Economics Bulletin

Volume 43, Issue 4

Global value chains participation and economic upgrading: Evidence from developing countries

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Abstract

Global Value Chains (GVC) have immensely increased during the last years, particularly in developing countries which are increasingly engaged in international production networks. Therefore, the objective of the paper is to explore the effect of GVC participation on firms' productivity and products' diversification in developing countries. In order to study this relationship between GVC and economic upgrading, a micro-level analysis is performed based on recent firm-level data from the World Bank Enterprise Surveys (WBES), by analysing a dataset of firms active in several developing countries. Controlling for fixed effects, the results suggest that firms' involvement in GVC has a significant positive effect on productivity. Firms that participate in GVC not only perform better, showing additional productivity gains, but also introduce new products. Nevertheless, sectoral evidence shows that this effect varies across industries, with a particularly negative effect of the interaction term in the textile and garment sector. Furthermore, the paper provides evidence that the positive effect of GVC is more pronounced for initially highly skilled firms.

Many thanks to Prof. Chahir Zaki & Prof. Rémi Bazillier for their constant support and feedback. The author is also grateful to the editor and the reviewers for their constructive comments and remarks.
Citation: Malak Hosny, (2023) "Global value chains participation and economic upgrading: Evidence from developing countries", *Economics Bulletin*, Volume 43, Issue 4, pages 1626-1641
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Submitted: August 20, 2023. **Published:** December 30, 2023.

1. Introduction

Trade barriers have dramatically decreased over the past few decades, transportation costs have increased, and technological progress has altered the way goods and services are produced and exchanged. International trade became therefore structured around so-called Global Value Chains (GVC), where the various stages of the same production are dispersed globally in a context of vertically fragmented production processes (World Bank, 2020). By definition, GVC refers to "*the full range of activities that firms and workers perform to bring a specific product from its conception to its end use and beyond*" (Gereffi and Fernandez-Stark, 2011). Over the past few years, GVC have increased significantly, especially in developing countries that are increasingly participating in global production networks. More than 60% of international trade is carried out through GVC, according to the World Trade Organisation and World Bank report from 2020. Consequently, there has been a growing interest in the effects and the implications of GVC on productivity and overall economic performance (Antràs, 2018).

Theoretically speaking, participation in GVC can be seen as a key element for economic upgrading, which refers to the acquisition of technological capabilities that enable firms to improve their productivity and move into higher value activities in order to increase the benefits from participating in GVC (Baldwin and Gu, 2003). Particularly for developing countries, the emergence of GVC has given firms the opportunity to internationalise by specialising in the production of specific inputs along the chain based on their comparative advantages, which will directly affect their competitiveness and productivity. In other words, GVC could have a profound impact on the productivity of firms in developing countries (Gereffi and Lee, 2016). Firstly, GVC have allowed firms in developing countries to access new markets and customers that they would not have been able to reach on their own. This has resulted in greater revenues and sales for these firms, which has, in turn, enhanced their productivity (World Bank, 2019). Secondly, GVC have created opportunities for firms in developing countries to access new technologies and knowledge, which they would not have been able to access otherwise. This has led to improvements in the production process and product quality, which have increased their productivity (Gereffi, 2018). Thirdly, GVC have enabled firms in developing countries to specialise in the production of specific components and activities, which have allowed them to achieve economies of scale, have access to more competitively priced inputs, higher variety, and increase their productivity (Baldwin and Lopez-Gonzalez, 2013; UNCTAD, 2013). In the same vein, the effect on productivity has been empirically investigated by Baldwin and Yan (2014), Criscuolo and Timmis (2017), Del Prete et al. (2018), and Giovanneti and Marvasi (2018). They argued that participating in GVC can stimulate productivity growth through access to imported inputs, knowledge spillovers from foreign firms, adoption of new technologies, and foreign competition.

Meanwhile, there are also challenges associated with participation in GVC that can hamper productivity gains for firms in developing countries. Firms in developing countries may lack the essential resources and skills to participate in GVC efficiently. This can limit their access to new markets, technology transfer, and knowledge, hampering their productivity (Gereffi and Fernandez-Stark, 2011). Moreover, GVC can expose firms in developing countries to competition from other countries, which can be challenging if they do not have a competitive advantage (Taglioni and Winkler, 2016).

Taking into account sectors specifications, according to Hanson (2020) and Frederick (2018), increased markups and technological advancements reallocate value added within countries from labour to capital. In this respect, production requires more capital, since machines enable mass production and can provide the accuracy needed for different tasks in GVC. Capital intensive sector can therefore gain from the transfer of technological advancements, economies of scale, adoption of new technology, and attraction of FDI to promote productivity. However, GVC participation in labour intensive and more traditional sectors like the textile and garment sectors is linked to economic downgrading, as outsourcing to developing countries often drives lower labour costs. This is due to the industry's lower position in the value chain, dealing primarily with the production of raw materials and essential inputs (World Bank, 2020).

Thus, this research contributes to the above microeconomic strand of the literature by exploring the nexus between GVC participation and economic upgrading, which is mostly seen through the productivity of firms regarding the production processes and the diversification of products. In this regard, a micro-level analysis will be performed, relying on evidence from the World Bank recent firm-level data in 117 developing countries from 2006 to 2020. The contribution of this paper is threefold. First, unlike the majority of empirical works on the economic effects of GVC at the country and sectoral levels, this study provides a micro, firm level analysis on GVC in developing countries. Second, it addresses the gaps in the literature by focusing on different measures of economic upgrading. The latter is captured not only by firms' productivity measures but also by products' diversification. Third, relying on a recent dataset, the paper is trying to study the industry specifications by examining whether GVC exerts a differential effect on the most integrated sectors into GVC (garment & textile, and machinery & equipment sectors, with a share of 10% and 9% participation in GVC according to the WBES dataset). The main findings suggest a positive and significant effect of GVC participation on economic upgrading measures. Sectoral evidence shows that this effect varies across industries. This positive effect is more pronounced when GVC firms are involved in the machinery and equipment sectors. However, this effect is negative in the garment and textile sectors. The paper also shows that the positive GVC effect is more evident for initially highly skilled firms.

The rest of the study is organised as follows. Section 2 describes the dataset. Section 3 is devoted to the empirical framework. Section 4 discusses the main results. The final section concludes the research.

2. Data and descriptive statistics

This study provides a micro-level analysis, based on a recent panel of firm-level data from the World Bank Enterprise Surveys (WBES), by analysing a panel of 84,191 manufacturing and service firms[1] active in 117 developing countries covering the period 2006-2020. The sample of countries is composed of Europe and Central Asian countries which account for 25.1% of the sample, followed by Latin American countries (20.5%), Sub-Saharan African countries

[1] The surveys provide information on the characteristics of firms across various dimensions, including sales, value added, output, size, trading status, workforce, ownership, performance, etc. (World-Bank, 2020). It covers manufacturing and service sectors, such as garment, textiles, food, wood and paper, rubber and plastics, metals and mechanical, transport, chemicals, electronic industries and leather, retail, construction, transport, hotel and restaurants, hospitality and tourism and IT services.

(16.4%), South Asian countries (14.7%), East Asian and Pacific countries (12.8%), and Middle Eastern and North African countries represent 10.5% of the firms' sample.

Furthermore, it is important to disentangle the sectoral dimensions of GVC participation since the aggregate picture hides some heterogeneity. In particular, in all regions, garment & textile and machinery & equipment are among the most integrated sectors into GVC. East Asia & Pacific, South Asia as well as Europe & Central Asia are relatively more involved into machinery and equipment sector (21%, 15% and 14%, respectively), however, garment and textile sector highlight a higher GVC involvement in MENA region and South Asia (with almost a share of 18% and 17%). It must be pointed out that Latin America and Sub-Saharan Africa present low level of participation in both sectors.

The evidence reveals that globalised firms are more likely to be involved in complex fragmented activities. Accordingly, firms integrated in GVC can be identified as international traders that received an internationally recognised quality certification, in line with Nadvi (2008), Beghin et al. (2015), and Del Prete et al., (2018). Given that the WBES includes information on the firms' trading status, foreign ownership, and quality certification, this allows us to construct different measures of GVC based on Dovis and Zaki (2020) definition, suggesting that GVC firms are exporters, importers, foreign owned and have international quality certification.

This paper investigates the effect of GVC participation on economic upgrading, which is captured by four different measures: first, sales per worker (ln), second, value added per worker (ln), third, total factor of productivity (TFP) and finally, products' diversification. Noting that TFP estimation assumes a Cobb-Douglas production function in which value added is the output variable. The estimation is provided by the WBES, which estimates production function coefficients according to Wooldridge (2009), a benchmark measure in the empirical literature; Products' diversification captures the development of new products, which is based on the question 'Has the firm introduced a new product this year?'. The main descriptive statistics for the variables employed in the empirical analysis are reported in Table 1.

Table 2 describes the positive association between growth in productivity and GVC participation. Across a large sample of countries, GVC firms show higher productivity than domestic firms. Additionally, the share of firms introducing new products is higher among GVC participants, as 60% of international firms introduce new products to the market on average.

Table 1. Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Sales/Emp.(ln)	69,676	9.759	1.515	0.80	17.67
VA /Emp.(ln)	60,153	9.177	1.434	0.13	17.67
TFP (ln)	47,257	2.167	3.443	-21.63	10.75
Products' divers.	64,850	0.405	0.491	0.00	1.00
GVC	84,191	0.035	0.185	0.00	1.00
Two way	84,191	0.246	0.431	0.00	1.00
Certification	84,191	0.125	0.331	0.00	1.00
Foreign ownership	84,191	0.060	0.237	0.00	1.00
Age (ln)	83,293	3.162	0.565	0.00	5.86
Size (ln)	84,191	3.523	1.419	0.00	10.31

Source: Author's elaboration based on WB Enterprise Surveys.

Table 2. Economic upgrading measures by GVC participation

	Sales per worker	Value added per worker	TFP	Products' diversification
Domestic firms	9.7	9.1	2.1	0.4
Firms in GVC	10.9	10.3	2.4	0.6

Source: Author's elaboration based on WB Enterprise Surveys.
Note: Firms in GVC are firms that export, import, have an international quality certification and foreign capital. The differences between the averages are tested and are statistically significant.

3. Methodology

The study tries to synthesise the definitions and implications of the GVC, by focusing on the economic upgrading and the following variables of interest: productivity (value added per worker, sales per worker and TFP) and products' diversification. Based on the literature, the research aims to access the effect of GVC participation on economic upgrading, by estimating the following regression using ordinary least squares (OLS):

$$Y_{i,j,s,t} = \beta_0 + \beta_1 \mathrm{GVC}_{\mathrm{i,j,s,t}} + \beta_2 X_{\mathrm{i,j,s,t}} + \delta_{\mathrm{j}} + \delta_{\mathrm{s}} + \delta_{\mathrm{t}} + \varepsilon_{\mathrm{i,j,s,t}} \quad (1)$$

The firm, the country, the industry, and the year are represented by i, j, s and t respectively. Where $Y_{i,j,s,t}$ is the dependent variable, alternatively value added per worker, sales per worker, total factor productivity (TFP), and products' diversification; $\mathrm{GVC}_{\mathrm{i,j,s}}$ is a dummy variable that

takes the value of 1, if the firm is a two-way trader, has an internationally recognised quality certification and has a share of their capital foreign owned; $X_{i,j,s,t}$ is the firm age and size[2], a variable that is expected to influence the dependent variable; δ_j and δ_s terms represent country and industry fixed effects respectively, in order to account for time-invariant country- and industry-specific characteristics. Moreover, year dummies (δ_t) are included to allow for common shocks within the firms. $\varepsilon_{i,j,s,t}$ is the error term, and β_1 is the coefficient of interest. To directly assess the effect of GVC integration on economic upgrading, we look at the results when the OLS estimator is used by including country, industry, and year dummies.

Second, it is important to examine if the effect of GVC participation depends on a specific sector. Based on the baseline equation, an additional dummy variable is included, S_i: sector specific variable, as follows:

$$Y_{i,j,s,t} = \beta_0 + \beta_1 \mathrm{GVC}_{i,j,s,t} + \beta_2 \mathrm{GVC}_{i,j,s,t} \times S_i + \beta_3 X_{i,j,s,t} + \delta_j + \delta_s + \delta_t + \varepsilon_{i,j,s,t} \quad (2)$$

In the same notation as in equation (1), $\beta_1 + \beta_2$ represent the coefficients of interest.

Finally, an additional dummy variable is included in the model, C_i in order to examine empirically whether this specification is robust to sample composition effects based on initial human capital levels[3],:

$$Y_{i,j,s,t} = \beta_0 + \beta_1 \mathrm{GVC}_{i,j,s,t} + \beta_2 \mathrm{GVC}_{i,j,s,t} \times C_i + \beta_3 C_i + \beta_4 X_{i,j,s,t} + \delta_j + \delta_s + \delta_t + \varepsilon_{i,j,s,t} \quad (3)$$

Where C_i is a dummy variable equals to 1 if firms' human capital is above the pre-treatment median in order to capture firms that initially have higher human capital levels.

4. Results

4.1. Baseline results

Table 3 exhibits the results of estimating the effect of GVC participation on firms' productivity and products' diversification. Regression results under OLS are reported below with country, sector and year fixed effects and robust standard errors clustered by country, year and sector. The main results suggest that GVC integration is associated with economic upgrading. Along the different regressions, the coefficient of interest GVC is positive and significant. Columns 1 and 2 reveals that the coefficients of interest for sales per worker and value added per worker are similar and equal to 0.61 and 0.6 respectively with country, sector and year dummies. In other words, on average, compared to domestic firms, GVC participation is associated with around 60% increase in sales per worker and value added per worker in the whole sample.

[2] Three dummy variables are used to represent the size of the firm: small firms (less than 20 employees), medium firms (between 21 and 99 employees), and large firms (more than 100 employees); Firm age is calculated by taking the logarithm of the difference between the date of the most recent available survey 2020 and the year when the establishment started operations. Industries are classified as two-digit ISIC rev 3.1 activities.

[3] Human capital is the ratio of skilled workers to the total number of workers, calculated as the share of non-production full-time workers over the total number of full-time workers, where the number of non-production workers is used as a proxy for the number of skilled workers.

Furthermore, participating in the GVC fosters the firms' productivity based on the results in column 3 on TFP. In terms of magnitude, the fact of being involved into GVC, affects TFP positively by increasing it by 18%.

These findings are consistent with both theoretical and empirical evidence. Three key arguments serve to explain the results. First, hypersecialisation and deep relationships between firms increase productivity, promote technological transfer and allow access to capital and inputs along the value chains. Generally speaking, in GVC, interdependent firms may share know-how and technology with suppliers because doing so increases their own productivity and sales, resulting in faster country catch-up growth. In contrast to traditional trade in which firms from different countries compete, GVC are networks of firms with common goals, including minimising production costs and maximising profits of the entire production chain (Del Prete et al. 2018, Macchiavello and Miquel-Florensa 2019, and Wagner, 2007). Additional empirical evidence supports this argument. Based on several studies in developing countries such as Mozambique, Vietnam, and Ethiopia, GVC firms show higher productivity that one-way traders or non-traders.

Second, GVC give countries the opportunity to gain from the efficiency of international division of labour, and it takes advantage of the fact that countries differ in their comparative advantages not only across sectors but also across stages of production within sectors. By breaking up complex production processes, GVC enable countries to specialise in particular components or tasks of production, avoiding domestic constraints (World Bank, 2020).

Third, by giving access to a broad variety of more effective products and services that can be used as intermediate inputs, participation in GVC may foster firms' performance. In other words, improved access to a wide range of better-quality or less-expensive intermediate inputs can contribute to growth and productivity gains. Moreover, exporting to the global market allows for greater economies of scale, which reinforces this productivity boost. These observations are consistent with empirical findings. Increasing direct and indirect exports and imports of goods, services, parts, and components produced by GVC has been linked to much higher per capita income growth than other forms of trade openness (Amiti and Konings, 2007; Constantinescu, Mattoo, and Ruta, 2017; Ehab and Zaki, 2021, and Rigo, 2020).

Additionally, the control variables have the expected signs. The firm’s age and size are positively associated with firms’ productivity measures. According to the theoretical predictions, larger and older firms are more capital intensive than small or newly founded firms, as they are more likely to innovate due to higher financial and technical capabilities; and as a result, they achieve greater productivity levels (Damanpour, 2010).

The evidence also shows that the effect of GVC is associated with products’ diversification. The coefficient of interest is positive and significant, equal to 0.085 with country, sector and year dummies, which indicates that being part of this fragmented production processes will have a positive effect on the development of new products, increasing it by 8.5% on average. This result is in line with some statistics provided by the World Bank, indicating that during the last decade, many new product types, mostly intermediate goods, have entered the global trade, which highlight the growing fragmentation of production and the emergence of new products. Trade in

new goods has indeed increased significantly. 65 percent of trade in 2017 was in categories that either did not exist in the 1990's or underwent modifications to better reflect trade changes. Trade in parts, components, and semifinished goods increased, and completely new products entered the market. For instance, over the past two decades, trade in IT products and in items that can be digitised has tripled (World Bank, 2020; WTO, 2018). Hence, the intuition behind these findings is that more goods and services and new products are likely to become tradable over time because of technological progress and fragmentation of production.

Table 3. Baseline equation

	(1)	(2)	(3)	(4)
Dep. Variable:	**Sales/Emp.**	**VA/Emp.**	**TFP**	**Products' divers.**
GVC	0.605***	0.590***	0.177**	0.0847***
	(0.0342)	(0.0357)	(0.0842)	(0.0118)
Medium	0.294***	0.259***	0.00563	0.0774***
	(0.0210)	(0.0195)	(0.0430)	(0.00522)
Large	0.475***	0.436***	-0.0526	0.154***
	(0.0332)	(0.0294)	(0.0751)	(0.00740)
Age (ln)	0.0724***	0.0731***	-0.0382	0.0199***
	(0.0162)	(0.0152)	(0.0337)	(0.00466)
Constant	9.288***	8.725***	2.290***	0.273***
	(0.0528)	(0.0506)	(0.117)	(0.0148)
Country & sector dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Observations	69,140	59,749	46,976	63,290
R-squared	0.344	0.340	0.220	0.157

Source: Author's elaboration based on STATA output.
Notes: (i) GVC is a dummy that takes the value of 1, if the firm is part of a GVC and zero otherwise. Firms integrated in GVC are firms that export, import, have international quality certification and foreign capital. (ii) Robust standard errors in parentheses. (iii) *** p<0.01, ** p<0.05, * p<0.1 (iv) OLS Regressions include country, year & sector dummies. (v) Standard errors are clustered by country, year and sector.

4.2. Extensions

4.2.1. Sectoral results

In a second step, the study focuses on two sectors that are more integrated into GVC; garment & textile, and machinery & equipment sectors, in order to examine whether the effect of GVC participation depends on a specific sector. By creating an interaction term GVC x S_i,, the results suggest that the effect varies by industry. Table 4 reveals that being part of the machinery and equipment sectors in developing countries, will amplify the positive effect of GVC participation on the firms' productivity, with an overall positive effect of 0.883 and 0.821 on sales per worker and value added per worker, with 5% and 10% significance level respectively (columns 5 and 6).

In contrast, the garment and textile sector reflect a statistically significant negative interaction term coefficients equal to -0.369 and -0.398, respectively. Interestingly, in this sector, GVC participation- two-way traders, having international quality certification, and foreign owned- is diminishing the effect on firms' performance, with an overall net effect of 0.264 and 0.222 significant at 1% level (columns 1 and 2). The effects on TFP and products' diversification are found to be insignificant. From a sector perspective, joining GVC in the textile and garment sector is associated with economic downgrading in a way that this sector diminishes the positive effect of GVC. This can be explained by the fact that this industry is at the bottom of the value chain, which corresponds to the production of raw materials and basic inputs.

The findings are in line with the theoretical predictions. GVC participation allows countries to specialise on few tasks rather than having to master the entire process in order to export goods. Consequently, GVC tends to make firms in developing countries more productive than standard trade. However, the biggest growth acceleration occurs when developing countries transition from traditional sectors to manufacturing sectors. According to empirical data, a country's per capita wealth increases by more than 20% three years after it joins a manufacturing GVC (World Bank, 2020). On the other hand, GVC can present some difficulties. In garment and textile sector, firms may be stuck in dead-end productions and tasks with limited opportunities to upgrade and innovate. In this sector, the organisation of value chains, the domestic workforce, the nature of technologies might not encourage the learning and innovation process that relational GVC are known for.

Table 4. Testing sector-specific effect

	Garment and Textile sector				Machinery and Equipment sector			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dep. Variable:	**Sales/Emp.**	**VA/Emp.**	**TFP**	**Products' divers.**	**Sales/Emp.**	**VA/Emp.**	**TFP**	**Products' divers.**
GVC	0.633***	0.620***	0.187**	0.0841***	0.584***	0.572***	0.181**	0.0877***
	(0.0368)	(0.0384)	(0.0901)	(0.0123)	(0.0353)	(0.0370)	(0.0889)	(0.0123)
GVC x S	-0.369***	-0.398***	-0.118	0.00669	0.299**	0.249*	-0.0577	-0.0441
	(0.0934)	(0.0898)	(0.102)	(0.0415)	(0.122)	(0.131)	(0.167)	(0.0394)
Medium	0.294***	0.259***	0.00562	0.0774***	0.295***	0.259***	0.00561	0.0774***
	(0.0210)	(0.0195)	(0.0430)	(0.00522)	(0.0210)	(0.0195)	(0.0430)	(0.00522)
Large	0.476***	0.437***	-0.0525	0.154***	0.475***	0.436***	-0.0526	0.154***
	(0.0332)	(0.0294)	(0.0751)	(0.00741)	(0.0332)	(0.0294)	(0.0751)	(0.00741)
Age (ln)	0.0721***	0.0728***	-0.0382	0.0199***	0.0725***	0.0732***	-0.0382	0.0198***
	(0.0162)	(0.0152)	(0.0337)	(0.00466)	(0.0162)	(0.0152)	(0.0337)	(0.00466)
Constant	9.289***	8.726***	2.291***	0.273***	9.288***	8.725***	2.291***	0.273***
	(0.0528)	(0.0506)	(0.117)	(0.0148)	(0.0528)	(0.0506)	(0.116)	(0.0148)
Country & sector dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	69,140	59,749	46,976	63,290	69,140	59,749	46,976	Yes
R-squared	0.345	0.340	0.220	0.157	0.344	0.340	0.220	0.157

Source: Author's elaboration based on STATA output.

Notes: (i) GVC is a dummy that takes the value of 1, if the firm is part of a GVC and zero otherwise and S is a sector specific variable equals to 1 for garment and textile sector and zero otherwise (columns 1 to 4) and equals to 1 for machinery, equipment and electronics sector and zero otherwise (columns 5 to 8). (ii) Robust standard errors in parentheses. (iii) *** p<0.01, ** p<0.05, * p<0.1 (iv) Standard errors that are clustered by country, sector and year. (v) All columns are estimated using the OLS estimator, with country, sector and year dummies.

4.2.2. Does human capital matter?

To examine if the specification is robust to sample composition effect, an additional dummy variable is included, C_i. The latter captures initially high skilled firms[4]. Integration in GVC appears to have a higher positive effect when the firm has a high level of skilled labour. As illustrated in Table 5, highly skilled firms are associated with a higher increase in productivity indicators and products' diversification. More precisely, GVC participation is associated with an increase in sales per worker, value added per worker and products' diversification, having an overall net positive effect of 0.721, 0.690, and 0.108 respectively for the whole sample (columns

[4] Firms are considered high skilled if their share of skilled workers is equal to or above the median (more robust than the mean). The median of the share of skilled workers is 0.214 in the whole sample and 0.25 in the panel sample. High-skilled firms are those that have a share equal to or above 21.4% and 25%, respectively in first year. The median is selected since it is more robust than the mean.

1, 2 and 4). This confirms previous findings in the literature (Del Prete et al., 2018), since high skilled firms are relatively more efficient than their counterparts as they have access to a broader and wider range of inputs, know-how and foreign technology; accordingly, results are more pronounced for these firms.

There are several possible explanations for these findings: Firstly, GVC have allowed firms in developing countries to access new markets, which they would not have been able to reach on their own. This has led to increased sales for these firms, which has, in turn, increased their productivity. Secondly, GVC have enabled firms to access new technologies and knowledge, which they would not have been able to access otherwise. This has led to improvements in the production process and product quality, which has increased their productivity. Thirdly, GVC have created opportunities for firms in developing countries to specialise in the production of certain components or activities, which has allowed them to achieve economies of scale and increase their productivity (Ehab and Zaki, 2021, and Rigo 2020).

Table 5. Empirical results by high initial human capital level

	(1)	(2)	(3)	(4)
Dep. Variable:	**Sales/Emp.**	**VA/Emp.**	**TFP**	**Products' divers.**
GVC	0.433***	0.439***	0.218*	0.0535***
	(0.0490)	(0.0517)	(0.123)	(0.0176)
GVC x C	0.288***	0.251***	-0.0757	0.0544**
	(0.0609)	(0.0629)	(0.165)	(0.0218)
Dummy C	0.256***	0.227***	0.0132	0.0390***
	(0.0136)	(0.0137)	(0.0354)	(0.00505)
Medium	0.309***	0.271***	0.00646	0.0797***
	(0.0207)	(0.0192)	(0.0434)	(0.00523)
Large	0.514***	0.470***	-0.0512	0.160***
	(0.0332)	(0.0295)	(0.0774)	(0.00749)
Age (ln)	0.0635***	0.0660***	-0.0384	0.0188***
	(0.0160)	(0.0150)	(0.0337)	(0.00471)
Constant	9.174***	8.622***	2.284***	0.254***
	(0.0530)	(0.0506)	(0.120)	(0.0146)
Country & sector dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Observations	69,140	59,749	46,976	63,290
R-squared	0.352	0.347	0.220	0.159

Source: Author's elaboration based on STATA output.

Notes: (i) GVC is a dummy that takes the value of 1, if the firm is part of a GVC and zero otherwise and C captures high-skilled firms based on their initial human capital level. (ii) Robust standard errors in parentheses are clustered by country, sector and year. (iii) *** p<0.01, ** p<0.05, * p<0.1 (iv) Columns (1), (2), (3) and (4) are estimated using the OLS estimator, with country, sector and year dummies.

4.3. Robustness checks

As a robustness check, an impact evaluation analysis using Propensity Score Matching and difference-in-differences techniques[5] is performed to control for selection bias and endogeneity issues between the variables. GVC participation can be influenced by ex-ante factors, leading to selection bias in evaluating its effect. To address this, comparing participants and non-participants based on observable covariates can be used. However, PSM cannot control for self-selection due to time-invariant and unobservable heterogeneity. To cancel out these effects, the difference-in-differences method can be combined with PSM to account for self-selection caused by some unobservable characteristics, assuming that they remain constant over time (Caliendo and Kopeinig, 2008 and Del Prete et al., 2018). Regression results under PSM-diff-in-diff are reported in Table 6, providing similar results. For the panel sample with firm fixed effects, results indicate that GVC firms are 45% and 56% more likely to increase their sales per worker and value added per worker compared to domestic firms. The effects on TFP and products' diversification are found to be insignificant.

Table 6. Baseline equation (PSM-diff-in-diff)

	(1)	(2)	(3)	(4)
Dep. Variable:	**Sales/Emp.**	**VA/Emp.**	**TFP**	**Products' divers.**
GVC	0.452***	0.556***	0.170	0.0243
	(0.0942)	(0.106)	(0.239)	(0.0306)
Medium	0.268***	0.212***	0.460*	0.104***
	(0.0900)	(0.0776)	(0.237)	(0.0374)
Large	0.355***	0.273***	0.476*	0.166***
	(0.112)	(0.102)	(0.266)	(0.0467)
Age (ln)	0.0642	0.105**	-0.0225	0.0337**
	(0.0394)	(0.0448)	(0.111)	(0.0155)
Constant	9.318***	8.665***	1.423***	0.285***
	(0.204)	(0.211)	(0.549)	(0.0872)
Firm fixed effects	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Observations	11,707	9,464	7,349	12,075
R-squared	0.650	0.628	0.628	0.533

Source: Author's elaboration based on STATA output.

Notes: (i) GVC is a dummy that takes the value of 1, if the firm is part of a GVC and zero otherwise. Firms integrated in GVC are firms that export, import, have international quality certification and foreign capital. (ii) Robust standard errors in parentheses. (iii) *** p<0.01, ** p<0.05, * p<0.1 (iv) The surveys are harmonised to create a panel dataset that includes 15,334 firms from 70 developing countries between 2006 and 2020 in order to account for firm's productivity heterogeneity. (v) All columns display the results using a PSM-diff-in-diff technique, when year and firm fixed effects are accounted for, with robust standard errors clustered by country, year and sector.

[5] Kernel PSM-diff-in-diff estimation is performed. The propensity scores are estimated by a probit model and firms are matched based on a set of firm-level control variables that includes: firm age, and size to control for the ex-ante characteristics. Distribution of propensity score and common support are reported in Figure A.1 in Appendix, showing almost even distribution and strong balance of the propensity scores between treated and control groups.

5. Conclusion

This study aims to examine whether GVC participation promotes economic upgrading, which can be associated with a rise in productivity and products' diversification. In order to study this relationship, a micro-level analysis is performed based on a recent firm level-data from the World Bank Enterprise Surveys (WBES) in 117 developing countries between 2006 and 2020. Using OLS estimation with country, sector, and year fixed effects, the study finds that firms that participate in GVC not only perform better, showing productivity gains, but also introduce new products into the market. More precisely, results suggest that along the different models, the effect of GVC involvement is positive and significant. Participating in the GVC fosters firms' productivity and products' diversification. This finding is in line with the literature, which indicates that participation in GVC will enhance firms' performance and lead to products' diversification through positive spillovers due to the introduction of new foreign technologies, technological transfer, quality upgrading, and economies of scale. Interestingly, the study provides evidence that the baseline equation results are more pronounced for initially highly skilled firms. At the sectoral level, the results highlight positive and significant coefficients in the machinery and equipments sector. However, in the garment and textile sector, the findings surprisingly reveal a significant negative effect of the interaction term. In other words, joining GVC in the textile and garment sector is associated with economic downgrading in the sense that this sector diminishes the positive effect of GVC. This can be explained by the fact that this industry is at the bottom of the value chain, which corresponds to the production of raw materials and basic inputs. Locked into low value added stages, this sector has a limited access to new markets, technologies, and knowledge, which can hamper its productivity. This study on GVC participation and economic upgrading provides useful insights for policymakers in developing countries. A key policy priority should therefore be to strengthen the positive effect on economic upgrading by enforcing measures that encourage domestic firms to join GVC, and motivate already integrated firms in GVC to expand and develop further.

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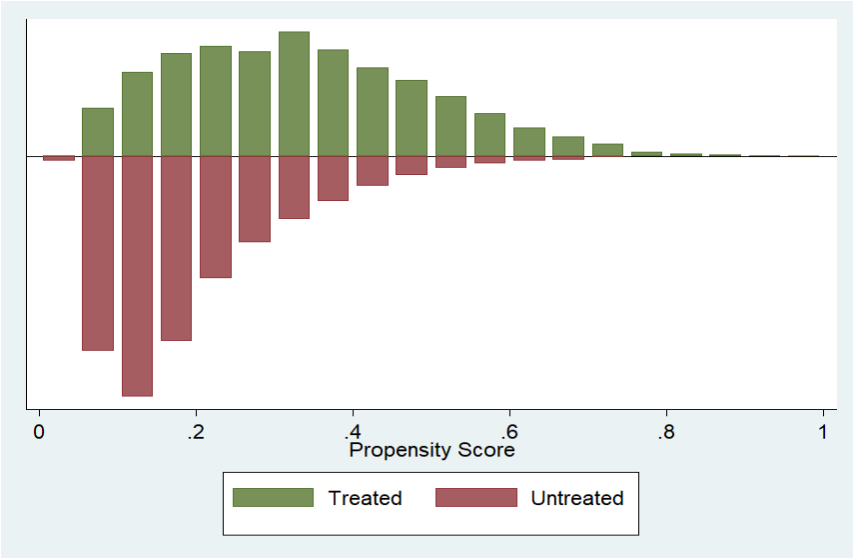
Appendix

Figure A.1. Propensity Scores distribution between GVC participants (Treated) and non-participants (Untreated)



Source: Author's elaboration based on STATA output.