

MOROCCO'S ECONOMIC PROSPECTS: A DYNAMIC ARDL SIMULATION ON GLOBAL VALUE CHAIN INTEGRATION

Charaf-Eddine Moussir¹

Received 02.10.2024. | Sent to review 16.10.2024. | Accepted 29.12.2024.

Original article



¹ Mohammed V University, Faculty of Law, Economics, and Social Sciences (FSJES-Souissi), Morocco

Corresponding Author:
Charaf-Eddine Moussir

Email: c.moussir@um5r.ac.ma

JEL Classification: C32, F14, F15, F23, O55

Doi: 10.2478/eoik-2025-0009

UDK: 339.976(4-672EU):330.322

ABSTRACT

This paper examines how Morocco's integration into global value chains (GVCs) impacts its economic development, addressing a critical gap in the literature on developing economies. While GVCs have transformed international trade over the past two decades and created new industrialisation opportunities, their developmental impact varies significantly across countries. Building on previous research, our study fills a significant gap by conducting a comprehensive analysis of Morocco's GVC participation using a dynamic autoregressive distributed lag (ARDL) simulation methodology from 1990 to 2018, examining the relationship between various GVC integration measures and GDP per capita. The empirical analysis reveals three key findings : backward linkages through foreign value added in exports drive long-term economic development ; domestic value added in exports generates significant positive long-run growth effects ; and forward linkages through indirect value added in exports produce both short-run and long-run economic benefits. These results demonstrate that Morocco's strategic GVC integration has been fundamental to its economic development. In light of these findings, policy implications are drawn to enhance Morocco's global competitiveness and optimize development benefits through targeted GVC participation strategies. The research emphasizes how balanced integration across different value chain linkages promotes sustainable economic growth in developing countries.

Keywords: *Global value chains, economic development, dynamic ARDL simulation, International trade, Morocco*

1. INTRODUCTION

Global production and international fragmentation of production have experienced significant transformations in recent decades, driven by two interrelated factors (Timmer et al. 2014; Gereffi & Fernandez-Stark, 2016; Mao, 2022). The first is the increasing integration of world markets, largely through trade liberalization, regional integration agreements and reductions in transport costs. Furthermore, improvements in information and communication technologies have been crucial in enhancing global integration (Gereffi & Sturgeon, 2013).

The second is the rise of international fragmentation of production, which is characterised by an increase in the share of intermediate goods in world trade (Stolzenburg et al. 2019). This shift

from the traditional production model allows for the strategic dispersion of value-added activities across global production networks (Antràs, 2020). The rapid expansion of global value chains (GVCs) raises critical questions about their implications for countries at different stages of economic development (Hernández et al. 2014; Jones et al. 2019).

GVCs, which are characterised by the international division of labour and the movement of goods and services across borders have become a fundamental aspect of modern economic globalization. These chains allow countries to specialize in specific stages of production, which can increase efficiency through specialization and economies of scale (Amador and Cabral, 2014; Johnson, 2018). By participating in GVCs, countries can also benefit from technology transfer, as firms often choose to locate production in areas with strong technological infrastructure. This can enhance domestic innovation and help sustain long-term economic growth (Mensah and Fofana, 2018; Hollweg, 2020).

However, the relationship between GVC participation and long-term economic growth is complex. While GVCs can offer significant benefits, they also raise potential challenges. For example, countries that heavily depend on GVCs may be vulnerable to global economic shocks, such as trade conflicts or supply chain disruptions (Mattoo et al. 2013). At the same time, the benefits of GVC participation may be unequally distributed, with some countries capturing a larger share of value-added than others. This can amplify existing economic inequalities and reduce inclusive growth (Baldwin, 2012; Rodrik, 2018).

For Morocco, an African country, participation in GVCs has become a crucial strategy for economic growth (Mouanda-Mouanda, 2019; Ajide, 2023). The country's strategic location, competitive labour costs, and proximity to European markets have made it an attractive destination to foreign investors (Jaidi and Msadfa, 2017; Lotfi and Lotfi, 2021). The automotive industry has seen significant growth due to major global car manufacturers setting up assembly plants (Amachraa & Quelin, 2022). However, Morocco's export performance could be further improved. A key challenge is the country's limited capacity to capture a larger share of value added within GVCs (Amachraa, 2023). According to the OECD (2024) data, 27.5% of Morocco's value added is generated for foreign final demand, indicating a concentration in low value-added activities such as assembly and final assembly. This is illustrated by sectors such as automobiles and textiles, which export more than 80% of their value added.

Between 1990 and 2018, important trade reforms, including agreements with the EU and the US, transformed Morocco's economic structure and changed its GVC participation in the automotive and aerospace sectors. Key indicators show significant growth: GDP per capita doubled to \$3,296, foreign value-added in exports increased by 10 times, and domestic value-added expanded significantly. Urbanisation has also increased from 48% to 62%.

Despite the 2008 financial crisis and post-2011 regional instability, Morocco has maintained its growth path. However, challenges remain in moving up the value chain, with high-tech exports accounting for only 3.4% of manufactured exports. This combination of sustained reforms and strategic location makes Morocco an interesting case for analyzing the relationship between GVCs and development.

The significance of this study lies in its potential to provide valuable insights into Morocco's deeper integration into global value chains (GVCs). By empirically examining the impact of Morocco's GVC participation—through backward and forward linkages—on economic growth, This paper contributes to the ongoing debate on the attractiveness and benefits of developing countries' participation in GVCs as a means of promoting industrialisation and enhancing economic resilience.

This paper contributes to the existing trade literature both theoretically and empirically. While

several studies have examined the impact of global value chains (GVCs) on developing countries, empirical investigations specifically focusing on Morocco's GVC participation are relatively limited. This gap in the literature serves as the theoretical motivation for this study. The specific objectives of this research are as follows : First, it determines the short-run and long-run effects of GVC participation on Morocco's economic development. Second, it identifies the type of GVC participation (forward or backward integration) that is most relevant for economic development in Morocco. Moreover, to our knowledge, this is the first study that attempts to assess the impact of forward and backward integration within GVCs on Morocco's economic development using the novel dynamic ARDL simulations developed by [Jordan and Philips \(2018\)](#).

While extensive research has examined the impact of GVCs on developed economies, significant gaps remain in understanding how African economies can optimize their participation. In particular, the existing literature lacks robust empirical analysis of Morocco's unique position within GVCs, especially regarding the relative importance of forward versus backward linkages for economic growth. This study addresses these gaps by employing innovative dynamic ARDL simulations—a methodological approach not previously applied to Morocco's GVC integration. The paper is organized as follows : Section 2 reviews the literature on the impact of GVC participation on economic growth ; Section 3 presents the empirical research methods and data used in the study ; Section 4 discusses the empirical results ; and Section 5 concludes.

2. LITERATURE REVIEW

The rise of global value chains (GVCs) has radically transformed the international organization of goods and services production. This has had profound implications for international trade and investment patterns ([Gereffi & Lee, 2012](#); [Casella et al. 2019](#)). The analysis of international trade is now firmly rooted in the context of GVCs, which includes all production activities from product design to distribution ([World Bank, 2020](#)).

The concept of global value chains (GVCs) has emerged as a powerful tool for analyzing the linkages between economic activities across national borders. GVCs represent the sequence of value-adding activities involved in the production of goods and services, from raw materials to final consumption ([World Bank, 2020](#)). This concept, which is based on the earlier notion of commodity chains, has evolved to capture a broader range of activities, including research and development, production, distribution, marketing, and after-sales services ([Hopkins & Wallerstein, 1977](#); [McWilliam et al. 2020](#)).

While GVCs can offer significant opportunities for development and industrialization, the benefits of GVC participation are not uniform across countries, and country-specific characteristics play a crucial role in determining economic upgrading outcomes. The term “global value chain” is in many ways similar to the term “commodity chain” ([De Backer and Miroudot, 2013](#)). Both terms describe the flow of goods and services through different stages of production and distribution. However, global value chains go deeper in understanding the factors that influence global industries, such as governance structures, industrial organization, and knowledge flows ([Baldwin & Freeman, 2022](#)).

Global value chains (GVCs) have intensified the “fragmentation” of production across international networks, moving away from the traditional model where production was concentrated within a single country or firm ([Del Prete et al., 2017](#)). According to [Baldwin \(2006\)](#), the development of international trade can be divided into two main phases. In the first phase, which lasted until the late 19th century, production was largely concentrated in individual firms. Parts and components were produced sequentially or in nearby units, minimizing the need for exten-

sive transportation. The second phase, characterized by a decline in transportation costs, enabled the spatial separation of production and consumption. This led to a more dispersed global production network with increasing trade in final products, but production activities remained relatively localized to reduce coordination costs (Martínez-Galán & Fontoura, 2019).

While GVCs offer several potential benefits, they also present significant challenges. On the positive side, GVC-led growth strategies can provide countries with increased opportunities for specialization, better access to technology and enhanced learning through repeated interactions with global partners (Kummritz et al. 2017; Antràs, 2020). However, they also come with challenges like potential income inequality and vulnerability to external shocks. Other concerns include dependencies on foreign partners, sourcing difficulties, and risks related to intellectual property and technology (Meng et al. 2013; World Bank, 2017).

The traditional measures of international trade don't accurately capture a country's participation in global value chains (GVCs). They do not capture the extent to which imported inputs are used in a country's exports relative to domestic production (Los et al. 2016). Koopman et al. (2014) suggest to decompose gross exports into four elements : (i) domestic value added sent to the importing economy, (ii) domestic value added sent to third economies, which corresponds to "forward GVC participation," (iii) reimported domestic value-added, and (iv) foreign value-added content of national exports, also known as "backward GVC participation." In other words, forward linkages refer to a situation where a country supplies its own products or services to another country for export or final use, while backward linkages refer to the extent to which a local economy imports foreign products or services for its own use or export.

On the empirical front, the studies on the impact of global value chains integration on economic performance are still limited, especially for developing countries. Kummritz (2015) conducted an early empirical study that used cross-country IO tables and found a positive correlation between GVC integration and economic growth in middle- and high-income countries. Subsequent studies have reinforced this finding, demonstrating that GVC participation can significantly boost output growth, per capita GDP, and environmentally sustainable development in various economies.

In the same way, Timmer et al. (2014) examine the impact of global value chains (GVCs) on the distribution of income between capital and labour, as well as between other categories of labour. They used the World Input-Output Database (WIOD) to analyze 40 countries and 35 industries from 1995 to 2008. The study found that advanced economies are shifting toward more high-skilled activities within GVCs. There has been a shift in the location of GVC activities, with emerging economies increasing their share of global manufacturing production. The study also finds that the share of income devoted to capital has increased in most countries, while the share of labour has decreased. Moreover, high-skilled workers have generally benefited more than low-skilled workers from participation in GVCs.

While most studies have focused on developed and emerging economies due to limited data in developing countries, some studies have shown that participation in global value chains (GVCs) can have positive effects on developing countries (Mao, 2022). Ajide (2023) found a strong relationship between GVC participation and overall productivity in African economies. Piermartini and Rubínová (2019) found that GVC-related trade can better promote knowledge sharing and economic growth compared to traditional trade. Boffa et al. (2016) found a positive relationship between GVC participation and GDP per capita, particularly in low-income countries.

Participation in global value chains (GVCs) offers great opportunities but also implies risks, especially for developing countries. Some studies suggest that participation in GVCs may

hinder the adoption of new technologies that are skilled labour-intensive, keeping developing countries stuck in low-value activities. Baldwin (2018) argues that while GVCs may initially increase productivity and employment in developing countries, their long-term effects may not be as significant. According to Rodrik (2011), GVCs often require high technical precision and quality standards, which can reduce the advantage of low-cost labour in developing countries and shift production to advanced economies.

The ability of developing countries to move up the value chain may also be constrained by the governance structure of GVCs, which is characterized by asymmetric power relations between leading firms in developed countries and suppliers in developing countries. Humphrey & Schmitz (2002) and Barrientos et al. (2012) highlight this issue, noting that suppliers in developing countries are often trapped in low-value activities. Raei et al. (2019) found that the positive effects of GVC participation are mainly concentrated in middle- and high-income countries with a high degree of GVC involvement, while latecomer countries may experience negative or insignificant effects.

Until now, there have been very limited empirical studies of GVC participation in economic development in Morocco. Lotfi and Lotfi (2021) address this gap by examining Morocco's integration into GVCs and its subsequent impact on the country's economic development. Using the Vector Error Correction Model (VECM) on the World Input-Output Database (WIOD), the study finds that GVC participation has a significant impact on Morocco's economic growth, employment, and industrial development. In addition, the study evaluates the changes in the structure of Moroccan exports and domestic value added. This study contributes to the understanding of the impact of GVC participation on the Moroccan economy and sheds light on the dynamics of economic development in the context of global value chains.

While Lotfi and Lotfi (2021) examined GVC integration effects using VECM, existing research lacks dynamic analysis of different GVC participation types in Morocco. Previous studies haven't distinguished between the short and long-run effects of forward versus backward linkages. Additionally, no studies have employed dynamic ARDL simulations to analyze Morocco's GVC participation. Specifically, the research gap is threefold: (i) No empirical distinction between forward/backward linkage impacts on Morocco's growth ; (ii) Absence of short vs. long-run effects analysis in Morocco's GVC participation ; (iii) Lack of methodologically robust studies using advanced econometric techniques. This study addresses these gaps through dynamic ARDL analysis of different GVC participation effects on Morocco's economic development.

3. MODEL, DATA AND ESTIMATION TECHNIQUE

3.1. MODEL SPECIFICATION

To empirically evaluate the impact of global value chains participation on GDP per capita in Morocco, the following econometric models are specified:

$$LGDPPC_t = \beta_0 + \beta_1 LFVA_t + \beta_2 LFDI_t + \beta_3 LINVST_t + \beta_4 LURB_t + \beta_5 RENT_t + e_t \quad (1)$$

$$LGDPPC_t = \alpha_0 + \beta_1 LDVA_t + \alpha_2 LFDI_t + \alpha_3 LINVST_t + \alpha_4 LURB_t + \alpha_5 RENT_t + e_t \quad (2)$$

$$LGDPPC_t = \gamma_0 + \beta_1 LDVX_t + \gamma_2 LFDI_t + \gamma_3 LINVST_t + \gamma_4 LURB_t + \gamma_5 RENT_t + e_t \quad (3)$$

Where $t=1, \dots, T$. LGDPPC is the log of GDP per capita. LFVA is the log of foreign value-added in exports. LDVA is the log of domestic value-added in exports. LDVX is the log of the indirect value-added. LFDI is the log of foreign direct investment, net inflows (% GDP). LINVST is the log of gross fixed capital formation (% GDP). LURB is the log urban population (% of the total population). LRENT is the log of total natural resources rents (% of GDP).

We propose several hypotheses about Morocco's GVC participation and its economic outcomes,

based on the recent literature on global value chains and economic development.

H1 : Higher levels of backward linkages (foreign value added in exports) positively impact Morocco's GDP per capita in both the short and long run.

H2 : Forward linkages (indirect value-added exports) have a stronger positive effect on Morocco's GDP per capita than backward linkages.

H3 : Domestic value added in exports has a significant positive impact on Morocco's GDP per capita only in the long run.

H4 : The interaction between GVC participation and domestic factors (urbanization, investment) amplifies the positive effects on economic growth.

In our empirical analysis, we examine the relationship between participation in global value chains (GVCs) and Morocco's economic performance. We use GDP per capita as the dependent variable and explore three different measures of GVC integration: backward linkages (foreign value added in exports) (equation 1), forward linkages (indirect value added) (equation 2), and domestic value added in exports (equation 3). By examining these variables, we aim to understand how different aspects of GVC participation impact Morocco's economic performance.

In addition to the three different measures of global value chains participation - following economic theory and empirical evidence - our analysis includes control variables such as foreign direct investment, gross fixed capital formation, urbanisation and natural resource rents. These variables help to isolate the specific effects of GVCs and ensure a more reliable understanding of their contribution to GDP per capita.

3. 2. DATA DESCRIPTION

The dataset includes time series data from 1990 to 2018, the longest available for Morocco, covering all the variables in Equations. (1-3). We focus primarily on three key measures of GVC participation: foreign value-added (FVA), domestic value-added (DVA) and indirect value-added exported (DVX). These key indicators are conveniently available in US dollars through the UNCTAD-Eora Global Value Chain Database, a publicly accessible resource (<https://worldmrio.com/unctadgvc/>). A comprehensive explanation of the methodology used to construct these GVC indicators can be found in the study by Casella et al. (2019). The control variables are obtained from the World Development Indicators (WDI). By using this robust dataset, we aim to provide a clear picture of the economic externalities associated with Morocco's GVC integration.

Table 1 presents the summary statistics for the variables included in Equations (1–3). The dependent variable - GDP per capita - ranges between 1668.375 USD and 3296.194 USD with an average value of 2367.697 USD. As for the independent variables of interest, FVA ranges between 386 million USD and 4.02 million USD with a mean value of 1.8 million USD, DVA ranges between 20.2 million USD and 2.8 million USD with an average value of 10.6 million USD, DVX ranges between 821 million USD and 8.7 million USD with a mean of 4.7 million USD.

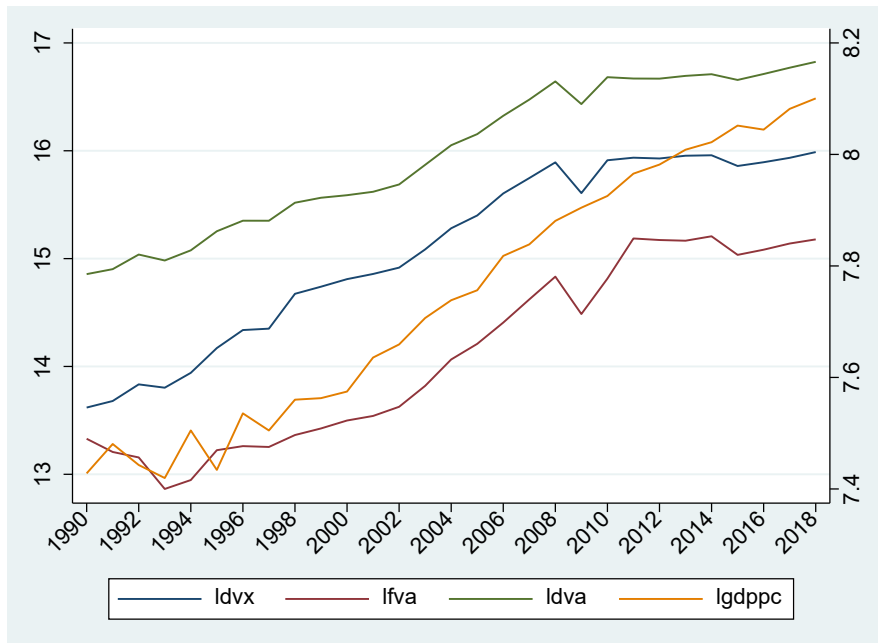
Table 1. Summary statistics

Variables	GDPPC	FVA	DVA	DVX	FDI	INVST	URB	RENT
Mean	2367.697	1840000	10600000	4730000	2.132	25.957	55.335	1.99
Median	2295.015	1283041	9354698	4331124	1.9478	25.7851	54.644	0.5702
Maximum	3296.194	4020849	20271530	8780543	6.444	31.268	62.453	7.44
Minimum	1668.375	386212	2830784	821512	0.547	21.782	48.391	0.195
Std. Dev.	548.142	1390000	6230000	3020000	1.235	2.602	4.033	2.212
Skewness	0.249	0.495	0.171	0.07	1.42	0.212	0.154	1.097
Kurtosis	1.605	1.57	1.364	1.34	6.142	1.967	1.956	2.917

Source: Author's calculation

Figure 1 provides the logarithmic transformations of the time series data for GDP per capita (GDPPC), foreign value-added (FVA), domestic value-added (DVA), and domestic value-added exports (DVX) over the study period. FVA, DVA, and DVX values are plotted on the left axis of the graph, while GDPPC is plotted on the right axis. The GDPPC plot shows a steady upward trend over time, indicating sustained economic growth in Morocco. In addition, all three variables of interest - FVA, DVA and DVX - show a continuous increase, suggesting a positive trend in GVC integration and value creation. In addition, forward linkages (DVX) have consistently exceeded backward linkages (FVA) over the study period. This suggests that Morocco's GVC participation has focused more on downstream activities, such as final assembly and exports, than on upstream activities, such as raw material production or intermediate inputs.

Figure 1. Time series plots of GDPPC, FVA, DVX and DVA



Source: Author's calculation

Table 2 presents the results of Pearson's correlation analysis, which reveals a positive correlation between all three measures of GVC integration (FVA, DVA, and DVX) and economic performance as measured by GDPPC. Moreover, the extremely high correlation coefficients among these variables highlight their strong interrelationship, suggesting that GVC integration plays a crucial role in driving economic growth in Morocco.

Table 2. Correlation matrix

Variables	GDPPC	FVA	DVA	DVX	FDI	INVST	URB	RENT
GDPPC	1.0000							
FVA	0.964*** (0.000)	1.0000						
DVA	0.983*** (0.000)	0.969*** (0.000)	1.0000					
DVX	0.973*** (0.000)	0.962*** (0.000)	0.996*** (0.000)	1.0000				
FDI	0.364* (0.052)	0.305 (0.108)	0.334* (0.077)	0.361* (0.054)	1.0000			
INVST	0.738*** (0.000)	0.791*** (0.000)	0.810*** (0.000)	0.810*** (0.000)	0.167 (0.386)	1.0000		
URB	0.983*** (0.000)	0.935*** (0.000)	0.965*** (0.000)	0.954*** (0.000)	0.380** (0.042)	0.669 (0.000)	1.0000	
RENT	0.737*** (0.000)	0.825*** (0.000)	0.806*** (0.000)	0.813*** (0.000)	0.138 (0.476)	0.836*** (0.000)	0.689*** (0.000)	1.0000

Source: Author’s calculation. *, **, ***Statistical significance at 10%, 5%, and 1%, respectively

3. 3. ESTIMATION TECHNIQUE

The Autoregressive Distributed Lag (ARDL) model, developed by Pesaran et al. (2001), has become a useful and robust tool for empirical economic research. This approach offers several advantages that make it appropriate for analyzing the relationships between economic variables. There are two main advantages of the ARDL approach. First, unlike traditional cointegration methods, the ARDL model can effectively accommodate variables that may be integrated of order I(0), I(1), or a combination of both. This flexibility is particularly valuable in empirical applications where the integration properties of variables are uncertain. Second, the ARDL approach can produce unbiased estimates even in the presence of endogeneity among the independent variables.

For these reasons, the ARDL approach is preferred for this study. However, the conventional ARDL approach has two limitations. First, when applied to small sample time series data, the ARDL model may suggest erroneously the absence of cointegration even when it exists. This limitation can be problematic in studies with limited data availability. Second, ARDL models often have complex dynamic structures, including multiple lags, contemporaneous values, first differences and lags of first differences. This complexity can make it difficult to interpret accurately the short-run and long-run effects of the regressors.

To address the challenges associated with the complex dynamic structure of ARDL models, Jordan and Philips (2018) introduced the dynamic ARDL model. This innovative approach offers a flexible framework for simulating various ARDL model specifications. Instead of relying on traditional hypothesis testing of parameter estimates, dynamic simulations evaluate the significance of results through counterfactual scenarios. The dynamic ARDL model allows researchers to estimate, simulate, and visualize the changes in the explained variable that would result from changes in an independent variable, holding all other factors constant (*ceteris paribus*). This capability provides valuable insights into the causal relationships between variables and their potential policy implications.

Given its ability to enhance the robustness and interpretability of ARDL models, the dynamic

ARDL approach is employed in this study to analyze the relationship between GVC participation and economic development. This method will enable us to assess the short-run and long-run effects of changes in independent variables on the dependent variable, providing a more comprehensive understanding of the underlying economic dynamics.

The dynamic ARDL simulations of the econometric models specified in equations (1-3) in the error correction form are derived as follows:

$$\Delta \text{LGDPPC}_t = \beta_0 + \beta_1 \text{LGDPPC}_{t-1} + \beta_2 \Delta \text{LFVA}_t + \beta_3 \text{LFVA}_{t-1} + \beta_4 \Delta \text{LFDI}_t + \beta_5 \text{LFDI}_{t-1} + \beta_6 \Delta \text{LINVST}_t + \beta_7 \text{LINVST}_{t-1} + \beta_8 \Delta \text{LURB}_t + \beta_9 \text{LURB}_{t-1} + \beta_{10} \Delta \text{RENT}_t + \beta_{11} \text{RENT}_{t-1} + e_t \quad (4)$$

$$\Delta \text{LGDPPC}_t = \alpha_0 + \beta_1 \text{LGDPPC}_{t-1} + \alpha_2 \Delta \text{LDVA}_t + \alpha_3 \text{LDVA}_{t-1} + \alpha_4 \Delta \text{LFDI}_t + \alpha_5 \text{LFDI}_{t-1} + \alpha_6 \Delta \text{LINVST}_t + \alpha_7 \text{LINVST}_{t-1} + \alpha_8 \Delta \text{LURB}_t + \alpha_9 \text{LURB}_{t-1} + \alpha_{10} \Delta \text{RENT}_t + \alpha_{11} \text{RENT}_{t-1} + e_t \quad (5)$$

$$\Delta \text{LGDPPC}_t = \gamma_0 + \gamma_1 \text{LGDPPC}_{t-1} + \gamma_2 \Delta \text{LDVX}_t + \gamma_3 \text{LDVX}_{t-1} + \gamma_4 \Delta \text{LFDI}_t + \gamma_5 \text{LFDI}_{t-1} + \gamma_6 \Delta \text{LINVST}_t + \gamma_7 \text{LINVST}_{t-1} + \gamma_8 \Delta \text{LURB}_t + \gamma_9 \text{LURB}_{t-1} + \gamma_{10} \Delta \text{RENT}_t + \gamma_{11} \text{RENT}_{t-1} + e_t \quad (6)$$

4. EMPIRICAL RESULTS

The main conclusions of the study may be presented in a short Conclusions section, which may To apply the dynamic ARDL simulation model effectively, our data must meet specific conditions. The dependent variable must be integrated at I (1), while the independent variables should be integrated at I (0), I (1) or a combination of both. To determine whether our data series meets these requirements, we applied unit root tests using the augmented **Dickey-Fuller (1979)** and **Phillips-Perron (1998)** methods. The results, as shown in Table 3, indicate that all of our data series become stationary at the first difference. This means that they are integrated at I (1), which satisfies the necessary conditions for the application of the ARDL model.

Table 3. Unit root results

Variables	ADF	Δ ADF	PP	Δ PP
GDPPC	-0.082	-10.991***	-0.082	-10.991***
FVA	-0.129	-4.793***	-2.505	-3.764***
DVA	-1.163	-6.214**	-1.224	-6.168***
DVX	-1.817	-5.964***	-1.918	-3.792**
FDI	-2.664	-13.476***	-1.623	-15.426***
INVST	-1.298	-5.634***	-1.281	-5.636***
URB	-1.159	-5.156***	-0.796	-2.367**
RENT	-1.486	-5.668***	-0.994	-4.666*

Source: Author's calculation. *, **, *** denote the rejection of the null hypothesis of nonstationarity for ADF and PP at 10%, 5% and 1% significance levels respectively

Before using the dynamic ARDL model, we need to confirm that there is a long-run relationship between the variables we're analysing. This is called cointegration. To check for cointegration, we used a modified version of the bounds test of **Pesaran et al. (2001)** with the critical values of **Kripfganz and Schneider (2020)**. These critical values are more reliable for smaller data sets like ours.

The results of this test, shown in Table 4, indicate that there is indeed a cointegration relationship between all the variables in our models. Since the F-test values for all three models exceed the upper critical value at the 1% level, the null hypothesis of no cointegration is strongly rejected. This confirms that there is a long-run stable relationship between the variables included in our analysis. Given the positive results of both the unit root and cointegration tests, we can conclude with confidence that our data are well adapted to the application of the dynamic ARDL simulation model.

Table 4. Pesaran, Shin and Smith bounds testing

Model	F-Stat	10%		5%		1%	
		I (0)	I (1)	I (0)	I (1)	I (0)	I (1)
(1) $Lgdppc = f(lfva, lfdi, linvst, lurb, lrent)$	6.65	2.58	3.86	3.13	4.61	4.54	6.37
(2) $Lgdppc = f(ldva, lfdi, linvst, lurb, lrent)$	8.78	2.58	3.86	3.13	4.61	4.54	6.37
(3) $Lgdppc = f(ldvx, lfdi, linvst, lurb, lrent)$	8.99	2.58	3.86	3.13	4.61	4.54	6.37

Source: Author's calculation

Our analysis, using the dynamic ARDL model, reveals the short- and long-run effects of Morocco's participation in global value chains (GVCs) on Morocco's GDP per capita (Table 5). While we find no direct short-term effects of domestic value added (DVA) or indirect value added exported (DVX), these factors positively influence GDP per capita in the long run. Specifically, a 1% increase in DVA or DVX leads to an increase in GDP per capita of 0.179% and 0.124% respectively.

Conversely, foreign value added (FVA) has both short and long-term effects on the Moroccan economy. A 1% increase in FVA leads to an increase in GDP per capita of 0.111% and 0.170% in the short and long run respectively. These results highlight the importance of both forward and backward linkages in GVCs for Morocco's economic growth. However, our results suggest that forward linkages, which involve exporting higher value-added goods, have a more significant impact than backward linkages, which focus on sourcing inputs locally.

These findings are consistent with theoretical expectations in the context of GVCs. Forward linkages can stimulate economic growth by increasing exports, generating employment and promoting technological progress. Backward linkages can also contribute to growth by promoting local industries and creating demand for domestic inputs. However, the impact of backward linkages may be limited if Morocco lacks the necessary capabilities or resources to contribute effectively to upstream value chain activities.

Morocco's increasing integration into GVCs, particularly in sectors such as automotive and aerospace, has positioned the country as a key player in global production networks. By focusing on developing domestic capabilities and enhancing value-added activities, Morocco can further capitalize on its GVC participation and achieve sustainable economic growth.

Our analysis also examined the impact of control variables on Morocco's GDP per capita. We find that investment (INVST) and urbanization (URB) have a positive and significant impact on economic performance in the short run. Moreover, urbanisation also has a positive effect in the long run. However, foreign direct investment (FDI) and natural resource rents (RENT) do not seem to have a significant impact on GDP per capita in either the short or long run.

This suggests that investment in physical capital, such as infrastructure and machinery, can raise productivity and stimulate economic activity. Urbanisation can also contribute to growth by fostering agglomeration economies, improving access to markets and resources and promoting innovation.

Table 5. Estimation based on dynamic ARDL simulations for Morocco

Variables	Model 1	Model 2	Model 3
LGDPCC _{t-1}	-0.917** (0.244)	-0.578** (0.221)	-0.534** (0.199)
LFVA ₋₁	0.170*** (0.045)	-	-
ΔLFVA	0.111*** (0.047)	-	-
LDVX ₋₁	-	-	0.124** (0.036)
ΔLDVX	-	-	0.054 (0.056)
LDVA ₋₁	-	0.179* (0.058)	-
ΔLDVA	-	0.094 (0.077)	-
LFDI ₋₁	0.014 (0.019)	-0.002 (0.022)	-0.017 (0.023)
ΔLFDI	0.007 (0.012)	0.001 (0.013)	-0.008 (0.014)
LINVST ₋₁	-0.001 (0.181)	-0.191 (0.215)	-0.170 (0.202)
ΔLINVST	-0.321* (0.155)	-0.486** (0.181)	-0.498** (0.173)
LURB ₋₁	1.199** (0.535)	0.603 (0.599)	0.814 (0.547)
ΔLURB	2.338 (3.410)	7.552* (4.278)	3.029** (1.429)
LRENT ₋₁	-0.010 (0.181)	-0.005 (0.006)	-0.005 (0.006)
ΔLRENT	0.001 (0.007)	0.003 (0.022)	0.004 (0.007)
_cons	-0.102	-0.222	-0.496
Adj. R ²	0.7198	0.6687	
<i>Residuals diagnostics tests</i>			
Prob > Breusch Pagan	0.843	0.183	0.556
Prob > Breusch Godfrey LM	0.150	0.844	0.153
Prob > Jarque Bera	0.456	0.393	0.610

Source: Author's calculation. *, **, *** indicate statistical significance at 10%, 5% and 1% respectively. Standard errors are given in brackets. 5000 simulations were performed

Nevertheless, the insignificant impact of FDI and natural resource rents on Morocco's GDP per capita can be attributed to several factors. While FDI can bring in capital and technology, its impact can vary depending on the sector and the quality of the investment. Natural resource rents may not be as important for Morocco's economic development as in other countries, especially if the country faces challenges in managing resource revenues or diversifying its economy.

To ensure the reliability of our dynamic ARDL model results, we performed a series of diagnostic tests. These tests checked for problems such as autocorrelation, heteroskedasticity, and non-normality issues. The results, as shown in Table 5, indicate that none of these problems are present in our models, which implies that the dynamic ARDL simulation model results are reliable.

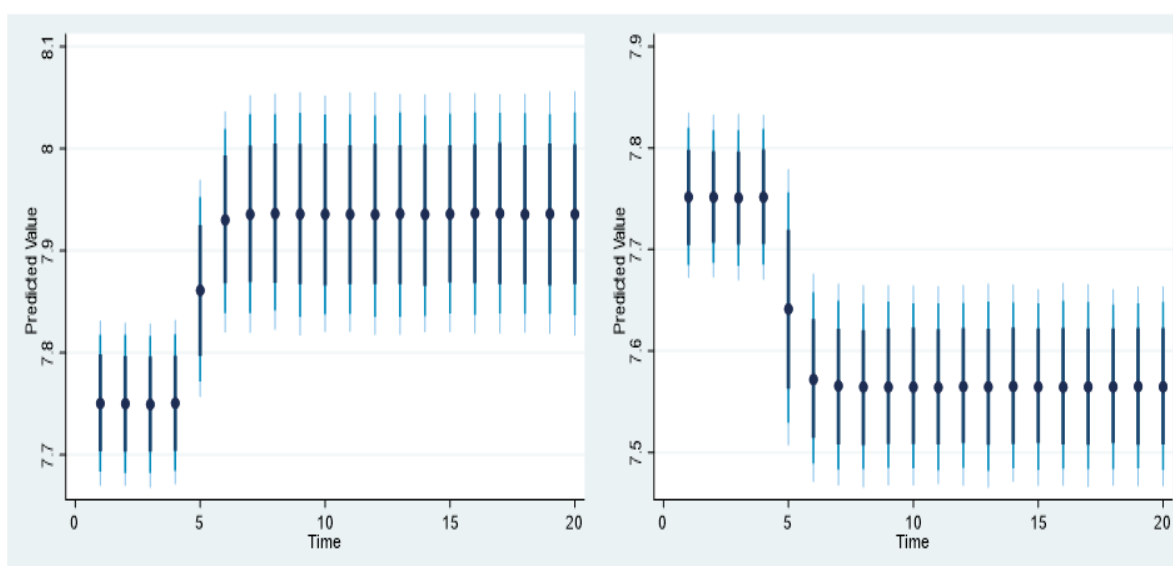
Our analysis of Morocco’s GVC participation from 1990 to 2018 provides clear validation for most of our theoretical predictions, while revealing some nuanced relationships. Our main hypothesis suggesting a significant impact of GVCs on economic development is strongly supported by the empirical results, with both forward and backward linkages showing statistical significance. The data confirms our prediction that forward linkages would have stronger effects, evidenced by a coefficient of 0.124 compared to 0.111 for backward linkages (H1). Similarly, we find support for the hypothesized timing differences between foreign and domestic value-added impacts: foreign value-added shows immediate effects (0.111 short-run coefficient) (H2), while domestic value-added benefits materialize over longer periods (0.179 long-run coefficient) (H3).

However, the impact of domestic factors on GVC participation and economic development appears more complex than initially hypothesized. While urbanization demonstrates the expected positive interaction with GVC participation, investment effects show mixed results across different specifications (H4). This suggests that domestic enabling factors may operate through more nuanced channels than initially theorized.

As a final step, the predicted effects of one standard deviation counterfactual shocks to the measures of global value chains integration (FVA, DVA and DVX) are simulated and plotted as shown in Figures 2-4. Figure 2 shows the impact of positive and negative shocks to FVA (foreign value added) on LGDPPC (long-run GDP per capita).

A positive shock significantly increases LGDPPC in the short run, leading to a sustained increase of approximately 7.94. Conversely, a negative shock leads to a significant decrease in LGDPPC, reaching a stable level between 7.5 and 7.6. These results highlight the importance of backward linkages in GVCs for Morocco’s economic growth.

Figure 2: ± 1 standard deviation change in the FVA and its effect on GDP per capita

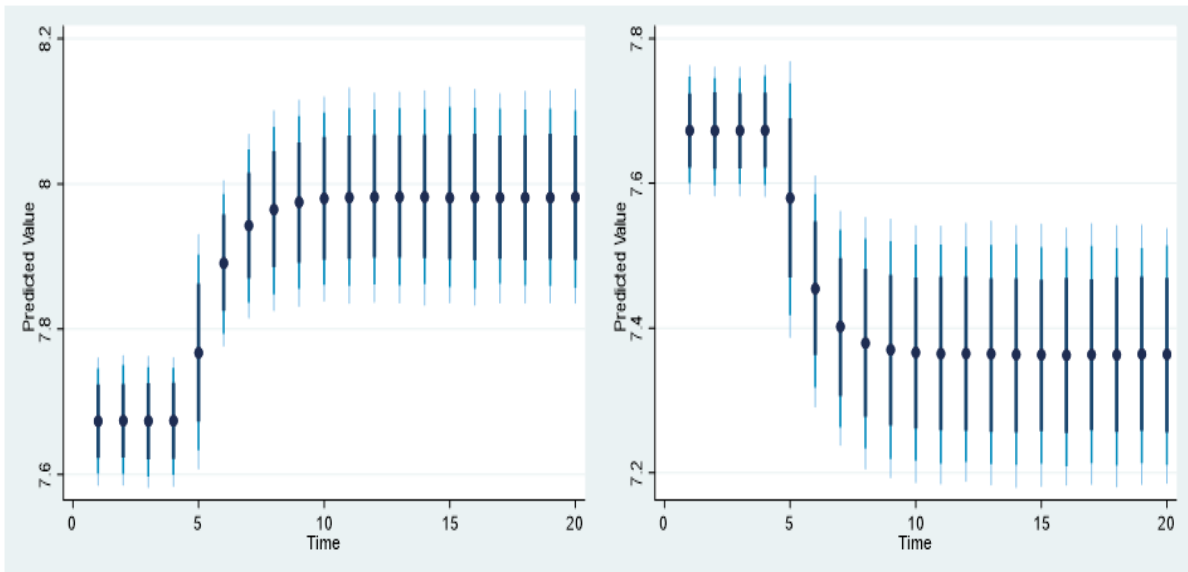


Source: Author calculation. The predicted impact of a ± 1 shock in LFVA at $t=5$. The dark spots are the predicted mean values; the blue lines, from darkest to lightest are the 75%, 90% and 95% confidence intervals, respectively

Figure 3 examines the impact of shocks to LDVA (domestic value added) on LGDPPC. A positive shock to LDVA significantly raises LGDPPC to a persistent level of around 7.89, while a negative shock lowers it to around 7.3. This confirms the crucial role of domestic value added in exports for Morocco's economic performance.

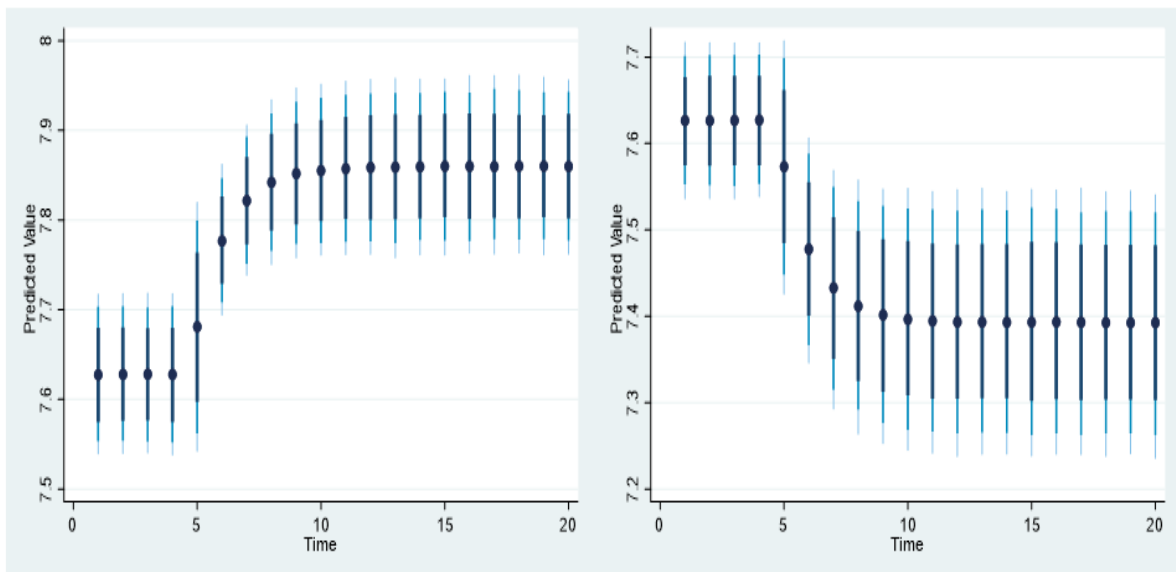
Figure 4 examines the impact of shocks to DVX (indirect value-added) on LGDPPC. Similar to LDVA, positive shocks to DVX lead to a significant increase in LGDPPC, reaching a sustainable level between 7.8 and 7.9. Negative shocks, on the other hand, cause LGDPPC to fall to around 7.4. These results confirm the importance of forward linkages in GVCs for Morocco's economic growth.

Figure 3 : ± 1 standard deviation change in the DVA and its effect on GDP per capita



Source: Author calculation. The predicted impact of a ± 1 shock in LDVA at $t=5$. The dark spots are the predicted mean values; the blue lines, from darkest to lightest are the 75%, 90% and 95% confidence intervals, respectively

Figure 4 : ± 1 standard deviation change in the DVX and its effect on GDP per capita



Source: Author calculation. The predicted impact of a ± 1 shock in LDVX at $t=5$. The dark spots are the predicted mean values; the blue lines, from darkest to lightest are the 75%, 90% and 95% confidence intervals, respectively.

Our findings confirm that Morocco's integration into global value chains (GVCs) has a positive impact on economic performance. Both forward and backward linkages play a role in boosting GDP per capita, but our results suggest that forward linkages, which involve adding value to exported goods, have a more significant impact. While domestic value added to locally produced goods is also a driver of economic growth, our results suggest that it is not as crucial as forward and backward linkages in GVCs. This is consistent with the findings of [Kowalski et al. \(2015\)](#), who find that countries often exhibit a correlation between the strength of their backward and forward linkages. In other words, countries with strong backward linkages may have weaker forward linkages, and vice versa. This suggests that a balanced approach to GVC participation is essential to maximise the benefits of integration. Morocco can further improve its economic performance by strategically developing both its backward and forward linkages within global production networks.

Our analysis of Morocco's GVC participation reveals patterns consistent with several comparative cases among developing economies. As demonstrated by [Del Prete et al. \(2017\)](#), Tunisia's experience with the automotive and aerospace sectors shows similar integration patterns, though Morocco has developed stronger backward linkages through more effective domestic supplier networks. This difference highlights Morocco's relative success in building local industrial capabilities while maintaining strong forward linkages.

Morocco's GVC integration also shares characteristics with South Africa's development trajectory, particularly in the automotive sectors, though South Africa has achieved higher domestic value addition ([Kummritz et al. 2017](#)). In contrast, Egypt demonstrates weaker GVC integration despite comparable economic structures, suggesting Morocco's policy framework has been more effective at attracting and retaining global production networks ([Dovis & Zaki, 2020](#)).

When compared to Gulf Arab states, Morocco presents an interesting contrast in GVC participation. While countries like the UAE and Saudi Arabia concentrate on energy-sector value chains, Morocco has developed a more diverse manufacturing base, though with lower value addition ([El-Said et al., 2015](#)). This diversification, as noted by [Delera et al. \(2022\)](#), provides potential for more sustainable long-term growth. However, the African Development Bank ([AfDB, 2024](#)) indicates that Morocco still lags behind Asian peers in domestic value addition, suggesting room for upgrading within global value chains.

These comparative insights demonstrate that while Morocco's GVC strategy has effectively driven economic growth, further policy interventions may be needed to enhance value capture and domestic capability development. The country's experience offers valuable lessons for other developing economies seeking to leverage GVC participation for economic development.

5. CONCLUSION

The emergence of global value chains (GVCs) has reshaped the landscape of international trade, offering both opportunities and challenges for countries at different stages of development. A fundamental question arises: Does participation in GVCs have a significant impact on economic development?

This study empirically examines the short- and long-term impact of Morocco's integration in GVCs on its GDP per capita from 1990 to 2018. Using three different measures of GVC participation - foreign value added in exports (backward linkages), domestic value added in exports and indirect value added (forward linkages) - we analyse the relative importance of these factors for economic performance.

Our results confirm a long-run relationship between global value chain participation and GDP per capita, along with the other control variables, in Morocco. Additionally, we estimated the

short-run and long-run dynamics through the use of dynamic ARDL model simulations.

Our study of Morocco's integration into global value chains (GVCs) shows that GVC participation is a key driver of economic development. Using a dynamic ARDL model, we examine the short- and long-run effects of GVCs on GDP per capita. Our results clearly show that both forward and backward linkages within GVCs stimulate Morocco's economic growth, although forward linkages, which involve adding value to exported goods, have a more significant impact.

Our study presents several limitations that shape future research perspectives. The analysis period (1990-2018) misses recent global disruptions, while multicollinearity between GVC measures limits our ability to isolate individual effects. Despite methodological controls, endogeneity concerns remain in the relationship between GVCs and growth.

Based on these limitations, future research should examine sector-specific evidence in the automotive and aerospace industries, the impact of COVID-19 on Morocco's GVC participation, and regional comparisons using a consistent methodology. The impact of Industry 4.0 and sustainability trends require investigation, as do domestic capacity development mechanisms. These orientations would strengthen our understanding of Morocco's GVC participation, while addressing current analytical limitations.

Our findings reveal significant economic implications for Morocco's GVC participation. While current integration shows positive effects on trade and GDP per capita, especially through forward linkages, a comprehensive policy framework is needed to enhance value creation.

A long-term strategy should balance Morocco's comparative advantages in less sophisticated production with the targeted development of high-value sectors. This requires strengthening domestic supplier networks and institutional frameworks, while building advanced technological capabilities.

Implementation will require coordinated action across time horizons. Medium-term measures include targeted skills training, investment incentives and quality certification programmes. Short-term priorities include support for supplier development, digital tracking systems and streamlined customs procedures. This integrated approach aims to consolidate Morocco's GVC achievements while exploiting emerging opportunities for sustainable competitive advantage.

REFERENCES

- AfDB (African Development Bank). (2024). African Economic Outlook: Driving Africa's Transformation. The Reform of the Global Financial Architecture. Abidjan: AfDB. <https://www.afdb.org/en/documents/african-economic-outlook-2024>
- Ajide, F. M. (2023). Global value chain and total factor productivity in Africa. *Organizations and Markets in Emerging Economies*, 14(1), 26-55. <https://doi.org/10.15388/omee.2023.14.81>
- Amachraa, A. (2023). Driving The Dream: Morocco's rise in the global automotive industry. *Policy Center for the New South*, Policy Paper - 09/23. <https://www.policycenter.ma/publications/driving-dream-moroccos-rise-global-automotive-industry>
- Amachraa, A., & Quelin, B. (2022). Morocco emergence in global value chains: Four exemplary industries. *Policy Center for the New South*, Policy Paper - 07/22. <https://www.policycenter.ma/publications/morocco-emergence-global-value-chains-four-exemplary-industries>
- Amador, J. L., & Cabral, S. (2014). Global value chains: A survey of drivers and measures. *Journal of Economic Surveys*, 30(2), 278-301. <https://doi.org/10.1111/joes.12097>
- Antràs, P. (2020). Conceptual aspects of global value chains. *The World Bank Economic Review*, 34(3), 551-574. <https://hdl.handle.net/10986/33228>
- Baldwin, R. (2006). Globalisation: the great unbundling (s). Economic Council of Finland, 5-47. [https://www.semanticscholar.org/paper/Globalisation%3A-the-great-unbundling\(s\)-Baldwin/ef39be7b39170b6155f9c44ee13a21a26b0d763d](https://www.semanticscholar.org/paper/Globalisation%3A-the-great-unbundling(s)-Baldwin/ef39be7b39170b6155f9c44ee13a21a26b0d763d)
- Baldwin, R. (2012). Global supply chains: why they emerged, why they matter, and where they are going", *CTEI Working Papers*, No. 2012-13, Geneva, The Graduate Institute, Centre for Trade and Economic Integration. <https://www.econbiz.de/Record/global-supply-chains-why-they-emerged-why-they-matter-and-where-they-are-going-baldwin-richard/10009786697>
- Baldwin, R. (2018). The great convergence: Information technology and the new globalization. In *The great convergence*. Harvard University Press. <https://www.hup.harvard.edu/books/9780674237841>
- Baldwin, R., & Freeman, R. (2022). Risks and global supply chains: What we know and what we need to know. *Annual Review of Economics*, 14(1), 153-180. <https://doi.org/10.1146/annurev-economics-051420-113737>
- Barrientos, S., Knorringa, P., Evers, B., Visser, M., & Opondo, M. (2016). Shifting regional dynamics of global value chains: Implications for economic and social upgrading in African horticulture. *Environment and Planning A: Economy and Space*, 48(7), 1266-1283. <https://doi.org/10.1177/0308518X15614416>
- Boffa, M.; Kumritz, V.; Santoni, G.; Taglioni, D.; Winkler, D. (2016). Overcoming the Middle-Income Trap: The Role of GVC Integration for Climbing-Up the Income Ladder. *The University of Geneva*: Geneva, Switzerland. <https://hdl.handle.net/10986/24426>
- Casella, B., Bolwijn, R., Moran, D., & Kanemoto, K. (2019). Improving the analysis of global value chains: the UNCTAD-Eora Database. *Transnational Corporations*, 26(3), 115-142. <https://doi.org/10.18356/3aad0f6a-en>
- De Backer, K. and S. Miroudot (2013). Mapping Global Value Chains. *OECD Trade Policy Papers*, No. 159. <https://doi.org/10.1787/18166873>
- Del Prete, D., Giovannetti, G., & Marvasi, E. (2017). Global value chains participation and productivity gains for North African firms. *Review of world Economics*, 153(4), 675-701. <https://doi.org/10.1007/s10290-017-0292-2>
- Delera, M., Pietrobelli, C., Calza, E., & Lavopa, A. (2022). Does value chain participation facilitate the adoption of industry 4.0 technologies in developing countries? *World Development*, 152, 105788. <https://doi.org/10.1016/j.worlddev.2021.105788>
- Dickey, D.A., & Fuller, W.A. (1979). Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American Statistical Association*, 74, 427-431. <https://doi.org/10.2307/2286348>

- Dovis, M., & Zaki, C. (2020). Global value chains and local business environments: A case study of North African countries. *Economic Research Forum Working Paper No. 1439*. <https://doi.org/10.2139/ssrn.3733242>
- El-Said, H., Al-Said, M., & Zaki, C. (2015). Trade and access to finance of SMEs: is there a nexus?. *Applied Economics*, 47(39), 4184-4199. <https://doi.org/10.1080/00036846.2015.1026583>
- Gereffi, G and Fernandez-Stark, K. (2016). *Global Value Chain Analysis: A Primer*. Second Edition. Durham, North Carolina, USA: Duke University Center on Globalization, Governance & Competitiveness (Duke CGGC). https://www.academia.edu/44307797/GLOBAL_VALUE_CHAIN_ANALYSIS_A_PRIMER
- Gereffi, G., & Lee, J. (2012). Why the world suddenly cares about global supply chains. *Journal of Supply Chain Management*, 48, 24–32. <https://doi.org/10.1111/j.1745-493X.2012.03271.x>
- Hernández, R. A., Martínez-Piva, J. M., & Mulder, N. (2014). Global value chains and world trade. Prospects and challenges for Latin America, Santiago (Chile), *United Nations Publication*. <https://www.cepal.org/en/publications/37041-global-value-chains-and-world-trade-prospects-and-challenges-latin-america>
- Hollweg, C.H. (2020). Global value chains and employment in developing economies. *World Bank Group*, 63–81. <https://www.wto-ilibrary.org/content/books/9789287049681c007>
- Hopkins, T. K., & Wallerstein, I. (1977). Patterns of development of the modern world-system. *Review (Fernand Braudel Center)*, 111-145. <https://www.jstor.org/stable/40240765>
- Humphrey, J., & Schmitz, H. (2002). How does insertion in global value chains affect upgrading in industrial clusters? *Regional studies*, 36(9), 1017-1027. <https://doi.org/10.1080/003434002200022198>
- Jaadi, L., & Msadfa, Y. (2017). The complexity of the rise of Global Value Chains: The case of the automotive and aeronautics industries in Morocco and Tunisia. *Policy Center for the New South*, Policy Brief PP-08/17. <https://www.policycenter.ma/publications/la-complexit%C3%A9-de-la-remont%C3%A9-des-cha%C3%A9nes-de-valeur-mondiales-cas-des-industries?page=1>
- Johnson, R. C. (2018). Measuring global value chains. *Annual Review of Economics*, 10(1), 207-236. <https://doi.org/10.1146/annurev-economics-080217-053600>
- Jones, L., Demirkaya, M., & Bethmann, E. (2019). Global Value Chain Analysis: Concepts and Approaches. *Journal of International Commerce and Economics*.1,1-29. https://www.usitc.gov/staff_publications/jice/global_value_chain_analysis_concepts_and
- Jordan, S., & Philips, A.Q. (2018). Cointegration testing and dynamic simulations of autoregressive distributed lag models. *The Stata Journal: Promoting Communications on Statistics and Stata*, 18, 902–923. <https://doi.org/10.1177/1536867X1801800409>
- Koopman, R., Wang, Z., & Wei, S. J. (2014). Tracing value-added and double counting in gross exports. *American Economic Review*, 104(2), 459-494. <https://doi.org/10.1257/aer.104.2.459>
- Kowalski, P. (2015). Participation of Developing Countries in Global Value Chains: Implications for Trade and Trade-Related Policies. *OECD Trade Policy Papers*, No. 179. <https://doi.org/10.1787/18166873>
- Kummritz, V. (2015). Global value chains: Benefiting the domestic economy? (No. HEIDWP02-2015). *Graduate Institute of International and Development Studies Working Paper*. <https://www.econstor.eu/handle/10419/122109>
- Kummritz, V., Taglioni, D., & Winkler, D. (2017). Economic upgrading through global value chain participation: which policies increase the value-added gains? (*World Bank Policy Research Working Paper 8007*). Washington, D.C.: The World Bank. <https://hdl.handle.net/10986/26348>
- Los, B., Timmer, M. P., & De Vries, G. J. (2016). Tracing value-added and double counting in gross exports: Comment. *American Economic Review*, 106(7), 1958-1966. <https://doi.org/10.1257/aer.20140883>

- Lotfi, I., & Lotfi, B. (2020). Global value chains and economic development: what impact on the Moroccan economy. *Review of Economics and Finance*, 1-18. <https://doi.org/10.55365/1923.x2021.19.23>
- Mao, Z. (2022). Global value chains (gvcs) and economic growth: a nonlinear analysis. *The Singapore Economic Review*, 67(03), 985-1004. <https://doi.org/10.1142/S0217590821450028>
- Martínez-Galán, E., & Fontoura, M. P. (2019). Global value chains and inward foreign direct investment in the 2000s. *The World Economy*, 42(1), 175-196. <https://doi.org/10.1111/twec.12660>
- Mattoo, A., Wang, Z., & Wei, S. J. (2013). Measuring trade in value added when production is fragmented across countries: An overview. In: Trade in value added Developing New Measures of Cross-Border Trade, 25. <http://documents.worldbank.org/curated/en/196231468326398562/Trade-in-value-added-developing-new-measures-of-cross-border-trade>
- McWilliam, S. E., Kim, J. K., Mudambi, R., & Nielsen, B. B. (2020). Global value chain governance: Intersections with international business. *Journal of World Business*, 55(4), 101067. <https://doi.org/10.1016/j.jwb.2019.101067>
- Meng, B., Wang, Z., & Koopman, R. (2013). How are global value chains fragmented and extended in China's domestic production networks? *IDE Discussion Paper*, 424. <https://www.ide.go.jp/English/Publish/Reports/Dp/424.html>
- Mensah, A.N., & Fofana, A.F. (2018). Global value chains and upgrading in economic community of West African states countries. In: *Building a resilient and sustainable agriculture in Sub-Saharan Africa* (pp. 257–283). Palgrave Macmillan. https://doi.org/10.1007/978-3-319-76222-7_12
- Mouanda-Mouanda, G. (2019). Global value chains participation for African countries: An overview from UIBE GVC index system. *Open Journal of Business and Management*, 07, 941–962. <https://doi.org/10.4236/ojbm.2019.72064>
- OECD (2024). Trade in value added. OECD Statistics on Trade in Value Added (database). Papers, No. 159, *OECD Publishing*. <https://doi.org/10.1787/36ad4f20-en>
- Pesaran, M.H., Shin, Y., & Smith, R.J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, 16, 289–326. <https://doi.org/10.1002/jae.616>
- Phillips, P.C., & Perron, P. (1988). Testing for a unit root in time series regression. *Biometrika*, 75, 335–346. <https://doi.org/10.1093/biomet/75.2.335>
- Piermartini, R., & Rubínová, S. (2014). Knowledge spillovers through international supply chains. *The Graduate Institute of International and Development Studies*: Cambridge, UK. <https://repository.graduateinstitute.ch/record/290683/usage?v=pdf>
- Raei, M. F., Ignatenko, A., & Mircheva, M. (2019). Global value chains: what are the benefits and why do countries participate? *International Monetary Fund. Working Paper No. 2019/018*. <https://www.imf.org/en/Publications/WP/Issues/2019/01/18/Global-Value-Chains-What-are-the-Benefits-and-Why-Do-Countries-Participate-46505>
- Rodrik, D. (2018). New technologies, global value chains, and developing economies. *National Bureau of Economic Research* (No. w25164). <https://doi.org/10.3386/w25164>
- Stolzenburg, V., Taglioni, D., & Winkler, D. (2019). Economic upgrading through global value chain participation: which policies increase the value-added gains? In *Handbook on global value chains* (pp. 483-505). Edward Elgar Publishing. <https://hdl.handle.net/10986/26348>
- Timmer, M. P., Erumban, A. A., Los, B., Stehrer, R., & De Vries, G. J. (2014). Slicing up global value chains. *Journal of Economic Perspectives*, 28(2), 99-118. <https://doi.org/10.1257/jep.28.2.99>
- World Bank (2017). Measuring and analyzing the impact of GVCs on economic development. Global. Washington, D.C.: *World Bank Group*. <https://hdl.handle.net/10986/29593>
- World Bank. (2020). World development report 2020: Trading for development in the age of global value chains. *The World Bank*. <https://hdl.handle.net/10986/32437>