

# Total Factor Productivity and Morocco's Participation in Global Value Chains: Evidence from ARDL Bounds Testing Approach

Farah Benomar\*, Hicham El Bouanani, Abdelaziz Ezziani

LMAEG, Hassan II University of Casablanca, Casablanca, Morocco

Email: \*benomar.farah-etu@etu.univh2c.ma

**How to cite this paper:** Benomar, F., El Bouanani, H., & Ezziani, A. (2025). Total Factor Productivity and Morocco's Participation in Global Value Chains: Evidence from ARDL Bounds Testing Approach. *Open Journal of Business and Management*, 13, 1825-1853.

<https://doi.org/10.4236/ojbm.2025.133095>

**Received:** February 26, 2025

**Accepted:** May 11, 2025

**Published:** May 14, 2025

Copyright © 2025 by author(s) and Scientific Research Publishing Inc. This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).

<http://creativecommons.org/licenses/by/4.0/>



Open Access

## Abstract

One of the most spectacular developments in international trade in recent decades has been the rise of global value chains (GVCs). Theoretical and empirical research shows that participation in GVCs offers numerous advantages for developing countries, has beneficial macroeconomic effects and could represent a development strategy. This paper is a contribution to the literature on global value chains, and empirically investigates the short- and long-term impact of Morocco's participation in GVCs on total factor productivity (TFP). The data used are annual time series covering the period 1991-2021. The data were obtained from the World Bank database, the OECD TIVA edition 2021 database and the Penn World Version 10.0 database. The empirical results showed a long-term relationship between TFP and participation in global value chains, as well as with the other control variables, namely the real effective exchange rate and wages. Indeed, upstream participation in GVCs has a negative impact on TFP in the short and long term, while downstream participation has a positive effect on TFP in the short and long term. The econometric study also shows that the real effective exchange rate has a negative impact on TFP in the short and long term, while wages have a positive impact on TFP in the short and long term.

## Keywords

Global Value Chain, Total Factor Productivity, Upstream Participation, Downstream Participation, Real Effective Exchange Rate, Wages, ARDL, Morocco

## 1. Introduction

Over the new millennium, global value chains (GVCs) have changed the pace of

economic development, driving changes in the global division of labor and fragmentation processes for a borderless production system (Feng, Xin, & Cui, 2020). Global value chain is the system by which production systems are broken down into different levels of specialization undertaken in countries or locations across international borders in order to take advantage of economies of scale. This means that at each stage, the added value depends on where the necessary skills and materials can be found at competitive costs (Globerman, 2011).

Developing countries can draw many benefits from their participation in global value chains. They don't need to create entire sectors and industries to be industrialized and competitive in international markets (Foster-McGregor & Verspagen, 2016; Richard, 2012).

It has been argued that GVCs contribute to total factor productivity growth in participating countries. In addition to the increase in economic activity resulting from their involvement in GVCs, these countries may be able to obtain technologies and management know-how, which would play an important role in increasing productivity and thus achieving economic growth (Benomar, El Bouanani, & Ezziani, 2023b).

In light of these observations, this paper attempts to examine the effects of participation in global value chains in Morocco, focusing on productivity. Productivity is expressed as a total factor productivity.

We examine the effects of participation in global value chains from two angles: upstream and downstream participation. Upstream participation refers to sourcing foreign inputs for a country's export production, while downstream participation refers to providing inputs for foreign partners for their export production.

However, the question of whether or not global value chains promote total factor productivity growth remains an empirical question that requires empirical answers. The few studies conducted in this area reveal some interesting results that remain inconclusive, while little is known about the case of developing countries such as Morocco (Yanikkaya & Altun, 2020; Feng, Xin, & Cui, 2020; Liu & Saam, 2021). Our study fills this gap and provides new evidence for the case of Morocco.

Thus, the remainder of the article will be devoted firstly to a review of the theoretical and empirical literature, secondly to the methodology pursued and thirdly to the presentation and discussion of the results obtained.

## **2. Literature Review**

### **2.1. Overview of the Global Value Chain and Total Factor Productivity**

One of the most spectacular developments in international trade in recent decades has been the rapid and remarkable expansion of trade in parts and components, which have been traded within global value chains (GVCs) or production networks. GVCs can be referred to as global production sharing, in which the production system is broken down into different stages. These stages are then carried out in different economies around the world. The production system is fragmented

into cross-border networks in different locations, which has implications for industrial productivity and the development of developing economies (Tong & Seric, 2019; Sydor, 2011). Global value chains have been developed mainly by foreign companies, who have fragmented production processes into several different sub-processes located in the country or region where each particular sub-process can be carried out at the lowest cost. Final products are assembled through the active trade of parts and components within global value chains. The development of global value chains can be attributed to many different factors. The development of information and communication technologies has facilitated the transfer of the knowledge needed to develop and manage value chains from the head company to its subsidiaries, the liberalization of trade and investment policies has also contributed to the expansion of global value chains, by reducing the costs of trade and investment.

Over time, researchers have become interested in measuring a country's GVCs using global input-output tables (Nomaler & Verspagen, 2014). Indeed, since the seminal paper by Hummels et al. (2001), participation in GVCs has generally been defined and measured as vertical specialization. According to this definition, the production of goods in a GVC must take place in different stages of production, in which at least two countries are involved, crossing at least two borders. A distinction is made between upstream and downstream participation. Upstream participation measures the foreign value-added content of exports. Here, the exporting country plays the role of input buyer. For example, the upstream participation rate is very high if a country functions as an assembly platform, where imported components are assembled solely for export. Downstream participation, on the other hand, represents the role of the seller. We measure here the national value added contained in third-country exports. These two values, taken together as a percentage of exports, express the rate of participation in GVCs. Carballa Smichowski, Durand, & Knauss (2020) present another method of measurement and considers participation in GVCs as the sum of the share of non-primary products in domestic value added in exports plus intermediate imports, both together as a share of GDP<sup>1</sup>. This method is characterized by three features: firstly, it excludes primary products. Secondly, imports of finished products for domestic use are also excluded. Thirdly, the denominator is GDP, not gross exports.

In Morocco, the country participates in global value chains through upstream and downstream linkages. Upstream participation occurs when the country uses inputs generated by another country. This mainly occurs when inputs are not available locally, while downstream participation occurs when Morocco provides inputs to a foreign country. This means that goods and services cross many borders before reaching the final production stage.

Similarly, Total Factor Productivity (TFP) is essential for any economy seeking

<sup>1</sup>The formal definition is:  $XDA^*(1 - PPX) + iPM^*(1 - ppM)$ . Where XDVA is domestic value added in gross exports, ppX is the share of primary products in total exports, ipM is gross imports of intermediate products and ppM is the share of primary products in total imports.

a higher level of economic performance. TFP is the residual of the production function that affects production performance after capital stock and human capital. It captures the efficiency used in input processing activities. It is the output per unit of total factors influenced by technical efficiency due to technological progress, effective economic policies and high quality of political institutions (Garzarelli & Limam, 2019; Ajide, 2021).

## 2.2. How Do Global Value Chains Influence Productivity?

In theory, the participation of developing countries in GVCs can improve productivity and expose them to opportunities on world markets, which can encourage the inflow of foreign direct investment. Technological spillovers can occur through technology transfers. These effects can result through the adoption of best practices in terms of organizational management and business methods, and through the use of high-tech intermediary products and the production of high-quality services. They can also result from the use of intellectual property, brand names, knowledge and the sharing of technologies from developed countries through demand and the improvement of skills by learning from customers (Foster-McGregor & Verspagen, 2016; Olasehinde-Williams & Oshodi, 2021).

The impact of production fragmentation on productivity in developing countries can be explained by endogenous growth models based on trade. These models determine long-term growth. The most important endogenous factor in economic growth is knowledge, technology, managerial know-how and human capital. Developing countries may be able to obtain technology and management know-how through a variety of channels, including technology licensing and the import of capital goods and intermediate goods containing technology. Among these channels, hosting foreign companies and participating in relocations or global value chains is one of the most effective ways of acquiring technological and management know-how, not only directly by being involved in the management of these companies and trading with them, but also indirectly through technological spillovers within the companies, for example through the demonstration effect.

Trade can also boost productivity and value added at the country level through a myriad of channels, including gains in specialization and the reallocation of resources. However, recent theoretical research shows that global value chains have altered the way trade is conducted, leading to new and ambiguous effects on its participants. This literature typically examines global value chains that link low-wage, developing countries (the South) to technologically advanced, high-wage, developed countries (the North). The differences between the two countries create incentives to exchange tasks or relocate, which in turn creates a set of advantages and drawbacks depending on the assumptions of the models. For example, in the dynamic model by Li and Liu (2014), the South gains through a learning-by-doing process that improves productivity, while the North gains by becoming more productive by specializing in tasks for which it has a strong advantage. In this model, a final good is produced using a sequence of tasks, based on the assumption that for each task, unit labor requirements in the North are equal to or lower than those

in the South. The development of global value chains enables the North and South to specialize in tasks according to their comparative advantage. Specialization enables the South to reduce its unit labor requirements through a learning-by-doing process, which in turn encourages the North to relocate more tasks to the South. Throughout the process, the South gains, but the North experiences a period of declining welfare because its comparative advantage deteriorates as the South becomes more productive in tasks performed by the North. Consequently, the overall effect of increased participation in global value chains on value added can be negative for the North but positive for the South.

### 2.3. Theoretical Literature

Classical theory explains that labor and capital are the main sources of production in the economy. Consequently, other factors, such as total factor productivity, do not receive the attention they deserve in the analysis. The neoclassical framework suggests that factor accumulation (labor and capital), including productivity growth, are the main sources of economic performance, and this has been widely debated in the literature (McMillan & Rodrik, 2011; Akinlo & Adejumo, 2016).

However, economic theories do not provide a clear picture of the contribution of GVCs to total factor productivity (Stiglitz & Pike, 2022; Young, 1991) argue that the participation of developing countries in GVCs can undermine their economic performance and discourage the growth of certain industries, limiting knowledge transfer and factor productivity growth. Other authors argue that GVCs can enhance overall productivity growth in various ways. In the context of imperfect conditions, GVCs can exert competitive pressure, improving the efficiency of resource allocation by encouraging firms to adopt a lower cost-price relationship. In addition, GVCs can reduce average cost and increase firm size, including efficiency of scale (Epifani, 2003). Then improving the position of countries in value chains is the best long-term strategy for preserving and increasing the benefits of their participation in GVCs (Benomar, El Bouanani, & Ezziani, 2023a).

Growth theory literature considers that economic openness can promote participation in global value chains and lead to economic expansion through changes in economies of scale, improved resource allocation, technological progress and total factor productivity (Kruger, 1985; Helpman & Krugman, 1987; Rodrik, 1988; Barro & Sala-i-Martin, 1995). This means that integration into the global economy can accelerate production efficiency and the pace of economic expansion. Global value chains can also improve factor productivity through trade intermediation, learning through interaction and the opening up of new market opportunities, as well as improving the country's position in the chains. CNUCED (2013), Yanikkaya & Altun (2020) and Fessehaie & Morris (2018) indicate that global value chains have the mechanism to improve an economy's total factor productivity through technological spillovers and access to rare and sophisticated production mechanisms. However, Grossman & Helpman (1991) support a restrictive policy, a policy against participation in GVCs, and point out that protectionism would help develop the domestic economy and protect against foreign pressures. Protec-

tion can also encourage investment in industrial research and development, which in turn promotes innovation in specific sectors.

However, the question of whether or not GVCs promote productivity growth remains an empirical question that requires empirical answers. The few studies carried out in this field reveal some interesting but inconclusive results, while little is known about the case of developing countries (Yanikkaya & Altun, 2020; Feng, Xin, & Cui, 2020; Liu & Saam, 2021).

## 2.4. Empirical Literature

### 2.4.1. GVCs and Productivity for Developed Countries

One of the most frequently discussed issues concerning global value chains is their impact on productivity, given that productivity is an important factor influencing economic growth. A number of studies on global value chains, focusing on fragmented production at international level, have examined the relationship between delocalization—the commercial practice that consists of basing a company or part of a company in a different country and productivity (Feenstra & Hanson, 1996; Egger & Egger, 2006; Amiti & Wei, 2009; Winkler, 2010). It has been shown theoretically and empirically that companies engaged in delocalization have higher productivity, and that delocalization tends to increase the productivity of delocalized companies as it allows companies to specialize in sub-processes with their comparative advantage. Furthermore, delocalization leads to increased access to new varieties of inputs for delocalized firms, improving their competitiveness. These discussions in terms of firms can also be formulated in terms of countries. Countries can improve their productivity by engaging in delocalization, as this enables them to specialize in the production of products with a comparative advantage (Mitra & Ranjan, 2007; Grossman & Rossi-Hansberg, 2007; Criscuolo, Timmis, & Johnstone, 2016). To sum up, countries involved in global value chains through delocalized firms can improve their productivity.

To this point, we have examined studies of the impact of global value chains on developed countries, now let's move on to the impact of global value chains on developing countries, which participate in these chains by hosting firms of developed countries.

### 2.4.2. GVCs and Productivity for Developing Countries

The relationship between TFP and global value chains has not yet been well studied in developing countries. Developing economies are generally expected to benefit from the acquisition of intermediate goods and services from developed countries, which may be used to enhance productivity.

Del Prete, Giovannetti, & Marvasi (2017) investigated if participation in global value chains boosted the competitiveness of local firms by increasing TFP and labor productivity, they used World Bank firm survey data for two North African countries, Egypt and Morocco, in 2004 and 2007. The results show that firms participating in global value chains perform better ex-ante (selection effect) and achieve additional productivity gains ex-post (learning effect).

Lu, Sun, & Chen (2016) analyzed the impact of Chinese firms' participation in GVCs on TFP for the period 2000-2006. They found a non-linear Inverted-U-shaped relationship between participation in GVCs and productivity.

De même (Ge et al., 2018) studied Chinese manufacturing firms for the period 2002-2007 and found that Chinese manufacturing firms benefited from a significant improvement in productivity due to their integration into the global value chain. Specifically, this effect is evident in capital-intensive, technology-intensive and general trading firms, while the effects are not evident in processing trading firms and labor-intensive firms.

Benkovskis, Masso, Tkacevs, Vahter, & Yashiro (2020) examined the effect of exporting intermediate goods, re-exporting and exporting services on the productivity of Latvian firms for the period 2006-2014 and Estonian firms for the period 1995-2014, the results show that in both countries, exporters have a significantly higher level of productivity than non-exporters and their productivity is associated with learning-by-doing and the diffusion of knowledge and technology between nations.

According to a study conducted by Urata & Baek (2020) covering 47 countries between 1995 and 2011, the authors found that participation in global value chains, both in upstream and downstream stages, contributed to an increase in the total factor productivity for those countries, and that productivity improvement was greater when developing countries sourced intermediate goods from developed countries, or in the case of upstream participation.

Ajide (2023) studied 23 African countries between 2007 and 2018 and found that there is a positive and significant relationship between participation in global value chains and the total factor productivity of African economies. The results reveal that participation in GVCs provides access to a larger global market that local firms can explore to benefit from economies of scale and learn to use modern technologies and innovations, access cheaper and quality inputs for domestic production.

The study by Kowalski, Gonzalez, Ragoussis, & Ugarte (2015) covered 152 countries over the period 1995 and 2009 and revealed that the developing countries' upstream participation in GVCs positively impacts the countries' productivity, the productivity is represented by the overall national value added per capita incorporated in the country's exports.

Over the period 1995-2011, Kordalska, Wolszczak-Derlacz, & Parteka (2016) studied 40 countries, and 20 industries (13 manufacturing and 7 service sectors). They found that there is a positive relationship between TFP growth and the share of foreign value added in exports. In particular, the positive impact of foreign value added on TFP growth occurs mainly in the manufacturing sectors.

In the study by Constantinescu, Mattoo, & Ruta (2017), which covers 13 sectors in 40 countries, the authors found that participation in global value chains is an important driver of labor productivity. A 10% increase in the level of upstream participation in GVCs raises average productivity by almost 1.7%.

After studying 20 industries and 54 countries between 1995, 2000, 2005 and 2008-2013 (Kummritz, 2016) found that DVX, the share of domestic value added

exported, has a positive impact on national productivity (measured by labor productivity) at both industry and country level, and that the effects of GVC integration on productivity do not depend on a country's stage of development.

Yanikkaya & Altun (2020) used the Generalized Method of Moments (GMM) to analyze the impact of upstream and downstream participation in global value chains on total factor productivity over two periods: 1995-2011 and 2005-2015. The study shows that higher participation in GVCs improves total factor productivity.

The study by Yanikkaya & Altun (2018) empirically estimates the impact of participation in global value chains on TFP growth for the years 1995-2014 by using OECD-WTO TiVA data. Their results indicate a significant positive impact on upstream participation and a significant negative impact on downstream participation for the entire sample.

Using the Eora Multi Regional Input-Output (MRIO) database for 125 countries and for the period 1997-2013, Fagerberg, Lundvall, & Srholec (2018) indicate that participation in GVCs does not increase productivity growth and that small and low-capacity countries do not benefit from GVCs.

In addition to participation in global value chains, many other determinants of Total Factor Productivity are taken into account in the literature. Among these are wages and the real effective exchange rate.

#### 2.4.3. The Relationship between Total Factor Productivity and Wages

Multinational firms tend to offer higher wages to their employees than local firms (Görg, Strobl, & Walsh, 2007; Urban, 2010). Such wages are necessary to attract a highly skilled and productive local workforce (Driffield, 1996). To compete with foreign firms on the labor market, local firms need to be able to offer wage rates that are relatively similar to those of foreign firms. Indeed, an increase in wage rates implies an increase in the efficiency and productivity of local firms. Higher wages motivate workers to be more productive, prevent labor turnover, and attract highly skilled workers (Akerlof, 1982; Katz, 1986). Ghose & Biswas (2000) finds that there is a positive association between real wages and TFP, and that real wages are considered as a TFP determinant. If the real wage is sufficiently high for a group of industries, skilled workers may be attracted to that industry, and if skills are considered as a positive determinant of TFP, it can be argued that if the wage increases through the involvement of skilled workers in the production process, productivity may increase.

In his empirical studies (Pal & Das, 2014) showed that there is a long-run relationship between total factor productivity and wages, Kumar, Webber, & Perry (2012) showed that the wage rate and labor productivity are mutually related and positively correlated in the long run, Klein (2012) found that there is a long-run relationship (cointegration) between the real wage and labor productivity and that this relationship is weak in the short run; Similarly, Nayak & Patra (2013) have examined the relationship between wage rates and productivity in the manufacturing sector and, on the basis of this analysis, they argue that wage rates and la-

bour productivity are positively correlated. While Wakeford (2004) has shown that there is a long-term equilibrium relationship (cointegration) between real wages and productivity and that real wages have a negative impact on productivity in the short term. Kumar, Webber, & Perry (2012) Assert that higher real wages result in greater work effort due to the higher opportunity cost of job loss. In addition, differences in real wages between firms lead to labor mobility, which in turn affects firm productivity (Urban, 2010; Fosfuri, Motta, & Ronde, 2001; Glass & Saggi, 2002). Since labor mobility occurs between foreign and local firms, any increase in the average wage of foreign firms should affect the TFP of aggregate manufacturing firms.

#### **2.4.4. The Relationship between Total Factor Productivity and the Real Effective Exchange Rate**

The monetary policy and exchange rate of countries cannot be decided independently of the economy's performance in terms of productivity. Although it is widely recognized that the exchange rate plays an important role as a potential source of productivity growth, the relationship between the exchange rate and productivity growth remains a work in progress.

Pandya & Mehta (2015) show that the exchange rate plays an important role in increasing total factor productivity.

Ghose & Biswas (2000) have attempted to explain TFP growth by taking into account the effect of the real effective exchange rate. The author concludes that the relative adjustment of the real effective exchange rate has contributed positively to total factor productivity growth.

Harris (2000) argues that, at the macroeconomic level, productivity is treated as an endogenous variable, in which the exchange rate regime is either fixed or floating. He points out that real exchange rate depreciations accelerate productivity growth in certain circumstances.

Richard (2001) has demonstrated, using a panel model, the positive short-term effects of exchange rate depreciation on productivity, which means that in the short term, the results are consistent with the competitiveness hypothesis, which suggests that exchange rate depreciations stimulate productivity growth in the short term, and that undervalued exchange rates have negative long-term consequences on productivity growth, in other words, real exchange rate depreciation has negative long-term consequences on productivity growth.

Darryl & Elitza (2011) estimate a country-fixed-effects panel model to study TFP growth as a function of the real effective exchange rate and several standard control variables for 58 developing countries over the period 1975-2004. They find that a 10% depreciation in the real exchange rate is associated with a 0.2% increase in the average annual growth rate of total factor productivity (TFP).

Aghion, Bacchetta, Ranciere, & Rogoff (2006) and Benhima (2012) use a panel of 83 countries between 1960 and 2000 and find that the real exchange rate can have a non-negligible effect on productivity growth, and the impact is a function of countries' level of financial development. The exchange rate acts negatively on

productivity growth in countries with a low level of financial development, while it has no effect on countries with a high level of financial development.

The results of Diallo (2012) show that real effective exchange rate volatility negatively affects total factor productivity growth, the author also found that the real effective exchange rate acts on total factor productivity depending on the level of financial development. For very low and very high levels of financial development, real exchange rate volatility has no effect on productivity growth, but for moderately financially developed countries, real exchange rate volatility reacts negatively on productivity.

## 2.5. Research Hypothesis

Based on this theoretical overview, we will attempt to empirically test the following hypotheses:

**H1:** Participation in GVCs can have a positive impact on total factor productivity.

**H1-1:** Upstream participation in GVCs can have a positive impact on total factor productivity.

**H1-2:** Downstream participation in GVCs can have a positive impact on total factor productivity.

**H2:** Wages can have a positive impact on total factor productivity.

**H3:** The real effective exchange rate may have a negative impact on total factor productivity.

## 3. Method and Data

### 3.1. Econometric Estimation

The various modeling steps are presented below.

#### 3.1.1. Stationarity Study

To assess data stationarity, we will first utilize the correlogram and then proceed with the traditional time-series methodology. The two most widely applied stationarity tests are the Augmented Dickey-Fuller (ADF) test (1981) and the Philips-Perron test. These tests are designed to determine whether a time series possesses a unit root, which would indicate non-stationarity.

#### 3.1.2. Model Estimation

The ARDL (AutoRegressive Distributed Lag) model, developed by Pesaran et al. (2001), is an econometric tool used to analyze both short- and long-term relationships between variables. It is particularly useful for modeling causal connections between a dependent variable and multiple explanatory variables.

#### 3.1.3. Cointegration Test

Cointegration between series indicates the presence of one or more long-term equilibrium relationships among them. When dealing with multiple integrated variables of different orders, such as  $I(0)$  and  $I(1)$ , the “bounds cointegration test”

developed by Pesaran et al. (2001), can be used to determine the existence of long-term relationships between variables within an ARDL model.

#### 3.1.4. Model Stability

To assess the stability of the model, we will employ the CUSUM test and the CUSUM of squares test. These tests are used to evaluate the stability of the model's parameters over time.

#### 3.1.5. Model Validity

The statistical validation phase involves evaluating the robustness of the model through various tests. These include the Lagrange Multiplier (LM) test for detecting residual autocorrelation, the Jarque-Bera test for assessing the normality of residuals, and the Breusch-Pagan-Godfrey tests for checking for heteroscedasticity.

### 3.2. Data

The objective of this study is to examine the relationship between participation in Global Value Chains (GVCs), both upstream and downstream, and total factor productivity. The data used for the analysis are annual time series spanning the period from 1991 to 2021, providing the longest possible timeframe for the study. This results in a sample comprising 31 observations. The data sources include the World Bank database, the OECD TiVA 2021 edition database, and the Penn World Table Version 10.0 database.

#### Variable Selection and Data Presentation

Five variables will be used in this study: total factor productivity is the variable to be explained, upstream and downstream participation are the explanatory variables, while wages and the real effective exchange rate are the control variables.

The following **Table 1** presents the study variables, the measurement indicator and source of each variable.

**Table 1.** Presentation of model variable (Source: Authors).

Variable	Indicator	Data source	Period
Productivity	Total factor productivity (TFP)	Penn World Table database, version 10.0 available at <a href="http://www.ggd.net/pwt">http://www.ggd.net/pwt</a>	1991-2021
Upstream participation	Foreign value added/Gross exports	Trade in Value Added (TiVA) database	1991-2021
Downstream participation	Indirect local value added/Gross exports	Value-added trade database (TiVA)	1991-2021
Employee compensation	Compensation of employees (% of expenses)	World Bank database	1991-2021
Real effective exchange rate	Real effective exchange rate (2010 = 100)	World Bank database	1991-2021

## 4. Results

Before conducting any analysis, we transformed the variables into logarithmic form. This step helps facilitate interpretation and addresses issues related to non-normality, non-linearity, and heteroscedasticity in the data series.

### 4.1. Descriptive Study

This phase is used to describe and analyze the data by calculating position, dispersion and normality indicators. The following **Table 2** shows these calculations using Eviews 12.

**Table 2.** Descriptive study of the model's variables (Source: Authors:our estimates on Eviews 12).

Statistic	Log PTF	Log Downstream Participation	Log Upstream Participation	Log Compensation of Employees	Log REER
Mean	-0.241238	-0.660016	-0.548737	1.659705	2.015273
Median	-0.246317	-0.665848	-0.555542	1.656794	2.014209
Maximum	0.090898	-0.544084	-0.340513	1.717107	2.060137
Minimum	-0.29232	-0.758506	-0.722257	1.615411	1.979472
Std. Dev.	0.043962	0.054434	0.11863	0.022479	0.024749
Skewness	1.40674	0.209045	0.153057	0.369401	0.269393
Kurtosis	5.076244	2.483387	1.731917	2.511769	1.901094
Jarque-Bera	15.79251	0.570513	2.198081	1.119752	1.936275
Probability	0.000372	0.751821	0.333191	0.57128	0.379709
Sum	-7.478379	-20.46048	-17.01084	51.45086	62.47345
Sum Sq. Dev.	0.057979	0.088598	0.422195	0.021079	0.015159
Observations	31	31	31	31	31

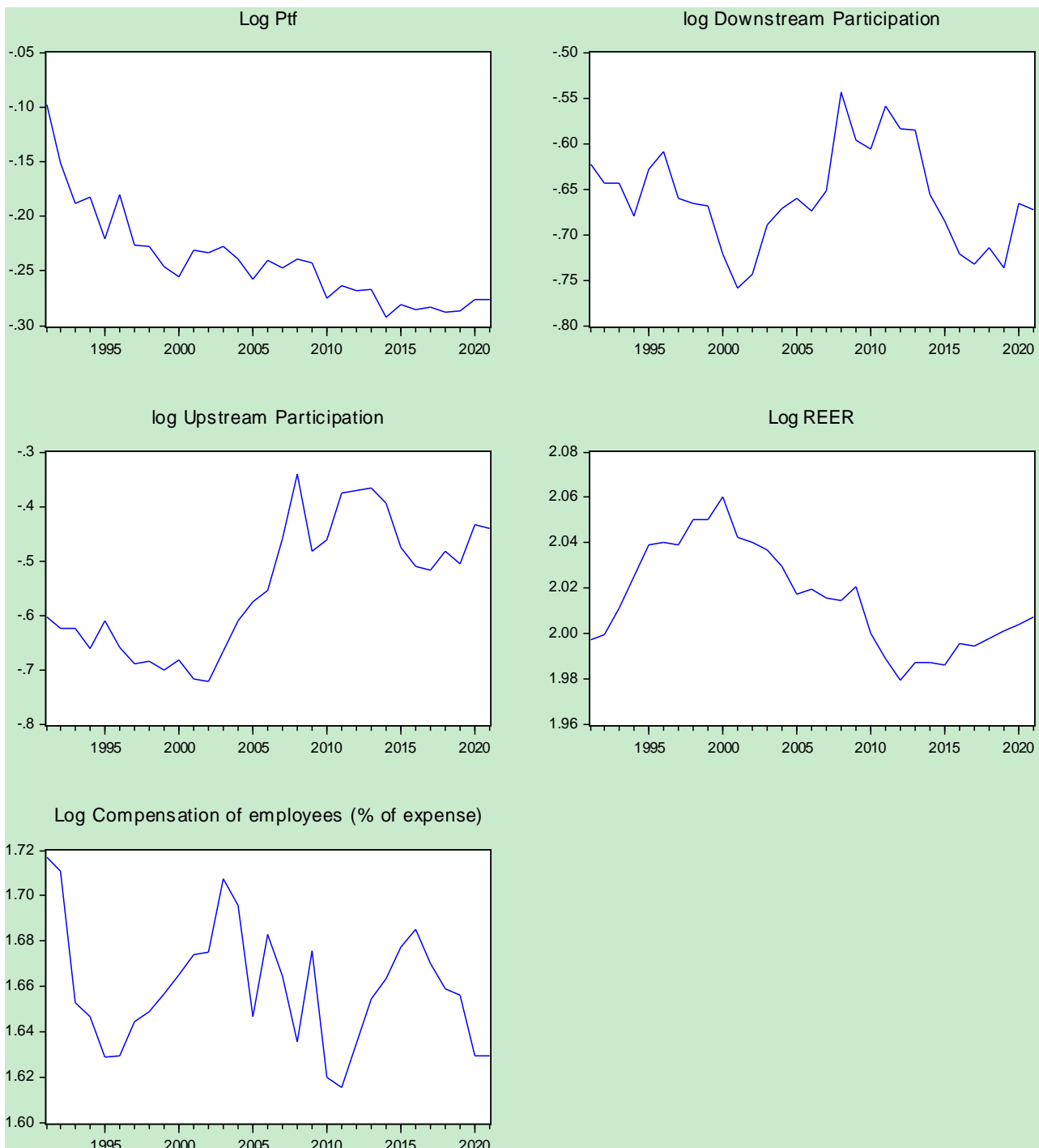
This descriptive study shows that all variables have a normal distribution, except for TFP, since Jarque Bera probabilities are greater than 5%.

The skewness coefficient indicates the presence of leftward skewness for all variables, since the coefficients are  $>0$ .

The Kurtosis coefficient indicates that the distribution of (PTF) is pointed (as this coefficient is greater than 3), while the other variables are flatter than the normal distribution.

### 4.2. Graphical Study

The graphical visualization (**Figure 1**) of the variables provides an opportunity to observe their variations over the period from 1991 to 2021. This visual analysis helps in understanding the trends and patterns in the data across the entire timeframe.



**Figure 1.** Graphical representation of model variables (Source: Authors our graphics on Eviews 12).

After an initial visualization of the series graphs, it appears that upstream participation, designated by log upstream participation, downstream participation, designated by log downstream participation, and the real effective exchange rate, designated by log REER, are not stationary in level. On the other hand, the evolution of total factor productivity, designated by log PTF, and wages, designated by log compensation of employees (% of expense), allow us to assume that these var-

ables are stationary in level.

### 4.3. Stationarity Tests

To determine the degree of integration for each variable, we will test the stationarity of the series to ensure that none of them is integrated of order greater than one. We will utilize the Augmented Dickey-Fuller (ADF) test and the Phillips-Perron (PP) test for this purpose. The results of these tests are summarized in **Table 3** below.

**Table 3.** Augmented-Dickey Fuller et Phillips-Perron test (Source: Authors our estimates on Eviews 12).

Test	Dickey Fuller Augmented					Philips Perron				
	Level		1st Difference		Ordre d'integration	Level		1st Difference		Ordre d'integration
Variable	Statistic	P-Value	Statistic	P-Value		Statistic	P-Value	Statistic	P-Value	
Log PTF	-4.328878	0.0039			I (0)	-4.693708	0.0007			I (0)
Log Compensation of employees (% of expense)	-3.660736	0.011			I (0)	-3.325538	0.0225			I (0)
Log Downstream Participation	0.06166	0.6948	-5.51722	0	I (1)	0.069258	0.6972	-5.517557	0	I (1)
Log REER	0.196775	0.7364	-4.2518	0.0001	I (1)	0.149992	0.7223	-4.280578	0.0001	I (1)
Log Upstream Participation	-0.770629	0.3739	-5.3338	0	I (1)	-0.772755	0.373	-5.333869	0	I (1)

The Augmented-Dickey Fuller and Phillips Perron test shows that upstream participation, downstream participation and the real effective exchange rate are stationary in first difference, meaning they are integrated of order 1, while Total Factor Productivity and employee compensation are stationary in level, meaning the variables are integrated of order 0. The most appropriate model is the Auto-regressive Distributed Lag model-ARDL.

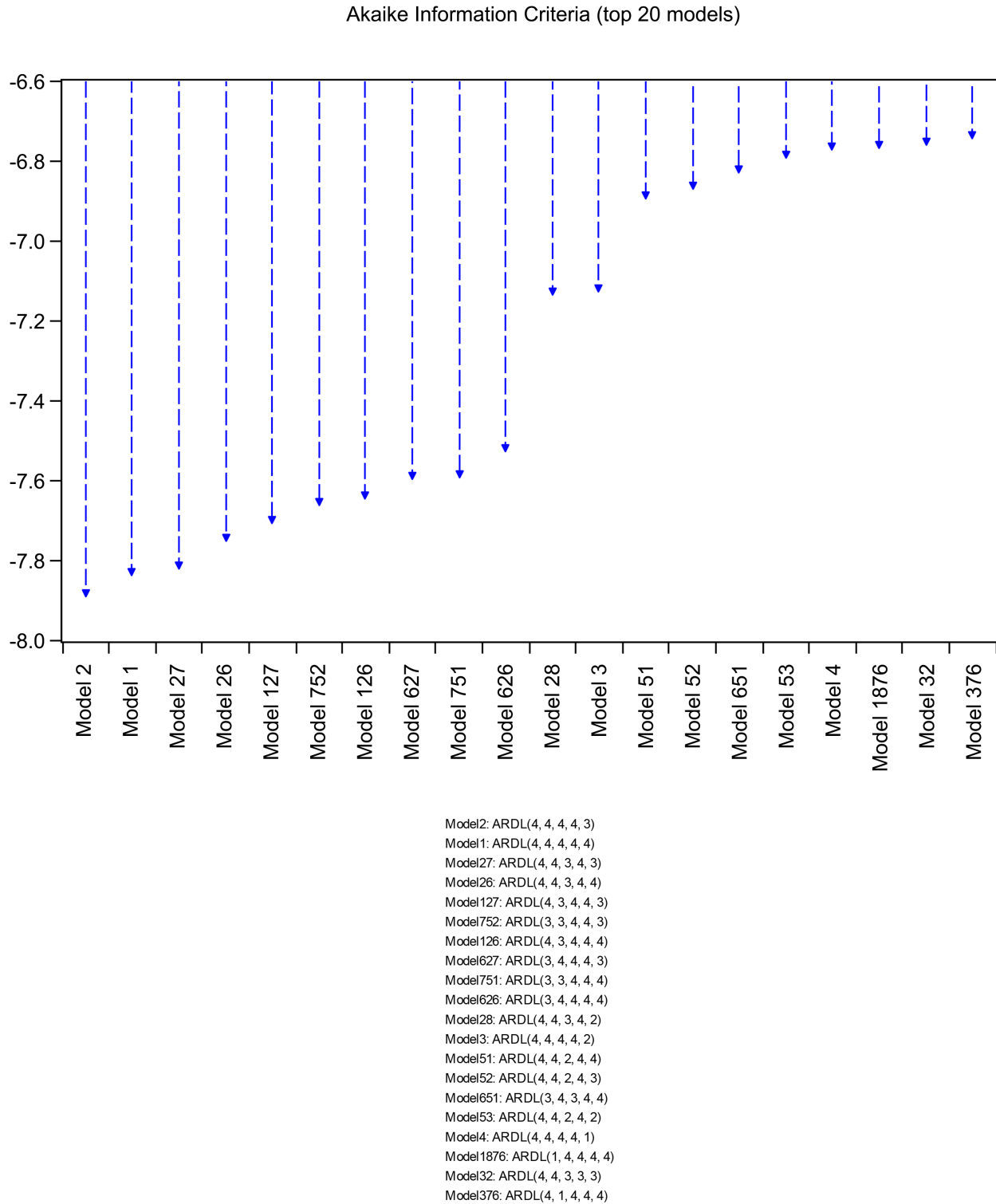
### 4.4. ARDL Model Estimation

#### 4.4.1. Optimal ARDL Model and Model Estimation

To select the optimal ARDL model, which provides statistically significant results with the fewest parameters, we will use Akaike's Information Criterion (AIC). This criterion helps identify the model that balances goodness-of-fit with model complexity.

**Figure 2** indicates that the ARDL (4, 4, 4, 4, 3) model is the most optimal among

the 19 models tested, as it has the lowest AIC value. This model not only provides statistically significant results but also has its coefficients estimated, as shown in **Table 4**.



**Figure 2.** Optimal ARDL model. Source: Authors Our graphics on Eviews 12).

**Table 4.** Estimation of optimal ARDL model (Source: Authors our estimates on Eviews 12).

Dependent Variable: LOG_PTF				
Method: ARDL				
Date: 03/19/25 Time: 16:03				
Sample (adjusted): 1995 2021				
Included observations: 27 after adjustments				
Maximum dependent lags: 4 (Automatic selection)				
Model selection method: Akaike info criterion (AIC)				
Dynamic regressors (4 lags, automatic): LOG_REER LOG_DOWNSTREAM PARTICIPATION LOG_COMPENSATION_OF_EMPLOYEES_OF_ EXPENSE_LOG_UPSTREAM_PARTICIPATION				
Fixed regressors: C				
Number of models evaluated: 2500				
Selected Model: ARDL (4, 4, 4, 4, 3)				
Variable	Coefficient	Std.Error	Statistic	Prob*
LOG_PTF (-1)	0.019428	0.151721	0.128053	0.9062
LOG_PTF (-2)	-0.513144	0.260071	-1.973095	0.1430
LOG_PTF (-3)	-0.860395	0.266768	-3.225252	0.0484
LOG_PTF (-4)	0.300213	0.260072	1.154346	0.3320
LOG_REER	-1.265310	0.301047	-4.203036	0.0246
LOG_REER (-1)	1.441959	0.601791	2.396113	0.0962
LOG_REER (-2)	0.295621	0.368746	0.801691	0.4814
LOG_REER (-3)	-1.093043	0.377614	-2.894605	0.0628
LOG_REER (-4)	-0.840147	0.302849	-2.774142	0.0693
LOG_DOWNSTREAM_ PARTICIPATION	0.796305	0.142763	5.577791	0.0114
LOG_DOWNSTREAM PARTICIPATION (-1)	-0.016143	0.090028	-0.179307	0.8691
LOG_DOWNSTREAM PARTICIPATION (-2)	0.090483	0.123863	0.730511	0.5180
LOG_DOWNSTREAM PARTICIPATION (-3)	0.369173	0.129624	2.848039	0.0652
LOG_DOWNSTREAM PARTICIPATION (-4)	-0.184631	0.196014	-0.941928	0.4157
LOG_UPSTREAM PARTICIPATION	-0.301750	0.095556	-3.157845	0.0510
LOG_UPSTREAM_ PARTICIPATION (-1)	-0.001280	0.074558	-0.017168	0.9874

## Continued

LOG_UPSTREAM_ PARTICIPATION (-2)	-0.236289	0.109798	-2.152036	0.1205
LOG_UPSTREAM_ PARTICIPATION (-3)	-0.121937	0.095809	-1.272707	0.2928
LOG_UPSTREAM_ PARTICIPATION (-4)	-0.092047	0.136397	-0.674850	0.5481
LOG_COMPENSATION_OF_ EMPLOYEES	0.745733	0.278876	2.674066	0.0754
LOG_COMPENSATION_OF_ EMPLOYEES. (-1)	-0.082340	0.161216	-0.510741	0.6447
LOG_COMPENSATION_OF_ EMPLOYEES. (-2)	-0.323031	0.136751	-2.368778	0.0986
LOG_COMPENSATION_OF_ EMPLOYEES. (-3)	0.386085	0.195154	1.978368	0.1423
c	1.515175	1.058725	1.431132	0.2478
R-squared	0.994617	Mean dependent var		-0.254017
Adjusted R-squared	0.953348	SD. Dependent var		0.026828
SE.of regression	0.005795	Akaike info criterion		-7.883250
Sum squared resid	0.000101	Schwarz criterion		-6.731395
Log likelihood	130.4239	Hannan-Quinn criter		-7.540743
F-statistic	24.10091	Durbin-Watson stat		3.222608
Prob (F-statistic)	0.011561			

\*Note: *P*-values and any subsequent tests do not account for model selection.

#### 4.4.2. ARDL Model (4, 4, 4, 4, 3) Validity Test

The validity of our model requires confirmation using a set of hypothesis, we perform the following robustness tests: Jarque-Bera test for normality of residuals, Breusch Pagan-Godfrey test for Heteroscedasticity, Lagrange Multiplier (LM) test for autocorrelation of residuals, white noise test for residuals, and CUSUM and CUSUM of square test for model stability.

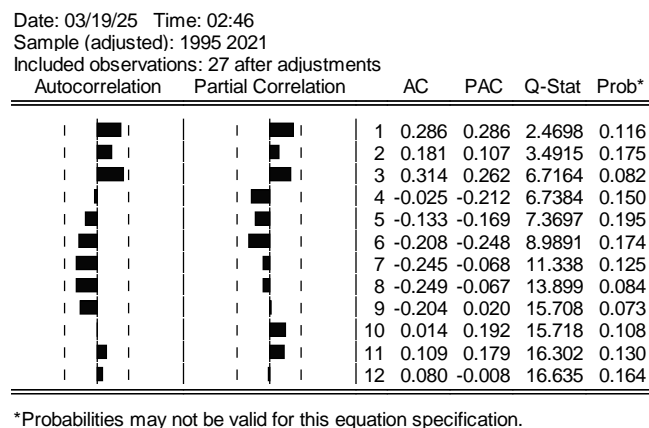
**Table 5** shows the results of these tests:

**Table 5.** ARDL model hypothesis test (4, 4, 4, 4, 3) (Source: Authors (Our estimates on Eviews 12)).

ARDL Model: (4, 4, 4, 4, 3)			
Null hypothesis to be tested (H0)	Test applied	Statistic	<i>P</i> -value
<b>There is normality of errors.</b>	Jarque-Bera	0.954096	0.620613
<b>No autocorrelation of errors</b>	LM test	6.844814	0.2609
<b>Homoscedasticity of errors.</b>	Breusch-Pagan-Godfrey	0.602799	0.7964

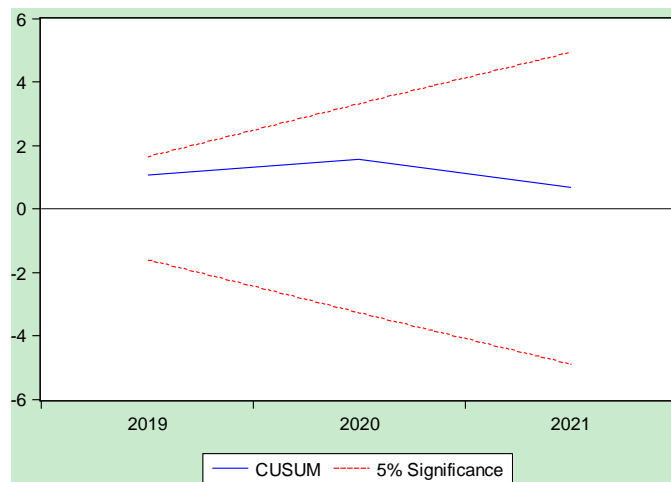
The probability of the statistic for the 3 tests is greater than 5%. This means that the H0 hypothesis is accepted in all these tests. The errors are uncorrelated, homoscedastic and normally distributed as shown in **Figure A1**, **Table A1** and **Table A2** in the Appendix.

The white noise test aims to verify that the residuals between the observed values and those estimated by the model behave like white noise. From **Figure 3**, it is evident that for all lags k, the test probability remains consistently above 0.05. This indicates that all terms in the correlogram fall within the two corridors: one for autocorrelation and the other for partial autocorrelation. Since none of the terms in the correlogram fall outside the stylized dotted band, it confirms that the residuals of the estimated model exhibit white noise characteristics.

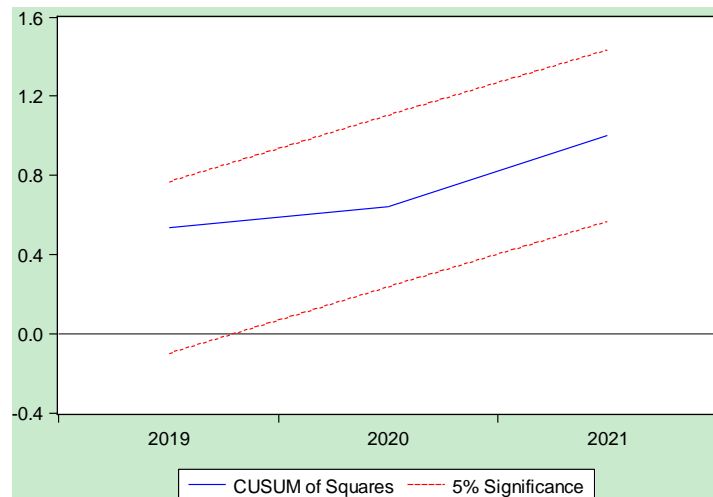


**Figure 3.** White noise test of squared residuals (Source: Authors (our estimates on Eviews 12)).

Based on the results of the CUSUM test and the CUSUM of the square test (**Figure 4** and **Figure 5**), we can say that the estimated model is stable (as the curve does not leave the dotted corridor). So the coefficients are stable over time.



**Figure 4.** ARDL model (4, 4, 4, 4, 3) stability CUSUM test (Source: Authors (our graphics on Eviews 12)).



**Figure 5.** ARDL model (4, 4, 4, 4, 3) stability CUSUM of Squares test (Source: Authors our graphics on Eviews 12).

In short, the results of the various diagnostic tests have led to the statistical validation of our ARDL (4, 4, 4, 4, 3) model.

**4.4.3. Peseran 2001 Cointegration Test (Bound Test)**

The results of the bounds cointegration test in **Table 6** confirm the existence of a cointegrating relationship between TFP (productivity) and indirect local value-added content (downstream participation) and foreign value-added content (upstream participation), Compensation of employees and real effective exchange rate, since the value of F-statistic = 13.14723 is greater than the upper bound for the different significance levels (1%, 5% and 10%). We therefore reject the H0 hypothesis of no long-term relationship, and conclude that there is a long-term relationship between the different variables.

**Table 6.** Peseran 2001 cointegration test (Bound test) (Source: Authors our estimates on Eviews 12).

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signit.	I (0)	I (1)
Asymptotic: n = 1000				
F-statistic	13.14723	10%	2.2	3.09
k	4	5%	2.56	3.49
		2.5%	2.88	3.87
		1%	3.29	4.37
Actual Sample Size	27	Finite Sample: n = 35		
		10%	2.46	3.46
		5%	2.947	4.088
		1%	4.093	5.532

Continued

Finite Sample: n = 30		
10%	2.525	3.56
5%	3.058	4.223
1%	4.28	5.84

#### 4.4.4. Short-Term Dynamics and Estimation of Long-Term Coefficients

Given that all the necessary preconditions are met, the short- and long-term effects of GVC integration, with the other control variables on total factor productivity, are estimated using the ARDL model.

**Table 7** reports the short-term dynamics resulting from the error-correction specifications of the ARDL models. This ECM specification is particularly well-suited to the articulation between short-term dynamics and long-term target. The estimated coefficients of the error-correction terms (ECM), represented here by CointEq (-1), are negative and significant at the 1% level, with an associated coefficient estimate of (-2.053898), showing the presence of a co-integration relationship between the variables and implying that around 205% of short-term deviations are corrected within one period.

**Table 7.** Short-term relationships estimated by the ARDL approach (Source: Authors our estimates on Eviews 12).

Case 2: Restricted Constant and No Trend				
Date: 03/19/25 Time: 14:58				
Sample: 1991 2021				
Included observations: 27				
ECM Regression				
Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std.Error	Statistic	Prob*
D (LOG_PTF (-1))	1.073326	0.112303	9.557384	0.0024
D (LOG_PTF (-2))	0.560182	0.075209	7.448313	0.0050
D (LOG_PTF (-3))	-0.300213	0.071058	-4.224868	0.0242
D (LOG_DOWNSTREAM PARTICIPATION)	0.796305	0.059832	13.30892	0.0009
D (LOG_DOWNSTREAM PARTICIPATION) (-1)	-0.275026	0.037268	-7.379614	0.0051
D (LOG_DOWNSTREAM PARTICIPATION) (-2)	-0.184542	0.041863	-4.408235	0.0217
D (LOG_DOWNSTREAM PARTICIPATION) (-3)	0.184631	0.045580	4.050714	0.0271
D (LOG_UPSTREAM PARTICIPATION)	-0.301750	0.034481	-8.751303	0.0031

## Continued

D (LOG_UPSTREAM_ PARTICIPATION) (-1)	0.450273	0.037298	12.07226	0.0012
D (LOG_UPSTREAM_ PARTICIPATION) (-2)	0.213984	0.030042	7.122869	0.0057
D (LOG_UPSTREAM_ PARTICIPATION) (-3)	0.092047	0.032753	2.810388	0.0673
'D (LOG_REER)	-1.265310	0.142935	-8.852309	0.0030
D (LOG_REER (-1))	1.637570	0.164294	9.967320	0.0021
D (LOG_REER (-2))	1.933190	0.162990	11.86078	0.0013
D (LOG_REER (3))	0.840147	0.142139	5.910744	0.0097
LOG_COMPENSATION_OF_ EMPLOYEES.	0.745733	0.067474	11.05217	0.0016
LOG_COMPENSATION_OF_ EMPLOYEES. (-1)	-0.062154	0.057394	-1.082924	0.3581
LOG_COMPENSATION_OF_ EMPLOYEES. (-2)	-0.386085	0.053683	-7.191941	0.0055
Cointeq (-1)*	-2.053898	0.141613	-14.1613	0.0007
R-squared	0.989030	Mean dependent var		-0.003467
Adjusted R-squared	0.964347	SD. Dependent var		0.018793
SE.of regression	0.003548	Akaike info criterion		-8.253620
Sum squared resid	0.000101	Schwarz criterion		-7.341735
Log likelihood	130.4239	Hannan-Quinn criter		-7.982469
Durbin-Watson stat	3.222608			

\*P-value incompatible with tBounds distribution.

The results of the short-term relationships indicate that downstream participation has an impact on total factor productivity, the impact being positive and statistically significant at the 1% level. Specifically, a 1% increase in downstream participation leads to a 0.97% increase in Morocco's total factor productivity.

Upstream participation has a negative impact on total factor productivity, and the result is statistically significant at the 1% level. Specifically, a 1% increase in upstream participation leads to a 0.30% decrease in Morocco's total factor productivity.

With regard to the control variables, the real effective exchange rate has a negative impact on total factor productivity. The impact is statistically significant at the 1% level: a 1% increase in the real effective exchange rate leads to a 1.26% decrease in Morocco's total factor productivity.

Wages have a positive impact on total factor productivity. The impact is statistically significant at the 1% level, and a 1% increase in wages leads to a 0.75% increase in Morocco's total factor productivity.

The long-run elasticities of total factor productivity with respect to the various variables in the study (**Table 8**) are significant at 1% for upstream and downstream participation, and 5% for employee compensation and the real effective exchange rate.

**Table 8.** Long-term relationships estimated by the ARDL approach. (Source: Authors nos estimates on Eviews 12).

Levels Equation				
Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_DOWNSTREAM_PARTICIPATION	0.513749	0.068425	7.508216	0.0049
LOG_UPSTREAM_PARTICIPATION	-0.36677	0.053968	-6.79604	0.0065
LOG_COMPENSATION OF ELPLOYEEES	0.353253	0.097876	3.609195	0.0365
LOG_REER	-0.71129	0.165835	-4.28916	0.0233
C	0.737707	0.440364	1.675261	0.1928
$EC = LOG\_PTF - (0.513749*LOG\_DOWNSTREAM\_PARTICIPATION - 0.3668*LOG\_UPSTREAM\_PARTICIPATION + 0.3533*LOG\_COMPENSATION - 0.7113*LOG\_REER$				

These results show that there is a negative relationship between total factor productivity and upstream participation, and a positive relationship between total factor productivity and downstream participation. Indeed, a 1% increase in downstream participation leads to a 0.51% increase in TFP. A 1% increase in upstream participation leads to a 0.36% decrease in TFP.

The control variables are statistically significant at 5%, employee compensation has a positive impact, a 1% increase in salary leads to a 0.35% increase in TFP, while the real effective exchange rate has a negative effect on TFP, a 1% increase in real effective exchange rate leads to a 0.71% decrease in TFP.

This assessment is in line with research by [Urata & Baek \(2020\)](#), [Ajide \(2023\)](#), [Kowalski, Gonzalez, Ragoussis, & Ugarte \(2015\)](#), [Kummritz \(2016\)](#), and [Yanikkaya & Altun \(2020\)](#) which found a positive relationship between downstream participation in developing countries and total factor productivity.

Downstream participation in GVCs will allow Morocco to access a larger global market that local firms can explore to benefit from economies of scale, learn how to integrate modern technologies into the production system to become more efficient ([Dutta, 2021](#); [Olasehinde-Williams & Oshodi, 2021](#)), acquire know-how, adopt best practices in terms of organizational management and business methods, and improve skills by learning from customers ([Foster-McGregor & Verspagen, 2016](#); [Olasehinde-Williams & Oshodi, 2021](#)) and through a learning-by-doing pro-

cess (Benkovskis, Masso, Tkacevs, Vahter, & Yashiro, 2020). As a result, boosting the share of local value added in Morocco's gross exports would increase total factor productivity. That's why Morocco needs to increase its participation in GVCs and, above all, increase the share of local value added contained in exports, which is a source of wealth creation for the country (Benomar, El Bouanani, & Ezziani, 2022).

The results of our empirical study on the impact of wages on TFP are in line with the research findings of Görg, Strobl, & Walsh (2007), Urban (2010), Akerlof (1982), Katz (1986), Ghose & Biswas (2000), Kumar, Webber, & Perry (2012) and Klein (2012). These authors have revealed a long-term relationship between total factor productivity and wages.

As far as the impact of the real effective exchange rate on TFP is concerned, our results are consistent with the competitiveness hypothesis which suggests that exchange rate depreciations stimulate productivity growth and with studies conducted by Richard (2001), Darryl & Elitza (2011), Aghion, Bacchetta, Ranciere, & Rogoff (2006), Benhima (2012) and Diallo (2012) which found a negative impact between the real effective exchange rate and TFP.

Although this study empirically demonstrates the differentiated impact of Morocco's participation in global value chains (GVCs) on total factor productivity (TFP), it is essential to deepen the analysis of the mechanisms underlying these results in order to better understand their structural dynamics.

On the one hand, upstream participation (the import of foreign inputs intended for national production) has a negative effect on TFP. This result can be explained by several factors:

- The strong dependence on imported inputs limits opportunities for the development of local skills and slows down technological learning, thereby reducing potential productivity gains.
- This dependence also makes the Moroccan economy vulnerable to external shocks (such as price fluctuations, supply chain delays, etc.), which undermines the stability and efficiency of production chains.
- Finally, the lack of efforts toward local substitution and technological absorption prevents the emergence of an industrial fabric capable of generating long-term positive externalities.

On the other hand, downstream participation (the integration of Moroccan inputs into other countries' exports) contributes positively to TFP. This beneficial effect is driven by several mechanisms:

- Integration into global value chains forces Moroccan companies to comply with higher quality standards, thereby stimulating skill enhancement, organizational innovation, and improvements in production processes.
- This dynamic also promotes technology and know-how transfers through relationships with foreign contractors, creating a particularly significant learning-by-doing effect.
- Furthermore, the diversification of commercial outlets and access to larger international markets enable the exploitation of economies of scale, optimizing

resource allocation and strengthening overall competitiveness.

These results confirm the importance for Morocco of adopting industrial policies focused on enhancing local content in exports, while gradually reducing dependence on foreign inputs. The development of national productive capacities and qualitative integration into global value chains thus appear to be essential levers for sustainably supporting productivity growth.

## 5. Conclusion and Perspectives

This paper empirically studies the short- and long-term impact of Morocco's integration into global value chains on total factor productivity over the period 1991-2021. Two different measures of participation in global value chains were used—foreign value added in exports (upstream participation), and indirect value added (downstream participation).

We developed an econometric model using both the empirical review and the data available for the Moroccan case. The nature of the data used, the unit root tests and the cointegration “bounds test” have led us to use the ARDL model to estimate the selected specifications. Indeed, the ARDL model is appropriate for a small sample size (Narayan, 2005) and offers the possibility of dealing with both long-term and short-term relationships between variables, which is the case for our data.

The empirical results showed the existence of a long-term relationship between TFP and participation in global value chains, as well as with the other control variables for the period sampled in Morocco. Indeed, upstream participation in GVCs has a negative impact on TFP in the short and long term, while downstream participation has a positive effect on TFP in the short and long term.

The econometric study also shows that the real effective exchange rate has a negative impact on TFP in the short and long term, while wages have a positive impact on TFP in the short and long term.

The relevance of these results may reflect the fact that Moroccan exports are placed at the beginning of global value chains in the form of downstream integration, so a significant proportion of exports serve as inputs for exports of other countries. This probably reflects the predominance of primary commodities in Moroccan exports. As Morocco's participation in global value chains is beneficial to the economy, policymakers should take appropriate measures and adopt trade policies that promote participation in global value chains.

Nevertheless, this work has limitations both in terms of the length of data available in the Eora-GVC database, which is limited to 31 observations (years), and in terms of the variables used. Although they are the most widely used in previous research, other factors may also be examined in future research.

This research also opens the way for further investigations. It is recommended that the analysis be repeated at the sectoral level, since aggregation at the national level may hide other complexities. Finally, while the paper discusses the economic effects of GVCs participation, it is also important to examine the environmental

and social effects.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

## References

- Aghion, P., Bacchetta, P., Ranciere, R., & Rogoff, K. (2006). *Uncovering Some Causal Relationships between Productivity Growth and the Structure of Economic Fluctuations: A Tentative Survey*. National Bureau of Economic Research.
- Ajide, F. M. (2021). Entrepreneurship and Productivity in Africa: The Role of Institutions. *Journal of Sustainable Finance & Investment*, *12*, 147-168. <https://doi.org/10.1080/20430795.2021.1939645>
- Ajide, F. M. (2023). Global Value Chain and Total Factor Productivity in Africa. *Organizations and Markets in Emerging Economies*, *14*, 26-55. <https://doi.org/10.15388/omee.2023.14.81>
- Akerlof, G. A. (1982). Labor Contracts as Partial Gift Exchange. *The Quarterly Journal of Economics*, *97*, 543-569. <https://doi.org/10.2307/1885099>
- Akinlo, A. E., & Adejumo, O. O. (2016). Determinants of Total Factor Productivity Growth in Nigeria, 1970-2009. *Global Business Review*, *17*, 257-270. <https://doi.org/10.1177/0972150915619801>
- Amiti, M., & Wei, S. (2009). Service Offshoring and Productivity: Evidence from the Us. *The World Economy*, *32*, 203-220. <https://doi.org/10.1111/j.1467-9701.2008.01149.x>
- Barro, R. J., & Sala-i-Martin, X. (1995). *Economic Growth*. The MIT Press.
- Benhima, K. (2012). Exchange Rate Volatility and Productivity Growth: The Role of Liability Dollarization. *Open Economies Review*, *23*, 501-529. <https://doi.org/10.1007/s11079-011-9205-5>
- Benkovskis, K., Masso, J., Tkacevs, O., Vahter, P., & Yashiro, N. (2020). Export and Productivity in Global Value Chains: Comparative Evidence from Latvia and Estonia. *Review of World Economics*, *156*, 557-577. <https://doi.org/10.1007/s10290-019-00371-0>
- Benomar, F., El Bouanani, H., & Ezziani, A. (2022). L'intégration du Maroc et l'Afrique du Sud dans les Chaines de valeur mondiale: Cas du secteur automobile. *Revue Internationale du Chercheur*, *3*, 434-457.
- Benomar, F., El Bouanani, H., & Ezziani, A. (2023a). La participation aux Chaines de valeur mondiale et la mise à niveau économique: Revue de littérature et élaboration de modèle conceptuel. *Revue Française d'Economie et de Gestion*, *4*, 126-153.
- Benomar, F., El Bouanani, H., & Ezziani, A. (2023b). Morocco's Participation in Global Value Chains and the Impact on Economic Growth, Application of the Auto-Regressive Lag Model (ARDL). *Review of Economics and Finance*, *21*, 2559-2567.
- Carballa Smichowski, B., Durand, C., & Knauss, S. (2020). Participation in Global Value Chains and Varieties of Development Patterns. *Cambridge Journal of Economics*, *45*, 271-294. <https://doi.org/10.1093/cje/beaa046>
- CNUCED (2013). *Rapport sur les investissements dans le monde vue d'ensemble. Les chaînes de valeur mondiales: L'investissement et le commerce au service du développement*. Nations UNIES.
- Constantinescu, C., Mattoo, A., & Ruta, M. (2017). *Does Vertical Specialization Increase Productivity? World Bank Policy Research Working Paper*. World Bank.
- Crisuolo, C., Timmis, O., & Johnstone, N. (2016). *The Relationship between GVCs and*

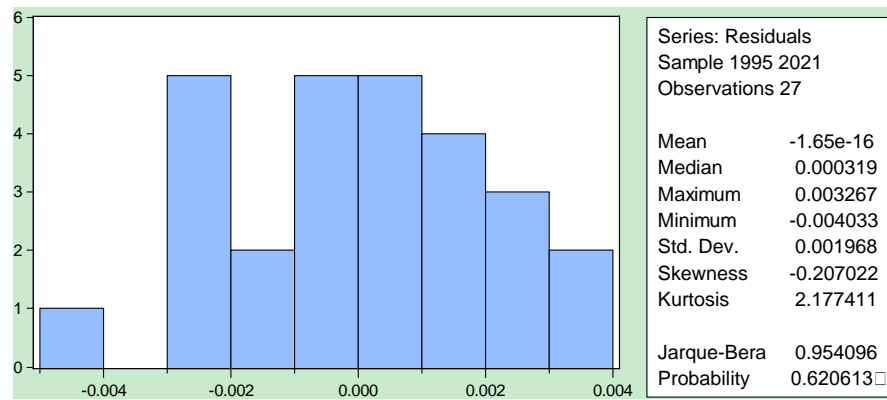
*Productivity*. OECD.

- Darryl, M., & Elitza, M. (2011). *Real Exchange Rate and Productivity Growth*. Fordham University Discussion Paper Series.
- Del Prete, D., Giovannetti, G., & Marvasi, E. (2017). Global Value Chains Participation and Productivity Gains for North African Firms. *Review of World Economics*, 153, 675-701. <https://doi.org/10.1007/s10290-017-0292-2>
- Diallo, I. A. (2012). *The Effects of Real Exchange Rate Volatility on Productivity Growth*. Centre d'Études et de Recherches sur le Développement International. MPRA.
- Driffield, N. (1996). *Global Competition and the Labour Market*. Routledge.
- Dutta, S. (2021). A Review of Literature of Global Value Chains. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.3784163>
- Egger, H., & Egger, P. (2006). International Outsourcing and the Productivity of Low-Skilled Labor in the EU. *Economic Inquiry*, 44, 98-108. <https://doi.org/10.1093/ei/cbi059>
- Epifani, P. (2003). *Trade Liberalization, Firm Performance and Labor Market Outcomes in the Developing World: What Can We Learn from Micro-Level Data?* World Bank.
- Fagerberg, J., Lundvall, B., & Srholec, M. (2018). Global Value Chains, National Innovation Systems and Economic Development. *The European Journal of Development Research*, 30, 533-556. <https://doi.org/10.1057/s41287-018-0147-2>
- Feenstra, R. C., & Hanson, G. H. (1996). *Globalization, Outsourcing, and Wage Inequality*. National Bureau of Economic Research.
- Feng, X., Xin, M., & Cui, X. (2020). Impact of Global Value Chain Embedding on Total-Factor Energy Productivity of Chinese Industrial Sectors. *Journal of Renewable Energy*, 2020, Article ID: 6239640. <https://doi.org/10.1155/2020/6239640>
- Fessehaie, J., & Morris, M. (2018). *Global Value Chains and Sustainable Development Goals: What Role for Trade and Industrial Policies?* International Centre for Trade and Sustainable Development.
- Fosfuri, A., Motta, M., & Rønne, T. (2001). Foreign Direct Investment and Spillovers through Workers' Mobility. *Journal of International Economics*, 53, 205-222. [https://doi.org/10.1016/s0022-1996\(00\)00069-6](https://doi.org/10.1016/s0022-1996(00)00069-6)
- Foster-McGregor, N., & Verspagen, B. (2016). The Role of Structural Change in the Economic Development of Asian Economies. *Asian Development Review*, 33, 74-93. [https://doi.org/10.1162/adev\\_a\\_00073](https://doi.org/10.1162/adev_a_00073)
- Garzarelli, G., & Limam, Y. R. (2019). Physical Capital, Total Factor Productivity, and Economic Growth in Sub-Saharan Africa. *South African Journal of Economic and Management Sciences*, 22, a2309. <https://doi.org/10.4102/sajems.v22i1.2309>
- Ge, J., Fu, Y., Xie, R., Liu, Y., & Mo, W. (2018). The Effect of GVC Embeddedness on Productivity Improvement: From the Perspective of R&D and Government Subsidy. *Technological Forecasting and Social Change*, 135, 22-31. <https://doi.org/10.1016/j.techfore.2018.07.057>
- Ghose, A., & Biswas, P. (2000). *Nexus between Real Effective Exchange Rate and Total Factor Productivity Growth of Manufacturing Sector: Evidence from a Non-Parametric Approach with Indian Data*. Gauhati University.
- Glass, A. J., & Saggi, K. (2002). Multinational Firms and Technology Transfer. *The Scandinavian Journal of Economics*, 104, 495-513. <https://doi.org/10.1111/1467-9442.00298>
- Globerman, S. (2011). Global Value Chains: Economic and Policy Issues. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.2179533>

- Görg, H., Strobl, E., & Walsh, F. (2007). Why Do Foreign-Owned Firms Pay More? The Role of On-the-Job Training. *Review of World Economics*, 143, 464-482. <https://doi.org/10.1007/s10290-007-0117-9>
- Grossman, G. M., & Helpman, E. (1991). Quality Ladders in the Theory of Growth. *The Review of Economic Studies*, 58, 43-61. <https://doi.org/10.2307/2298044>
- Grossman, G., & Rossi-Hansberg, E. (2007). The Rise of Offshoring. It's Not Wine for Cloth Anymore. In F. R. City, (Éd.), *The New Economic Geography: Effects and Policy Implications* (pp. 59-102). Federal Reserve Bank of Kansas City.
- Harris, R. (2000). *The New Economy and the Exchange Rate Regime*. The John Deutsch Institute for the Study of Economic Policy. Queen's University.
- Helpman, E., & Krugman, P. (1987). *Market Structure and Foreign Trade: Increasing Returns, Imperfect Competition, and the International Economy*. The MIT Press.
- Hummels, D., Ishii, J., & Yi, K. (2001). The Nature and Growth of Vertical Specialization in World Trade. *Journal of International Economics*, 54, 75-96. [https://doi.org/10.1016/s0022-1996\(00\)00093-3](https://doi.org/10.1016/s0022-1996(00)00093-3)
- Katz, L. F. (1986). Efficiency Wage Theories: A Partial Evaluation. *NBER Macroeconomics Annual*, 1, 235-276. <https://doi.org/10.1086/654025>
- Klein, N. (2012). Real Wage, Labor Productivity, and Employment Trends in South Africa: A Closer Look. *IMF Working Papers*, 12, 1. <https://doi.org/10.5089/9781475502824.001>
- Kordalska, A., Wolszczak-Derlacz, J., & Parteka, A. (2016). Global Value Chains and Productivity Gains: A Cross-Country Analysis. *Collegium of Economic Analysis Annals*, 41, 11-28.
- Kowalski, P., Gonzalez, J. L., Ragoussis, A., & Ugarte, C. (2015). *Participation of Developing Countries in Global Value Chains: Implications for Trade and Trade-Related Policies*. OECD Publishing.
- Kruger, S. M. (1985). *Productivity and Nest-Site Selection of Eastern Bluebirds in Wisconsin*. Ph.D. Thesis, University of Wisconsin-Stevens Point, College of Natural Resources.
- Kumar, S., Webber, D. J., & Perry, G. (2012). Real Wages, Inflation and Labour Productivity in Australia. *Applied Economics*, 44, 2945-2954. <https://doi.org/10.1080/00036846.2011.568405>
- Kummritz, V. (2016). *Do Global Value Chains Cause Industrial*. Centre for Trade and Economic Integration.
- Li, S. D., & Liu, Z. Q. (2014). A Dynamic North-South Model of Trade and Learning-by-Doing. *Journal of International Economics*, 93, 276-290.
- Liu, C., & Saam, M. (2021). ICT and Productivity Growth within Value Chains. *Review of Income and Wealth*, 68, 711-737. <https://doi.org/10.1111/roiw.12533>
- Lu, Y., Sun, S. L., & Chen, Y. (2016). *Global Value Chain Embeddedness and Latecomer's Productivity: Examining the Springboard Perspective*. National University of Singapore.
- McMillan, M., & Rodrik, D. (2011). Globalization, Structural Change and Productivity Growth. In D. M. Bacchetta, & M. Jansen (Eds.), *Making Globalization Socially Sustainable* (pp. 49-84). WTO. <https://doi.org/10.30875/b10cb347-en>
- Mitra, D., & Ranjan, P. (2007). *Offshoring and Unemployment*. Institute of Labor Economics (IZA).
- Narayan, P. K. (2005). The Saving and Investment Nexus for China: Evidence from Cointegration Tests. *Applied Economics*, 37, 1979-1990. <https://doi.org/10.1080/00036840500278103>
- Nayak, S., & Patra, S. (2013). Wage-Labour Productivity Relationship in Manufacturing

- Sector of Odisha: An Observed Analysis. *International Journal of Engineering Science Invention*, 2, 8-11.
- Nomaler, Ö., & Verspagen, B. (2014). *Analysing Global Value Chains Using Input-Output Economics: Proceed with Care*. Working Paper, United Nations University-MERIT.
- Olasehinde-Williams, G., & Oshodi, A. (2021). Global Value Chains and Export Growth in South Africa: Evidence from Dynamic ARDL Simulations. *Transnational Corporations Review*.
- Pal, M., & Das, N. (2014). An Empirical Analysis on Total Factor Productivity Growth, Employment & Wages in Indian Basic Metal Industry: 1980-81 to 2010-11. *The Journal of Industrial Statistics*, 3, 288-309.
- Pandya, N. A., & Mehta, A. S. (2015). Nexus between Total Factor Productivity Growth of Manufacturing Sector, Growth Rate of Output and Exchange Rate: Does Exchange Rate Play a Significant Role? *International Journal of Social and Economic Research*, 5, 53-75. <https://doi.org/10.5958/2249-6270.2015.00041.0>
- 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>
- Richard, B. (2012). *Global Supply Chains: Why They Emerged, Why They Matter, and Where They Are Going*. CEPR Discussion Paper.
- Richard, H. (2001). *Is There a Case for Exchange Rate Induced Productivity Changes?* Centre for International Economic Studies.
- Rodrik, D. (1988). Imperfect Competition, Scale Economies, and Trade Policy. In D. R. E. Baldwin, & R. E. Baldwin (Éds.), *Trade Policy Issues and Empirical Analysis* (pp. 109-144). University of Chicago Press.
- Stiglitz, J., & Pike, R. M. (2022). Globalization and Its Discontents (Review). *The Canadian Journal of Sociology*, 29, 321-324. <https://doi.org/10.1353/cjs.2004.0028>
- Sydor, A. (2011). *Global Value Chains: Impacts and Implications*. Foreign Affairs and International Trade Canada.
- Tong, Y., & Seric, A. (2019). *What Are Global Value Chains and Why Do They Matter?* <https://iap.unido.org/articles/what-are-global-value-chains-and-why-do-they-matter>
- Urata, S., & Baek, Y. (2020). Does Participation in Global Value Chains Increase Productivity? An Analysis of Trade in Value Added Data. *Thailand and The World Economy*, 38, 1-28.
- Urban, D. M. (2010). FDI, Technology Spillovers, and Wages. *Review of International Economics*, 18, 443-453. <https://doi.org/10.1111/j.1467-9396.2010.00909.x>
- Wakeford, J. (2004). The Productivity-Wage Relationship in South Africa: An Empirical Investigation. *Development Southern Africa*, 21, 109-132. <https://doi.org/10.1080/0376835042000181444>
- Winkler, D. (2010). Services Offshoring and Its Impact on Productivity and Employment: Evidence from Germany, 1995-2006. *The World Economy*, 33, 1672-1701. <https://doi.org/10.1111/j.1467-9701.2010.01269.x>
- Yanikkaya, H., & Altun, A. (2018). Impacts of Participation in Export Value Chains on TFP Growth. *Ege Academic Review*, 19, 119-129.
- Yanikkaya, H., & Altun, A. (2020). The Impact of Global Value Chain Participation on Sectoral Growth and Productivity. *Sustainability*, 12, Article 4848. <https://doi.org/10.3390/su12124848>
- Young, A. (1991). Learning by Doing and the Dynamic Effects of International Trade. *The Quarterly Journal of Economics*, 106, 369-405. <https://doi.org/10.2307/2937942>

## Appendix



**Figure A1.** Jarque-Bera test for normality of residuals Source: Auteurs (our graphs on Eviews 12).

**Table A1.** Breusch-Pagan-Godfrey test for heteroskedasticity (Source: Authors (our estimates on Eviews 12)).

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
Null Hypothesis: Homoskedasticity			
F-statistic	0.602799	Prob. F (23, 3)	0.7964
Obs*R-squared	22.19698	Prob. Chi-Square (23)	0.5084
Scaled explained SS	0.161327	Prob. Chi-Square (23)	1.0000

**Table A2.** Lagrange multiplier (LM) test for autocorrelation of residuals (Source: Authors (our estimates on Eviews 12)).

Breusch-Godfrey Serial Correlation LM Test			
Null Hypothesis: No serial correlation at up to 2 lags			
F-statistic	6.844814	Prob. F (2, 1)	0.2609
Obs*R-squared	25.16197	Prob. Chi-Square (2)	0.0000