Global Value Chains Participation: Determinants and Effects

Anna Ignatenko[*], Faezeh Raei[†], Borislava Mircheva[‡], Volodymyr Tulin[§]

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Abstract

Over the last two decades, world trade, investment and production have become increasingly organized around global value chains (GVCs). Recent theoretical work has shown that countries can benefit from participation in GVCs through multiple channels: finer international division of labor, greater diversity in input varieties, learning externalities, technology spillovers, etc. However, besides the German auto-supply chain, little is known about supply chains in Europe and their economic importance. This study aims to contribute to this literature, as follows: (i) we use Eora MRIO database to compute different measures of GVC participation developed in theoretical literature for 180 countries; (ii) we document stylized facts about patterns of supply chain participation globally, and in particular for European countries, and their evolution over time; (iii) we empirically show that participation in GVCs has positive impact on countries income per capita as well as on its components investment and productivity. And lastly, (iv) we investigate the determinants of GVC participation, and find that apart from standard determinants of bilateral trade flows, bilateral GVC participation is affected by labor costs, exchange rate volatility, contract enforcement and overall quality of infrastructure.

[*]IMF Summer intern, European Department and UC Davis: aignatenko@ucdavis.edu
[†]IMF, European Department: FRaei@imf.org
[‡]IMF, European Department: BMircheva@imf.org
[§]IMF, European Department: VTulin@imf.org

1 Introduction

Rapidly falling transportation costs and an increasing number of trade agreements have allowed countries to specialize and exploit their comparative advantages. As a result, international trade in both manufacturing and service industries has been increasing over time, as Figure 1 (left) demonstrates. More recently, dramatic decline in communication and coordination costs has fostered global fragmentation of production, when different production stages are completed in different countries. Participation in global value chains (GVCs) has allowed countries to use foreign value added in production of their exports. This last phenomenon is evidenced in the growing share of foreign value added in countries' gross exports of both manufacturing goods and services (Figure 2 (right)).

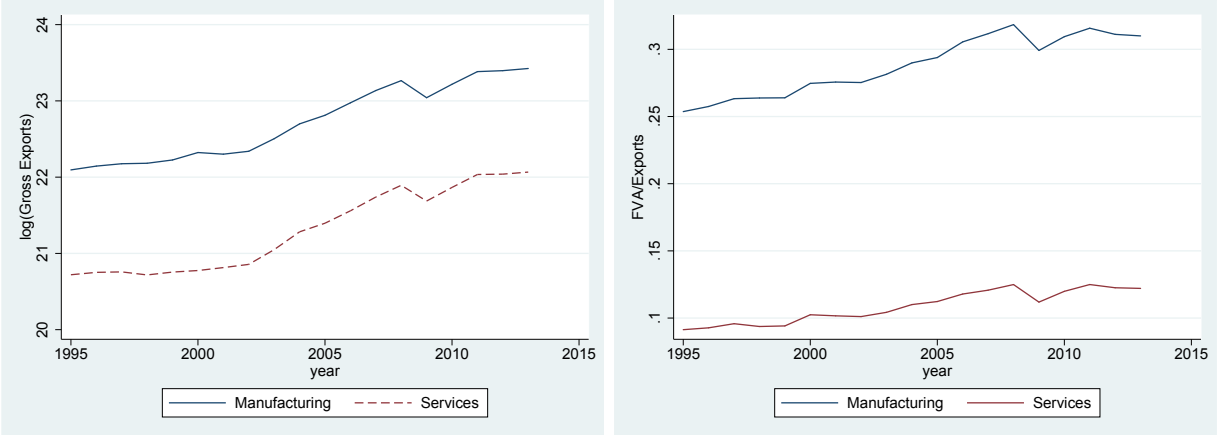

Figure 1: Gross exports (left) and FVA in gross exports (right) of goods and services, 1995 - 2013

Over time, from 1995 to 2013, this trend is observed in all country groups except emerging Asia (excluding China), where imported content in exports declined over this time period (Figure 2).

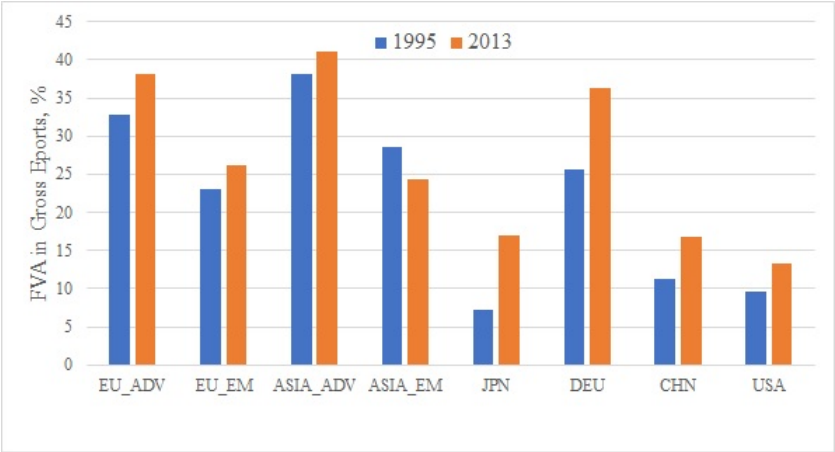

Figure 2: Foreign value added in gross exports, by country groups

Although welfare consequences of international trade have been largely emphasized in both theoretical and empirical literature, medium-term and long-term effects of global value chains participation remain under-explored. In the earlier work, Frankel and Romer (1999) provide a reduce-form evidence that international trade positively effects standards of living measured by GDP per capita. Modern quantitative trade models imply that in OECD countries welfare costs of moving to autarky range from 0.2 to 10.3% (Eaton and Kortum (2002)).

This paper studies the economic consequences of countries' participation in global value chains. Welfare gains are shown to be even larger if one uses multiple-sector framework and takes into account input-output linkages (e.g. Caliendo and Parro (2015), Ossa (2015)). However, these estimates of welfare gains typical abstract from sequentiality of global production and a possibility of trade-induced domestic productivity improvements. Melitz and Redding (2014) offer a simple model that demonstrates that productivity effects of trade can lead to sufficiently higher welfare gains from trade compared to the ones found in the literature.

Recent theoretical literature has shown that productivity gains associated with offshoring and global value chains can arise through multiple channels: finer division of labor across countries (Grossman and Rossi-Hansberg (2008)), availability of greater input varieties (Halpern, Koren, Szeidl (2015)), increased competition, learning externalities and technology spillovers (Li and Liu (2014), Kee (2015)). Empirical investigation of these effects of GVC participation, however, requires data on input-output linkages both within countries and across countries as well as a set of GVC participation measures consistent with theoretical literature. Such data and methodology of computing GVC participation

measures did not exist until recently, which explains limited empirical research in support of the effect of GVC participation on countries' economic performance.

Existing empirical evidence is mostly based on World Input-Output Database, which covers a limited sample of relatively developed countries. For example, Rahman and Zhao (2013) study the relationship between export performance and GVC participation in Europe and find that there is a positive and statistically significant relationship between foreign value added and domestic value added export growth. In a panel of 40 countries, Constantinescu et al. (2017) find that GVC-related trade has a positive effect on labor productivity at the industry level, and this effect is larger than that of the non-GVC related trade (final goods and inputs absorbed in the importing country).

Despite this growing attention to global value chains in both academia and international policy institutions, little is known about GVC effects in small and emerging economies. This paper seeks to fill in this gap in the empirical literature by using the more comprehensive Eora MRIO database to draw conclusion about the impact of GVC participation on countries' income and its main components - investment, TFP and human capital. Motivated by the established positive relationship between GVC participation and economic outcomes, we further explore the determinants of bilateral GVC participation in the gravity equation framework.

Given the focus of the paper on economic development, it is especially important to include both developed and emerging economies in the sample. Eora MRIO database is the only database, which provides yearly input-output tables covering 189 countries and 26 sectors for the period from 1990 to 2013. This paper is thus one of the first papers to document the stylized facts on GVC participation across both developed and emerging countries and across both manufacturing and service industries. In order to document those stylized facts, we first compute various GVC participation measures recently developed by Koopman et al. (2010, 2014), Fally (2012), and Wang et al. (2017).

The remainder of the paper is organized as follows. Section 2 briefly describes the data and the methodology employed to calculate GVC participation measures. Section 3 present major stylized facts on GVC participation across countries and industries. Section 4 explores the relationship between GVC participation and income as well as its components. Section 5 studies the determinants of bilateral GVC participation. Section 6 concludes the paper.

2 Data

In this section we describe the data and the methodology employed in the paper to quantify GVC participation across countries and industries over time.

The core dataset that we use to study GVC participation is Eora Multi-Region Input-Output (MRIO) database, which provides data on input-out linkages between 189 countries, 26 sectors (including services) over the period from 1990 to 2013. Construction of such a comprehensive database required imputation of some countries' input-output linkages based on the available trade flows data. However, as Antras and de Gortari (2017) show, the resulting data is largely consistent with an extensively used World Input-Output Database (WIOD), but contains information on more countries.

To understand the nature of the data and how it can be used to calculate GVC participation measures, a schematic representation of the data can be useful. As Figure 3 illustrates, the data is organized as a matrix split into two blocks. The block on the left contains information on bilateral intermediate input trade flows across countries and the block on the right contains information on final good trade flows. Every row of this table shows how country's gross output is used in both domestic economic and abroad: it can be used either as an input in other industries or as a final good. On the other hand, each row demonstrate the breakdown of inputs used in each country, when it can use output from other industries in the same country, other countries' inputs or direct value added (i.e primary factors of production - labor and capital). Therefore, multi-country input-output tables not only contains information on gross trade flows between countries, but also keeps track of input-output linkages within and across countries.

		Input use & value added				Final use				Gross output
		Country A		Country B		Country A		Country B		
		Industry		Industry		Industry		Industry		
Country A	Industry									
Country B	Industry									
Value added										
Gross input										

Figure 3: The structure of Eora MRIO Database

Using this data we follow methodology developed in Koopman et al. (2010, 2014), Fally (2012), and Wang et al. (2017) to compute several measures of GVC participation.

A standard measure extensively used in the existing literature is foreign value added or share of foreign value added (FVA) in country's gross exports. Intuitively, it represents imported intermediate content of country's exports and thus reflects backward linkages in GVC participation or GVC participation from import perspective. On the other hand, countries and sectors can participate in global value chains by actually supplying their domestic value added, which then gets processed and re-exported from other countries. This measure thus captures forward linkages when GVC participation is viewed from export perspective. Hummels, Ishii and Yi (2001) label this measure of GVC participation as VS1 and emphasize that a complete picture of a country's involvement in GVCs entails studying both - its forward and backward linkages. They note that when countries specialize in stages of production, VS1 can be high when FVA is low. However, calculating VS1 measure of GVC participation is more difficult, because it requires matching *bilateral* trade flows data to the input-output linkages.

Due to bilateral data limitations, this measure was ignored in empirical literature, but, thanks to its bilateral structure, Eora MRIO database allows us to compute VS1 measure of GVC participation and compare it to the FVA measure.

Apart from GVC participation measures, we calculate indexes of countries' and industries' position in global value chains. At the sectoral level, upstreamness index reflects the number of production stages embodied in a particular good produced within a sector, while downstreamness index reflects the number of production stages this good has to go through before it reaches final consumers. Following Fally (2012), we calculate country's upstreamness as a weighted average of its sectoral upstreamness indexes with weights being the shares of industries' value added in countries' total value added. Analogously, country's downstreamness is calculated as a weighted average of its sectoral downstreamness indexes with weights being the shares of industries' in final demand.

In the next section we document summary statistics of these measure of GVC participation and position in GVC as well as major stylized facts on countries' GVC participation and their evolution over time.

3 Stylized Facts on GVC participation

We start off our analysis by documenting cross-country and cross-industry differences in GVC participation. Table 1 reports summary statistics of GVC participation and position measures that we calculate in a selected sample of industries. To reflect the importance of each industry in world production, we add a column containing the share of each industry in total world output.

Industry	Share	FVA/Exp	VS1/Exp	Upstreamness	Downstreamness
Agriculture	18.4	8.0	91.5	2.2	1.6
Construction	8.6	9.5	41.6	1.3	1.8
Education & Health	8.4	32.6	25.1	2.8	2.5
Electrical & Machinery	8.1	32.0	15.4	2.1	2.6
Finance	4.7	18.6	38.4	2.5	1.98
Fishing	4.5	23.2	9.4	1.7	2.5
Food & Beverages	4.5	29.2	34.8	3.2	2.6
Hotels & Restaurants	4.4	12.7	46.7	1.8	2.7
Metal Products	3.7	36.7	9.9	1.8	2.8
Retail Trade	0.8	8.9	272.8	2.1	1.9
Transport Equipment	0.3	18.1	31.0	2.2	2.6

Table 1: Summary statistics

From this table it is easy to see that some industries have strong backward linkages, while other have strong forward linkages inside global supply chains. It also seems that industries with strong forward linkages are often higher upstream in the supply chain, while industries with strong backward linkages are located relatively closer to final demand in the value chain. This suggests that differences in industrial composition across countries can result in asymmetries in GVC participation based on forward and based on backward linkages.

Figures 4 and 5 illustrate this idea by mapping FVA and VS1 shares in gross exports, respectively, using data for year 2013. Darker colors are used to reflect higher involvement of a country in global value chains.

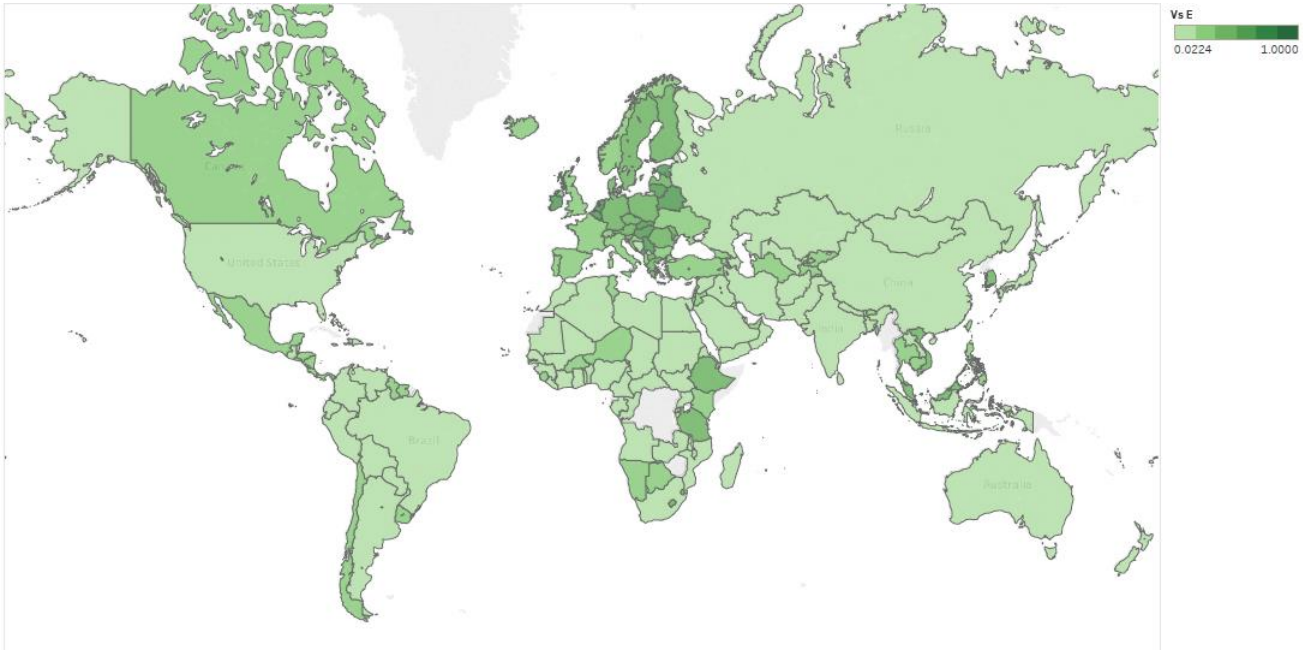

Figure 4: Intensity of backward linkages in the world, 2013

These world maps thus illustrate the point made by Hummels, Ishii and Yi (2001): although, in principle, complementary, these two measures can result in two completely different pictures of the world if used separately.

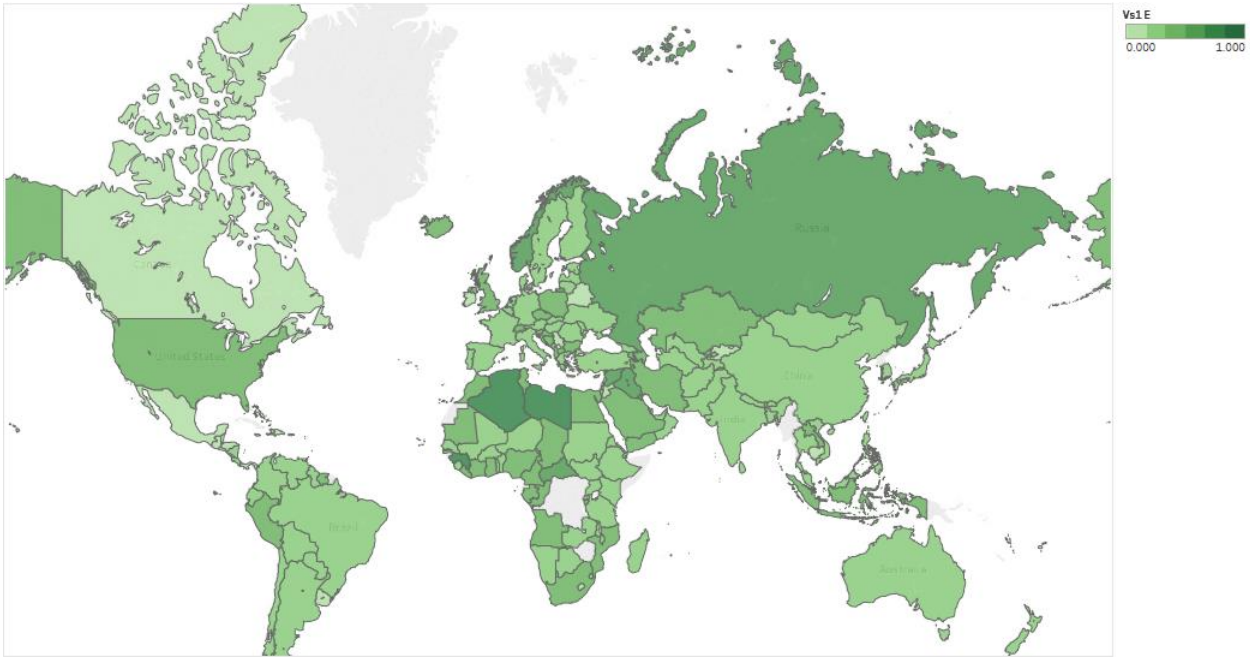

Figure 5: Intensity of forward linkages in the world, 2013

For example, resource-rich countries like Russia tend to have low share of FVA in their gross exports and high share of domestic value added that is re-exported from other countries. This suggests that there is international specialization in stages of production along global value chains. In order to explore this possibility, we study vertical specialization as measured with either FVA share of VS1 share in gross exports at the industry level.

Figures 6 and 7 demonstrate that there vertical specialization is heterogeneous across industries and that some industries are mostly connected to GVCs though forward linkages while others participate in GVCs mostly through backward linkages.

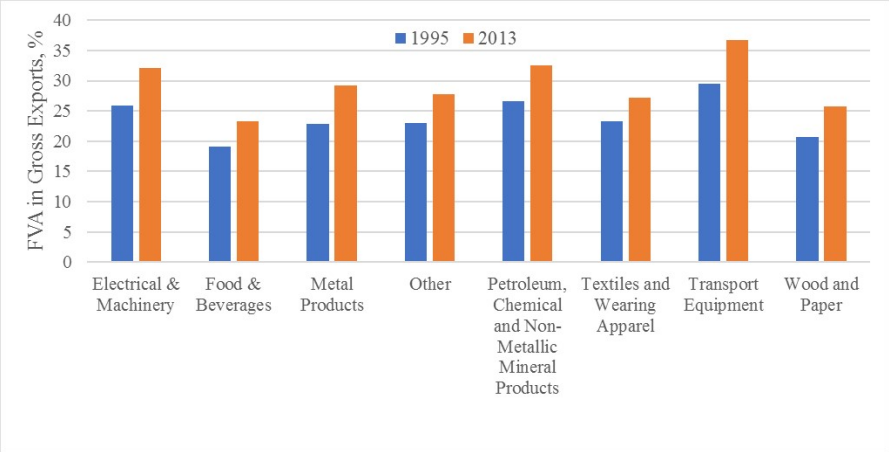

Figure 6: Share of FVA in gross exports of manufacturing goods

For example, electrical and machinery sector tends to rely relatively intensively on imported inputs when producing its exports, but its exports does not seem to be very re-exported embodied in other countries' exports compared to other manufacturing sectors.

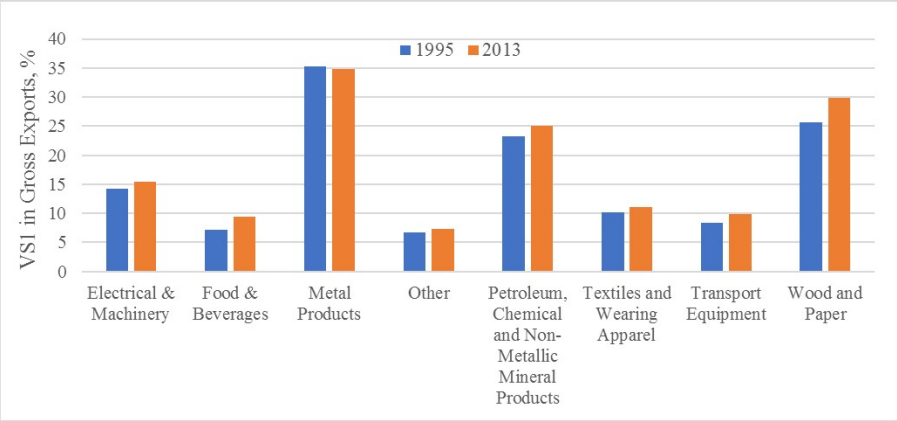

Figure 7: Share of VS1 in gross exports of manufacturing goods

When comparing manufacturing to service industries, we find that service industries enter global value chains mostly through forward linkages and rely relatively less on backward linkages. Intuitively, services are produced mostly with domestic value added and then exported embedded in both manufacturing and service industries. Figures 8 and 9, respectively, demonstrate how vertical specialization in various service industries changed from 1995 to 2013. They show that if one considers only FVA in gross exports as a measure of GVC participation, one would incorrectly conclude that service industries are not well incorporated in global value chains. However, in fact, service industries have very strong forward linkages.

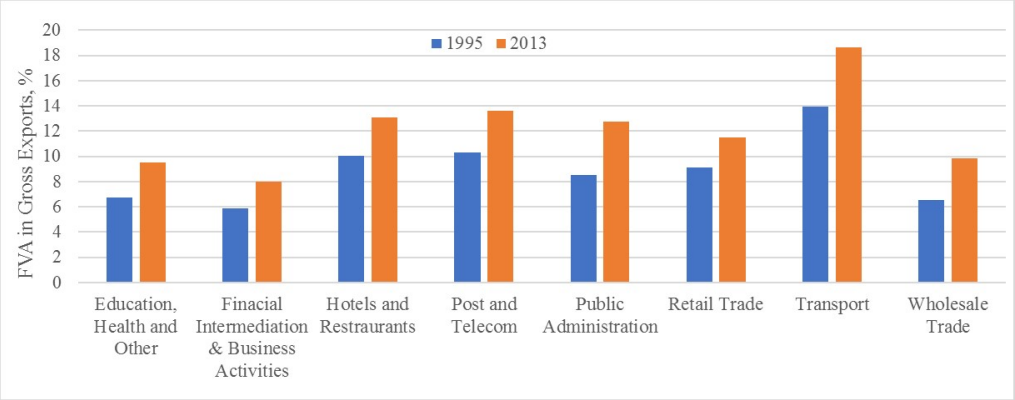

Figure 8: Share of FVA in gross exports of services

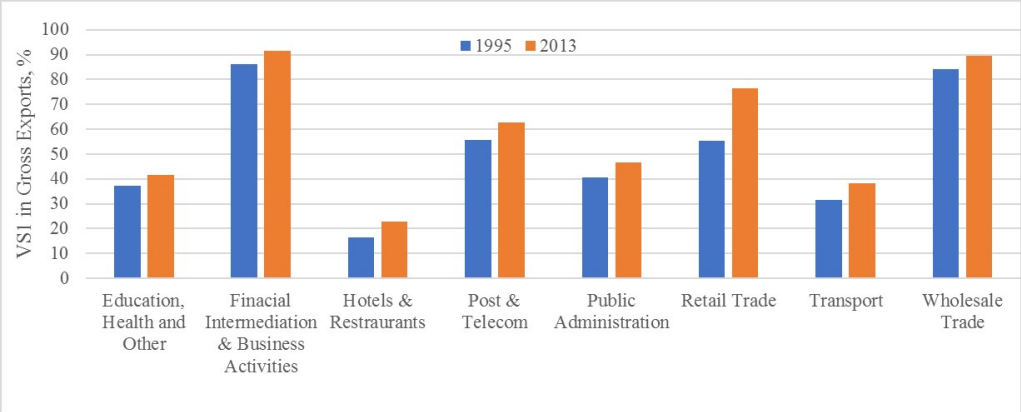

Figure 9: Share of VS1 in gross exports of services

Fore example, consider financial intermediation and business activities industry. In order to produce its gross exports, it draws mostly on countries' domestic value added leading to low share of FVA in gross exports. However, this industry's output is likely

to be re-exported while being embedded in many manufacturing industries' exports at multiple stages of the value chain.

In the next section we seek to understand if cross-country differences in GVC participation can explain cross-country differences in income levels, as well as investment, productivity and human capital.

4 GVC participation and economic outcomes

Our empirical study of the effect of GVC participation on countries' economic performance is motivated by a fact illustrated in Figure 10: both measures of GVC participation are positively correlated with income per capita. Although instructive, this is just a simple correlation that does not detect the channels through which participation in global value chains can impact countries' income per capita.

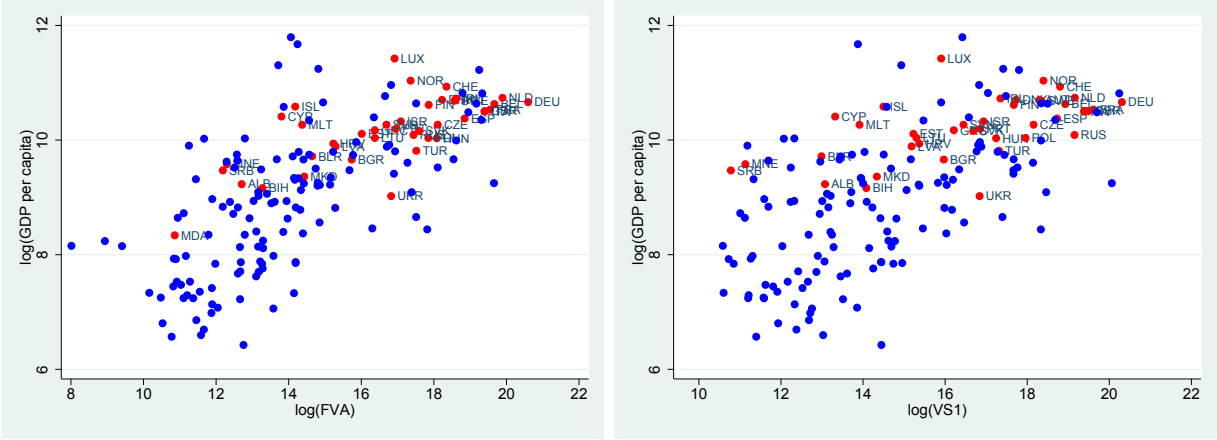

Figure 10: Countries' participation in global value chains and income per capita, 2013

In fact, theoretical literature suggests that this positive correlation could arise for several reasons, including productivity effects of GVC and investment boosting. Figure 11 is suggestive of this last mechanism - it shows that bilateral GVC participation measures and bilateral FDI volumes are positively related. However, since GVC participation could also encourage domestic investment, we will further study its effect on total investment.

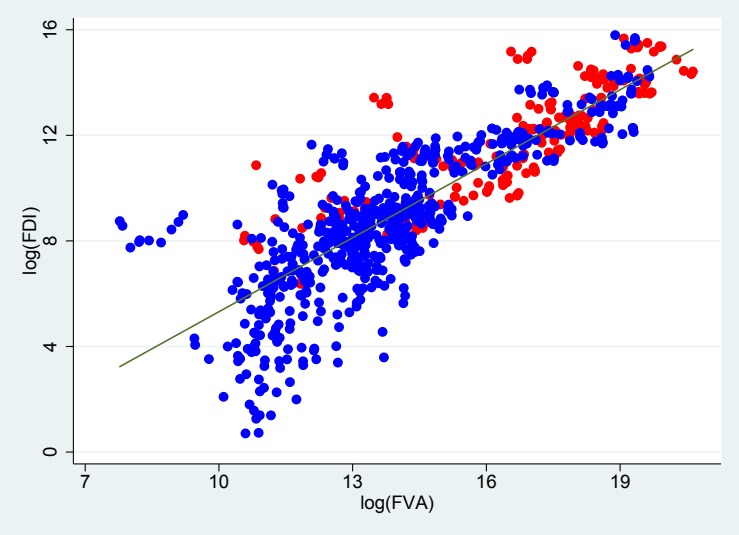

Figure 11: Foreign value added and FDI in 2009 - 2013

In this section we provide a more formal econometric analysis of the relationship between GVC participation and income per capita, as well as the main factors that contribute to the formation of GDP per capita - productivity, investment and human capital.

4.1 Theoretical Framework

The empirical methodology of the paper relies on a production function and its decomposition, similar to the one used in Frankel and Romer (1999) to study the impact of trade on economic well-being.

Consider country i, whose gross output is produced using domestic (V_i) and foreign (X_i) value added combined in a Cobb-Douglas production function:

$$Y_i = V_i^{1-\alpha_i} X_i^{\alpha_i} \tag{1}$$

Country i's domestic value added (GDP) is produced using capital, labor and human capital in the following way:

$$V_i = K_i^{\beta_i} (e^{\phi(S_i)} A_i N_i)^{1-\beta_i}, \tag{2}$$

where K_i, N_i denote country's endowment of capital and labor, A_i stands for labor-augmenting productivity, S_i is workers average years of schooling and $\phi(S_i)$ is a piecewise linear function that transforms years of schooling into human capital. Following Frankel

and Romer (1999), we can rewrite (2) as:

$$V_i = \left(\frac{K_i}{V_i}\right)^{\frac{\alpha_i}{1-\alpha_i}} e^{\phi(S_i)} A_i N_i \tag{3}$$

Dividing both sides by N_i and taking logs, we obtain the following decomposition of country i's GDP per capita:

$$log(\frac{V_i}{N_i}) = \frac{\alpha_i}{1-\alpha_i} log(\frac{K_i}{V_i}) + \phi(S_i) + log(A_i) \tag{4}$$

This equation thus decomposes log of income per capita into contributions of capital depth, which was shown to be proportional to the investment rate on balanced growth path (Hall and Johns (1999)), human capital and productivity.

As Figure 10 suggests, country's participation in global value chains can have an impact of its GDP per capita. This impact can manifest itself through any or all factors contributing to income per capita - investment rate ($log(\frac{K_i}{V_i})$), human capital ($\phi(S_i)$), or labor productivity ($log(A_i)$).

In order to detect the overall effect of GVC participation on income per capita, we first estimate the following reduced-form equation:

$$log\left(\frac{V}{N}\right)_{it} = \alpha + \sum_{i=1}^{n} \beta_i share_{i(t-1)} + \gamma X_{it} + \eta_t + \eta_{it}, \tag{5}$$

where $share_{i(t-1)}$ states for a range of lagged trade- and GVC participation related variables. In particular, we separately study the effect of final goods trade and intermediate goods trade as well as GVC-related intermediate goods trade and trade in intermediate goods that get absorbed inside the country and thus are not related to GVC. Note that we use lagged trade variables in this specification as a first attempt to tackle the endogeneity issues associated with a possibility of refer causality. Following Frankel and Romer (1999), we also control for such country characteristics as population and area, in order to reflect the effect of internal trade (as opposed to international trade) on country's income per capita.

In order to study the channels through which GVC participation impacts social well-being, we regress each of the contributing components of economic growth on the same range of lagged trade- and GVC participation measures. In those specifications we use human capital index developed by Barro and Lee (2010) as a proxy for human capital, and we calculate productivity as a residual in equation (4).

Next section summarizes the main results of OLS estimation.

4.2 Suggestive Evidence

Table 2 below summarizes our main findings on the relationship between trade and GVC participation and economic development. Column (1) reports the results from a regression exploring the relationship between (lagged) shares of final and intermediate goods trade in country's GDP and country's income per capita. It suggests that it is mostly trade in intermediate goods that contributes to country's income per capita.

In column (2) we distinguish between GVC-related and GVC-non-related trade as factors affecting income per capita. GVC-related trade is defined as imports and exports that either embed foreign value added or are exports of domestic value added that are re-exported embedded in other countries' exports. GVC-non-related trade is, in turn, defined as imports and exports that get directly absorbed in other countries. The preliminary OLS results suggest that it is mostly the share of GVC-related trade flows in country's GDP that is positively related to income per capita.

	(1)	(2)	(3)	(4)	(5)
	$log(\frac{Y}{N})$	$log(\frac{Y}{N})$	$log(\frac{I}{Y})$	$\phi(S)$	$log(A)$
share(FNL TRD)	0.143				
	(0.728)				
share(INT TRD)	1.610***				
	(0.339)				
$log(popul)$	-0.041	-0.060	-0.007	-0.024	-0.059
	(0.068)	(0.069)	(0.020)	(0.043)	(0.051)
$log(area)$	-0.012	-0.013	0.007	0.028	-0.030
	(0.061)	(0.060)	(0.013)	(0.036)	(0.047)
share(TRD)		0.227	-0.007***	0.402	-0.351
		(0.458)	(0.002)	(0.302)	(0.489)
share(GVC TRD)		2.738**	0.367***	1.366*	1.869*
		(1.148)	(0.103)	(0.750)	(1.107)
Constant	9.458***	9.674***	2.943***	1.562***	6.573***
	(0.722)	(0.726)	(0.139)	(0.415)	(0.612)
Observations	3,049	3,049	3,045	2,777	2,625
R-squared	0.172	0.183	0.042	0.261	0.072

Clustered robust standard errors in parentheses
Year fixed effects are included
*** p<0.01, ** p<0.05, * p<0.1

Table 2: GVC participation and income per capita

In columns (3) - (5), we study the channels through which GVC participation and trade could affect income per capita. Surprisingly, our preliminary results suggest that although GVC-related trade share positively affects investment rate, GVC-non-related trade share has a negative impact on it. This result could be explained by competition effect of international trade: once a country opens up to trade, it faces tougher competition from abroad, which makes some (less productive) firms leave the market, which might cause investment to go down. However, further exploration of this result is needed. Columns (4) and (5) show that GVC-related trade share also positive affects human capital and productivity, measured as a residual in the income decomposition equation.

These results are suggestive, but they should be interpreted with caution, because using lags of independent variables does not always solve the endogeneity problem. Our natural next step would be to use instrumental variables approach in these specifications, in order to establish a causal link between GVC participation on the one hand, and income per capita. investment rate, human capital accumulation and productivity - on the other hand.

Motivated by the positive link between GVC participation and income per capita as well as its contributing components, we further explore how countries can increase their participation in global value chains.

5 Determinants of Bilateral GVC participation

5.1 Empirical Strategy

The analysis in the previous section suggests that countries with higher GVC participation have higher income per capita, higher investment rate, higher human capital and higher productivity. From policy making perspective, it is thus important to study what factors determine country's participation in global value chains.

In order to explore this question empirically, we rely on the structural gravity equation, which can be represented in the following equation:

$$log(FVA_{ijt}) = \beta X_{ijt} + \eta_{it} + \eta_{jt} + \epsilon_{ijt}, \tag{6}$$

where X_{ij} are country-pair characteristics such as distance, common language, common border, common currency and colonial ties, η_{it} is time varying source-country fixed effect and η_{it} is time varying destination-country fixed effect. Apart from standard gravity controls, we augment this specification with two policy-related variables - an indicator of preferential trade agreement between two countries (fta-wto) and exchange rate volatility

(exvol).

In the second step, we use time-varying source- and destination fixed effects estimated in this specification, in order to investigate what time-invariant country characteristics contribute to country participation in global value chains. Therefore in the second step, we estimate the following specification:

$$\eta_{it} = log(GDP_{it}) + \alpha X_i + \eta_t + \epsilon_{it}, \tag{7}$$

where η_{it} is either source- or destination- fixed effects estimated in the first step, $log(GDP_{it})$ is log of either source- or destination- country, respectively, X_i is time-invariant country characteristics of interest, and η_t is year fixed effect.

Now we turn to the results of the two-step estimation procedure that we employ.

5.2 Results

Table 3 shows the results of OLS estimation of the gravity equation in (6). Columns (1) and (2) suggest that physical proximity as well as standard country-pair characteristics such as common border, common language and colonial linkages are important determinants of GVC participation measured with foreign value added. In particular, distance discourages GVC participation with elasticity -0.75, having a common border, colonial ties and the same official language encourages countries' bilateral participation in GVCs. Columns (3) and (4) include additional policy-related variables in the gravity equation specification, ie preferential trade agreement indicator, exchange rate volatility and common currency indicator. The results suggest that having the same currency or at least lower exchange rate volatility increases countries' bilateral value chain participation.

Taking advantage of Eora dataset, which allows us to calculate bilateral GVC participation at the industry level as well, we estimate eq. (6) at the industry level for year 2013. Instead of time fixed effects we thus include source country-sector and destination country-sector fixed effects, which helps controlling for country-sector heterogeneity. We report the results in Table 4 below.

The first three columns of Table 4 study if there are any differences in the determinants of GVC participation in manufacturing and service industries. The results suggest that geographical proximity is more important for manufacturing rather than service industries, as one can expect. Other standard gravity controls have more or less equal impact on GVC participation in both manufacturing and service industries.

In the last two columns of Table 4 we investigate the implications of industrial upstreamness and downstreamness for trade cost elasticities in manufacturing industries. In

order to do so, we interact log of distance with either upstreamness (n-ldist) or downstreamness (d-ldist) indexes and include it as an additional term in our gravity equation specification. The results imply that international trade of goods from upstream industries is more sensitive to distance compared to goods closer to final demand. Moreover, interacting preferential trade agreement indicator with upstreamness and downstreamness indexes shows that preferential trade agreements facilitate trade in upstream sector by more than trade in relatively downstream sectors.

	(1)	(2)	(3)	(4)
	lfva	lfva	lfva	lfva
ldist	-1.010***	-0.752***	-0.579***	-0.574***
	(0.019)	(0.013)	(0.013)	(0.013)
contig		1.823***	1.390***	1.386***
		(0.096)	(0.078)	(0.078)
comlang_off		0.349***	0.266***	0.261***
		(0.025)	(0.022)	(0.022)
comcol		0.043	-0.022	-0.023
		(0.027)	(0.026)	(0.026)
col45		0.402***	0.494***	0.513***
		(0.097)	(0.096)	(0.095)
comcur			1.513***	1.416***
			(0.107)	(0.106)
fta_wto			0.648***	0.627***
			(0.024)	(0.024)
exvol				-1.183***
				(0.207)
Country-Year FE	Yes	Yes	Yes	Yes
Observations	544,170	544,170	544,170	537,775
R-squared	0.899	0.907	0.913	0.913

Country-pair clustered robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3: Determinants of bilateral GVC participation, 1995 - 2013

Although Table 3 does not report them, time-varying country fixed effects are also useful if one wants to study which countries are more or less involved in global value chains compared to the average. To illustrate, in Figure 12 we plot the average (over time) estimated origin fixed effects conditional on GDP against the average quality of infrastructure in 1995 - 2013. In that plot, origin countries with fixed effects above zero participate in global value chains more actively than the average, while countries with

fixed effects below zero are less involved in global value chains than the average. The plot also shows that there is a slight positive partial correlation between country's GVC participation on the source side and the quality of its infrastructure.

	All lfva	Man lfva	Serv lfva	Man lflow	Man lflow
ldist	-0.397***	-0.533***	-0.392***	-0.876***	-0.733***
	(0.00949)	(0.0119)	(0.0101)	(0.0589)	(0.0284)
n_ldist				0.0715***	
				(0.0214)	
contig	0.613***	0.677***	0.557***	0.909***	0.918***
	(0.0586)	(0.0687)	(0.0596)	(0.0915)	(0.0916)
comlang_off	0.130***	0.192***	0.127***	0.283***	0.288***
	(0.0159)	(0.0206)	(0.0169)	(0.0273)	(0.0273)
comcol	0.142***	0.186***	0.142***	0.229***	0.227***
	(0.0158)	(0.0206)	(0.0171)	(0.0274)	(0.0274)
col45	0.474***	0.506***	0.495***	1.011***	1.011***
	(0.0871)	(0.101)	(0.0885)	(0.133)	(0.133)
comcur	0.0822	0.122**	0.0586	0.0881	0.0815
	(0.0531)	(0.0592)	(0.0585)	(0.0776)	(0.0777)
fta_wto	0.407***	0.568***	0.366***	0.852***	0.409***
	(0.0186)	(0.0234)	(0.0197)	(0.147)	(0.0641)
n_fta				-0.0653	
				(0.0537)	
d_ldist					0.0211**
					(0.0107)
d_fta					0.119***
					(0.0249)
Country-Sector FE	Yes	Yes	Yes	Yes	Yes
Observations	588,833	199,550	172,939	199,550	199,550
R-squared	0.923	0.922	0.921	0.837	0.837

Table 4: Sector-level determinants of bilateral GVC participation, 2013

Analogously, in Figure 13 we plot the average (over time) destination fixed effects conditional on GDP against contract enforcement in the destination country. Apart from showing which countries are more involved in GVCs relative to the average on the import side, this plot suggests a positive link between contact enforcement in the destination country and its GVC participation level. These findings motivate us to investigate what time-invariant country characteristics contribute to countries' relatively higher participation in GVCs in the second step of our estimation strategy. The results of estimation of

specification in (7) with source-country fixed effects on the left-hand side are reported in Table 4.

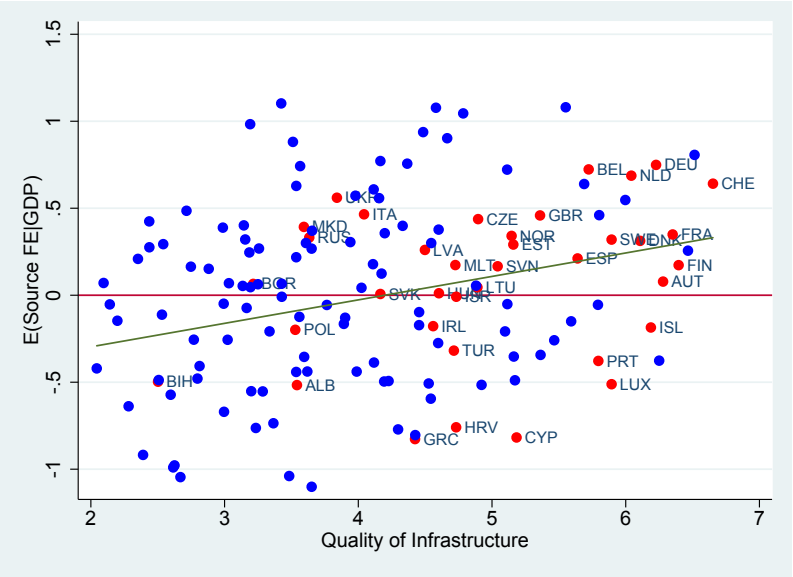

Figure 12: Origin fixed effects and its quality of infrastructure

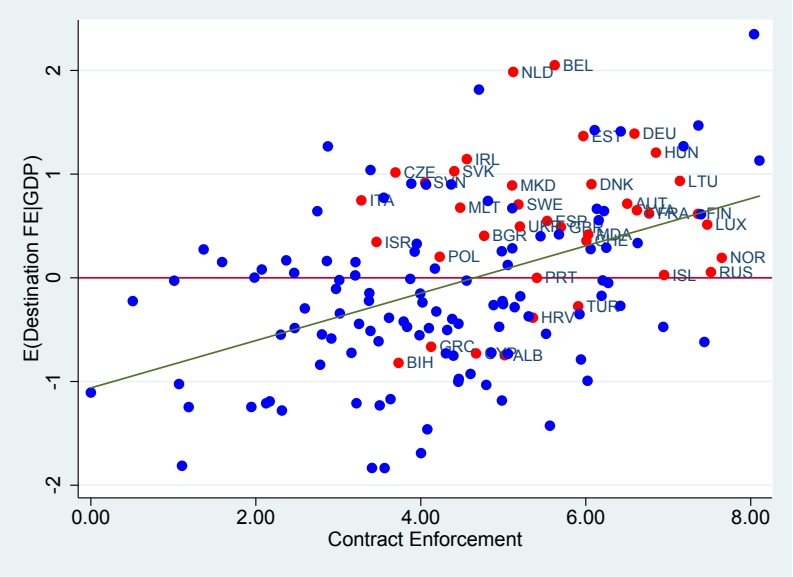

Figure 13: Destination fixed effects and contract enforcement

Table 4 thus suggests that having strong institutions reflected in high-degree of contract enforcement and rule of law positively effects countries participation in GVCs on the exporting side. Moreover, ease of doing business (here proxied with the number of procedure

needed to set up business) and overall quality of infrastructure are important for GVC participation as well. Higher unit labor costs in the exporting country makes that country less competitive and thus decreases the extent of its participation in global value chains.

Table 5 summarizes regression results when destination fixed effects are used as dependent variable. The results are qualitatively similar to the ones discussed above, except for the unit labor costs, that do not seem to have a significant effect on country's participation in global value chains on the importing side.

	(1) Or FE	(2) Or FE	(3) Or FE	(4) Or FE	(5) Or FE	(6) Or FE	(7) Or FE
lngdp_o	0.740***	0.753***	0.708***	0.742***	0.742***	0.841***	0.826***
	(0.024)	(0.022)	(0.028)	(0.025)	(0.025)	(0.037)	(0.042)
enforce_o		0.085***					
		(0.027)					
ruleoflaw_o			0.167***				
			(0.062)				
entry_proc_o				-0.024*			
				(0.014)			
l_ulc_o						-0.077	-0.411**
						(0.126)	(0.169)
h_cap_o							0.564**
							(0.243)
q_infra_o							0.075
							(0.085)
Constant	-2.740***	-3.169***	-2.651***	-2.248***	-2.248***	-2.809***	-3.353**
	(0.092)	(0.119)	(0.093)	(0.190)	(0.190)	(0.500)	(1.271)
Observations	531,527	482,021	528,316	288,499	288,499	114,067	98,350
R-squared	0.854	0.905	0.860	0.843	0.843	0.924	0.934

Table 5: Time-invariant exporting country characteristics and GVC participation

	(1) Dest FE	(2) Dest FE	(3) Dest FE	(4) Dest FE	(5) Dest FE	(6) Dest FE	(7) Dest FE
lngdp_d	0.782***	0.770***	0.685***	0.783***	0.721***	0.781***	0.725***
	(0.035)	(0.031)	(0.035)	(0.033)	(0.032)	(0.066)	(0.035)
enforce_d		0.231***					
		(0.040)					
ruleoflaw_d			0.501***				
			(0.072)				
entry_proc_d				-0.088***			
				(0.020)			
q_infra_d					0.412***		
					(0.064)		
l_ulc_d						0.016	
						(0.125)	
h_cap_d							0.926***
							(0.121)
Constant	-2.036***	-3.123***	-1.763***	-1.406***	-3.626***	-1.696***	-4.060***
	(0.119)	(0.176)	(0.116)	(0.259)	(0.236)	(0.446)	(0.254)
Observations	531,581	481,785	528,390	288,605	462,710	113,306	371,482
R-squared	0.765	0.836	0.815	0.785	0.841	0.821	0.854

Table 6: Time-invariant importing country characteristics and GVC participation

6 Conclusions

This paper uses the new comprehensive Eora MRIO Database to uncover the extend to which both developed and emerging economies participate in global value chains and to estimate the determinants and consequences of GVC participation. In doing so, we first construct different measures of GVC participation and industry and country position in the value chain, using recently developed methodology consistent with theoretical literature. We find that GVC participation based on backward and forward linkages often go in opposite directions, suggesting that there exist international specialization in stages of production and that both measures should be used to obtain a complete picture of countries' GVC participation. We also document that there is a great degree of heterogeneity in GVC participation and position measures across countries and across industries.

We exploit this heterogeneity in order to study the relationship between GVC participation and income per capita as well as its determinants (investment rate, human capital and productivity). Our results suggest that participation in global value chains can positively

effect countries' economic performance through its effect of all these components. Therefore, we proceed by investigating what determines countries' success in fitting in the value chains. As a result, we find that standard gravity variables are able to explain country's participation in GVCs, but on top of them, quality of institutions, overall infrastructure and unit labor costs are important determinants of GVC participation.