macroeconomic stability, measured by inflation rates and the fiscal balance. Finally, we account for financial development using indicators such as private-sector credit and capital market depth.  $\delta_i$  represents country fixed effects,  $\theta_t$  accounts for time fixed effects, and  $\epsilon_{it}$  is the error term.

We employed lagged dependent variables to address endogeneity concerns and GMM estimation to account for the panel data's dynamic nature.

Tables 1–3 present estimated impacts from multiple regressions of traditional trade and GVC-related trade on key macroeconomic indicators using ordinary least squares (OLS), fixed effects, and dynamic GMM.

Table 1: Estimating the impact of traditional trade and GVC-related trade on the economy: OLS

Independent variables	Dependent variables								
	TFP (1)	GDP per capita (2)	GDP per person employed (3)	Unemployment (4)	Export-to-GDP ratio (5)	Import-to-GDP ratio (6)	Agriculture, forestry, and fishing value added (7)	Industry (incl. construction) value added (8)	Services value added (9)
Output related to traditional trade (crossing just one border)	0.00155 (-0.000984)	-0.0155*** (-0.00104)	-0.0165*** (-0.00136)	0.00192 (-0.00403)	-0.0574*** (-0.00196)	-0.0521*** (-0.00171)	0.0305*** (-0.00233)	-0.00721*** (-0.00157)	0.000928 (-0.000801)
GVC-related output (crossing more than one border)	-0.000518 (-0.000907)	0.0171*** (-0.000957)	0.0178*** (-0.00126)	-0.0037 (-0.00372)	0.0637*** (-0.00181)	0.0528*** (-0.00158)	-0.0257*** (-0.00215)	0.0117*** (-0.00145)	-0.000463 (-0.000739)
Observation	60,101	68,228	68,228	68,228	68,228	68,228	67,847	67,847	67,847
R <sup>2</sup>	0.722	0.998	0.99	0.859	0.96	0.963	0.993	0.997	0.999

All variables are in log form for better comparability. Controls include final consumption expenditure, gross fixed capital formation, population growth, and labor force participation rate to account for macroeconomic influences. Country income group dummies (low, lower-middle, upper-middle, high income) are included to capture structural differences using a panel dataset covering 45 sectors across 75 countries. The econometric technique used is OLS (when random effects matched OLS). Standard errors are in parentheses (\*\*\*)  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Table 2: Estimating the impact of traditional trade and GVC-related trade on the economy: Fixed effects

Independent variables	Dependent variables								
	TFP (1)	GDP per capita (2)	GDP per person employed (3)	Unemployment (4)	Export-to-GDP ratio (5)	Import-to-GDP ratio (6)	Agriculture, forestry, and fishing value added (7)	Industry (incl. construction) value added (8)	Services value added (9)
Output related to traditional trade (crossing just one border)	0.0170*** (-0.00211)	-0.0291*** (-0.00219)	-0.0363*** (-0.0029)	-0.0146* (-0.00863)	-0.105*** (-0.00397)	-0.155*** (-0.00357)	0.152*** (-0.00497)	0.0312*** (-0.00332)	0.00861*** (-0.00172)
GVC-related output (crossing more than one border)	-0.00295* (-0.00178)	0.0582*** (-0.00183)	0.0609*** (-0.00242)	-0.0108 (-0.0072)	0.216*** (-0.00331)	0.185*** (-0.00298)	-0.0967*** (-0.00414)	0.0351*** (-0.00276)	-0.00231 (-0.00143)
Observation	60,101	68,228	68,228	68,228	68,228	68,228	67,847	67,847	67,847
R <sup>2</sup>	0.298	0.976	0.739	0.194	0.524	0.488	0.845	0.959	0.991

All variables are in log form for better comparability. Controls include final consumption expenditure, gross fixed capital formation, population growth, and labor force participation rate to account for macroeconomic influences. Country income group dummies (low, lower-middle, upper-middle, high income) are included to capture structural differences using a panel dataset covering 45 sectors across 75 countries. Country, sector, and year fixed effects were applied to control for unobserved heterogeneity. The econometric technique used is fixed effects for within-group variation. Standard errors are in parentheses (\*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1).

Table 3: Estimating the impact of traditional trade and GVC-related trade on the economy: GMM

Independent variables	Dependent variables								
	TFP (1)	GDP per capita (2)	GDP per person employed (3)	Unemployment (4)	Export-to-GDP ratio (5)	Import-to-GDP ratio (6)	Agriculture, forestry, and fishing value added (7)	Industry (incl. construction) value added (8)	Services value added (9)
Output related to traditional trade (crossing just one border)	-0.000595* (-0.000329)	-0.00821*** (-0.000859)	-0.000742** (-0.000339)	-0.00313 (-0.00222)	-0.0133*** (-0.00108)	-0.0160*** (-0.00101)	0.0106*** (-0.00153)	-0.00159 (-0.00115)	0.00136** (-0.000661)
GVC-related output (crossing more than one border)	0.000661** (-0.000303)	0.00925*** (-0.000793)	0.000820*** (-0.000313)	0.00251 (-0.00205)	0.0151*** (-0.00009)	0.0160*** (-0.00093)	-0.00935*** (-0.00141)	0.00369*** (-0.00107)	-0.00116* (-0.000661)
Lag-1	0.950*** (-0.00141)	0.397*** (-0.00227)	0.944*** (-0.000961)	0.845*** (-0.00215)	0.784*** (-0.00201)	0.774*** (-0.00219)	0.700*** (-0.00244)	0.567*** (-0.00242)	0.285*** (-0.00172)
Observation	57,736	65,645	65,645	65,645	65,645	65,645	65,264	65,264	65,264

All variables are in log form for better comparability. Controls include final consumption expenditure, gross fixed capital formation, population growth, and labor force participation rate to account for macroeconomic influences. Country income group dummies (low, lower-middle, upper-middle, high income) are included to capture structural differences using a panel dataset covering 45 sectors across 75 countries. The econometric technique used is GMM for endogeneity correction. Standard errors are in parentheses (\*\*\*)  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Across all model specifications, the results consistently indicate that an increase in the volume of GVC trade (measured by output crossing multiple borders) has a significantly more positive effect on economic performance than traditional single-border trade. Under OLS and fixed effects, GVC-related output significantly increases GDP per capita, export and import ratios to GDP, and industrial value added, whereas traditional trade becomes insignificant or shows weak, inconsistent effects once country-specific effects are considered.

The GMM estimates, which address endogeneity and dynamic persistence, reinforce this conclusion: GVC-related trade has a positive and significant impact on TFP, GDP per capita, GDP per worker, and industrial value added, while also slightly reducing unemployment. The size of the GVC coefficients suggests that economies engaging in high GVC-related trade experience greater productivity (as measured by TFP, GDP per capita, export competitiveness, and industrial upgrading) than those relying solely on traditional trade in final goods.

We complemented our econometric analysis with a graphical comparison of four countries with distinct patterns of GVC participation: the US and China (higher-income countries) and India and Pakistan (lower-middle-income countries with varying levels of GVC linkages). For each case, historical trends and patterns of GVC participation, shifts in F/B linkages, and changes in upstream and downstream orientation are examined. We also examine historical trends in GVC participation, shifts in forward-backward linkage ratios, changes in upstream-downstream positioning, key policy interventions, and challenges of upgrading within GVCs. This qualitative approach contextualizes our econometric findings by highlighting differences between developed and developing economies and offering insights into practical pathways to enhance GVC-related trade and growth.

## **Conceptual Framework (Participation Versus Positioning)**

### *GVC Participation*

GVC participation measures the level of integration through forward linkages (the export of intermediates) and backward linkages (the import of inputs).

Forward linkages refer to the exports of intermediate goods and services that are included in a country's exports. For example, the export of advanced machinery from Germany to China's manufacturing sector illustrates forward

integration. Conversely, backward linkages occur when a country imports intermediate goods used in the production of exports, which account for the foreign value added in a nation's total exports. It is essential to note that GVC participation is a dynamic process, and countries may participate in it based on their initial endowment.

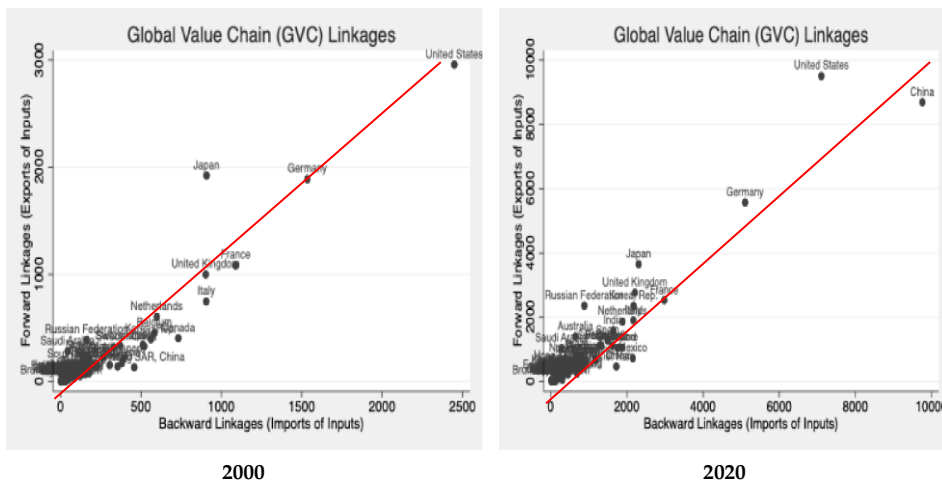
- Low-income and emerging countries → May start with high backward linkages (assembly phase)
- Advanced economies → Transition to high forward linkages (innovation and supply hubs)
- A balanced F/B ratio is key for long-term economic diversification and competitiveness

We break gross exports into components that reflect different types of trade integration to measure GVC participation. Conventional trade output reflects value added that crosses borders once and is used in the final country. GVC-related production involves multiple border crossings and value-added transactions and is further divided into pure forward linkages (domestic value added in intermediate exports used by other nations for reexport) and pure backward linkages (foreign value added in intermediate imports used to produce export goods). We scale these measures relative to GDP and derive the F/B ratio to account for differences in the economy's size.

$$F/B \text{ ratio} = \frac{\text{pure forward linkages}}{\text{pure backward linkages}}$$

The F/B linkage ratio is an indicator used to assess balance and determine a country's position in GVCs. An F/B linkage ratio greater than 1 indicates that the country has dominant forward linkages and is therefore a major supplier of intermediate goods. In contrast, a ratio less than one suggests that the country has strong backward linkages, processes inputs from other countries, and then returns those processed inputs to those countries.

Figure 4: GVC participation



Source: Author's calculations.

Figure 4 illustrates GVC participation through F/B linkages worldwide, comparing 2000 and 2020. The notable increase in both forward and backward linkages may be a crucial factor in China's economic success and its strategic integration into the global economy. A scatterplot of cross-country data on forward and backward linkages over 20 years shows that China has significantly repositioned itself within GVCs compared to other nations. We categorize countries based on their F/B ratios as follows:

**Case 1:**  $F/B > 1$ , meaning that forward linkages are higher than backward linkages. This case indicates that such countries function more as suppliers (strong forward):

- The short-term impact is that exporting intermediate inputs increases net exports
- The long-term impact is boosts in value added, innovation, and resilience
- These economies export more high-value intermediate goods that other countries use in their production
- Strong domestic production capacity and a technological edge
- Higher domestic value added in exports drives continued growth

We suggest that following this trajectory for most developing countries would help them move up the value chain (e.g., from assembly to innovation). It leads to higher wages, advanced industries, and long-term economic resilience.

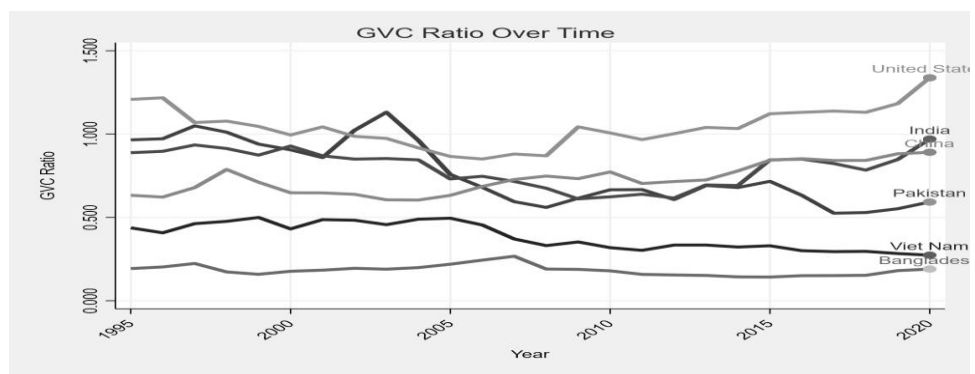
**Case 2:**  $F/B < 1$ , meaning that backward linkages are higher than forward linkages. This case indicates whether a country acts as an assembler (strong backwards).

- The short-term impact is a decline in net exports because assemblers rely on imports
- The long-term impact is more sophisticated inputs, lower domestic value added, and greater dependence on imported inputs for the country's exports
- These countries often specialize in low-cost assembly and manufacturing
- There is higher integration into global supply chains but lower domestic value added

Figure 5 shows the evolution of the F/B linkage ratio across countries from 1995 to 2020. A ratio above one indicates stronger forward linkages, meaning it is a major supplier of intermediate goods, while a ratio below one indicates greater reliance on imported inputs, reflecting backward linkages.

Pakistan's GVC ratio has remained relatively steady, consistently below one, indicating ongoing dependence on imported inputs and limited forward integration. In contrast, China and India have seen significant increases in their ratios over time, surpassing Pakistan, which suggests a shift toward more upstream, value-adding roles. Vietnam and Bangladesh consistently show low F/B ratios, indicating that their economies are assembly-based and heavily reliant on imports. The US demonstrates the highest and most consistent growth, reaffirming its role as a global input supplier with strong forward linkages.

**Figure 5: Comparison of F/B ratios across countries**

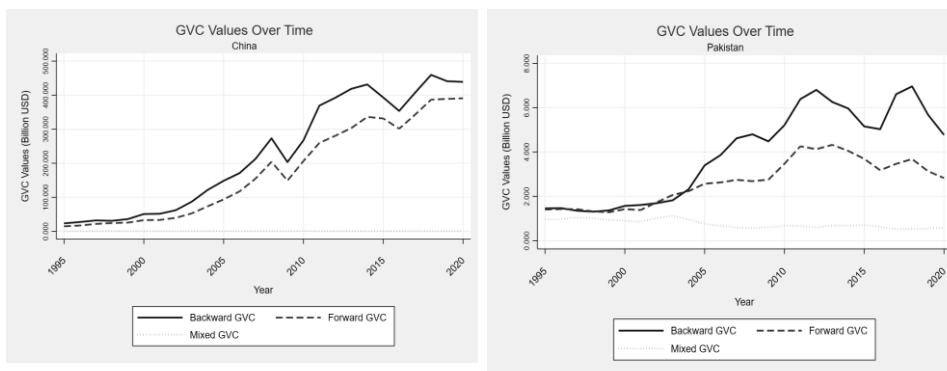


Source: Author's calculations.

*Forward/Backward Ratio Insights*

Next, we separate F/B ratios into volumes of forward and backward linkages over time from 1995 to 2020 (Figure 6). Countries with F/B ratios greater than one export intermediate goods and have higher innovation potential, while those with F/B ratios less than one are dependent assemblers. Pakistan’s F/B ratio remains below one, indicating structural limitations and an overreliance on imported goods.

**Figure 6: Volumes of F/B linkages over time for China and Pakistan**



Source: Author’s calculations.

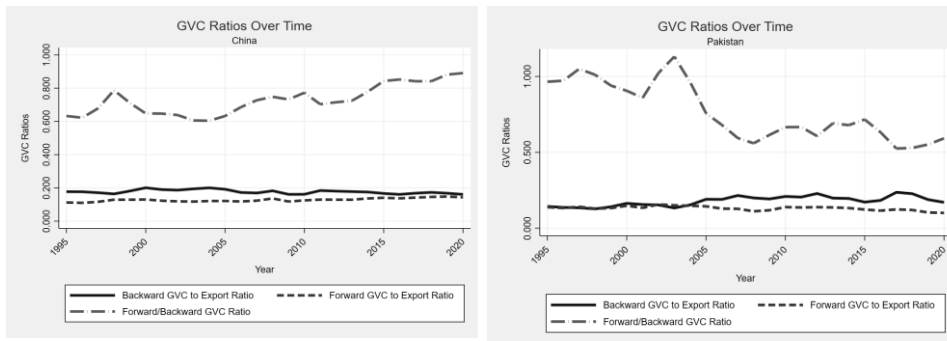
In Figure 7, we disaggregate the F/B ratios for China and Pakistan into backward and forward linkage shares of total trade to adjust for each country’s size in the world market. China has successfully advanced up the value chain, with increasing forward linkages and a rising F/B ratio.

Pakistan, in contrast, continues to lag, maintaining a backward linkage-heavy profile, low forward integration, and a declining F/B ratio, reflecting limited value-added contributions to global supply chains.

Overall, Pakistan lags behind regional competitors in transitioning toward a more balanced or forward-dominant GVC role.

Moving up the value chain requires forward linkages to grow faster than backward linkages (for countries where backward linkages dominate).

**Figure 7: Disaggregating F/B ratios over time: China vs. Pakistan**



Source: Author's calculations.

### *GVC Positioning*

We developed indicators for upstreamness and downstreamness to capture a nation's position in GVCs. Upstreamness focuses on the origin of inputs, capturing the distance of production from raw materials; greater values indicate later-stage production (Fally, 2012). Downstreamness focuses on where output goes; it captures the weighted-average distance of a nation-sector's output from final demand, with higher values indicating earlier-stage production (Antràs et al., 2012). We employ these indicators to calculate the U/D ratio as:

$$U/D \text{ ratio} = \frac{\text{upward streamness}}{\text{downward streamness}}$$

Higher values of this ratio indicate specialization in upstream activities, while lower values suggest concentration in downstream activities.

### *Upstreamness and Downstreamness*

GVC positioning evaluates a country's position along the value chain—upstream (input supplier) versus downstream (assembler or final goods exporter). The U/D ratio offers insights into value-added potential and strategic importance. We can categorize sectors as being part of four different combinations:

- Low downstream and low upstream countries comprise sectors that produce non-tradable goods, mainly provide local services, and are part of extremely short GVCs
- Low upstream and high downstream countries include assemblers in relatively longer GVCs

- Low downstream and high upstream are characteristic of resource-based sectors (positioned very low) in relatively longer value chains
- High upstream and high downstream are part of longer value chains, maintaining strong positions. These sectors convert core intermediate inputs into high-value tradable goods, such as electrical equipment.

Empirical evidence shows that an increase in both positions (upstreamness and downstreamness) has a significant positive impact on growth indicators for middle-income countries.

Figure 8 shows a hypothetical scenario where a country moves from using less-advanced inputs to producing simpler final goods, then shifts to using more-advanced inputs to create more sophisticated final products. The process pushes the country further upstream in the value chain while keeping downstream integration low. This ultimately results in limited value added within its domestic production system because the country remains embedded in the same value chain, i.e., the end product remains the same. However, it connects to the chain at a higher level.

**Figure 8: Diagrammatic representation of a change in position within a GVC**

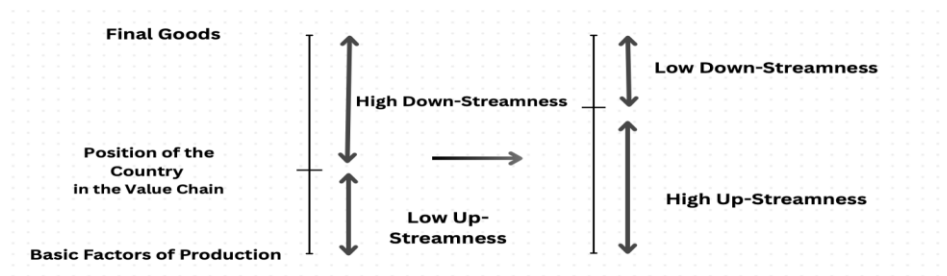


Figure 9 illustrates a hypothetical scenario where a country transitions from being part of a shorter GVC to integrating into a longer one. It moves from a more upstream to a more downstream position, progressing from producing less significant goods to higher-value-added branded products, resulting in greater value addition.

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**Figure 9: A transition from shorter to longer GVCs**

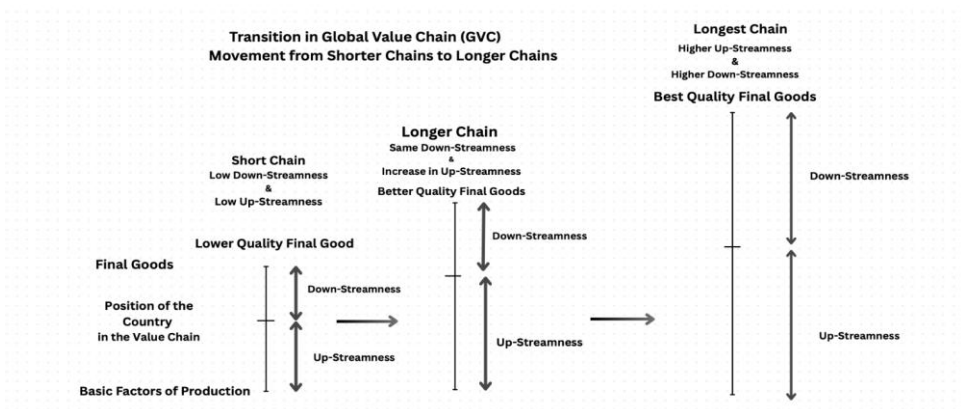
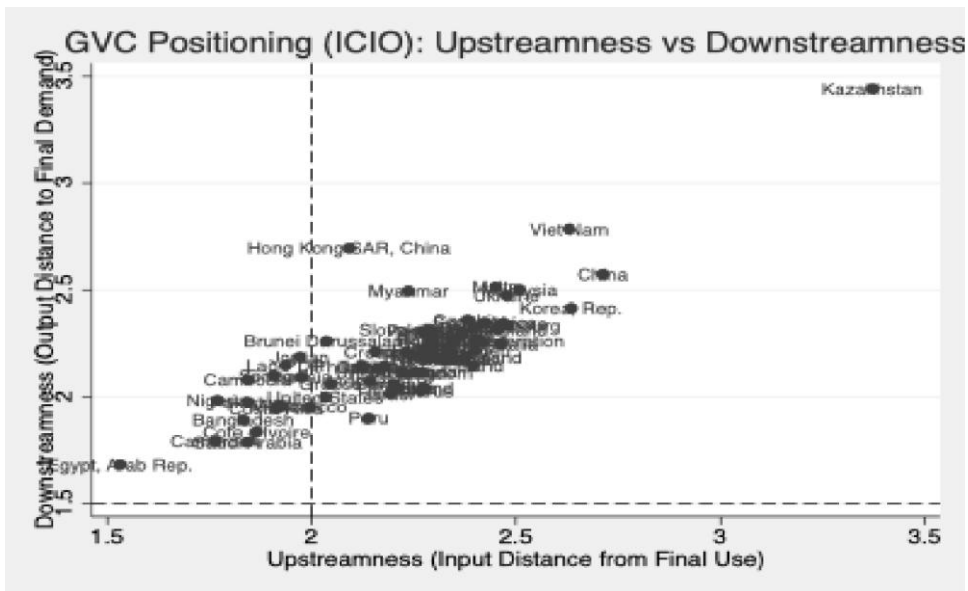


Figure 10 provides a cross-country comparison of each country’s global positioning based on upstream and downstream positions within the GVC for 2022–2023.

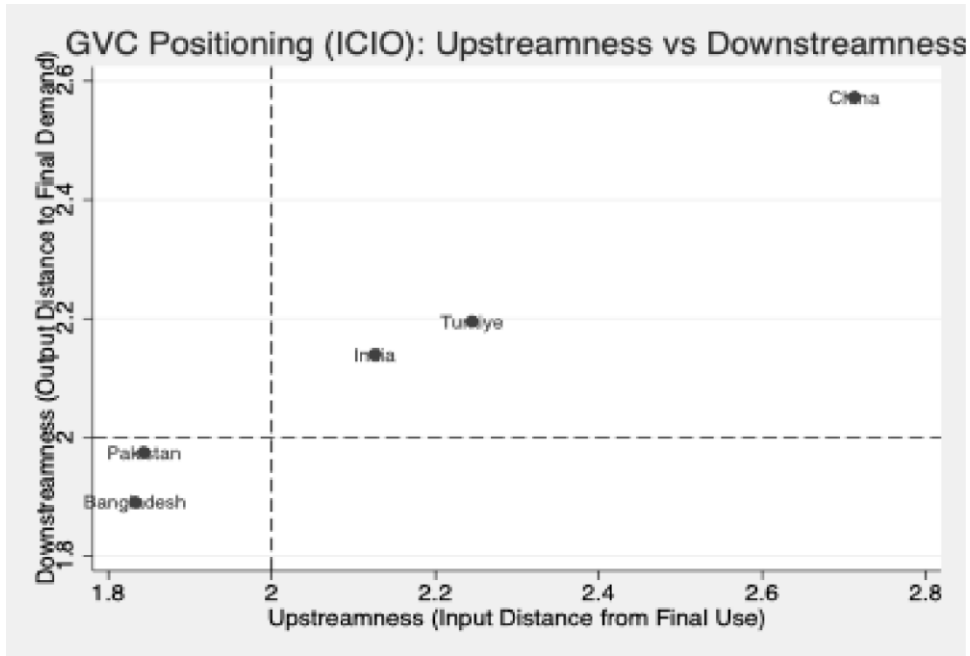
**Figure 10: Cross-country scatter plot of GVC positioning based on upstreamness and downstreamness (2022–2023)**



Source: Author’s calculations.

Next, we select four countries (Bangladesh, India, Turkey, and China) to compare their relative standings with Pakistan (Figure 11).

**Figure 11: Pakistan's GVC position relative to India, Turkey, Bangladesh, and China**



Source: Author's calculations.

Figure 11 shows that China occupies the top-right quadrant, indicating a position that is both high upstream and high downstream. This suggests that China is deeply involved in both the early and late stages of production, providing complex inputs and participating in multi-stage production processes, thereby maintaining a strong, diversified GVC position.

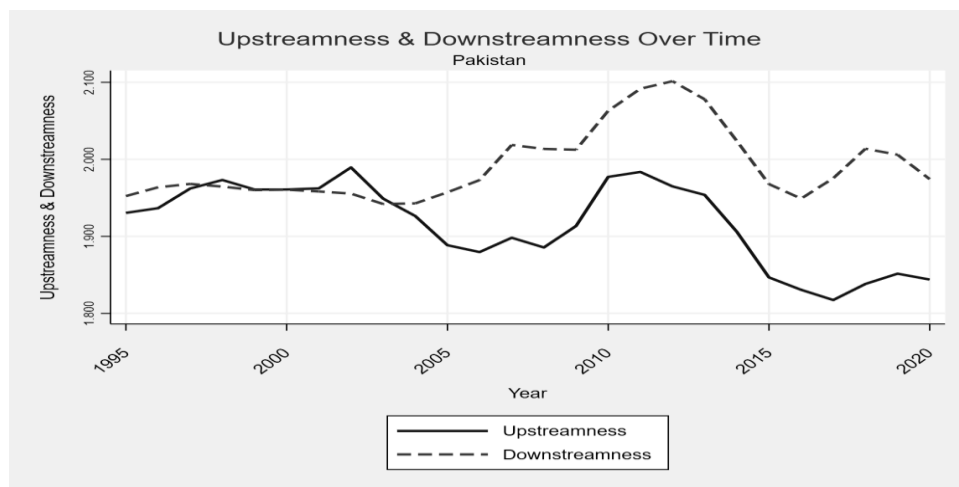
Turkey and India are positioned in the upper-mid quadrant, with moderate upstream and downstream activities, ensuring a balanced GVC role as they supply inputs and export semi-final or final products.

Pakistan and Bangladesh are in the bottom-left quadrant, indicating low upstreamness and downstreamness. This means they engage mainly in simpler, lower-value-added activities closer to final use, relying on imported inputs. These

inputs are used to manufacture assembly-based, labor-intensive exports with limited vertical integration.

Figure 12 shows how Pakistan's position in GVCs has changed from 1995 to 2020.

**Figure 12: Pakistan's upstreamness and downstreamness in GVCs (1995–2020)**



Source: Author's calculations.

Figure 12 highlights three key points. First, upstreamness (blue line) was relatively stable until 2010, then declined sharply, indicating a shift toward final demand and less involvement in early production stages.

Second, downstreamness (red dashed line) increased significantly after 2005, peaking around 2013, showing Pakistan's growing role as a final assembler or exporter of products directly consumed by users.

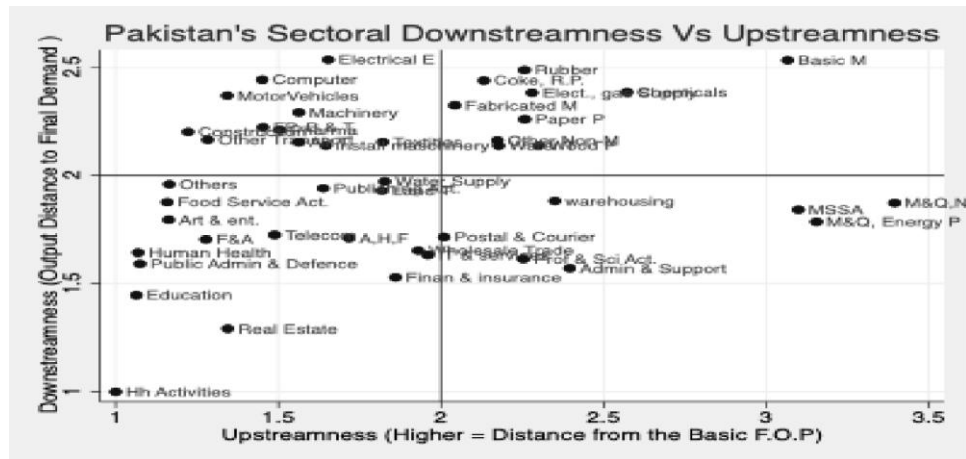
Third, the growing gap between rising downstreamness and falling upstreamness reflects a GVC structure where Pakistan is more focused on final-stage activities. These lower-value tasks may limit its ability to achieve higher margins and benefit from innovation spillovers.

Figure 12 highlights the importance of strategic upgrades in Pakistan that could move GVC participation toward higher-value roles. Progress in both areas could lead to stronger growth, particularly for middle-income countries like Pakistan, which have a weak position in downstream integration.

Sectoral Mapping: The Case of Pakistan

We categorize all sectors by their position in the GVC, distinguishing upstream and downstream sectors to support our argument for Pakistan. Figure 13 presents Pakistan’s sectoral positioning in GVCs in 2022–2023.

Figure 13: Pakistan’s sectoral positioning in GVCs (2022–2023)



Source: Author’s calculations.

Each quadrant in Figure 13 represents different levels of upstreamness and downstreamness.

**Top-right quadrant (high upstream/high downstream):** This quadrant comprises core intermediate sectors that are deeply integrated into GVCs. Their products serve as inputs into lengthy production chains, making them strategically vital while also contributing indirectly to value creation. These sectors are part of complex, lengthy supply chains with significant potential for technological advancement. Examples include basic metals, chemicals, rubber, coke, and electrical equipment.

**Bottom-right quadrant (high upstream, low downstream):** These are typically raw material- or capital-intensive services closer to input provision but with outputs that quickly reach final demand. These sectors are resource-driven and not closely integrated downstream, resulting in fewer opportunities for multiple layers of value addition. Examples include mining and quarrying, energy production, and administration and support.

**Top-left quadrant (low upstream, high downstream):** These are downstream manufacturing sectors that often serve as assemblers, using a wide variety of imported or domestic inputs before exporting. While downstream integration can boost export growth, it may limit domestic value addition if upstream capabilities remain weak. Examples include motor vehicles, electrical equipment, machinery, and textiles.

**Bottom-left quadrant (low upstream, low downstream):** These sectors are non-traded or localized services with limited involvement in GVCs. They generate low foreign exchange but can still support domestic welfare and human capital. Examples include education, real estate, health, and public administration.

Pakistan's key industrial sectors, such as textiles, machinery, and motor vehicles, are located near the top-left, indicating a role as a final assembler that relies on imported inputs; high downstream, limited upstream.

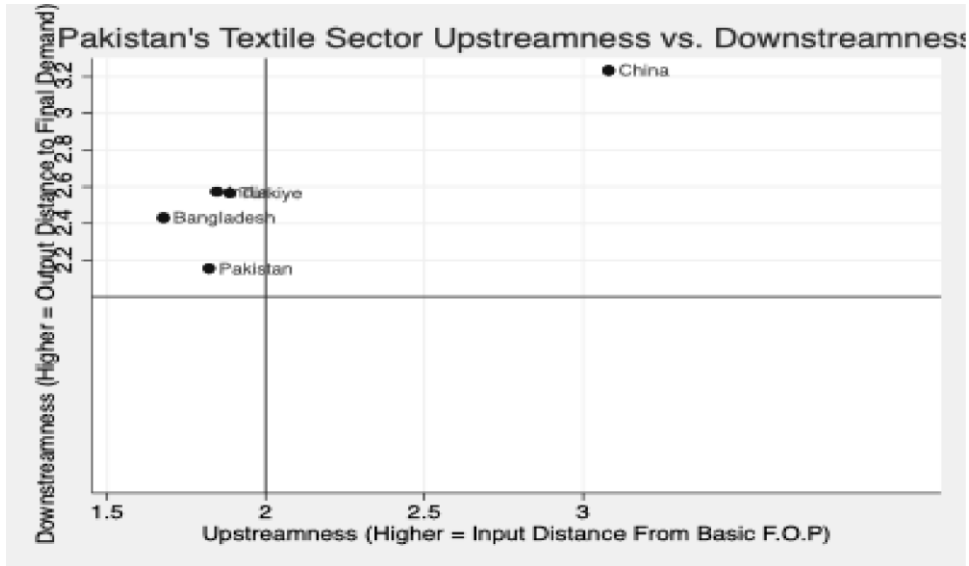
To boost domestic value addition, we recommend that Pakistan focus on further advancing along the value chain for sectors already involved in longer chains. This includes strengthening upstream industries (e.g., chemicals, metal processing), integrating them more closely downstream by building longer supply chains, and upgrading technological capacity in downstream sectors to shift them more upstream.

#### *A Case Study of Pakistan's Textile Sector*

This section provides a brief case study of Pakistan's textile sector in light of GVC positioning. Using a comparative analysis, we show that Pakistan's textile sector is less developed downstream and less technologically integrated than those of India and Bangladesh. It relies heavily on imported inputs and provides limited value-added.

Figure 14 shows the textile sector's relative position in 2022–2023, based on its downstream and upstream capacity in the GVC, compared to Bangladesh, Turkey, India, and China.

**Figure 14: GVC positioning of the textile sector across Pakistan and selected competitor countries**



Source: Author's calculations.

Pakistan's textile sector has a moderate upstream position and lower downstream involvement. This indicates that the sector imports a mix of domestic and foreign inputs, but its outputs are closer to final consumption (i.e., fewer intermediate processing steps remain). This reflects a narrower GVC role, common among final-stage exporters (e.g., garments), with limited integration into longer, multi-stage value chains.

Countries like India, Turkey, and Bangladesh have higher downstream positions, meaning their textile outputs undergo more transformation and use before reaching final demand. This suggests greater vertical integration and increased potential for value capture and complexity in the textile sector. Their upstreamness is comparable to, or slightly higher than, Pakistan's, indicating broader input diversity and greater involvement in intermediate stages. China stands out with significantly higher upstream and downstream activity. This shows a textile sector that produces key intermediate inputs and exports outputs used in complex, multi-country production chains. It reflects China's strategic dominance across the entire textile value chain, from inputs to advanced processing and integration.

Pakistan's textile sector exhibits the following features:

- The country assembles or finishes products using complex foreign inputs
- It adds limited intermediate value
- Pakistan's textile sector is less integrated and less value-adding in global production chains compared to its peers
- While it may be competitive in volume or labor costs, its limited upstream and downstream depth constrains opportunities for technological upgrading, branding, and innovation-led export growth

## **Conclusion**

GVC participation is essential, but not enough for long-term growth. Countries also need to aim for advantageous positioning. For Pakistan, the way forward involves reducing reliance, advancing up the value chain, and using both upstream and downstream integration for sustainable development. By adjusting its GVC approach, Pakistan can transform from a peripheral assembler to a key player in global production networks.

This paper examines the intricate relationships between GVC engagement and economic growth across various nation groupings and stages of development. Our results reveal several significant conclusions that support knowledge of GVC development tracks. First, GVC-linked trade has far more beneficial economic effects than traditional trade flows. Our cross-country regressions show that GVC-linked production (where products cross borders multiple times) positively affects productivity, GDP per capita, and trade performance. Traditional trade, on the other hand, is either negatively related to or unrelated to the same indicators, demonstrating the value of being part of GVCs.

Second, forward and backward linkages operate differently in promoting economic performance at varying levels of a country's development. In low-income countries, backward linkages facilitate early market access and promote export growth. In contrast, in high-income countries, forward linkages contribute to productivity growth and long-term development. Middle-income countries are particularly vulnerable to the unique challenges of transitioning from backward-driven to more balanced GVC participation patterns.

Third, the F/B linkage ratio becomes a strategic measure of countries' development paths. Economies that successfully industrialize tend to exhibit

rising F/B ratios over time as they transition from assembly-focused participation to higher domestic capability building. Consistently low F/B ratios tend to indicate minimal upgrading and bottlenecks to sustainable growth.

Fourth, upstream-downstream positioning is also critical for value capture in GVCs. Upstream value activities are higher in value-added but lower in employment, whereas downstream employment-intensive activities are higher in employment but lower in value-added. Strategic repositioning toward more upstream activities, while maintaining domestic supply chain integration, will likely be needed for successful development.

Ultimately, our case studies reveal distinct patterns of GVC integration. Chinese sequential upgrading from assembly to components, US innovation-led forward integration, Indian service engagement, and Pakistani failure to upgrade under constrained conditions capture how nationally specific conditions and policy choices determine GVC outcomes. These findings support the notion that GVC engagement is not always beneficial; it has differential growth impacts that depend on the nature of integration, indigenous capacities, and accompanying policies. Policymakers' work is not merely to promote GVC engagement but to consciously determine its composition and direction to achieve maximum development benefits.

For firms with predominantly backward linkages ( $F/B < 1$ ), strategic import facilitation is mainly required. This involves reducing tariffs and non-tariff barriers on intermediate and capital goods, creating bonded warehouses and export processing zones with streamlined customs clearance procedures, and utilizing electronic trade facilitation systems to minimize transaction costs. Domestic supplier development programs must be created to connect domestic firms with multinational firms, enabling technology transfers and knowledge spillovers. Strategic skills development is essential for aligning vocational education with GVC demand, promoting management training, and enabling targeted worker training programs. A gradual backward-to-forward transition strategy should also be pursued by identifying subsectors where domestic capabilities can be developed, phasing localization plans, and enabling applied research and development for technology adaptation.

Middle-income transition economies ( $F/B \approx 1$ ) need to build innovation systems. Strengthened research-industry linkages, the establishment of technology centers, and investment in digital infrastructure facilitate entry into high-value

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activities. Strategies for upgrading, such as product development, functional upgrading, and chain upgrading, should be pursued to transition into higher value chains. High-end business services, such as design, finance, and logistics, propel GVC competitiveness. Meanwhile, regional value chain integration needs to be addressed through regional trade agreements, common standards, and enhanced infrastructure connectivity.

For high forward linkage ( $F/B > 1$ ) countries, frontier innovation support plays a critical role in competitiveness sustenance. Investment in basic and applied research, better intellectual property systems, and support for the commercialization of research are critical. An advanced manufacturing retention policy must prioritize innovative specialization strategies, Industry 4.0 adoption, and high-value production technologies that integrate automation with specialized human capital. Regulatory systems for cross-border data flows and service trade agreements should enhance the development of service GVCs. Resilience improvement mechanisms, such as supply diversification, strategic inventory management, and the implementation of early warning systems, must be put in place to prevent disruptions.

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