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Examining Nonlinearities

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Global Value Chain Participation and Economic Growth in MENA: Examining Nonlinearities

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Abstract

This paper investigates whether and to what extent Middle East and North Africa (MENA)'s participation in Global Value Chains (GVCs) impacts economic growth. Although MENA has experienced increased integration into GVCs, its involvement has been concentrated in low-value-added tasks. To explore the relationship between MENA GVC participation and economic growth, this study utilizes data from the UNCTAD Eora GVC database, covering the years 1990 to 2017. The methodology used consists of estimating a dynamic threshold panel model in order to find whether there is a critical level of GVC participation after which the impact on economic growth vanishes or differs significantly. By examining the forward and backward participation by sector type and their implications for MENA economies, this study reveals threshold-dependent, sector-specific effects. Forward GVC participation drives growth in MENA and emerging and developing regions, with significant gains above critical thresholds in sectors like agriculture, transport, and machinery. In contrast, backward GVC participation yields mixed results, with MENA countries facing diminishing returns. However, emerging economies benefit more consistently. The findings highlight the importance of surpassing thresholds, enhancing domestic value creation, and balancing GVC trade dynamics to maximize GVC-related growth.

Key words: *Global Value Chains, Economic Growth, Forward Participation, Backward Participation, Dynamic Panel Threshold Model, MENA.*

JEL: *F14, F15, O47*

1. Introduction

Global value chains (GVCs), which gained importance in the global economy in the twenty-first century, have provided opportunities for developing countries to participate in international trade and accelerate their economic growth (Cattaneo et al., 2013). However, the extent to which GVCs' participation affects economic growth in emerging and developing economies remains a subject of discussion among economists and policy makers (Praveen Jangam et al., 2024; Yanikkaya & Altun, 2020). In particular, the empirical relationship between Global Value Chain participation and economic growth in Middle East and North Africa (MENA) could be non-linear.

In recent years, parts and components of goods have been produced in different locations since the emergence of GVCs, which are an important aspect of international trade, accounting for roughly 70% of all international trade as shown by (OECD, n.d.). A value chain is a set of activities that occur in multiple countries and that takes a product from conception to end use (De Backer & Miroudot, 2013). One way to examine the involvement of countries in GVCs is by considering two main measures: the backward participation index (Foreign Value Added, which refers to upstreamness) and the forward participation index (Domestic Value Added exported to third parties, which refers to downstreamness). Africa is considerably integrated in GVCs, surpassing many other developed (i.e., USA) and developing countries in GVC participation level (Foster-Mcgregor et al., 2015). Foster-Mcgregor et al. (2015) indicate that Africa's participation is mainly in upstream production, providing primary inputs to firms. Historically, MENA's role in GVCs has been limited to supplying raw materials and low value-added manufacturing, such as assembly. Similarly, Del Prete et al. (2018) also examine the level of involvement and positioning of North African countries within GVCs and find that a significant portion of North African trade, despite being relatively low, is attributed to activities in the early stages of production.

Other studies have extensively examined the relationship between trade and economic growth. For instance, Vianna & Mollick (2021) examine the relationship between terms of trade volatility and economic growth in 14 Latin American economies from 1997 to 2014. They also find that the relationship between trade and economic growth is nonlinear. Moreover, stronger links between trade and growth are observed during the commodity boom of the 2000s and in larger economies. Lim & McNelis (2016) show the potential positive effects of trade and financial

openness on income growth and equality, particularly when certain thresholds in capital intensity and imported intermediate good usage are surpassed. By employing threshold regression techniques, Foster (2006) explores whether African nations benefit more from exports once they reach a certain level of development or openness. Their findings indicate a positive relationship between exports and growth in Africa. Interestingly, the analysis suggests that it is not necessary for a country to have a specific level of development or an established export base for this relationship to hold. However, he finds that the relationship between exports and growth tends to be stronger in countries experiencing higher rates of export growth (Foster, 2006). Furthermore, Zahonogo (2017) investigates the impact of trade openness on economic growth in sub-Saharan Africa (SSA) using a dynamic growth model and data from 42 SSA countries spanning the years 1980 to 2012. Results show the presence of a trade threshold, indicating that below a certain level of trade openness, increased openness has positive effects on economic growth. However, once the threshold is surpassed, the trade effect on growth diminishes. This suggests that the relationship between economic growth and trade openness in SSA is non-linear. Kamau (2010) explores the relationship between regional economic integration and growth in the COMESA, EAC, and SADC trade blocs. Using a system GMM estimation technique, the study demonstrates a positive and significant impact of economic integration and trade on economic growth.

Participation in GVCs has been a powerful driver of productivity growth, job creation, and increased living standards. Countries that embrace GVCs tend to grow faster, import skills and technology, and boost employment (World Development Report, 2020). The mechanisms through which GVCs drive economic growth are multifaceted. Specialization in particular tasks enables countries to capitalize on their comparative advantages, leading to productivity gains and economies of scale. Moreover, GVCs facilitate the transfer of technology and knowledge from advanced economies to developing countries, fostering skill development among the workforce. Access to larger international markets through GVCs boosts exports and attracts foreign direct investment (FDI) (Ignatenko et al., 2019).

A more limited number of studies have conducted an empirical assessment of the impact of GVC participation on economic growth. For instance, Praveen Jangam et al. (2024) explore the role of GVC trade in economic growth, particularly during the COVID-19 pandemic. Analyzing data from 60 countries (2007–2021) using the system GMM technique, their study highlights that GVC trade consistently supports economic growth, even amidst the pandemic. Yanikkaya and Altun (2020) examine the influence of GVC participation on sectoral growth and

productivity between 1995–2011 and 2005–2015. Using both standard and OECD-suggested backward and forward participation indices, their GMM analysis reveals that higher GVC participation significantly boosts sectoral output and total factor productivity (TFP), particularly during the earlier period. However, the later period shows diminished benefits. These studies often do not assess the threshold effects of GVC participation. The literature on the non-linear relationship between GVC participation and economic growth is scarce. We find one previous study that discusses the issue of the nonlinear effects of GVC participation on economic growth. Jithin et al. (2022) investigate the effects of GVC participation on economic growth for 62 economies from 2000 to 2018. They find that GVC participation positively impacts economic growth in countries with higher initial growth, but negatively affects countries with lower growth. The study also highlights the differing effects of forward and backward GVC participation, with forward participation having more detrimental effects on economic growth in less developed economies.

GVC participation positively impacts income per capita and productivity. However, the benefits were more pronounced for upper-middle and high-income countries. This indicates that the advantages of GVC participation might not be uniformly distributed across all economies (Ignatenko et al., 2019). Additionally, (Kowalski et al. (2015) highlighted that while GVC participation offers opportunities for productivity enhancement and export diversification, the actual benefits depend on factors such as a country's level of development, market size, and geographic location. These findings offer promising insights and support the idea that the relationship between GVC participation and economic growth in MENA region could be nonlinear. This is why we employ a dynamic panel threshold model to capture the non-linear relationship between economic growth and participation in GVCs. In our analysis, we distinguish between MENA countries and emerging and developing economies to account for regional specificities, economic structures, and varying levels of integration into global production networks. The threshold model would help to determine whether the influence of GVC participation on economic growth differs depending on the level of participation. Beyond a certain point, additional gains in GVC integration may not result in proportionate economic advantages. Therefore, conducting a study to explore the impact of GVC participation (by type of participation and by sector) on economic growth in MENA region could provide valuable insights for policymakers. Research for other regions has found some significant threshold effects for some trade variables and/or regions, e.g. Foster and Lim & McNelis (2016) for openness, Vianna & Mollick (2021) for trade volatility in Latin America. However, to the best

of our knowledge there is no research examining the link between GVC participation and economic growth in MENA region, mostly due to lack of data until recently. We aim to cover this gap in the literature.

Our contribution to the literature is threefold. First, we empirically examine the relationship between GVC participation and economic growth in the MENA region, an area previously unexplored. We specifically implement GVC measures that account for variations by sector and type of integration. Second, we employ a dynamic panel threshold model to account for the potential non-linearities in this relationship. Our chosen methodology combines Threshold Estimation and System GMM following (Seo et al., 2019), offering robust tools to capture non-linear relationships and address potential endogeneity issues. Third, we extend the analysis by distinguishing between MENA countries and other emerging and developing economies, capturing regional specificities and economic structures.

The findings reveal that GVC participation's impact on economic growth is highly sector- and threshold-dependent, with significant variations across regions. For MENA countries, forward GVC participation below critical thresholds yields limited or negative effects, particularly in agriculture, textiles, transport, and machinery sectors. However, surpassing these thresholds unlocks substantial growth potential. This demonstrates the transformative power of deeper GVC integration. In contrast, backward GVC participation in MENA countries often leads to diminishing returns above thresholds. This indicates inefficiencies and demonstrates more clearly how backward GVC participation fails to significantly contribute to MENA growth.

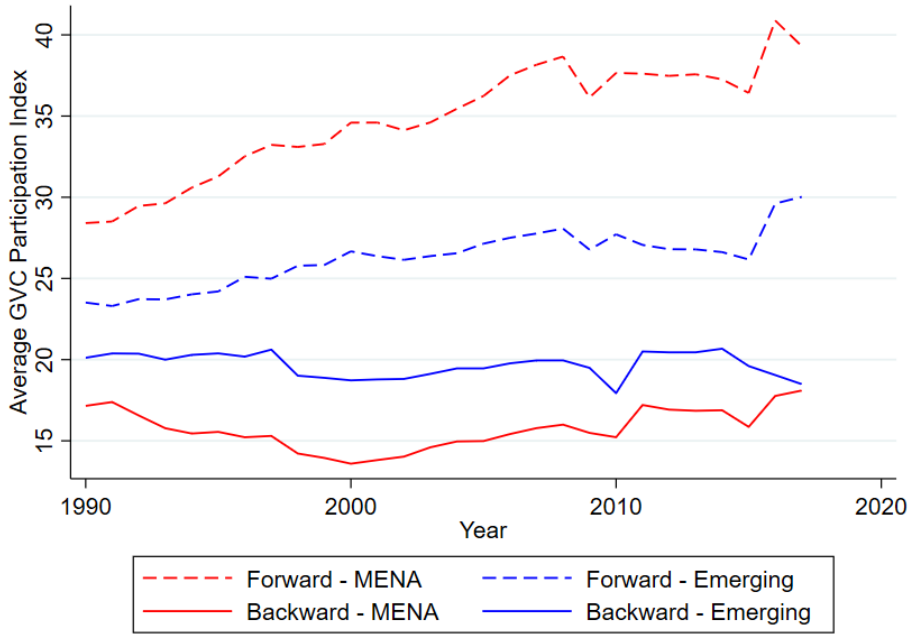
In contrast, emerging and developing economies show a more consistent trajectory of growth benefits from both forward and backward GVC participation, particularly in capital-intensive and export-oriented sectors such as agriculture, electrical and machinery, and transport. These economies sustain growth through higher productivity and domestic value addition. Though, over-participation in GVCs in resource-dependent sectors poses risks of diminishing returns.

The paper is structured as follows: first, we present the introduction, followed by an overview of the stylized facts. Next, we detail the methodology, discuss the results, conduct robustness checks, and conclude with key findings.

2. Stylized Facts on GVC Participation and Economic Growth

Forward and backward participation in Global Value Chains (GVCs) reflect different roles countries play in global production networks. Forward participation measures a country's contribution to GVCs by supplying intermediate goods or raw materials that are incorporated into other countries' exports, showcasing its role as an upstream provider in the supply chain. In contrast, backward participation captures a country's reliance on imported intermediate goods or services used in the production of its own exports, indicating its integration as a downstream consumer of foreign inputs. Together, these metrics highlight the extent and nature of a country's engagement in GVCs (Capello et al., 2020; Ignatenko et al., 2019; World Development Report, 2020).

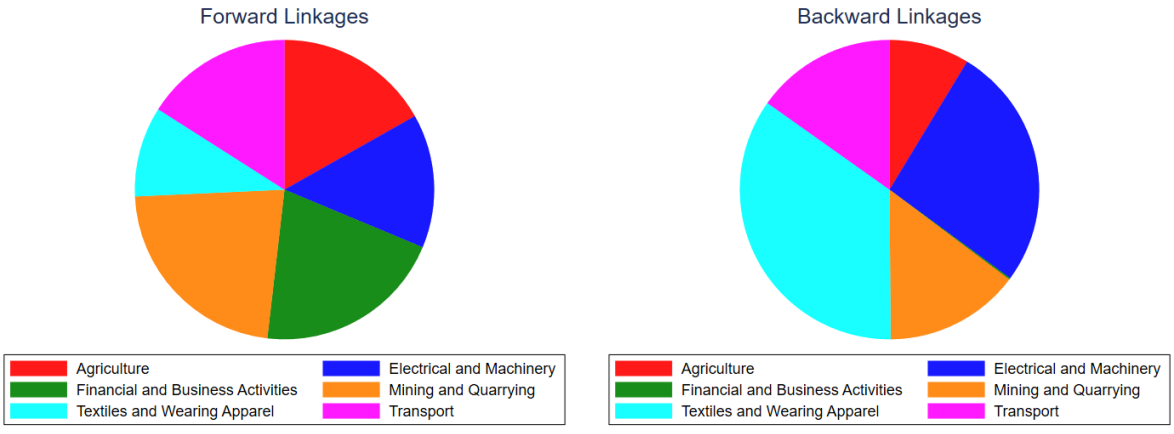
Figure 1 illustrates trends in forward and backward Global Value Chain (GVC) participation for MENA and emerging and developing economies from 1990 to 2017. Forward participation (dashed lines) shows a steady increase for both regions, with emerging economies lagging behind MENA, which display sharper growth. Backward participation (solid lines) also rises over time, but MENA shows slower progress and stagnation in the 2000s, remaining consistently below emerging economies. This suggests that while MENA is increasingly contributing intermediate goods for export (forward participation), its integration as an importer of intermediate goods (backward participation) is limited compared to other emerging regions.



Source: Authors' elaboration, adapted from UNCTAD-Eora GVC Database.
Note: The country classification is based on the IMF framework in 2012, with North African countries excluded from the list of emerging and developing economies.

Figure 1: Forward and backward GVC participation in MENA and emerging and developing economies from 1990 to 2017, in %.

Figure 2 highlights the sectoral composition of GVC participation in MENA countries from 2013 to 2017, distinguishing between forward and backward linkages. Forward linkages are more diversified. They are dominated by Mining and Quarrying, reflecting the region's dependence on resource-based exports. In addition, they are dominated by Financial and Business Activities, followed by notable contributions from Agriculture, Transport, and smaller shares from Textiles, and Electrical and Machinery. As for backward linkages, Textiles and Wearing Apparel sector plays a dominant role, alongside significant contributions from Electrical and Machinery, Mining and Quarrying and, Transport, while Agriculture remains minor. Backward participation in Financial and Business Activities is limited. This distribution underscores the region's reliance on resource exports and Financial and Business Activities for forward participation and on textiles for integration in global value chains for imported intermediate goods.



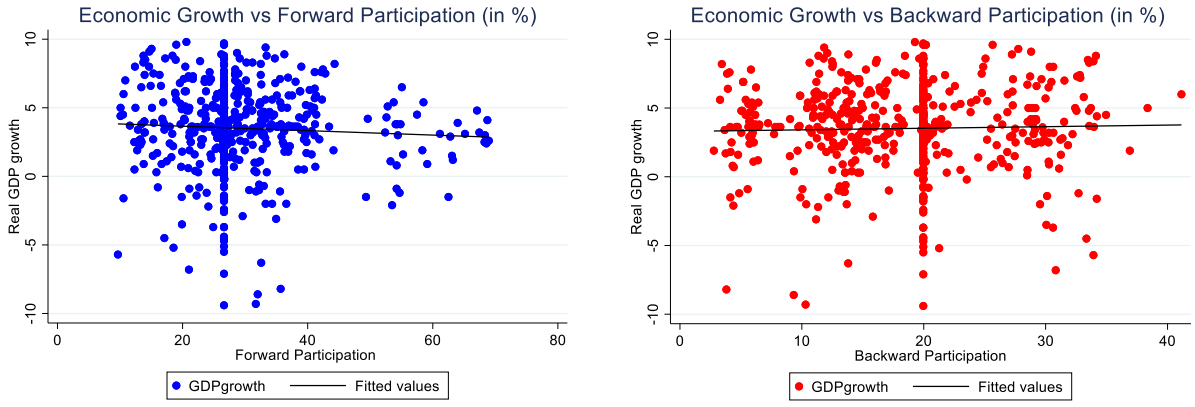
Source: Authors' elaboration, adapted from UNCTAD-Eora GVC Database.

Figure 2: Sectoral GVC participation for MENA countries, averaged over five years from 2013 to 2017.

Figure 3 examines the relationship between economic growth (real GDP growth) and GVC participation (forward and backward linkages) in MENA countries from 1990 to 2017. The left scatter plot shows the relationship between economic growth and forward participation, with data points (blue) indicating a weak and slightly negative association, as fitted values suggest minimal impact of higher forward participation on GDP growth. The right scatter plot illustrates the relationship between economic growth and backward participation, with data points (red) showing a weak positive association, as the fitted line suggests a modest positive impact of increased backward participation on economic growth. Overall, backward linkages appearing slightly more beneficial for growth.

Figure 3 do not indicate a strong linear correlation between economic growth and forward or backward GVC participation. Changes in GVC participation have minimal explanatory power for GDP growth in a simple linear model. The weak negative association suggests that increasing forward GVC participation (exporting raw or intermediate goods) may not directly translate into GDP growth for MENA countries. This could reflect low value-added exports, or over-reliance on commodities. The slightly positive association suggests that higher backward participation (using imported inputs in exports) may have a small but positive impact on GDP growth. This could indicate benefits from integrating foreign inputs into production processes.

The lack of a strong linear correlation means the relationship is likely complex and non-linear. In this study, we implement threshold effects and sectoral GVC participation breakdowns to uncover potential meaningful patterns.



Source: Authors' elaboration, adapted from UNCTAD-Eora GVC Database and IMF.

Figure 3: Economic growth in relation to GVC participation in MENA countries from 1990 to 2017.

3. Methodology

We use data on Real GDP Growth (annual percent change) and Inflation Rate (average consumer prices, annual percent change) obtained from the IMF. Data on Trade Openness (trade as a percentage of GDP) is sourced from the World Development Indicators. Additionally, we include data on Total Factor Productivity (TFP), measured in log differences (percent), sourced from the World Bank. Inflation rate, trade openness, and TFP serve as control variables. Moderate inflation can stimulate economic activity by encouraging spending and investment. Good trade openness level allows countries to access larger markets, attract foreign investments, and improve resource allocation. It also facilitates the transfer of technology and innovation. TFP measures how efficiently inputs (labor and capital) are used in production, reflecting technological progress, innovation, and efficiency improvements. It is a key driver of long-term GDP growth as it reflects improvements in productivity and competitiveness. Thus, low and stable inflation, increased trade openness, and high TFP growth generally contribute positively to economic growth by ensuring stability, efficiency, and technological advancement (Banday & Aneja, 2024; Barro, 1996; Basu & Fernald, 2002; Ndoricimpa, 2017; Saleem et al., 2019).

Information on GVC Participation is calculated using data from the UNCTAD-Eora GVC database, with values expressed in the current year thousand US dollars ('000 USD). To calculate Forward and Backward GVC Participation, we use input-output tables. Forward GVC participation refers to the value of domestic inputs embodied in foreign exports, which can be calculated as:

$$Forward\ GVC\ Participation\ =\ \frac{Value\ of\ Domestic\ Inputs\ in\ Foreign\ Exports}{Total\ Exports} \times 100 \qquad (1)$$

Backward GVC participation, on the other hand, measures the value of foreign inputs used in domestic production for exports, and is calculated as:

$$Backward\ GVC\ Participation\ =\ \frac{Value\ of\ Foreign\ Inputs\ in\ Domestic\ Exports}{Total\ Exports} \times 100 \qquad (2)$$

Both indicators highlight the degree of integration of a country or sector in global production networks, with forward participation emphasizing supply to other countries and backward participation emphasizing dependency on foreign inputs. This study will use a panel dataset over the period 1990 to 2017.

To assess the relationship between economic growth and GVC participation in MENA region, we implement a Dynamic Panel Threshold Model (DPTM). The threshold model does allow for a nonlinear relationship between GVC participation and economic growth. The rationale for implementing this model stems from the observations in Figure 3, which reveal the absence of a linear correlation between economic growth and GVC participation variables in MENA.

For a DPTM, we build upon the standard Panel Threshold Model by including a lagged dependent variable to capture persistence in growth and account for dynamic effects. This approach allows us to see if past growth influences current GVC participation thresholds and thus economic growth, providing a richer understanding of the dynamic relationships

The model can be specified as follows:

$$Growth_{it} = \alpha_i + \vartheta\, Growth_{it-1} + \beta_1 X_{it} \times I\,(GVC_{it}^{k} \leq \gamma) + \beta_2 X_{it} \times I\,(GVC_{it}^{k} > \gamma) + \varepsilon_{it} \quad (3)$$

$$, 1 \leq i \leq N$$

Where i=1,2 …N; t=1.2…T are the country and year, respectively. $Growth_{it}$ is the economic growth rate for country i at year t, with $Growth_{it-1}$ representing the lagged growth rate to account for persistence and dynamic effects in growth. X_{it} denotes a vector of control variables, such as inflation, trade openness, Total Factor Productivity (TFP) and GVC participation, while GVC_{it}^{k} serves as the threshold variable of GVC participation and denotes forward and backward GVC participation by sectors/industry. The estimated threshold value level, γ, identifies the point at which the relationship between GVC participation and economic growth changes. I() is the indicator function that takes 0 or 1 values. Finally, α_i captures country-specific fixed effects to control for unobserved heterogeneity across countries, ε_{it} is the error term.

This model divides the data into two regimes based on whether the GVC participation indicator GVC_{it}^{k} is above or below the threshold γ. Different coefficients (β_1 and β_2) are estimated for each regime. Additionally, observing changes in β_1 and β_2 provides insights into the dynamic effects across regimes, highlighting how countries benefit from GVC integration either immediately or with a delay, depending on their level of integration.

The estimation approach consists of two key methods following Seo and Shin (2016) and Seo et al., (2019). First, Threshold Estimation follows Hansen's (1999) methodology to identify the threshold level of the GVC participation variable where the relationship between GVC participation and economic growth changes. Second, System Generalized Method of Moments (GMM) is employed to address the endogeneity issue arising from the inclusion of the lagged

dependent variable ($Growth_{it-1}$) and the error term (ε_{it}). System GMM is particularly advantageous as it controls for unobserved heterogeneity and ensures consistent estimates by using instruments derived from lagged values of the variables.

4. Results and Discussion

Table 1 illustrates the nuanced impact of forward GVC participation on GDP growth in MENA and emerging and developing economies[1], differentiated by sectors and threshold levels of GVC participation. The findings reveal that the impact of GVC participation on GDP growth varies significantly across regions and sectors, with critical thresholds influencing the extent of benefits.

For MENA countries, below-threshold GVC participation has a limited or negative impact on growth, particularly in sectors such as agriculture, electrical and machinery, textiles and wearing apparel and transport, reflecting structural inefficiencies. However, once these thresholds are surpassed, the positive effects of GVC integration become evident. For example, forward GVC participation in agriculture shows a dramatic shift, highlighting the transformative potential of deeper GVC integration in Agri-sectors. Moreover, surpassing the threshold in forward GVC participation for textiles, wearing apparel, and transport has a positive impact on economic growth. These sectors benefit from exporting higher-value inputs or services, leveraging improved productivity and infrastructure. GVC participation in Financial Intermediation and Mining and Quarrying exhibit positive impacts on GDP growth below the threshold but negative impacts above it. Above the threshold, inefficiencies in these sectors—such as weak institutions in finance or exposure to commodity price volatility in mining—may limit their ability to sustain growth. Similarly, total factor productivity (TFP) plays a vital role in unlocking growth, with high participation rate in forward linkages in sectors like mining and Financial Intermediation and Business Activities.

In emerging and developing countries, the results underscore the importance of surpassing sector-specific thresholds to harness the benefits of forward participation in GVCs. Lagged GDP growth exhibits strong positive effects above the threshold in sectors like transport, Agriculture, Electrical and Machinery and financial intermediation. This suggests that past

[1] The threshold model results for forward participation in GVCs for all countries are presented in Table A.1.

economic momentum is better sustained in economies with higher forward GVC integration. Inflation, often a deterrent to growth, also exhibits threshold-dependent behavior. Inflation negatively impacts growth below the threshold, but this relationship reverses above it. This indicates improved macroeconomic stability in economies more deeply embedded in GVCs. Trade openness displays a positive impact below the threshold and negative impact above the threshold. We explain this by the fact that trade openness facilitates access to international markets, technologies, and inputs, fostering initial growth in less integrated economies. However, above the threshold, excessive trade openness without sufficient domestic value addition or competitive capabilities may expose economies to import dependency and external shocks, leading to diminishing returns and a negative impact on growth.

Forward GVC participation is a critical driver of value-added exports in emerging and developing countries. Economic growth benefits more when forward GVC participation in Agriculture, Electrical, and Machinery is high. These sectors benefit specifically because they are capital-intensive and export-oriented. High domestic value-added embedded in the exports of others in agriculture enables access to advanced farming techniques, global supply chains, and economic gains. It enhances value addition and growth through food processing and exports. Montalbano and Nenci (2020) emphasize that participation in GVCs significantly enhances economic growth in the agricultural and food sectors by improving productivity, increasing export value, attracting investment, and fostering innovation. Electrical and Machinery sector relies on innovation, technology and specialized components and benefits from economies of scale. High forward GVC participation in those sectors increases economic growth and facilitates productivity. This suggests these sectors drive growth through local value addition. It shows that excessive GVC integration boosts their impact on growth.

However, forward participation in GVCs in financial and business services, mining, textiles, and transport drives economic growth when GVC participation remains below the forward GVC participation threshold. These sectors drive growth below the GVC participation threshold because they benefit more from local linkages and domestic value chains. Excessive GVC integration may dilute these benefits by shifting value creation abroad. The strong positive impact of forward GVC participation across multiple sectors emphasizes the need for value addition in exports.

Most of our results reveal consistent trends regarding the positive impact of forward sectoral GVC participation on growth across various thresholds. Specifically, in the long run, the

initially positive effects tend to diminish or reverse. Similar findings have been reported by (Yanikkaya & Altun, 2020). They examine the effects of forward and backward participation in GVCs on sectoral value-added and total factor productivity (TFP) growth. Their study finds that sectors with higher GVC participation experience significantly higher output and TFP growth. This positive relationship is observed for forward participation. However, the study also notes that the gains from GVC participation have decreased in the later period. The diminishing returns in more recent years suggest that participating in GVCs may not be sufficient for sustained growth.

Overall, the analysis confirms that forward GVC participation is a critical driver of economic growth but requires surpassing specific thresholds to realize its full potential. These findings echo those of Koopman et al. (2014) and Taglioni and Winkler (2016), who stress the importance of domestic value addition, institutional quality, and policy coherence in maximizing GVC benefits.

Table 1: Threshold Model Results for Forward Participation in GVCs – MENA and Emerging and Developing Economies

Dep var: GDP growth	MENA countries											
	Agriculture		Electrical and Machinery		Financial Intermediation and Business Activities		Mining and Quarrying		Textiles and Wearing Apparel		Transport	
Ind variables:	Below	Above	Below	Above	Below	Above	Below	Above	Below	Above	Below	Above
Lagged GDP Growth	0.6130	-0.9207	-0.1692	-0.1457	-0.4903***	-0.3230	-0.3168	-0.8542	-0.3030	0.2872	0.1529	-0.1787
	(3.5310)	(3.7998)	(0.4901)	(1.0491)	(0.1405)	(0.4836)	(0.9881)	(0.5350)	(0.3682)	(0.3264)	(3.3563)	(3.5080)
inflation	1.9910	-2.2482	-0.3543	1.3999*	0.4761*	-0.5210	-0.0869	0.3823	-0.2053	0.6506	-1.5805	1.9760
	(2.5195)	(2.8423)	(0.4474)	(0.7489)	(0.2806)	(0.4762)	(0.4114)	(0.4788)	(0.3003)	(0.9671)	(1.2811)	(1.3171)
Total Factor Productivity	-0.8256	1.5487	0.2173	0.9966	0.5237***	0.1958	0.5479***	0.0957	1.0372	-0.7728	-1.1025	2.0033**
	(3.2597)	(3.5708)	(0.3709)	(0.8025)	(0.1774)	(0.4290)	(0.1880)	(0.2865)	(0.6384)	(1.0961)	(1.3498)	(0.7790)
Trade Openness	1.1191	-1.1588	-0.0119	-0.1084	-0.0071	0.2982	-0.0307	0.2976	-0.0220	0.1369	-0.0150	0.0030
	(0.8314)	(0.7756)	(0.0189)	(0.1985)	(0.2375)	(0.3297)	(0.2750)	(0.2286)	(0.0443)	(0.1508)	(0.4129)	(0.2055)
Forward GVC participation	-14.5197*	14.7995*	-0.0325	-1.1052	2.5062	-3.5370	1.1011	-1.6161	-1.8982	1831724	-3.0096	3.2687
	(7.5772)	(8.1400)	(2.5835)	(2.2630)	(2.2005)	(2.2235)	(2.0339)	(2.5091)	(2.6436)	(2.8824)	(3.6250)	(4.5536)
constant		-76.8362		49.4301		112.1523		21.4890		-32.51125		-49.0591
		(98.3005)		(49.2473)		(76.9404)		(112.5158)		(51.9839)		(130.3808)
Threshold Value (r)	19.4374***		29.1313*		33.4012***		36.0787		15.4836		26.3419**	

(5.8890)	(15.4553)	(8.9883)	(33.7489)	(15.2037)	(13.0776)	

Dep var: GDP growth	Emerging and developing countries											
	Agriculture		Electrical and Machinery		Financial Intermediation and Business Activities		Mining and Quarrying		Textiles and Wearing Apparel		Transport	
Ind variables:	Below	Above	Below	Above	Below	Above	Below	Above	Below	Above	Below	Above
Lagged GDP Growth	0.2382***	0.0372	0.0404**	0.1592***	-0.1414***	0.4556***	0.2148***	0.4968***	0.3901***	-0.1907***	-0.0718***	0.3871***
	(0.0258)	(0.0272)	(0.0171)	(0.0201)	(0.0259)	(0.0303)	(0.0046)	(0.0138)	(0.0126)	(0.0154)	(0.0237)	(0.0249)
inflation	-0.0096***	0.0102***	-0.0140***	0.0145***	-0.0055***	0.0054***	-0.0003***	-0.0063***	-0.0066***	0.0066***	-0.0085***	0.0088***
	(0.0002)	(0.0001)	(0.0003)	(0.0002)	(0.0002)	(0.0002)	(0.0001)	(0.0006)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Total Factor Productivity	0.4356***	0.3457***	1.0319***	-0.3527***	0.3500***	0.3779***	0.8021***	-0.4077***	0.5129***	0.2494***	0.9476***	-0.2018***
	(0.0145)	(0.0155)	(0.0259)	(0.0283)	(0.0164)	(0.0180)	(0.0040)	(0.0217)	(0.0128)	(0.0132)	(0.0194)	(0.0208)
Trade Openness	0.0550***	-0.0385***	0.0161***	-0.0085	0.0236***	-0.0214***	0.0011	0.0620***	-0.0034***	0.0378***	0.0369***	-0.0266***
	(0.0062)	(0.0071)	(0.0056)	(0.0064)	(0.0038)	(0.0050)	(0.0009)	(0.0053)	(0.0008)	(0.0028)	(0.0053)	(0.0056)
Forward GVC participation	-0.3360***	0.2913**	-0.9117***	0.9185***	0.9768***	-0.8300***	0.2780***	-0.3091***	1.7790***	-1.5849***	0.2660***	-0.4930***
	(0.1125)	(0.1159)	(0.1250)	(0.1352)	(0.0739)	(0.0856)	(0.0303)	(0.0378)	(0.1135)	(0.1199)	(0.0751)	(0.0834)
constant		5.7811***		-9.0183***		20.9480***		2.9696**		5.1143***		17.2467***
		(2.0945)		(2.5537)		(2.9397)		(1.3393)		(1.0654)		(2.1096)
Threshold Value (r)	22.7469***		20.7698***		32.5760***		34.9506***		13.6075***		24.7704***	
	(0.1882)		(0.0279)		(0.3829)		(0.1888)		(0.0820)		(0.1236)	

Source: Authors' elaboration.

Notes: Robust standard errors are shown in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The sectors presented reflect changes in GVC participation, measured using indices. The other control variables, such as inflation, trade openness, and total factor productivity, do not vary across sectors. 'Below' refers to coefficients when they are

below the threshold value, while 'Above' refers to coefficients when they exceed the threshold.

Table 2 represents the threshold model results for backward participation in GVCs. It reveals significant insights into how varying levels of sectoral GVC integration influence GDP growth in MENA countries and emerging and developing economies[2].

These findings highlight nonlinear relationships, with differing effects depending on whether GVC participation in a sector is below or above the threshold. For MENA countries, the results demonstrate mixed effects of backward GVC participation across sectors. Backward GVC participation in Agriculture, Electrical and Machinery, mining and transport below the threshold exhibits a positive effect, albeit statistically insignificant for some coefficients. While above the threshold, the effect becomes negative. This shift may indicate diminishing returns or structural inefficiencies as GVC participation deepens. GDP growth does not improve with backward GVC participation in the textiles and wearing apparel sector. This pattern aligns with studies emphasizing the limited contribution of backward GVC participation to economic growth. Since backward participation primarily involves importing value-added inputs created in other countries, it does not significantly leverage domestically produced value-added, which is a key driver of growth. For instance, Yanikkaya and Altun (2020) suggest that although higher backward GVC participation correlates with increased output and productivity growth across sectors, the benefits have diminished over time. Moreover, a study by López-Villavicencio et al., 2021) found that while backward GVC participation can boost exports, the associated rise in imports of intermediates may offset these gains, potentially deteriorating the trade balance. These results suggest that MENA economies face structural constraints and sector-specific challenges that limit their ability to sustain growth as backward GVC participation increases.

In contrast, the results for emerging and developing economies demonstrate more consistent benefits from backward GVC participation. Economic growth exhibits a positive impact when backward GVC participation in Electrical and Machinery, financial and business activities, textile and transport is below the threshold level, while growth remains positive when backward GVC participation in Electrical and Machinery, Agriculture and mining exceeds the threshold level. Comparing the two regions reveals that nonlinear threshold effects are observed in both

[2] The threshold model results for backward participation in GVCs for all countries are presented in Table A.2.

MENA and emerging economies, but the latter demonstrates a clearer trajectory of sustained benefits.

In conclusion, the findings suggest that policymakers in MENA economies must address structural bottlenecks to enhance GVC-related gains. Meanwhile, emerging economies should focus on sustaining their competitive advantages and mitigating the risks of over-integration in resource-dependent sectors. Our findings are strongly supported by existing literature on how economic growth is influenced by trade dynamics and economic integration (Ferraz et al., 2015; Foster, 2006; Jangam & Rath, 2021; Praveen Jangam et al., 2024; Yanikkaya & Altun, 2020; Zahonogo, 2017). For instance, Ferraz et al., (2015) explore the relationship between regional economic integration and growth in the COMESA, EAC, and SADC trade blocs. They demonstrate a positive and significant impact of economic integration and trade on economic growth. Praveen Jangam et al. (2024) explore the role of GVC trade in economic growth, particularly during the COVID-19 pandemic. Their study highlights that GVC trade consistently supports economic growth, even amidst the pandemic. The positive impact is robust across GVC components, sectors, and country groups.

Table 2: Threshold Model Results for Backward Participation in GVCs – MENA and Emerging and Developing Economies

Dep var: GDP growth	MENA countries											
	Agriculture		Electrical and Machinery		Financial Intermediation and Business Activities		Mining and Quarrying		Textiles and Wearing Apparel		Transport	
Ind variables:	Below	Above	Below	Above	Below	Above	Below	Above	Below	Above	Below	Above
Lagged GDP Growth	-0.2010	0.1582	-1.4832**	0.7325	0.2969	0.0316	0.3541	-0.2283	-0.2969	0.2919	-3.7065	3.6480
	(0.2980)	(2.3094)	(0.7225)	(0.7658)	(1.7436)	(2.0564)	(0.6538)	(0.6125)	(0.6799)	(0.6354)	(6.5502)	(6.5313)
inflation	0.6502*	-0.6173	-2.3254**	2.2750***	0.0939	-0.7914	0.3790	-0.3800	1.4017**	-1.2783*	-7.2324	7.2357
	(0.3628)	(1.6124)	(0.9718)	(0.8264)	(2.9279)	(3.2013)	(0.7456)	(0.7479)	(0.6678)	(0.7259)	(4.8066)	(5.2525)
Total Factor Productivity	0.6179*	0.1385	1.0273	-0.5487	0.6820	-0.4147	0.6200	0.5476	0.2133	0.4901	0.2134	1.1671
	(0.3643)	(4.6653)	(0.6334)	(0.6413)	(0.6224)	(1.1378)	(0.4228)	(0.4480)	(0.4609)	(0.9118)	(2.1626)	(3.8052)
Trade Openness	0.0008	-0.0206	0.0630	-0.0682	-0.1757	0.1523	-0.0110	0.0705	0.9508*	-0.9791*	-2.2164**	2.2136**
	(0.1483)	(0.1486)	(0.6172)	(0.6275)	(0.7302)	(0.4628)	(0.0403)	(0.1084)	(0.5391)	(0.5713)	(0.9164)	(1.0125)
Backward GVC participation	14.7725	-19.0455**	4.2758	-3.8239	-370.9160	449.2893	0.4135	-0.8366	-0.1239	-0.1712	41.7215*	-43.0731*
	(9.6146)	(9.3585)	(3.9510)	(4.4714)	(333.5253)	(402.3762)	(0.8010)	(0.7052)	(1.3417)	(1.3583)	(21.6955)	(22.4213)
constant		222.0738**		11.9126		-43.5484		10.8180		91.7948		198.8080
		(101.2410)		(122.1377)		(117.6547)		(17.0964)		(58.0837)		(131.3604)
Threshold Value (r)	10.6455*		21.4436**		0.2424		19.0291		31.3135***		8.1500**	
	(5.8639)		(8.6482)		(0.4455)		(13.4041)		(8.5582)		(3.3492)	

Dep var:	Emerging and developing countries

GDP growth												
	Agriculture		Electrical and Machinery		Financial Intermediation and Business Activities		Mining and Quarrying		Textiles and Wearing Apparel		Transport	
Ind variables:	Below	Above	Below	Above	Below	Above	Below	Above	Below	Above	Below	Above
Lagged GDP Growth	0.2127***	0.3700***	0.1993***	0.1161***	0.7147***	-0.4931***	0.1726***	0.0588***	0.2171***	0.0812***	0.5648***	-0.3806***
	(0.0018)	(0.0215)	(0.0033)	(0.0190)	(0.0189)	(0.0173)	(0.0164)	(0.0174)	(0.0022)	(0.0147)	(0.0182)	(0.0207)
inflation	-0.0003***	-0.0199***	-0.0001	-0.0163***	-0.0074***	0.0072***	-0.0024*	0.0021	0.0004***	-0.0116***	-0.0307***	0.0302***
	(0.0001)	(0.0007)	(0.0001)	(0.0005)	(0.0005)	(0.0005)	(0.0014)	(0.0014)	(0.0001)	(0.0003)	(0.0011)	(0.0009)
Total Factor Productivity	0.6893***	-0.2609***	0.7873***	-0.3513***	0.6635***	0.0735***	0.9254***	-0.2425***	0.7359***	-0.2334***	0.7820***	-0.0586***
	(0.0031)	(0.0282)	(0.0043)	(0.0245)	(0.0113)	(0.0116)	(0.0273)	(0.0298)	(0.0088)	(0.0192)	(0.0158)	(0.0176)
Trade Openness	0.0084***	0.0247***	0.0115***	0.0069***	0.0285***	-0.0167***	0.0448***	-0.0312***	0.0431***	-0.0420***	0.0177***	-0.0435***
	(0.0015)	(0.0056)	(0.0011)	(0.0026)	(0.0042)	(0.0050)	(0.0037)	(0.0030)	(0.0016)	(0.0020)	(0.0031)	(0.0038)
Backward GVC participation	-0.6377***	0.7124***	0.1490***	0.0828**	75.3118***	-74.9259***	-0.4229***	0.3858***	0.1966***	-0.2394***	0.2223***	-0.0368
	(0.0428)	(0.0518)	(0.0284)	(0.0406)	(2.8586)	(2.8126)	(0.0301)	(0.0324)	(0.0196)	(0.0185)	(0.0309)	(0.0333)
constant		-9.2717***		-8.7657***		4.6095***		-1.0254**		11.0403***		1.1378
		(0.6356)		(1.4030)		(0.5008)		(0.5009)		(0.6777)		(0.6960)
Threshold Value (r)	10.0309***		31.0247***		0.1287***		16.9096***		46.3095***		19.0131***	
	(0.0377)		(0.0935)		(0.0291)		(0.4892)		(0.1202)		(0.1383)	

Source: Authors' elaboration.

Notes: Robust standard errors are shown in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The sectors presented reflect changes in GVC participation, measured using indices. The other control variables, such as inflation, trade openness, and total factor productivity, do not vary across sectors. 'Below' refers to coefficients when they are below the threshold value, while 'Above' refers to coefficients when they exceed the threshold.

5. Robustness Check

To do a robustness check, we employ a fixed-effects model to examine the impact of GVC participation, Total Factor Productivity (TFP), inflation, and trade openness on economic growth. This approach accounts for unobserved heterogeneity across countries by controlling for time-invariant factors specific to each entity. The model specification is as follows:

$$Growth_{it} = \alpha + \beta_1 GVC_{it}^{k} + \beta_2 TFP_{it} + \beta_3 Inflation_{it} + \beta_4 Trade\ Openness_{it} + \mu_i + \vartheta_t + \epsilon_{it} \quad (4)$$

where $Growth_{it}$ is the GDP growth and represents the economic growth of country i at year t; GVC_{it}^{k} denote forward or backward GVC participation; TFP_{it} , $Inflation_{it}$ and $Trade\ Openness_{it}$ are the independent variables of interest; μ_i and ϑ_t capture the fixed effects; and ϵ_{it} is the error term.

The fixed-effects model results presented in Table 3 highlight the relationship between forward participation in GVCs across sectors and GDP growth in MENA countries and emerging and developing countries. In MENA countries, forward GVC participation shows limited significant impact. Conversely, in emerging and developing countries, forward GVC participation across sectors exhibits more consistent and statistically significant positive impacts on GDP growth. This suggests that emerging and developing countries may derive greater growth benefits from forward GVC integration, especially in higher value-added sectors. However, for MENA countries, the positive impact of forward GVC participation is notably absent. This could be attributed to the nonlinear relationship between forward GVC participation and economic growth.

Control variables provide additional insights. Total factor productivity shows a strong and highly significant positive association with GDP growth in both regions, emphasizing its critical role in driving economic performance. Inflation negatively influences GDP growth consistently, though its magnitude is small, particularly in emerging and developing countries. Trade openness has a positive but statistically insignificant relationship with GDP growth. These findings underline the varying effects of forward GVC participation across regions and sectors, with emerging and developing countries benefiting more significantly.

Table 3: Fixed Effects Model Results for Forward Participation in GVCs

Dep var: GDP growth	MENA countries						Emerging and developing countries					
	Agriculture	Electrical and Machinery	Financial Intermediation and Business Activities	Mining and Quarrying	Textiles and Wearing Apparel	Transport	Agriculture	Electrical and Machinery	Financial Intermediation and Business Activities	Mining and Quarrying	Textiles and Wearing Apparel	Transport
Ind variables:												
Forward GVC participation	-0.0346	0.0074	0.0514	0.0199	0.0077	0.1550	0.0218	0.0434**	0.0619***	0.0219*	0.0011	0.0549***
	(0.0442)	(0.0590)	(0.0610)	(0.0429)	(0.0716)	(0.0998)	(0.0154)	(0.0197)	(0.0179)	(0.0127)	(0.0278)	(0.0208)
inflation	-0.0036	-0.0002	0.0042	0.0014	-0.0001	0.0118	-0.0010***	-0.0010***	-0.0010***	-0.0010***	-0.0010***	-0.0010***
	(0.0328)	(0.0327)	(0.0330)	(0.0328)	(0.0330)	(0.0335)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Total Factor Productivity	0.5073***	0.5066***	0.5075***	0.5070***	0.5065***	0.5089***	0.6525***	0.6517***	0.6491***	0.6507***	0.6524***	0.6478***
	(0.0407)	(0.0407)	(0.0407)	(0.0407)	(0.0407)	(0.0406)	(0.0175)	(0.0175)	(0.0175)	(0.0175)	(0.0175)	(0.0176)
Trade Openness	0.0186	0.0183	0.0180	0.0180	0.0182	0.0194	0.0042	0.0045	0.0038	0.0039	0.0043	0.0044
	(0.0127)	(0.0127)	(0.0127)	(0.0127)	(0.0127)	(0.0127)	(0.0043)	(0.0043)	(0.0043)	(0.0043)	(0.0043)	(0.0043)
Constant	3.8212**	2.6757	0.9980	2.1373	2.7506*	-2.0240	2.9931***	2.5460***	1.6088**	2.8430***	3.5593***	2.1247***
	(1.6583)	(1.9397)	(2.4956)	(1.9478)	(1.6073)	(3.3498)	(0.5432)	(0.5868)	(0.6707)	(0.5526)	(0.5252)	(0.6544)
Observations	560	560	560	560	560	560	3,976	3,976	3,976	3,976	3,976	3,976
R-squared	0.226	0.225	0.226	0.225	0.225	0.229	0.274	0.275	0.276	0.275	0.274	0.275
Number of countries	20	20	20	20	20	20	142	142	142	142	142	142

Source: Authors' elaboration.

Notes: Robust standard errors are shown in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The sectors presented reflect changes in GVC participation, measured using indices. The other control variables, such as inflation, trade openness, and total factor productivity, do not vary across sectors. Country and year fixed effects are incorporated

into the model.

In Table 4, we evaluate the impact of backward participation in GVCs on GDP growth. In general, backward GVC participation in most sectors does not display statistically significant impacts on GDP growth. This lack of significance indicates that backward GVC integration has not substantially contributed to economic growth in emerging and developing countries including MENA, potentially reflecting limited linkages between domestic production and global supply chains in backward sectors.

Across both groups of countries, total factor productivity consistently demonstrates a strong and highly significant positive relationship with GDP growth, underscoring its role as a key growth driver. Inflation remains a significant negative determinant of GDP growth in emerging and developing countries. Trade openness shows a positive but statistically insignificant relationship in all cases. These findings suggest that while backward GVC participation offers limited benefits for GDP growth in both regions, emerging and developing countries might derive some gains in specific sectors like agriculture, depending on their integration into global supply chains.

Table 4: Fixed Effects Model Results for Backward Participation in GVCs

Dep var: GDP growth	MENA countries						Emerging and developing countries					
	Agriculture	Electrical and Machinery	Financial Intermediation and Business Activities	Mining and Quarrying	Textiles and Wearing Apparel	Transport	Agriculture	Electrical and Machinery	Financial Intermediation and Business Activities	Mining and Quarrying	Textiles and Wearing Apparel	Transport
Ind variables:												
Backward GVC participation	0.0379	-0.0185	-3.5001	0.0008	-0.0413	-0.1117	0.0531*	0.0219	-0.1083	0.0024	0.0026	0.0127
	(0.1106)	(0.0663)	(3.4538)	(0.0526)	(0.0581)	(0.0861)	(0.0299)	(0.0172)	(0.1567)	(0.0134)	(0.0151)	(0.0184)
inflation	-0.0019	0.0013	0.0079	-0.0007	0.0037	0.0133	-0.0010***	-0.0010***	-0.0010***	-0.0010***	-0.0010***	-0.0010***
	(0.0328)	(0.0333)	(0.0336)	(0.0326)	(0.0331)	(0.0342)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Total Factor Productivity	0.5061***	0.5068***	0.5071***	0.5065***	0.5071***	0.5104***	0.6507***	0.6521***	0.6517***	0.6523***	0.6524***	0.6539***
	(0.0407)	(0.0407)	(0.0407)	(0.0407)	(0.0407)	(0.0408)	(0.0175)	(0.0175)	(0.0175)	(0.0175)	(0.0175)	(0.0177)
Trade Openness	0.0183	0.0187	0.0166	0.0184	0.0184	0.0204	0.0038	0.0036	0.0042	0.0043	0.0042	0.0040
	(0.0127)	(0.0127)	(0.0128)	(0.0127)	(0.0127)	(0.0127)	(0.0043)	(0.0043)	(0.0043)	(0.0043)	(0.0043)	(0.0043)
Constant	2.5211*	3.3327*	3.7066***	2.8588*	4.3421*	4.3660***	3.1266***	3.0116***	3.6335***	3.5269***	3.4733***	3.3536***
	(1.5287)	(1.9980)	(1.3985)	(1.4681)	(2.3572)	(1.6132)	(0.4357)	(0.5671)	(0.3650)	(0.4461)	(0.6886)	(0.4784)
Observations	560	560	560	560	560	560	3,976	3,976	3,976	3,976	3,976	3,976
R-squared	0.225	0.225	0.227	0.225	0.226	0.228	0.275	0.274	0.274	0.274	0.274	0.274
Number of countries	20	20	20	20	20	20	142	142	142	142	142	142

Source: Authors' elaboration.

Notes: Robust standard errors are shown in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The sectors presented reflect changes in GVC participation, measured using indices. The other control variables, such as inflation, trade openness, and total factor productivity, do not vary across sectors. Country and year fixed effects are incorporated

into the model.

6. Conclusion

The relationship between sectoral GVC participation, threshold levels, and economic growth is inherently complex. This study provides evidence to support this claim. The results underscore that the impact of forward GVC participation on GDP growth is highly sector- and threshold-dependent. In MENA countries, below-threshold GVC participation often yields limited or negative effects, particularly in agriculture, textiles, transport, and machinery sectors. However, surpassing these thresholds unleashes significant growth potential, emphasizing the transformative power of deeper GVC integration, especially in agriculture and high-value sectors. Emerging and developing countries benefit more consistently from forward GVC participation in sectors like agriculture, electrical and machinery, and transport. However, diminishing returns are evident when GVC integration becomes excessive, particularly in finance, mining, and textiles, highlighting the risks of inefficiencies in the long run.

The findings also reveal the critical role of macroeconomic factors such as inflation, trade openness, and past economic momentum, which interact with GVC participation to shape growth outcomes. While inflation and trade openness exhibit threshold-dependent impacts, economies with higher forward GVC integration demonstrate greater stability and resilience. Forward GVC participation drives growth but requires surpassing sector-specific GVC thresholds to maximize benefits.

The analysis of backward GVC participation reveals nonlinear effects on GDP growth, varying across regions and sectors. In MENA countries, below-threshold backward GVC participation in sectors like agriculture, mining, and transport demonstrates limited positive impacts, while above-threshold participation often leads to diminishing returns or negative effects. This pattern highlights the limited contribution of backward participation, which relies heavily on imported value-added rather than leveraging domestic production capabilities. Sectors like textiles and wearing apparel exhibit minimal growth benefits. Emerging and developing economies show more consistent benefits from backward GVC participation, with positive impacts below thresholds in sectors such as electrical and machinery, transport, and textiles. Above-threshold benefits are sustained in key sectors like agriculture, electrical and machinery, and mining, demonstrating these economies' greater capacity to capitalize on backward GVC integration.

However, excessive reliance on backward linkages in resource-dependent sectors could still pose risks of diminishing returns.

To conclude, policies promoting domestic value addition is crucial to sustaining the long-term advantages of GVC participation. The findings underscore the need for MENA policymakers to address domestic value creation to maximize the benefits of backward GVC participation. These insights align with existing literature, reinforcing the importance of balanced trade dynamics and targeted sectoral strategies to sustain growth through GVC integration.

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Appendix

Table A.1: Threshold Model Results for Forward Participation in GVCs – All countries

Dep var: GDP growth	All countries											
	Agriculture		Electrical and Machinery		Financial Intermediation and Business Activities		Mining and Quarrying		Textiles and Wearing Apparel		Transport	
Ind variables:	Below	Above	Below	Above	Below	Above	Below	Above	Below	Above	Below	Above
Lagged GDP Growth	0.4070***	-0.2760***	0.4400***	-0.3415***	0.4273***	-0.2910***	0.4075***	-0.2764***	0.5707***	-0.4705***	0.3460***	-0.2343***
	(0.0117)	(0.0140)	(0.0050)	(0.0057)	(0.0046)	(0.0053)	(0.0076)	(0.0080)	(0.0056)	(0.0057)	(0.0066)	(0.0071)
inflation	-0.0079***	0.0077***	-0.0074***	0.0073***	-0.0084***	0.0082***	-0.0099***	0.0097***	-0.0078***	0.0077***	-0.0056***	0.0053***
	(0.0001)	(0.0001)	(0.0001)	(0.0002)	(0.0002)	(0.0001)	(0.0003)	(0.0003)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Total Factor Productivity	0.4657***	0.2041***	0.3242***	0.4244***	0.2459***	0.5296***	0.4710***	0.2545***	0.2881***	0.4074***	0.0454***	0.7672***
	(0.0072)	(0.0071)	(0.0053)	(0.0080)	(0.0039)	(0.0043)	(0.0023)	(0.0040)	(0.0106)	(0.0111)	(0.0062)	(0.0054)
Trade Openness	-0.0193***	0.0631***	0.0230***	-0.0010	0.0087***	0.0165***	0.0021***	0.0357***	0.0222***	-0.0200***	-0.0031***	0.0245***
	(0.0013)	(0.0013)	(0.0014)	(0.0016)	(0.0008)	(0.0014)	(0.0006)	(0.0010)	(0.0006)	(0.0012)	(0.0010)	(0.0017)
Forward GVC participation	1.6743***	-1.6851***	-1.0611***	1.1861***	0.6168***	-0.7263***	-0.1006***	0.0760***	0.1355***	0.0866**	0.8416***	-0.6008***
	(0.0318)	(0.0341)	(0.0414)	(0.0420)	(0.0236)	(0.0224)	(0.0104)	(0.0117)	(0.0347)	(0.0366)	(0.0224)	(0.0278)
constant		29.6266***		-10.1317***		27.9850***		-3.8332***		-2.6186***		8.3488***
		(0.6729)		(0.5773)		(0.6460)		(0.3728)		(0.5147)		(0.6198)
Threshold Value (r)	24.8775***		20.2830***		31.1878***		31.8602***		13.4966***		26.3776***	
	(0.1471)		(0.0629)		(0.1183)		(0.2098)		(0.0316)		(0.0854)	

Table A.2: Threshold Model Results for Backward Participation in GVCs – All countries

Dep var: GDP growth	All countries											
	Agriculture		Electrical and Machinery		Financial Intermediation and Business Activities		Mining and Quarrying		Textiles and Wearing Apparel		Transport	
Ind variables:	Below	Above	Below	Above	Below	Above	Below	Above	Below	Above	Below	Above
Lagged GDP Growth	0.1842***	-0.0328***	0.0969***	0.6728***	0.2974***	-0.1758***	-0.0204***	0.1888***	0.0710***	0.5062***	0.3135***	-0.1784***
	(0.0029)	(0.0031)	(0.0027)	(0.0048)	(0.0031)	(0.0026)	(0.0043)	(0.0047)	(0.0045)	(0.0049)	(0.0044)	(0.0049)
inflation	-0.0017***	0.0013***	-0.0001***	-0.0081***	-0.0011***	0.0006***	0.0216***	-0.0227***	-0.0002***	-0.0035***	-0.0304***	0.0297***
	(0.0001)	(0.0001)	(0.0000)	(0.0001)	(0.0001)	(0.0001)	(0.0005)	(0.0005)	(0.0000)	(0.0001)	(0.0003)	(0.0003)
Total Factor Productivity	0.4418***	0.4464***	0.7410***	-0.6499***	0.4876***	0.2695***	0.5166***	0.2643***	0.6698***	-0.0781***	0.5557***	0.1711***
	(0.0085)	(0.0072)	(0.0020)	(0.0038)	(0.0045)	(0.0034)	(0.0022)	(0.0036)	(0.0013)	(0.0062)	(0.0017)	(0.0026)
Trade Openness	-0.0389***	0.0522***	0.0142***	-0.0346***	0.0145***	-0.0081***	-0.0730***	0.0869***	0.0042***	-0.0125***	0.0206***	-0.0190***
	(0.0027)	(0.0031)	(0.0008)	(0.0016)	(0.0017)	(0.0018)	(0.0015)	(0.0017)	(0.0008)	(0.0014)	(0.0014)	(0.0016)
Backward GVC participation	0.8598***	-0.8533***	-0.1947***	0.3080***	24.7081***	-24.7786***	0.2445***	-0.2183***	-0.2738***	0.2295***	0.5090***	-0.5378***
	(0.0479)	(0.0495)	(0.0120)	(0.0135)	(1.1123)	(1.1263)	(0.0134)	(0.0143)	(0.0102)	(0.0112)	(0.0140)	(0.0167)
constant		-0.6306**		-8.6118***		-0.6963***		-5.9979***		-7.4373***		6.6572***
		(0.2852)		(0.3173)		(0.1944)		(0.2543)		(0.4041)		(0.2957)
Threshold Value (r)	6.0771***		29.0943***		0.1827***		18.9741***		43.9816***		19.1584***	
	(0.2903)		(0.0528)		(0.0162)		(0.0385)		(0.1978)		(0.0399)	