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Impact of Global Value Chains on the Performance of Moroccan Exports: Sector Analysis with Economic Dependencies

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Abstract: *The last few decades have been marked by profound changes in international trade, which is increasingly organised around global value chains. Theoretical and empirical research shows the benefits associated with increasing participation in global value chains (GVCs) for both developed and developing countries. However, empirical studies on the effects of backward and forward participation in GVCs for the specific case of a country remain limited. This article seeks to examine whether Morocco's backward and forward participation in GVCs improves the performance of its exports over the period of 1995 to 2018 using different cointegration techniques in panel data. Our empirical results show that forward and backward participation positively impact exports and domestic value added in Moroccan exports. They also indicate that domestic and foreign service inputs contribute positively to this performance. Based on the obtained results, we propose some recommendations for policymakers.*

Keywords: Global value chains; Economics dependencies; Panel unit root; Cointegration analysis; Moroccan exports
JEL Classification: F13, F53, C51

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1. Introduction

More than two decades of development of global value chains (GVCs) have disrupted the structure of global foreign trade. Intermediate products and commercial services benefit from the development of means of transport and communication technologies. The latter has facilitated the transfer of information and products to all four corners of the world, which has given more margins to companies, mainly multinationals, to fragment and disperse their production processes and to manage their production networks on a global scale.

These changes have led to a shift from a trade in goods to a "trade in tasks" (Grossman & Rossi-Hansberg, 2008), i.e., more trade in intermediate goods and services, due to the widespread emergence of fragmentation/relocation of production processes. This involves adding valuable elements in many places (Baldwin & Robert-Nicoud, 2014) and weakening the link between labour specialisation and geographic concentration, making segregation of duties in the workplace increasingly viable in time and in space. The result has been a boom in the "offshoring" of manufacturing tasks and other business functions (Grossman & Rossi-Hansberg, 2008). The appearance of international production and exploitation activities distributed spatially in different countries and regions of the world is qualified by researchers as GVCs, which describe all the activities carried out by companies and workers around the world to bring a product from conception to end use and beyond (Gereffi & Fernandez-Stark, 2016). This includes value-added activities such as research and development (R&D), design, production, distribution, marketing and end-consumer services. GVCs are therefore made up of inter-firm cross-border networks that bring a good or service to market.

The globalisation of value chains has enabled emerging and developing countries to create new branches by specialising in one or a few activities without developing the entire chain from upstream to downstream. However, this new reality has created statistical and economic challenges. Statistically, the traditional tools for measuring gross exports posed a problem of double counting of intermediate products that cross borders several times and a problem of allocating all the value added to the last exporter (Banga, 2014; Escaith, 2015). The appearance of databases of trade in value added—e.g., the Organisation for Economic Co-operation and Development (OECD)

and the World Trade Organization's (WTO) TiVA database, and the United Nations Conference on Trade and Development (UNCTAD) and Eora's GVC database —count only the added value added by each country to the finished products, thus reflecting trade performance in the framework of GVCs. On the economic front, countries had to take the rise of GVCs into consideration when defining their trade and economic policies to take advantage of them. The question of the repercussions of GVCs on the commercial level may then arise.

Beltramello et al. (2012) point out the growing importance of GVCs in the international organisation of production is increasingly challenging the traditional way of measuring countries' export performance and therefore international competitiveness. Due to the increasing fragmentation of production, a country's export bundle includes imports of intermediate goods representing a large part of its value.

The theoretical debates mentioned above allow us to analyse the participation of the Moroccan economy in the GVCs. Indeed, Morocco is among the leading exporters and producer of phosphate in the world and one of the largest fertiliser manufacturers. This has given it a marked position in the global economy. In addition, the Moroccan economy has sectorial strengths that have enabled it to be integrated into the GVCs and to compete with other countries. These assets are manifested through the automotive industry, the country's leading export sector. The kingdom has extraordinary untapped agricultural and natural potential to further develop its renewable energy sector or significantly increase its food and energy independence. The performance of the textile and garment sector is limited, and the country has suffered heavy losses in terms of competitiveness (Amachraa & Quelin, 2022).

Since the early 2000s, Morocco has increasingly participated in GVCs to become a major player in the automotive and aeronautics industries, and an African hub for international investors. However, it is no longer enough to integrate GVCs to achieve gains (Banga, 2014). This article therefore seeks to answer the following question: What is the impact of participation in GVCs on the performance of Moroccan exports?

Thus, Section 2 reviews the work on GVCs, which is characterised by a wide range of cases with results that seem to contradict the assumptions of traditional trade theory. Section 3 illustrates the empirical strategy as well as the data used, Section 4 presents the results, and their discussion and Section

5 concludes the paper.

2. Literature Review

GVC integration concerns all countries participating in international trade to varying degrees. Recent studies show that developing and emerging countries play an increasingly important role in trade in intermediate products, which makes their share in GVCs remarkable.

Indeed, these countries participate in GVCs by specialising in one or a few upstream or downstream segments. The basis of this vertical specialisation is the abundance of resources and the comparative advantages of each country. In this sense, rentier countries are rather upstream of GVCs, while developed countries are rather present upstream and downstream of chains with knowledge-intensive service segments (Qiang et al., 2021). However, this form of specialisation is not generalised on all chains; developed countries are still concentrated in high-tech value chains. The latter are characterised by a strong geographical concentration (the example of Silicon Valley) and remain monopolised by a restricted club of countries.

Researchers have presented indicators for measuring participation in GVCs using macro and micro data. In the first case, the studies referred to international input-output tables derived from national supply-use tables (SUT) and national input-output tables (IOT) (Borin & Mancini, 2019; Koopman et al., 2010, 2014; Wang et al., 2017). In the second case, the studies relied on firm-level data to decipher the boundaries between domestic value chains and GVCs and the degree of integration of local firms (Kee & Tang, 2016; Urata & Baek, 2020).

Regarding the gains from trade within GVCs, studies are relatively new in the international economic community. In this regard, Kowalski et al. (2015) conclude that broader engagement in GVCs, whether by using more foreign value added (FVA) embodied in imported intermediates or by importing more sophisticated intermediates, has a positive impact on the domestic value added (DVA) embodied in exports, although there is great heterogeneity between income groups. This implies that there is no unique way to capture the gains from GVCs, since these seem to depend strongly on the structure of specialisation and the level of development. Lopez Gonzalez (2016) arrives at the fact that the Association of Southeast Asian Nations (ASEAN) have benefited from the use of FVA to increase the DVA contained

in their sectoral exports. The use of FVA was therefore a complement, and not a substitute, for the development of domestic capacities. In this framework, Yu and Luo (2017) find that productivity improvement, R&D inputs and gross fixed capital formation, as well as synergies between R&D and vertical specialisation affect positive on the growth of DVA contained in Chinese sectoral exports.

Hua (2022) analyses the determinants of domestic value added in exports during the period 2005-2014 using panel-specific means (fixed effects) of 16 Chinese manufacturing sectors. The study shows positive effects of labour productivity, capital intensity, employment and China's GVCs moving up on DVA in exports. In line with these studies, Hermida et al. (2022) examine the long-term effects between four GVCs measures and growth between 1995 and 2011 for 40 developed and emerging countries. Their study, which takes a panel autoregressive dynamics lags (PARLD) approach, indicates that higher levels of international fragmentation of production and GVC participation allow higher GDP per capita growth rates, and that fragmentation and GVC participation are more important to GDP growth than the gross exports (as a percentage of GDP). Jangam and Rath (2021) investigate whether participation in GVCs improve the DVA in exports in panel of 24 emerging market economies (EMEs) from 1995 to 2011. By controlling the existing dependencies of the countries and using panel FGLS techniques, their empirical findings indicate that both forward and backward participation in GVCs significantly enhance the domestic value-added in exports for EMEs, indicating economic upgrading.

In addition, Jangam and Akram (2019) investigate the long-term effects of GVCs by using a panel of 91 economies categorised into high-, middle-, and low-income groups from 1995 to 2017. The results from the Westerlund (2007) cointegration test without structural breaks and without economic dependencies show a long-run link between GVCs and export concentration for all the income groups. Olasehinde-Williams and Oshodi (2021) tried to examine the cointegration relationship through the ARDL model in South Africa over the period of 1990 to 2019. They find that the backward linkages (foreign value added) and domestic impacts on export growth and indirect value added (forward linkages) have a significant short-run and long-run increasing effect on export growth in the country.

By studying a sample of Central and Eastern European countries (CEECs), Olczyk and Kordalska (2017) indicate that labour productivity

and highly qualified employees have a significant positive impact on the generation of domestic added value. For his part, Vrh (2018) compared the CEECs with the EU-15 countries and showed that the differences in the share of DVA in exports depend on investments in intangible capital, in particular investments in R&D. In addition, inward FDI leads to a reduction in the demand for local inputs for both groups of countries, thus reducing the DVA in exports. More recently, Pahl and Timmer (2020) provide long-term econometric evidence of the impact of GVC participation on economic upgrading using data since 1970 across a broad set of countries. They find that greater integration into GVCs has a positive effect on labour productivity, embodied in formal manufacturing exports.

The share of services value added in goods exports has grown remarkably in recent years (Heuser & Mattoo, 2017). Indeed, Miroudot and Cadestin (2017) show that service inputs, whether domestic or foreign, account for around 37% of the value of manufacturing exports in the sample of countries covered. Along the same lines, Baldwin et al. (2015) suggest that the more a country/industry is involved as a supplier of third country exports, the more it is dependent on the value added of third countries' foreign services. To examine the implications of services development on the export performance of manufacturing sectors, Liu et al. (2019) constructed new measures of revealed comparative advantage based on DVA in gross exports. They show that the development of financial and business services improves the revealed comparative advantage of manufacturing sectors that use these services intensively, but not of other manufacturing sectors. They also find that a country can partially overcome the handicap of an underdeveloped domestic service sector by relying more on imported service inputs, which can help promote its exports of manufactured goods.

In the case of Morocco, research on the evaluation of the kingdom's participation in GVCs and its impact on its trade performance remains limited. They mainly concern specific sectors, such as the automotive and aeronautics industries (Benaini, 2020; Jaidi & Msadfa, 2017; Lam'hammdi & Makhtari, 2020), services (Rodriguez et al., 2019), or SMEs (Augier et al., 2019). However, studies on the impact of GVCs on macroeconomic performance are minimal. These studies conclude that Morocco's participation in GVCs presents opportunities for productivity gains (Aït Ali & Msadfa, 2016) and structural transformation (Aït Ali & Msadfa, 2019). Del Prete et al. (2017, 2018) remain the researchers to present an

econometric modelling of the impact of GVCs on firms and countries in North Africa (Algeria, Egypt, Libya, Morocco and Tunisia). They find that firms that participate in GVCs both perform better ex-ante, and show additional productivity gains ex-post. Similarly, improving the integration of North African countries into GVCs can substantially benefit local industries, countries and even the region.

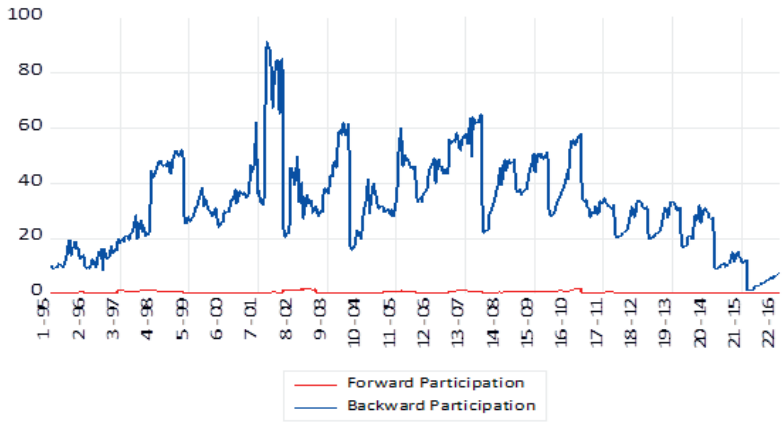
3. Empirical Analysis

3.1 Descriptive analysis of GVC participation in Morocco

In this subsection, we present the evolution of Morocco's participation in GVCs, the following variables: domestic value added, gross exports, and forward and backward participation. This panel analysis includes 22 sectors covering agriculture, industry and services during the period of 1995 to 2018.

Figure 1 depicts the evolution of forward and backward participation in 22 economic sectors in Morocco (1995-2018). This figure shows that backward participation is more significant than forward participation.

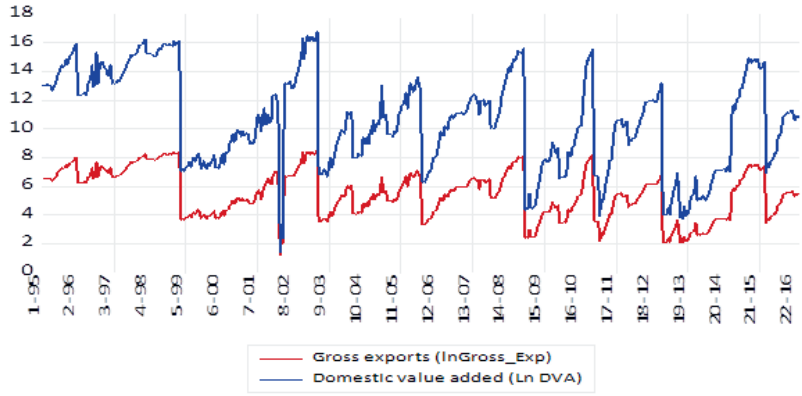
Figure 1: Evolution of Forward and Backward Participation in 22 Sectors in Morrocco (1995-2018)



Source: TiVA database.

The evolution of gross exports and DVA are represented in Figure 2. We notice the two series for the 22 sectors analysed evolve in the same direction. This assumes the possibility of the existence of dependency between DVA and gross exports.

Figure 2: Evolution of gross exports and domestic value added in Morrocco (1995-2018)



Source: TiVA database.

3.2. Data and model specification

Based on the literature review, this section contains the empirical analysis of the impact of GVC participation on Moroccan export performance for 22 sectors. Our data comes from the latest version of the TiVA database (ed. 2021) from OECD-WTO, the International Labor Organization (ILO) and the UN Industrial Development Organization (UNIDO) and covers the period of 1995 to 2018. Within this empirical framework, we express our model of export performance in terms of GVC participation indicators and industry variables discussed in the literature.

Following the model used by Yu and Luo (2017), we estimate the model defined below:

$$lnexp_{it} = \alpha_i + \beta_1 GVC_{it} + \beta_2 D\_Services_{it} + \beta_3 F\_Services_{it} + \beta_4 lnLP_{it} + \varepsilon_{it} \quad (1)$$

In Equation (1), $lnexp_{it}$ is the dependent variable and represents the

DVA contained in exports and gross exports (Gross_Exp) of sector i in year t; GVC_{it} represents the GVC participation index; $D\_Services_{it}$ represents the share of domestic value added content of services in exports; $F\_Services_{it}$ is the share of foreign value added content of services in exports; and LP_{it} represents labour productivity.

As for the variables used for statistical estimates, *exp* is the measure of Moroccan sectoral exports. At this stage, we count two indicators: gross exports, or the exports of traditional international trade statistics which contain a share of FVA, and the second indicator, which only considers the DVA contained in exports. In our analysis, we will use the two indicators to be able to compare the impact of participation in GVCs on gross exports and on exports in value added.

GVC represents the GVC participation index, which is composed of two indices: the backward participation (BP) index and the forward participation (FP) index. The GVC participation index is the sum of these two indices. We expect them to have a positive sign.

According to Koopman et al. (2014), the BP index is the share of foreign value added (FVA) contained in gross exports, while the FP index is the domestic value added exported in intermediate products re-exported to third countries (DVX) as a percentage of gross exports. The two indices are calculated as follows:

$$\text{Backward participation} = \text{FVA/gross exports}$$
$$\text{Forward participation} = \text{DVX/gross exports}$$

BP and FP determine the GVC participation index, which is defined as follows:

$$\text{GVC participation index} = (\text{FVA}+\text{DVX})/\ (\text{gross exports})$$

D_Services is the share of the domestic value added of services contained in the secto's exports. The expected sign of this variable is positive. *F_Services* is the share of foreign value added of services contained in the sector's exports. The expected sign of this variable is negative. *LP* is labor productivity defined as the ratio between the value added and the number of employees in the sector concerned. We expect a positive effect of this variable on exports.

Before checking the stationarity of the variables and the cointegration between the endogenous variable and the exogenous variables, we will analyse the correlation matrix of the exogenous variables so as not to introduce the correlated variables into the same model. Table 1 reports the results of this matrix.

Table 1: Correlation Matrix

Variables	LnDVA	LnGross_ Exp	BP	FP	GVC	D_ Services	F_ Services	LnLP
LnDVA	1.000							
LnGross_ Exp	0.983*** (0.000)	1.000						
BP	-0.101*** (0.000)	0.073* (0.092)	1.000					
FP	0.559*** (0.000)	0.601*** (0.000)	0.290*** (0.000)	1.000				
GVC	-0.086** (0.050)	0.087 (0.045)	1.000*** (0.000)	0.312*** (0.000)	1.000			
D_ Services	-0.073* (0.092)	-0.150*** (0.001)	-0.521*** (0.000)	-0.289*** (0.000)	-0.524*** (0.000)	1.000		
F_ Services	0.032 (0.468)	0.151*** (0.001)	0.811*** (0.000)	0.361*** (0.000)	0.814*** (0.000)	-0.448*** (0.000)	1.000	
LnLP	0.271*** (0.000)	0.308*** (0.000)	0.205*** (0.000)	0.400*** (0.000)	0.213*** (0.000)	-0.109** (0.012)	0.140**** (0.001)	1.000

Note: Probability values in parentheses.

From the results in Table 1, we see a strong correlation between the independent variables BP, GVC, and F_Services, which means that we should not include them in the same model under the risk of multicollinearity because the correlation coefficients are greater than 70%. These tests result also indicate that there is still a relationship (correlation that can be tolerated); otherwise, it can be concluded that there is no problem of multicollinearity. Therefore, we derive the following sub-models:

Model 1

$$lnDVA_{it} = \alpha_i + \beta_1 BP_{it} + \beta_2 FP_{it} + \beta_3 D\_Services_{it} + \beta_4 lnLP_{it} + \varepsilon_{it} \qquad (2)$$

Model 2

$$lnDVA_{it} = \alpha_i + \beta_1 BP_{it} + \beta_2 D\_Services_{it} + \beta_3 F\_Services_{it} + \beta_4 lnLP_{it} + \varepsilon_{it} \quad (3)$$

Model 3

$$lnDVA_{it} = \alpha_i + \beta_1 GVC_{it} + \beta_2 D_{Services_{it}} + \beta_3 lnLP_{it} + \varepsilon_{it} \quad (4)$$

Model 4

$$lnGross\_Expit = \alpha_i + \beta_1 BP_{it} + \beta_2 FP_{it} + \beta_3 D_{Services_{it}} + \beta_4 lnLP_{it} + \varepsilon_{it} \quad (5)$$

Model 5

$$lnGross\_Expit = \alpha_i + \beta_1 FP_{it} + + \beta_2 D_{Services_{it}} + \beta_3 F_{Services_{it}} + \beta_4 lnLP_{it} + \varepsilon_{it} \quad (6)$$

Model 6

$$lnGross\_Expit = \alpha_i + \beta_1 GVC_{it} + + \beta_2 D_{Services_{it}} + \beta_3 lnLP_{it} + \varepsilon_{it} \quad (7)$$

In this study, before estimating the different models, it is suggested to perform the stationarity tests of our variables in the context of the panel.

3.2 Panel unit root tests

Before testing the long-term relationship between our variables, we first apply the first-generation (without dependence), second-generation (with dependence) and third-generation stationarity tests. The results are reported in Table 2.

From Table 2, the results of the first- and second-generation tests show that some series are integrated of order 1 and others are stationary in level. Moreover, the Carrion-i-Silvestre et al. (2005) test under the hypothesis of interdependence without structural breaks shows that all the bootstrap values (values in square brackets), with a heterogeneous panel, are higher than the critical values. This last test confirms that when these interdependencies between the sectors of the panel are considered, the series in question become stationary in level.

Table 2: Panel Unit Root Tests

Variables	Levin et al. (2002)	Im et al. (2003)	Bai & Ng (2004)	Carrion-I-Silvestre et al. LM ( )-test	
Ln DVA	-0.665 (0.253)	2.987 (0.999)	-0.568 (0.878)	-2.818 (0.998) [12.408]	10.130 (0.000) [22.868]
Δ(LnDVA)	-16.993 (0.000)	-16.269 (0.000)	-4.723 (0.000)	–	–
LnGross_Exp	-0.948 (0.172)	2.760 (0.997)	-1.298 (0.627)	-2.397 (0.992) [13.920]	10.544 (0.000) [24.429]
Δ(LnGross_Exp)	-17.969 (0.000)	-17.326 (0.000)	-4.595 (0.000)	–	–
BP	-2.391 (0.008)	0.141 (0.556)	-1.737 (0.414)	-1.663 (0.951) [14.507]	8.332 (0.000) [25.644]
Δ(BP)	–	-17.131 (0.000)	-5.041 (0.000)	–	–
FP	-2.078 (0.019)	-1.263 (0.103)	-1.583 (0.500)	2.213 (0.013) [17.280]	10.127 (0.000) [28.987]
Δ(FP)	–	-19.619 (0,000)	-5.696 (0.000)	–	–
GVC	-2.522 (0.006)	0.122 (0.549)	-1.752 (0.404)	-1.641 (0.950) [14.711]	8.666 (0.000) [23.781]
Δ(GVC)	–	-18.152 (0.000)	-5.072 (0.000)	–	–
D_Services	-2.750 (0.003)	-0.454 (0.325)	-2.294 (0.170)	-2.895 (0.998) [20.842]	19.898 (0.000) [24.386]
Δ(D_Services)	–	-14.763 (0.000)	-4.015 (0.000)	–	–
F_Services	0.591 (0.723)	3.088 (0.999)	-1.111 (0.709)	11.648 (0.000) [10.604]	13.327 (0.000) [23.234]
Δ(F_Services)	-19.454 (0.000)	-19.011 (0.000)	-5.603 (0.000)	–	–
LnLP	-1.132 (0.129)	-0.633 (0.263)	-2.863 (0.050)	11.406 (0.000) [15.472]	2.969 (0.001) [25.598]
Δ(LnLP)	-17.863 (0.000)	-16.341 (0.000)	-5.877 (0.000)	–	–

Note: Probability values in parentheses. Bootstrap values in square brackets

After these unit root tests, we will check if there is a long-term relationship between the variables of our models.

3.3 Panel cointegration tests

To analyse the effect of long-term GVC participation variables on sectoral export performance (gross and value added) in Morocco, we used cointegration tests under the following two assumptions: without interdependencies and with economic interdependencies. In the case of our panel, it seems difficult to reject this last hypothesis because of the strong integration of the activities of multinationals through GVCs. To test the existence or otherwise of this hypothesis of interdependence between sectors, we applied the Pesaran (2004) test and calculated the cross-section dependence (CD) statistic. The results are given in Table 3.

Table 3: Pesaran (2004) Dependency Test

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
Pesaran CD	48.14 (0.000)	46.71 (0.000)	45.52 (0.000)	49.19 (0.000)	48.72 (0.000)	46.70 (0.000)

Note: The null hypothesis is the absence of interdependence. Probability values in parentheses.

According to the Pesaran (2004) test, the null hypothesis of the absence of interdependence between sectors is rejected regardless of the model used. This confirms that these sectors are very interdependent and that there are similar regulations applicable to the sectors on the economic, financial, commercial and institutional level, etc. In addition, economic globalisation also seems to accentuate this economic interdependence between the sectors of our panel.

Given that the coefficients of the explanatory variables of our models can have a heterogeneous impact according to the literature, we will verify this hypothesis of heterogeneity through the test of Pesaran and Yamagata (2008). The results of this test are presented in Table 4. According to these results, the null hypothesis of homogeneity of the coefficients of the explanatory variables is radically rejected according to the values of $\Delta^{\wedge}$ and adjusted $\Delta^{\wedge}$. In this study, we will consider that the estimators are heterogeneous in panel.

Table 4: Results of Homogeneity Test

Model	Test statistics	Probability value
Model 1		
Δ^	19.578	0.000
Δ^*adj*	15.792	0.000
Model 2		
Δ^	17.712	0.000
Δ^*adj*	20.317	0.000
Model 3		
Δ^	19.578	0.000
Δ^*adj*	22.457	0.000
Model 4		
Δ^	19.681	0.000
Δ^*adj*	22.575	0.000
Model 5		
Δ^	17.096	0.000
Δ^*adj*	19.611	0.000
Model 6		
Δ^	19.635	0.000
Δ^adj	22.522	0.000

This result may have economic implications for policymakers to consider. Our research attempts to analyse the long-term relationship for all the specifications retained by applying cointegration tests without interdependencies (Pedroni, 1999; Westerlund, 2005) and with interdependencies (Westerlund & Edgerton, 2007). The results of these tests are presented in the following Tables 5.1, 5.2 and 5.3.

The Pedroni (1999) test shows that all the results are mixed and do not confirm the cointegration relationship for all the models retained. Therefore, we conducted the Cusum test of Westerlund (2005), which is a residual-based test with the null hypothesis of panel cointegration. The test results are presented in Table 5.2.

Table 5.1: Pedroni (1999) Cointegration Test

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Panel v-statistics	-0.878	-0.462	-0.548	-0.959	-0.508	-0.571
	(0.810)	(0.678)	(0.708)	(0.831)	(0.694)	(0.716)
Panel rho-statistics	1.341	1.102	0.604	0.117	0.779	0.508
	(0.910)	(0.865)	(0.727)	(0.547)	(0.782)	(0.694)
Panel PP-statistics	-2.108	-3.196	-1.793	-5.406	-3.918	-1.967
	(0.018)	(0.001)	(0.037)	(0.000)	(0.000)	(0.025)
Panel ADF-statistics	-2.329	-3.610	-2.322	-1.735	-0.473	0.115
	(0.010)	(0.000)	(0.010)	(0.041)	(0.318)	(0.546)
Group rho-statistics	2.523	2.249	1.420	1.664	1.993	1.290
	(0.994)	(0.988)	(0.922)	(0.952)	(0.977)	(0.902)
Group PP-statistics	-4.846	-5.596	-4.640	-7.832	-6.797	-4.835
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Group ADF-statistics	-3.706	-5.148	-3.975	-2.422	-1.690	-0.796
	(0.000)	(0.000)	(0.000)	(0.008)	(0.046)	(0.213)

Note: The null hypothesis of the Pedroni (1999) tests is the absence of cointegration. Probability values are in parentheses.

Table 5.2: Westerlund (2005) Cusum Cointegration Test

	FMOLS	DOLS
Model 1 (with DVA)		
Model with constant	0.280 (0.233)	19.886 (0.000)
Model with constant and trend	2.592 (0.005)	33.967 (0.000)
Model 2 (with DVA)		
Model with constant	14.724 (0.000)	11.858 (0.000)
Model with constant and trend	5.162 (0.000)	7.199 (0.000)
Model 3 (with DVA)		
Model with constant	3.208 (0.001)	1.885 (0.030)
Model with constant and trend	3.113 (0.001)	3.65 (0.000)

	FMOLS	DOLS
Model 4 (with Gross_Exp)		
Model with constant	0.752 (0.226)	18.482 (0.000)
Model with constant and trend	3.290 (0.001)	32.416 (0.000)
Model 5 (with Gross_Exp)		
Model with constant	14.094 (0.000)	11.293 (0.000)
Model with constant and trend	5.919 (0.000)	7.469 (0.000)
Model 6 (with Gross_Exp)		
Model with constant	22.864 (0.000)	7.562 (0.000)
Model with constant and trend	10.515 (0.000)	12.056 (0.000)

Note: The null hypothesis of the Cusum test is cointegration (no unit root in the residuals). Probability values in parentheses

The results in Table 5.2 indicate that whichever model is chosen, the test extremely rejects cointegration between variables. As mentioned above for unit root tests, failure to consider the economic interdependencies between sectors can lead to the rejection of the long-term relationship between the variables. To this end, we carried out the test of Westerlund and Edgerton (2007), which has as null hypothesis the existence of a long-term relationship between the endogenous variable and the exogenous variables. The test results are presented in Table 5.3.

Table 5.3: Westerlund and Edgerton (2007) Test

	Stat-LM p-value	p-value asymptotic	p-value bootstrap
Model 1 (with DVA)			
Model with constant	9.358	0.000	0.978
Model with constant and trend	16.352	0.000	0.990
Model 2 (with DVA)			
Model with constant	8.235	0.000	0.999
Model with constant and trend	17.492	0.000	0.974
Model 3 (with DVA)			
Model with constant	6.182	0.000	0.627
Model with constant and trend	8.963	0.000	0.901

	Stat-LM p-value	p-value asymptotic	p-value bootstrap
Model 4 (with Gross_Exp)			
Model with constant	9.284	0.000	0.989
Model with constant and trend	16.139	0.000	0.993
Model 5 (with Gross_Exp)			
Model with constant	8.410	0.000	0.999
Model with constant and trend	18.135	0.000	0.993
Model 6 (with Gross_Exp)			
Model with constant	6.041	0.000	0.671
Model with constant and trend	8.812	0.000	0.956

Note: The bootstrap is based on 2000 simulations. The null hypothesis of the test is the existence of a long-term relationship between DVA, exports and the independent variables.

The bootstrap p-values presented Table 5.3 confirm the existence of long-term relationships between the dependent variables (DVA, gross exports) and the independent variables.

4. Empirical Results

After establishing the cointegration between the variables, we will estimate our equations to examine the effect of GVC participation on Morocco's sectoral export performance. We propose four techniques to estimate the long-run relationship by ordinary least squares (OLS), fully modified least squares (FMOLS), dynamic ordinary least squares (DOLS), and apparently unrelated regressions (SUR). This last technique proposed by Zellner (1962) considers the existing interdependencies between the sectors. The results of the estimates of the effect on DVA are presented in Table 6.1.

Table 6.1: Panel Long-Term Estimators

Dependent variable: LnDVA	FMOLS	DOLS	SUR	FE-OLS
Model 1				
BP	5.420***	5.370***	5.297***	5.370***
	(0.000)	(0.000)	(0.000)	(0.000)
FP	225.353***	225.267***	224.059***	225.267***
	(0.000)	(0.000)	(0.000)	(0.000)
D_SERVICES	6.151***	6.268***	6.165***	6.268***
	(0.000)	(0.000)	(0.000)	(0.000)

Dependent variable: LnDVA	FMOLS	DOLS	SUR	FE-OLS
LnLP	0.721***	0.592***	0.591***	0.592***
	(0.000)	(0.000)	(0.000)	(0.000)
C			-4.806***	-4.868***
			(0.000)	(0.000)
Hausman test: p-value			(0.000)	
Dependency test: Pesaran CD			0.162	21.939***
			(0.871)	(0.000)
Model 2				
FP	179.775***	180.109***	166.276***	166.059***
	(0.000)	(0.000)	(0.000)	(0.000)
D_SERVICES	1.846***	0.463***	1.604***	1.672***
	(0.008)	(0.6377)	(0.000)	(0.000)
F_SERVICES	16.530***	17.381***	15.037***	15.160***
	(0.000)	(0.000)	(0.000)	(0.000)
LnLP	0.637***	0.286**	0.655***	0.656***
	(0.000)	(0.0158)	(0.000)	(0.000)
C			-4.412***	-4.450***
			(0.000)	(0.000)
Hausman test: p-value			(0.000)	
Dependency test: Pesaran CD			0.062	4.439***
			(0.951)	(0.000)
Model 3				
GVC	8.536***	9.273***	6.851***	6.924***
	(0.000)	(0.000)	(0.000)	(0.000)
D_SERVICES	9.531***	10.817***	7.560***	7.647***
	(0.000)	(0.000)	(0.000)	(0.000)
LnLP	0.722***	0.655***	0.682***	0.685***
	(0.000)	(0.000)	(0.000)	(0.000)
C			-5.429***	-5.503***
			(0.000)	(0.000)
Hausman test: p-value			(0.000)	
Dependency test: Pesaran CD			0.188	18.761***
			(0.851)	(0.000)

Notes: Probability values are in parentheses. ***, **, and * indicate that the estimated coefficient is significant at the 1%, 5%, and 10% levels, respectively.

The estimation results show that BP, FP, D_services and F_services service content and LP have positive and statistically significant effects on the DVA contained in exports. Specifically, the results of our reference model (SUR) confirm the positive role of BP and FP in increasing DVA by 5.3% and 224.06% respectively for each increase from 1%. Similarly, participation in GVCs improves DVA by 6.85%. In addition, greater use of domestic service inputs and foreign services increase the DVA by 6.17% and 15.04% respectively. For LP, and despite its positive impact, its contribution to DVA remains low and only reaches 0.59% for each 1% increase. We now examine the effect on gross exports. The results are presented in Table 6.2.

Table 6.2: Panel Long-Term Estimators

Dependent variable: LnGross_Exp	**FMOLS**	**DOLS**	**SUR**	**FE-OLS**
Model 4				
BP	8.389***	9.128***	7.151***	7.183***
	(0.000)	(0.000)	(0.000)	(0.000)
FP	245.421***	242.711***	221.758***	221.912***
	(0.000)	(0.000)	(0.000)	(0.000)
D_SERVICES	6.961***	7.054***	5.411***	5.443***
	(0.000)	(0.001)	(0.000)	(0.000)
LnLP	0.588***	0.382***	0.580***	0.580***
	(0.000)	(0.006)	(0.000)	(0.000)
C			-4.706***	-4.721***
			(0.000)	(0.000)
Hausman test: p-value			(0.000)	
Dependency test: Pesaran CD			0.096	19.555***
			(0.924)	(0.000)
Model 5				
FP	181.106***	186.157***	167.672***	167.359***
	(0.000)	(0.000)	(0.000)	(0.000)
D_SERVICES	-1.117	-2.348**	-1.453***	-1.412**
	(0.109)	(0.017)	(0.000)	(0.003)
F_SERVICES	18.083***	19.034***	16.591***	16.673***
	(0.000)	(0.000)	(0.000)	(0.000)
LnLP	0.604***	0.240**	0.635***	0.636***
	(0.000)	(0.041)	(0.000)	(0.000)
C			-3.374***	-3.397***
			(0.000)	(0.000)

Dependent variable: LnGross_Exp	**FMOLS**	**DOLS**	**SUR**	**FE-OLS**
Hausman test: p-value			0.000	
Dependency test: Pesaran CD			-0.030	2.881***
			(0.976)	(0.004)
Model 6				
GVC	10.182***	10.845**	8.656***	8.701***
	(0.000)	(0.000)	(0.000)	(0.000)
D_SERVICES	8.581***	9.545***	6.741***	6.790***
	(0.000)	(0.000)	(0.000)	(0.000)
LnLP	0.702***	0.607***	0.669***	0.671***
	(0.000)	(0.000)	(0.000)	(0.000)
C			-5.299***	-5.341***
			(0.000)	(0.000)
Hausman test: p-value			(0.000)	
Dependency test: Pesaran CD			-0.006	15.970***
			(0.996)	(0.000)

Notes: Probability values are in parentheses. ***, **, and * indicate that the estimated coefficient is significant at the 1%, 5%, and 10% levels, respectively.

The results of the estimates of the effects on gross exports are very similar to those of the effects on DVA. Once again, the results confirm the role of BP and FP in increasing exports by 7.15% and 221.76% respectively. The services input coefficients show their overall positive contribution to export growth. The LP coefficient is positive and significant, suggesting that a 1% increase increases exports by 0.58%.

5. Conclusions and Policy Recommendations

The objective of this article is to investigate the relationship between GVC participation and the performance of Moroccan sectoral exports between 1995 and 2018. The results indicate the existence of a long-term relationship between GVC participation, backward and forward participation, domestic and foreign service content in exports, labour productivity, and exports. This relationship has been verified by different cointegration tests, including the Pedroni (1999), Westerlund (2005), and Westerlund and Edgerton (2007) tests. The tests of cointegration with interdependencies are the only ones that have shown a long-term relationship for all the models retained.

An estimation of the effect of GVC participation on exports was obtained using different estimation methods: FMOLS, DOLS, SUR and FE-OLS. The empirical results show that GVC participation and backward and forward participation positively impact DVA and gross exports; moreover, the domestic and foreign service content also positively affect DVA and gross exports. Finally, DVA and gross exports gradually increase in response to improved productivity. Based on these findings, we offer some policy recommendations. First, Morocco has an interest in further integrating GVCs. The backward participation of GVCs is, in some cases, seen as a substitute for DVA embodied in exports. However, Kowalski et al. (2015) and Yu and Luo (2017) confirm our results by suggesting that FVA and DVA contained in exports are rather complementary and not substitutable. This means that, the more BP increases, the more the DVA and the exports increase. Regarding FP, our results show that their impact is much greater on DVA and exports. Consequently, Morocco has an interest in increasing its FP by exporting more intermediate products with high added value by improving its comparative advantages in sectors such as the computer, electronic and electrical, pharmaceutical, and aeronautical sectors.

Second, domestic and foreign service inputs contribute positively to DVA and export growth, suggesting that a policy dedicated to promoting this type of service is highly recommended. Indeed, services face two types of problems preventing the strengthening of their roles in goods value chains and the emergence of services value chains: explicit restrictions on foreign services and service suppliers, as well as regulatory differences between jurisdictions (Heuser & Mattoo 2017). Third, an improvement in labour productivity could be a key factor to increase the performance of Moroccan exports. The Moroccan economy can improve its productivity in two different ways. On the one hand, it must emphasise the training of its workforce to raise the level of its competence and its efficiency. On the other hand, it should stimulate the accumulation of human capital to catch up in terms of productivity and therefore to strengthen the nation's position in GVCs.

The limitations of this work are partly due to the unavailability of data for a larger sample, both for the sectors considered and for the period used. In addition, value chains can have effects on other performance indicators such as economic growth or economic development, which can be a very relevant subject of further research.

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