Global Value Chains and Economic Upgrading in Developing Countries

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The emergence of global value chains (GVCS) has allowed countries to specialise in the production of specific inputs (intermediate goods and final goods), which has a direct implication for productivity. This paper explores the impact of GVCS on the economic upgrading of developing economies. Specifically, our analysis relates to the effect of foreign value added in gross exports (GVCS) on domestic value-added content of gross exports (economic upgrading), which includes the added value that emanates from all the industries of the exporting country to their trading partners. The sample covers 50 countries (22 developing and 28 advanced countries) over the period 2005–2015. We employ both a pooled OLS and a system GMM method. We contribute to the literature by differentiating between trade flows from developing economies (South-South) and developed economies (South-North). The results indicate a positive effect between GVCS participation and economic upgrading, with the effect being stronger in the case of South-North integration. Further, the results support the view that infrastructure development can play a key role in supporting the economic development of developing economies. GDP per capita, innovation, and institutional quality can all promote economic upgrading even though their effects vary across trade flows.

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Introduction

There has been a drastic change in global trade over the last two decades. Emerging economies are gradually increasing their share in the international trading market, which has sparked policy and academic interest regarding the integration of countries from the south. It has also triggered a debate on the economic growth repercussions for less developed

economies (Kaplinsky and Farooki 2009; Amighini and Sanfilippo 2014).

The network trade that involves countries in the south increased continuously from 40% around the mid-1990s to 50% in the last decade (2010). The production network has gained maturity in East Asia with China emerging as the Asian hub for global value chains (GVCS) (UNC-TAD 2015). This trend supports the idea that lifting trade barriers can help developing countries to maximise the gains from trade liberalisation. However, the traditional approach to trade analysis that considers horizontal and vertical trade tends to overestimate South-South trade because of the risk of overstating the growth due to the difference between the trade volumes and the value added in the trade flow. Emerging and developing economies can now participate much more effectively in the global supply chains instead of starting an entire chain in their domestic market.

There seems to be a consensus in the literature that developing countries can acquire knowledge through capital inflows and external flow of trade. This leads to a rapid accumulation of technology and higher productivity level (Schiff and Wang 2006). This occurs because international trade provides another incentive for domestic firms to enhance their production efficiency in order to remain competitive. Foreign direct investment (FDI) is also an important driver for the transfer of technology. Further, the advanced technology and high level of management capabilities foreign companies bring into developing countries may produce knowledge spill over, which can in turn result in export upgrading (Narula and Driffield 2012).

The work of Greenaway and Milner (1990) shows that although the external trade flow may be beneficial to developing countries, South-South trade flows would provide more gains than the South-North ones. The literature also suggests that partner countries are an important element regarding knowledge transfer through the use of imported goods (Mlachila and Takebe 2011; Amighini and Sanfilippo 2014).

However, what is still under investigation in the literature is the extent to which GVCS enhance productivity in developing countries. Developing countries stand to gain a lot from diversifying the production process. Countries with more diversified exports tend to be more resilient and grow faster by adding value at the higher end of their exports goods while creating employment (Amiti and Freud 2010).

A concern for developing countries that become integrated into GVCS is that such countries become trapped in low value-added segments of the

GVC, where there is little possibility for innovation or technology transfer. There is also the fear that the global companies may pull out of developing countries in times of economic slowdown. It is imperative to understand the effects of GVC participation given the rise in multinational corporations and the globally traded intermediates. Therefore, the study attempts to investigate the effects of GVCS in developing countries.

The key question the study aims to address is whether the foreign value acquired through value chain participation adds value in gross exports. To the best of our knowledge, no studies have investigated the effects of GVCS on economic upgrading in developing countries by distinguishing the flow of trade. Previous studies on the subject (Görg and Strobl 2001) have focused only on productivity spill over without considering the added value in the production network. Others have focused on the role of foreign direct investment in raising the quality of exports using data at the four-digit Standard International Trade Classification (SITC) level (Harding and Javorcik 2012).

This study complements the existing literature by focusing on the effects of GVC participation on economic upgrading in developing countries. Specifically, we assess how economic upgrading in developing countries is influenced by participation in the value chains and the level of economic development of the trading partners. We provide an answer to this question by using data from 50 countries, which we classify into two groups (emerging and advanced economies) following the fiscal monitor database (https://www.imf.org/en/Publications/FM). Within this literature, exports quality has also been used to measure exports upgrading (Amighini and Sanfilippo 2014; Ndubuisi and Solomon 2020). The challenge, however, with this indicator is that it uses exports values which are sometimes limited in terms of developing country coverage.

The rest of the paper is organised as follows: the second section discusses the literature on GVC participation and economic upgrading. The third section describes the model and shows the data sources used in the empirical analysis. The fourth section discusses the results. The fifth section concludes.

Literature Review

ECONOMIC UPGRADING AND GVCS

The economic channels through which trade improves output growth is well documented. This occurs through a more efficient resource allocation between countries, which eventually raises growth.

The new trade theory which has been developed by Grossman and Helpman (1991) has emphasised the dynamics gain from trade where foreign direct investment, new knowledge and technology can alter trade patterns and support economic growth. The new trade theory paved the way for the New Economic Geography, which stresses the unequal distribution of economic activity because firms produce intermediate and final products using diverse intermediate inputs and labour.

The GVCS and economic upgrading nexus has been discussed in the literature at both the macro and micro level. The seminal work of Bernard and Jensen (1995) has questioned the idea that exporters can outperform non-exporter firms that operate in the same sector in terms of economic upgrading. Melitz (2003) shows that GVCS can boost economic upgrading when the allocation of resources is shifted from less productive firms to more productive ones.

Further, other researchers have investigated whether learning by doing, knowledge spill over, and cost of production are necessary to make firms more productive.

Firms attempt to get around trade barriers by changing their production patterns through economic upgrading. It is referred to as capturing more value by enhancing the production process or moving into higher value in GVCS (Gereffi 2019). In the literature, authors have used several indicators (output per worker, domestic value added embodied in a country's exports, sophistication of export bundles, diversification of exported products) as a proxy for economic upgrading (Taglioni and Winkler 2016). The term 'upgrading' has been referred to in the literature as industrial or economic upgrading. Cattaneo et al. (2013) associate economic upgrading with rising benefits from different stages of production along the value chains.

Nevertheless, GVCS can be a barrier to learning for local firms, by only allowing few firms to have access to technology dissemination (UNESCAP 2015). In that instance, firms will be locked into low value-added activities. Shepherd (2015) documents that the participation of GVCS in developing countries can support economic upgrading if several factors such as the policy environment, the economic structure and, more importantly, the domestic institution (rule of law) are stable.

EMPIRICAL LITERATURE

The economic growth observed in recent years has revealed the importance of GVCS participation by developing countries. The work of Ro-

drik (2006) shows that countries that embark on the promotion of quality exports tend to grow faster. Hausmann, Hwang, and Rodrik (2007) also find that economic growth occurs when resources are transferred from low productivity activities to high productivity ones. They argue that entrepreneurship that promotes the exports of sophisticated products is vital for GDP growth.

The exports of higher quality goods are less exposed to international price competition from low-cost producers. This in turn contributes to improving the balance of payment and output which is necessary for a country's sustainable development and prosperity.

Akayleh (2014) also stresses the importance of trade liberalisation policies on GDP growth in developing economies. Amiti and Freund (2010) document that one of the key reasons behind China's economic success was its ability to radically transform its export structure over the last two decades. The country experienced a reduction in the share of soft manufacture and agriculture goods while the share of hard manufacture and electronic appliances increased. Hence it has been argued in the literature that it is not the quantity of goods a country can export that matter, but the quality.

The challenge, however, is that not all firms can produce quality exports because of the lack of the required intermediate inputs. China has overcome this boundary using the activity of assembling intermediate inputs to boost its export growth.

The literature has shown that imports from the North add more to local knowledge, technology, and the export upgrading of developing economies than imports from the South. Early empirical work on the diffusion of technology has shown that bilateral trade with advanced countries leads to high spill overs (Schiff and Wang 2006).

Many researchers have also investigated the effects of FDI participation on economic upgrading. Early results on the subject have found positive spill overs (Görg and Strobl 2001) while the findings of other scholars show evidence of ambiguous effects (Lipsey and Sjöholm 2005). Paus and Gallagher (2008) suggest that econometric analyses based on cross-sectional data find positive spill overs whereas the analyses based on panel data show negative spill overs. Harding and Javorcik (2012) find a positive association between FDI and exports value in developing countries using the priority sector for attracting investment.

Hausmann, Hwang, and Rodrik (2007) show that increasing backward participation (higher share of foreign value added in exports), with ris-

ing per capita GDP, is positively related with the exports of sophisticated products.

Amador and Cabral (2015) suggest that technology is a key driver of GVCS. They show that only technological advances allow components from different parts of the world to produce sophisticated final products. Communication and transportation are also important elements for managing and maintaining complex value chains.

Similarly, Kowalski et al. (2015) studied the relation between GVCS and economic upgrading using domestic and foreign value added in imported inputs. Their results show that foreign value added contributes to increasing per capita domestic value added in exports. Further, they found different paths between value chains and economic upgrading across income groups. The gains in economic upgrading from high income countries are driven by sophisticated primary and non-primary intermediates. The gains in economic upgrading have been attributed to the flow of FDI and the sophistication of non-primary intermediates in middle and low-income economies, respectively. They conclude that GVCS in countries are impacted by the level of development and economic specialisation.

Several studies have examined the factors that influence export upgrading. In sum, these studies have agreed that a country's ability to upgrade its export is determined by investment in research and development (R&D), foreign direct investment (FDI), institutional quality, transfer of technology, and ease of credit (Zhu and Fu 2013; Crino and Ogliari 2017; Xu and Mao 2018).

Zhu and Fu (2013) examined the determinants of exports upgrading in low, middle- and high- income countries. They acknowledge the limitations of export sophistication to capture exports upgrading. The findings suggest that R&D intensity, institutional law, FDI, and human capital contribute to economic growth. The effects of human capital (proxied as the number of university students per 100,000 inhabitants) is only positive in the case of low-income economies.

Using firm-level data, Xu and Mao (2018) show evidence that exports quality in manufacturing firms in China is improved through the imports of exports of intermediate inputs.

While these papers contribute to the literature by providing important channels through which exports upgrading can be improved, none of them have examined the impact of value chains in the context of South-South and South-North trade. Also, most of the studies have used exports sophistication or exports quality, which is computed at the disag-

gregate level and therefore does not allow comparison at the macroeconomic level. Third, we also include standard measure of GVCS (backward participation) to better capture the effects of value chains in developing countries.

The measurement of GVCS participation needs to be documented as well as other factors that influence exports upgrading to fill the gap in the literature.

In the next section, the underlying argument that GVCS participation allows firms in developing countries to focus on their niche products and raise exports upgrading is assessed within an empirical framework.

Data and Model Specification

This section shows how we calculate our main indicators (GVC participation) and export upgrading. With the rapid rise of GVCS, the effects of exports have become less noticeable as they occur not only in the exporting industries or countries but also in other industries that provide intermediates, a theory that traces back to the time of at least Hirschman (1958).

We capture economic upgrading by using domestic value added in gross exports. This indicator has been used in the literature (see Kummritz, Taglioni, and Winkler 2017).

Our measure of GVC participation is the foreign value added that is embodied in domestic final demand. This is sometimes referred to as 'backward participation.' It is the foreign value added that is embodied in domestic final demand. This indicator has been used in the literature (see Ndubuisi and Solomon 2020). It is adequate for examining the effects of countries that are in the downstream activities of the supply chains. In other words, it can capture the benefits of GVC participation for countries that are involved in assembly activities based on imported components.

Countries participate in the value as either buyers (backward participation) or sellers (forward participation). Because we are interested in the channel through which foreign value affects economic upgrading, we only examine the independent effects of backward participation. We follow the literature (Kummritz, Taglioni, and Winkler 2017; Wang, Wan, and Wang 2019) to estimate the participation of GVCS. The extant literature also includes the role of institutional indicators such as rule of law, which can be an obstacle for export upgrading (see Rodrik 2008).

We estimate the determinants of economic upgrading based on the following model:

$$\text{DVA}_{i,t} = \beta_0 + \beta_1 \text{GVC}_{i,t} + \beta_2 X_{i,t} + \varepsilon_t, \tag{1}$$

where DVA stands for domestic value added and captures economic upgrading. It measures the benefit obtained along the different stages of production. X represents a vector of country-specific time characteristics such as GDP per capita, innovation, foreign direct investment, inflation, institutional quality, and infrastructure.

The innovation variable is captured by spending on research and development. Institutional quality is obtained from the worldwide governance indicators. A country's infrastructure level is obtained from the World Economic Forum (tcdata360). We control for the infrastructure level using the logarithm of road network. GDP per capita is taken from the Federal Reserve Bank of St Louis. The inclusion of these control variables is well documented in the literature (see Harding and Javorcik 2012; Kummritz, Taglioni, and Winkler 2017; Ndubuisi and Solomon 2020, for a detailed review).

We then use the log function of equation (1) and obtain:

$$\begin{aligned}
\ln \text{DVA}_{i,t} = {} & \beta_0 + \beta_1 \ln \text{GVC}_{i,t} + \beta_2 \ln \text{GDP}_{i,t} + \beta_3 \text{innovation}_{i,t} \\
& + \beta_4 \ln \text{FDI}_{i,t} + \beta_5 \text{inflation}_{i,t} + \beta_6 \ln \text{institutional quality}_{i,t} \\
& + \beta_7 \ln \text{infrastructure}_{i,t} + \varepsilon_t. \tag{2}
\end{aligned}$$

It is important to note that all the data are in current prices except innovation, which is expressed as a percentage of GDP, and inflation, which reflects the annual percentage change in the cost of the average consumer spending.

Harding and Javorcik (2012) have incorporated several control variables which influence export sophistication such as inflation and GDP per capita. Although we argue that GVC participation can increase exports upgrading, it is crucial to examine its effects in the context of developing countries. The next section discusses the methodology and the results. We use the OECD ICIO database for the period 2005–2015 for the GVC and economic upgrading indicator. This database allows us to cover the effects of GVCs in the full sample of countries. We split countries from the sample based on the level of economic development. Thus, we have countries from the South (emerging and developing countries) and countries from the North (EU countries) (table 1). The developing countries selected are mostly from the East Asian region because of their increasing role in GVCs (UNCTAD 2019). Table 2 presents the summary statistics of the variables used in the study.

TABLE 1 Countries Considered in the Sample

Developing economies		Advanced economies	
Argentina	Kazakhstan	Austria	Lithuania
Brazil	Malaysia	Belgium	Luxembourg
Brunei	Morocco	Cyprus	Malta
Bulgaria	Peru	Czech Republic	Netherlands
Cambodia	Philippines	Denmark	Poland
China	Russia	Estonia	Portugal
Costa Rica	Saudi Arabia	Finland	Romania
Croatia	South Africa	France	Slovakia
Hong Kong	Thailand	Germany	Slovenia
India	Tunisia	Greece	Spain
Indonesia	Vietnam	Hungary	Sweden
		Ireland	United Kingdom
		Italy	Bulgaria
		Latvia	Croatia

NOTES Based on data from the IMF fiscal monitor database (https://www.imf.org/en/Publications/FM). We investigate the effects of GVCs in South-South and South-North trade. Bulgaria and Croatia are classified as emerging market economies based on the IMF fiscal monitor database. Hence, we follow this classification and put them in countries that belong to the Global South. For the South-North trade, we use EU countries to capture domestic value added (DVA). Thus, because Bulgaria and Croatia are members of the EU we include them in the advanced economies as well.

Methodological Considerations

We employed the pooled OLS to show the baseline regressions of the analysis. The popularity of this approach in the literature is based on its ability to capture the fluctuations of the data. The model also predicts robust estimates by capturing country-year observations. We then use the system GMM method as a robustness test for our analysis. This estimator is ideal when the period under study is less than the number of observations. It also helps to identify regressors that are not only exogenous (Arellano and Bover 1995). Another advantage of this model is that it solves the problem of dynamic panel bias when the lagged regressor is correlated with the fixed effect of the error term.

Previous studies in the regression literature have indicated that not treating the problem of endogeneity may result in serious bias in the regression results (see Lee 2007; Sakata 2007; Guei and Choga 2022). To

TABLE 2   Summary Statistics

Variable	(1)	(2)	(3)	(4)	(5)
Economic upgrading (south)	242	43622.3	72621.9	241.5	468107.3
GVC (south)	242	40136.5	73217.7	394.8	480416.6
GDP per capita	242	9266.1	9752.1	474.1	47740.5
Innovation	136	0.819	0.384	0.042	2.065
Foreign direct investment ($\times$ 1000000)	136	36452	59376	52	290928
Inflation	136	4.748	3.319	−1.418	15.534
Institutional quality	143	30.871	18.719	4.265	74.271
Infrastructure	117	63.222	42.185	3	136
Economic upgrading (north)	242	31209.4	56060.3	27.2	304358.1
GVC (north)	242	28295.1	44761.3	293.3	291185.8

NOTES   Column headings are as follows: (1) observations, (2) mean, (3) standard deviation, (4) minimum, (5) maximum.

deal with the problem of the endogeneity issue and country-specific effect, we apply a system GMM model. The endogeneity problem may occur because of an omitted independent factor that can affect economic upgrading. It can also occur if both economic upgrading and the independent variables influence each other.

The system GMM provides several benefits. The first advantage is that it allows for the inclusion of several instruments which can in turn enhance efficiency in the model. Secondly, the system GMM does not remove the fixed effects as in the difference GMM and can allow for an unknown form of heteroscedasticity and does not require normal distributions assumptions (Greene 2002). To examine the link between GVC participation and exports upgrading we first investigate their relationship in South-South trade. We then include other country-specific characteristics. We follow the same approach for the South-North trade.

This section has three steps. The first sub-section presents the results from South-South trade. The second sub-section discusses the findings from the South-North trade, while the third sub-section carries the robustness analysis.

GVC PARTICIPATION AND ECONOMIC UPGRADING: SOUTH-SOUTH TRADE

We start by discussing the results of the South-South trade which is reported in table 3. Column (1) up to column (4) show the pooled OLS re-

TABLE 3 Impact of South-South Trade (GVC Participation and Economic Upgrading)

Item	Pooled OLS estimates			
	(1)	(2)	(3)	(4)
GVC participation	1.099***	1.426***	1.478***	1.559***
	(0.027)	(0.035)	(0.044)	(0.050)
GDP per capita	–	0.361***	0.298***	0.346***
		(0.045)	(0.056)	(0.061)
Innovation	–	−0.598***	−0.660***	−0.624***
		(0.110)	(0.114)	(0.126)
FDI	–	−0.142***	−0.162***	−0.221***
		(0.037)	(0.011)	(0.039)
Inflation	–	−0.021**	−0.016	−0.022*
		(0.011)	(0.011)	(0.012)
Institutional quality	–	–	0.154**	0.276***
			(0.083)	(0.087)
Infrastructure	–	–	–	0.099**
				(0.054)
Observations	242	136	136	117
R-squared	0.86	0.97	0.97	0.97

NOTES * Denotes significant at 10% level; ** significant at 5% level; *** significant at 1% level.

sults. Specifically, column (1) displays the results when we regress economic upgrading on the participation of GVCs without controlling for other regressors. The results reveal a positive and significant association between the participation of GVCs and economic upgrading. The magnitude of the effect increases as we control for other important determinants of economic upgrading. Specifically, column (1) and column (4) show that a 1% increase in GVC leads to 1.09% and 1.5% rise in economic upgrading, respectively.

These results are consistent with the findings of Criscuolo and Timmis (2017), and Ndubuisi and Solomon (2020). For instance, Ndubuisi and Solomon (2020) show that the participation of GVC has a positive effect on the quality level of exports using both a panel fixed effect and an IV regression method. This result remains the same regardless of the specification of the controlled variables.

In column (2), we include other independent variables as indicated in equation (1) except for Institutional quality and Infrastructure. In column (3) and (4), we include Institutional quality and Infrastructure, respec-

tively. The coefficient on our main variable (GVCS) remains unchanged in all our specifications. The coefficient remains positive and significant, with the effects being stronger when we control for Institutional quality and Infrastructure.

We control for macroeconomic stability using the inflation variable. The results show that macroeconomic stability has a negative effect on economic upgrading in columns (2) and (3). A possible explanation can be attributed to the distortionary impact inflation volatility has on export upgrading. The foreign direct investment coefficient is negative and significant in all our specifications, indicating an inefficient allocation of resources and the inability of investment to enhance economic upgrading. The innovation coefficient is also negative, suggesting that innovation in South-South trade does not promote export upgrading.

Moving on to the level of economic development, the analysis confirms that there is a positive and significant link between GDP per capita and economic upgrading. This finding is consistent with the empirical literature (see Tadesse and Shukralla 2013; Agosin, Alvarez, and Bravo-Ortega 2012).

GVC PARTICIPATION AND ECONOMIC UPGRADING: SOUTH-NORTH TRADE

Next, in table 4, we perform an additional analysis but this time we examine the impact of South-North flow on economic upgrading. The findings regarding our main variable are similar to table 3. Thus, GVCS participation has a positive and significant effect on economic upgrading in all the columns in the table. However, this effect becomes weaker when we control for other regressors. Our results are similar to the broader literature on GVCS that stresses that the participation of GVC can provide access to new knowledge and technology, which in turn improves export upgrading (Harding and Javorcik 2012).

Hausmann, Hwang, and Rodrik (2007) also note that developing economies that export unsophisticated goods can avoid the trap of the Hecksher-Ohlin model through growth in the exports of high technology goods in the context of South-North value chains.

Another interesting finding is that the quality of institution, which is proxied by rule of law, is negative and significant in columns (3) and (4). This suggests that developing countries with poor institutions cannot effectively enhance economic upgrading. The coefficient on inflation and innovation does not have a significant value, which is an indication of

TABLE 4   Impact of South-North Trade (GVC Participation and Economic Upgrading)

Item	Pooled OLS estimates			
	(1)	(2)	(3)	(4)
GVC participation	1.082***	0.952***	0.831***	0.813***
	(0.025)	(0.030)	(0.039)	(0.043)
GDP per capita	–	−0.035	0.067*	0.057
		(0.029)	(0.036)	(0.044)
Innovation	–	0.174**	0.356***	0.382***
		(0.077)	(0.084)	(0.099)
FDI	–	0.002	0.016	0.024
		(0.913)	(0.019)	(0.021)
Inflation	–	0.007	0.003	0.004
		(0.007)	(0.006)	(0.008)
Institutional quality	–	–	−0.241***	−0.197***
			(0.055)	(0.059)
Infrastructure	–	–	–	0.058*
				(0.033)
Observations	242	136	136	117
R-squared	0.87	0.95	0.96	0.96

NOTES   * Denotes significant at 10% level; ** significant at 5% level; *** significant at 1% level.

the negligible role these two variables have on exports upgrading. On the other hand, the impact on innovation is positive and significant in the three columns. This is in contrast with the findings in table 3. This finding implies that efforts by developing countries to innovate can help them find a new market in the advanced countries. The impact of FDI is not significant in any of our specifications. This finding is similar to the results of Harding and Javorcik (2012), who show that the effects of FDI on economic upgrading is ambiguous for high income countries. Their study suggests further that there is no evidence that FDI raises economic upgrading (export sophistication) similarly between developing and high-income countries. The impact on GDP per capita is ambiguous, as it is only positive and significant in the third column.

GVC PARTICIPATION AND ECONOMIC UPGRADING: ROBUSTNESS TEST

For the robustness test, the paper first split the period of analysis into two periods by taking the global financial crisis into consideration. Thus, we

TABLE 5   Sensitivity Test (GVC Participation and Economic Upgrading)

Item	Pooled OLS estimates	
	South-south trade	South-north trade
GVC participation	1.560*** (0.050)	0.813*** (0.043)
GDP per capita	0.349*** (0.062)	0.059 (0.045)
Innovation	−0.624*** (0.126)	0.382*** (0.100)
FDI	−0.222*** (0.039)	0.024 (0.021)
Inflation	−0.021* (0.012)	0.004 (0.008)
Institutional quality	0.277*** (0.088)	−0.197*** (0.059)
Infrastructure	0.100** (0.054)	0.059* (0.033)
Observations	117	117
R-squared	0.97	0.96

NOTES   * Denotes significant at 10% level; ** significant at 5% level; *** significant at 1% level.

include a dummy variable that assigns the value of 0 to the global financial crisis year and 1 otherwise.

The results from table 5 are similar to our baseline estimations. Column (1) confirms the positive and significant effect of GVC participation on economic upgrading in South-South trade. The effects of institutional quality and infrastructure on economic upgrading have become even stronger. This suggests that these policies variables are important determinants of economic upgrading.

The findings from Column (2) reveal comparable results with our baseline regressions. GVC participation and innovation activities in the context of South-North trade show a consistent and positive impact on economic upgrading.

Thus far, our estimations reveal a positive relationship between GVCs participation and export upgrading regardless of the trade flow considered. While the initial analysis was based on the implicit assumption that the regressors are strictly exogenous in the model, this section assumes the opposite and investigates the effects of GVCs on economic upgrading as highlighted in Brock and Durlauf (2001). Hence, we attempt to correct for omitted specific effects which may be correlated with other independent variables.

We ensure that the Arellano estimator is consistent for the validity of the instruments.

Equation (2) becomes:

$$\ln \text{DVA}_{i,t} = \beta_0 + \beta_1 \ln \text{DVA}_{i,t-1} + \beta_2 \ln \text{GVC}_{i,t} + \beta_3 \ln \text{GDP}_{i,t}$$
$$+ \beta_4 \text{innovation}_{i,t} + \beta_5 \ln \text{FDI}_{i,t} + \beta_6 \text{inflation}_{i,t}$$
$$+ \beta_7 \ln \text{institutional quality}_{i,t}$$
$$+ \beta_8 \ln \text{infrastructure}_{i,t} + \varepsilon_t. \tag{3}$$

The instrument variables also deal with the possibility that the error term may be correlated with the lag of the economic upgrading.

Under this new assumption the new error term $(\varepsilon_t - \varepsilon_{t-1})$ is not serially correlated. Equation (4) controls for country-specific effect:

$$\ln \text{DVA}_{i,t} - \ln \text{DVA}_{i,t-1} = \beta_0 + \beta_1 (\ln \text{DVA}_{i,t-1} - \ln \text{DVA}_{i,t-2})$$
$$+ \beta_2 (\ln \text{GVC}_{i,t} - \ln \text{GVC}_{i,t-1}) + \beta_3 (\ln \text{GDP}_{i,t} - \ln \text{GDP}_{i,t-1})$$
$$+ \beta_4 (\text{innovation}_{i,t} - \text{innovation}_{i,t-1})$$
$$+ \beta_5 (\ln \text{FDI}_{i,t} - \ln \text{FDI}_{i,t-1}) + \beta_6 (\text{inflation}_{i,t}$$
$$- \text{inflation}_{i,t-1}) + \beta_7 (\ln \text{institutional quality}_{i,t}$$
$$- \ln \text{Institutional quality}_{i,t-1}) + \beta_8 (\ln \text{infrastructure}_{i,t}$$
$$- \ln \text{infrastructure}_{i,t-1}) + (\varepsilon_t - \varepsilon_{t-1}). \tag{4}$$

First, compared to South-South flow (column 1), GVCS have a greater effect on economic upgrading in the case of South-North flow (column 2), meaning that developing countries tend to gain more by trading with more advanced nations. This supports the idea that backward linkage can stimulate demand in the host country. Thus, the quality of exports increases because leading firms can provide knowledge to local suppliers in developing countries (Taglioni and Winkler 2016).

Second, GDP per capita matters for economic upgrading. The results from column 1 show that a higher level of economic development improves economic upgrading. In column 2, GDP per capita has a negative and significant impact on economic upgrading even though the effect is small.

Conclusion

The law of global comparative advantage has changed with the introduction of GVCS. This is because countries have been successful in cutting down communication and transportation costs and taking opportunities for technological advancement.

The pervasiveness of value chains has a strong impact on international trade, productivity and the environment. Participation of GVCS

TABLE 6   Sensitivity Test – System GMM

Item	South-south trade		South-north trade	
Lag (economic upgrading)	0.706***	(0.053)	0.402***	(0.173)
GVC participation	0.355***	(0.078)	0.558***	(0.168)
GDP per capita	0.118***	(0.036)	−0.085**	(0.038)
Innovation	−0.117	(0.074)	−0.113	(0.108)
FDI	0.013	(0.026)	−0.035	(0.044)
Constant	−1.900***	(0.477)	2.057	(1.449)
Observations	104		104	
Arellano-bond test for AR (1)	0.003		0.033	
Arellano-bond test for AR (2)	0.612		0.097	
Hansen test of overid. restrictions	0.144		0.999	

NOTES   * Denotes significant at 10% level; ** significant at 5% level; *** significant at 1% level.

offers developing countries the opportunity to improve exports upgrading through the use of foreign intermediate inputs. Understanding the creation of value added by GVCS is crucial for the prosperity of developing countries.

Hence, the paper studies the impact of GVCS on the economic upgrading in developing countries. We specifically distinguish between two types of trade flow (South-South) and (South-North). First, the results from the South-South trade indicate that: (i) GVCS captured as foreign value added embedded in domestic exports is positively associated with economic upgrading; and (ii) the level of economic development contributes positively to economic upgrading. Second, we examine the role of GVCS in the context of South-North trade. The results confirm that GVCS have a positive relationship with economic upgrading. We find that innovation and infrastructure are key contributors in developing countries' economic upgrading.

The findings are robust when we allow for endogenous variables in the model. However, an interesting finding is that the level of economic development has different effects on economic upgrading. Our sensitivity test shows that it is either a driver or an obstacle of economic upgrading in the case of South-South and South-North, respectively.

These developments set the stage for the following policy implications. Although GVCS have a positive effect on economic upgrading in developing countries, the choice of trading partners matters in assessing its

impact. The economic development level is an important channel for economic upgrading. In the case of South-South trade, higher economic development can support economic upgrading and facilitate the integration of developing countries into the global supply chain. It is therefore important for developing countries to carefully select their trading partners to ensure that they fully reap the benefits from every trade policy. Policies to support a strong middle class can also be a stepping stone towards building higher economic upgrading in developing countries.

Policies that ease the participation of developing countries in the global supply chain need to be supported. Achieving such policies will require better quality of institutions and infrastructure development.

A potential limitation of the study is that it captures the effects of GVCS on economic upgrading at the aggregate level, which may be inflated by the efficiency of firms in a certain area of the production chains. Hence, further study may look at sectoral analysis, especially the effects of sophisticated exports goods on economic upgrading.

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