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Paths of economic development: a global evidence for the mediating role of institutions for participation in global value chains

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ABSTRACT

Integration into global value chains (GVCs) provides opportunities for economic development, but the extent and nature of these opportunities differ across countries. The economic impact of a country's participation in GVCs can be modified by domestic institutional arrangements in a variety of ways depending on the types of GVCs. Most recent empirical and correlational studies assume that causality leads to economic growth through the participation of GVCs and institutions, but an inverse relationship between them is also feasible and only a few studies have analyzed this possibility. Using a large panel data set of sixty countries from 2000 to 2016, this paper contributes to closing these gaps using instrumental variable analysis as an empirical strategy. Key findings include that GDP per capita is positively affected by participation in GVCs and that this effect is greater when such participation is accompanied by institutional facilitation. These findings suggest that participation in GVCs accompanied by well-functioning domestic institutions can be highly effective in enhancing countries' economic growth.

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1. Introduction

Participation in global value chains (GVCs) has become one of the most important factors in the global economy. According to Chaines (2013), GVCs fragment production processes and disperse tasks/activities throughout numerous locations in various countries that lead to a large number of cross-border production networks. Taglioni et al. (2016) termed participation in GVCs as 'importing to export'. The concept of participation in GVCs was derived from schools of thought in economic theory, international trade disciplines, and studies of development. Kimura (2006) described

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GVCs as ‘international production and distribution networks’ and stressed the use of the ‘fragmentation theory’ which was originally introduced by Jones et al. (2005), as the mechanics for these networks.

As firms’ production processes are sliced across borders, participation in GVCs (‘GVC participation’ hereafter) becomes the central factor in growth policy. Policymakers across institutions and countries have placed GVC participation at the heart of their agendas and have continually emphasized its importance to economic development. According to estimates by the World Economic Forum (2013), reduction in trade barriers could raise global GDP by 5 percent and trade by 15 percent. However, a positive effect on domestic economic growth of GVC participation is not self-evident. The recent extension of GVCs across borders has resulted in significant discontinuity in institutional facilitation, so the effect of institutional facilitation across countries on the pattern of GVC participation and its economic contributions remains to be understood. Previous studies have suggested that institutional facilitation in international trade is one of GVC participation’s sources of advantage (Dollar & Kidder, 2017), and institutional analysis has revealed how GVCs are coordinated and controlled when certain of their actors have more power and connectivity than others. The most important question, however, concerns whether GVC participation accompanied by well-functioning domestic institutions can help countries to attain sustainable economic development, that is, whether such arrangements would accelerate economic growth thus enabling countries to achieve greater convergence with diversified development stages. Altomonte et al. (2018), which discusses the relationship between trade and growth, considered some of the traditional channels that have an asymmetric impact on GVC participation, but no studies have discussed the possibility of an indirect relationship between GVC participation and economic growth.

This study presents an elaborated typology of institutional structure for the GVC literature using analysis of case examples to draw implications for GVC theory. The field lacks assessments that analyze the role of domestic legal and economic institutions to modify the economic contribution of countries’ GVC participation. This study provides the first macro-level evidence of the significant role of the interaction between economic freedom (as a measure of institutional facilitation) and GVC participation in explaining the variations in countries’ GDP per capita. In measuring GVC participation, we follow Koopman et al.’s (2010) accounting framework, which quantifies country-level GVC participation from forward and backward linkages. Moreover, we decompose the economic freedom index into its institutional dimensions for robustness checks, following a standard empirical framework from the GVC-institution literature (e.g., Cheng et al., 2015; Dollar & Kidder, 2017; Dollar et al., 2016). Finally, we use SYS-GMM to control for the problem of endogeneity by stopping the potential two-way causations between GVC participation and economic growth and between economic freedom and economic growth.

The rest of the paper is structured as follows: Section 2 provides a literature review, while Section 3 discusses the data and the indicators of GVC participation and institutional facilitation used in the estimation. Section 4 describes the theoretical framework and econometric methodology, and Section 5 presents empirical

specifications and describes the findings of those specifications and their robustness. Section 6 concludes the study.

2. Literature review

This section provides a review of the extant literature on how GVC participation and institutions affect economic growth.

2.1. Participation in global value chains and economic growth

The OECD (2013) found that GVC participation has a positive impact on GDP per capita growth in both developed and developing countries, but other studies' contradictory findings suggest rejecting these hypotheses. The differences in these findings are due to variations in model estimations, econometrics techniques, variable selection, countries and time periods. Chaines (2013) conducted a country-level analysis of GVC participation's impact on growth in terms of the addition of local value, job creation, and technology spillover as direct effects and building and upgrading productivity as an indirect effect. Taguchi (2014) took into consideration Chaines's (2013) first-of-its-kind country-level analysis of the impact of GVC participation on growth and applied it to Asian economies, determining that Asia has considerable potential to increase its GVC participation. Taguchi (2014) modified Chaines's (2013) analysis by means of a more sophisticated method to estimate non-linear and quadratic curves that were used to analyze the relationship between domestic value added (DVA) and GDP per capita growth. Taguchi (2014) concluded that GVC participation in terms of DVA share to exports makes a positive significant contribution to the selected countries' GDP per capita growth.

The effect of GVC participation in structural change is also based on Chaines (2013), which summarized the economic contributions of GVC participation to local value capture, technology dissemination and job creation. According to Schumpeter (1950), innovation is one of the major causes of 'creative destruction,' where sectors and firms that incorporate traditional technologies see decreased growth, and firms and sectors that employ innovative and disruptive technologies see increased growth (Verspagen, 2000). When GVC participation increases there is an aggregate boost in the economy that is due to displacement of less productive and profitable firms and sectors by more profitable ones. Structural change that is due to GVC participation is essential for economic growth in the modern world. At the beginning of the GVC era, structural change took place mainly in the manufacturing sector; now researchers like Stehrer and Stöllinger (2015) and Sampath and Vallejo (2018) have asserted that expansion of the manufacturing sector because of GVC participation is the driving force of economic growth.

Considerable literature has analyzed the economic impact of GVC participation at the firm and industry levels through case studies. Nadvi et al. (2004) addressed how Vietnamese textile firms are incorporated into GVCs and how the nature of this incorporation leads to gains for private and state-owned enterprises, as well as workers. Another factor that affects GVC participation's economic impact is market

diversification. Fernandez-Stark and Gereffi (2011) attributed the success of apparel exports from Asia, especially China, to the market diversification achieved through GVC participation. Zheng and Sheng (2006) presented another case study that shows significant knowledge and learning opportunities leading to increased production capacity for local firms through GVC participation.

GVCs create opportunities for local companies to use the ‘open invitation’ system, standards and procedures, specific knowledge and advanced technologies that have been used by the market-dominating GVC participants, resulting in technology spillovers (Dedrick et al., 2010; Ketels & Memedovic, 2008; Sturgeon & Kawakami, 2011). Such advantages can be assessed through the diffusion effect which explains how domestic firms can use knowledge-sharing and improved technology through the assistance of MNEs; the availability and quality effect, where GVC participation ensures the quality and availability of inputs in the buyer’s industry; and the demonstration effect, where firms can benefit from technology spillovers and knowledge-gathering when they apply reverse/imitating engineering of products, business models, strategies for marketing and exports, and production processes (Taglioni & Winkler, 2016).

While it is possible for countries to capture productivity gains by means of GVC participation, economies could also come across an eventual slowdown termed as the ‘middle-income trap’ (Engel & Taglioni, 2017). However, higher value-added activities by firms in or across industries can offset these slowdowns and can continue to add value in GVCs (OECD, 2013). The relative level of a country’s development is central to upgrading its GVC participation or improving its positioning in the global economy (Gereffi & Fernandez-Stark, 2016). The World Bank’s 2019 report, ‘Trading for Development in the Age of Global Value Chains,’ estimated that a 10 percent increase in GVC participation would result in an 11–14 percent increase in GDP per capita which is higher than previous estimates. The report observed this trend through growth regression using a panel of 100 countries from 1990 to 2015. GDP per capita, indicators of GVC participation, and variables with country and time-fixed effects were augmented to a Solow Growth Model. As a result, the coefficients that achieved a 10 percent increase in GDP per capita were backward GVC integration (13.6%), forward GVC integration (10.5%), and non-GVC exports relative to output (1.9%). For various statistical tests, the estimation results for this study remained robust.

2.2. Institutional facilitation and participation in global value chains

This section contains an overview of the recent literature on institutional effects on GVC participation. The institutional facilitation may enhance firms’ productivity and ability to participate in GVCs is hardly news for policymakers of developed and developing countries as several microeconomic and macroeconomic studies have found empirical evidence of economic and legal institutions’ positive contribution to firms’ GVC participation. To make a case for grounding this emerging literature in an institutional perspective, Eckhardt and Poletti (2018) argued that domestic institutional arrangements play a critical role in determining a country’s response to the

constraints and incentives of GVC participation. For reasons of brevity, our discussion of previous studies is selective rather than exhaustive.

Because of highly globally integrated production and increased flow of capital, researchers have questioned how countries can regulate their economies and promote economic development (Brady et al., 2007; Guillén, 2001). One group of researchers has argued that a borderless world and liberalization could create free markets with minimum government intervention through privatization and deregulation (Gore, 2000), while another group has argued that the decline of government intervention is premature, as today's globalization challenges require a continued role for governments in facilitating industry (Iskander et al., 2017; Walter, 2006; Weiss, 2000).

Cross-border challenges are not the only challenges governments must address but ensure the integrity of economic and legal institutions in their role related to GVC participation, including those that operate outside the border. Despite many challenges, the role of domestic institutions is neither in crisis nor destined to decline. Rent-seeking and corruption have been perennial problems when there is interaction between private parties and the state when the state has a monopoly on allocating property rights through regulations, laws, subsidies, tariffs, taxes, or contract enforcement in public and private procurement (Lambsdorff, 2002). Pressures from neo-liberalization and globalization vary across countries and the divergent responses to these phenomena reflect each country's domestic institutional and political conditions (Foucade-Gourinchas & Babb, 2002). A fragmented and decentralized production network means that institutions are the principal providers of regulations and play multiple roles (Shin & Chang, 2005). As such, institutions can play the role of facilitator in linking domestic firms to the global networks (O'Riain, 2004).

3. Empirical strategy

To assess the impact on GDP per capita growth of GVC participation, accompanied by well-functioning domestic institutional arrangements, we use macroeconomic panel data for sixty countries for the period from 2000 to 2016. Our panel data are unbalanced because of a lack of complete information for all countries for the period under analysis.

3.1. Measuring institutional facilitation

Most studies that have been concerned with the institutional effects of GVC participation have focused on governance indicators. Some studies have created this focus through their design. For instance, Dollar et al. (2016) evaluated the impact of regulatory quality, rule of law, political stability, governance effectiveness and absence of terrorism, while Dollar and Kidder (2017) evaluated the effects of changes in neighbor countries' rule of law on GVC participation. Other studies have used a broad view of institutional measures with various indicators to investigate institutional determinants empirically. Our primary objective in this study is to explore the effects of changes in institutional facilitation on GVC participation by exploiting cross-country differences in levels of economic freedom to determine whether ideological and

paradigmatic changes that limit government intervention influence the economic contribution of GVC participation.

As the principal goal of this study is to determine the effects of legal and economic institutions' freedom on GVC participation to explain variations in GDP per capita, we use economic freedom as a measure of institutional facilitation. An individual/identity is said to have economic freedom when its acquired property is protected from fraud, theft, and physical invasion by other individuals/identities and is free to exchange it for use without violating the identical rights of other individuals/identities (Gwartney et al., 1996). This definition neither restricts nor justifies an active role of government, so the question is whether a higher or lower level of legal and economic institutions' freedom increases GVC participation and the respective countries' growth.

Several competing measures of economic freedom are currently being used, but the most heavily cited index was developed by the Fraser Institute to provide a comprehensive measure of economic freedom and legal institutions for 160 countries and territories. The economic freedom index is constructed as an un-weighted average of five sub-dimensions to ensure a balanced composition of each dimension. The index captures the policies of legal and economic institutions as they relate to 1) the size of government, 2) the legal system and property rights, 3) the soundness of money, 4) the freedom to trade internationally and 5) government regulations. These areas are essential to any exploration of GVC participation's institutional origins such as countries' freedom of trade, the role of taxes and tariffs, government spending and legal system.

The choice to use the economic freedom index as a measure of the degree of institutions' facilitation of GVC participation is consistent with previous studies on the effects of legal and economic institutions' freedom on GVC participation and economic growth. As discussed earlier, the literature on GVC participation focused on the contribution of governance indicators but did not consider any indicators of economic freedom. Therefore, we focus on other institutional contributions to GVC participation, such as the impact of economic freedom and its dimensions on GVC participation, to explain variations in GDP per capita across countries.

3.2. Measuring global value chain participation

GVCs are challenging the world economy with enormous increases in production that are due to segmented production processes (i.e., from designing to distribution across borders). Firms are focusing on complex production networks and collaborating with domestic and foreign firms to access diverse inputs to their goods and services. Discussion of GVCs is increasing over the time with new ideas and opportunities for its growth. The two types of GVC participation—forward participation (supplying intermediate goods and services for third-country exports) and backward participation (using imported goods and services in a country's own exports)—make up overall GVC participation. GVC participation may differ across countries, such as in OECD countries, where large economies rely less on GVCs than small and

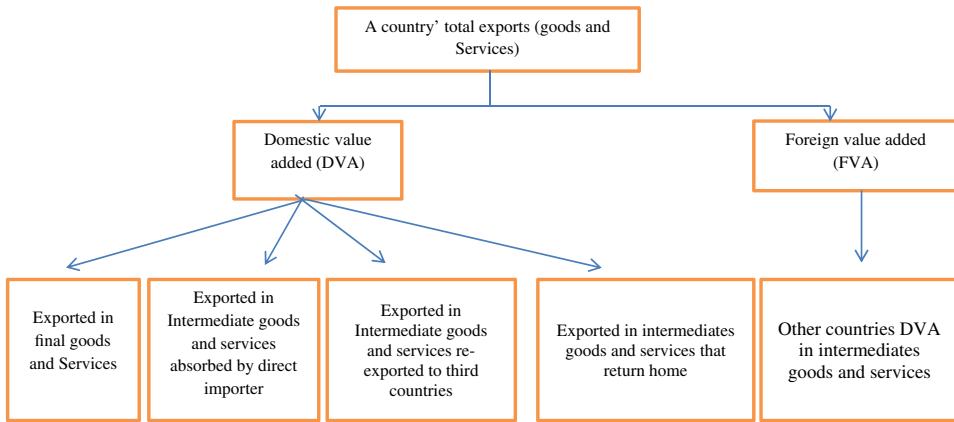


Figure 1. GVCs participation characterization.

Source: Adopted from Koopman et al. (2010)

open economies do (OECD, 2013). The decomposition method of GVCs is illustrated in Figure 1:

The extent of a country's GVC participation is defined as overall GVC participation (the sum of forward and backward participation) divided by the country's gross exports. We calculate GVC participation based on the indices obtained from the OECD-TiVA database on December 2016 (for 2000–2011) and December 2018 (for 2012–2016). Following Koopman et al.'s (2010) procedure, we obtain DVA_{gvc} and FVA_x from this data set and define GVC participation:

$$\text{Forward Participation Index} = \left(\frac{DVA_{gvc}}{x} \right) * 100$$

$$\text{Backward Participation Index} = \left(\frac{FA_x}{x} \right) * 100$$

$$\text{Total GVC Participation Index} = \left(\frac{DVA_{gvc}}{x} \right) * 100 + \left(\frac{FA_x}{x} \right) * 100,$$

where DVA_{gvc} is the country's domestic value added exports for other countries' re-export, FVA_x is foreign value added in the country's own exports, and x is the country's gross exports. All the values are in USD. Appendix A contains detailed descriptions and data sources for the variables, and Appendix B contains summary statistics of the variables.

4. Theoretical framework and econometric methodology

The objective of this study is to examine the effects of GVCs participation and institutional facilitation on GDP per capita growth for developed and developing countries. Our empirical strategy relies on panel regressions with SYS-GMM to account for endogeneity concerns. Moreover, our GVCs participation index is measured in

terms of value-added trade with annual frequency from 2000 to 2016, as opposed to the six periods that are available in OECD-TiVA database. The regression to assess the impact of GVCs participation and institutional facilitation on GDP per capita growth is based on the following specification given by Taguchi (2018):

$$GDPPC_{it} = \alpha + \beta K_{it} + \gamma GVC_{it} + \delta EFi_{it} + \Omega GVC_{sit} \times EFi_{it} + \varepsilon_{it} \quad (1)$$

where K_{it} is a set of standard growth determinants, $GDPPC_{it}$ is the GDP per capita, GVC_{sit} is the GVCs participation index of the country i at time t , EFi_{it} is the level of economic freedom, and ε_{it} is the standard error term.

Empirical assessment of the impact of GVCs participation on economic growth of our panel data set has some econometric issues, which can be addressed by the following simple dynamic equation:

$$\begin{aligned} y_{it} - y_{it-1} &= \alpha y_{it-1} + \beta Z_{it} + \gamma GVC_{sit} + \delta EFi_{it} + \Omega GVC_{sit} \times EFi_{it} + \mu_t + \eta_t + \varepsilon_{it} \\ &= \alpha y_{it-1} + \theta X_{it} + \mu_t + \eta_t + \varepsilon_{it} \end{aligned} \quad (2)$$

Here, y_{it} is the GDP per capital in log form, Z_{it} is a set of control variables, GVC_{sit} is GVCs participation, EFi_{it} represents the economic freedom index and $GVC_{sit} \times EFi_{it}$ is the interaction between GVCs participation and economic freedom index. The terms μ_t and η_t denote all the common factors affecting the countries and capturing unobserved country-effects characteristics. The second equality is defining: $X_{it} = (Z_{it}, GVC_{sit}, EFi_{it})$ and $\theta = (\beta, \gamma \text{ and } \delta)$.

It is observed that such kind of dynamic equations with panel data faces the problem of endogeneity with its regressors. This problem will affect the set of control variables such as human capital, R&D expenditure, real effective exchange rate and financial development, as well as the GVCs participation and economic freedom index. It can be argued that the set of control variables, GVCs participation and economic freedom are jointly determined with other endogenous variables of the economy and they may be subject to the possibility of reverse causation from human capital, R&D, real effective exchange rate, financial development and GDP per capita growth. In equation (1), the lag dependent variable (y_{it-1}) is endogenous because of the possible presence of country-specific effects.

In order to address the endogeneity, we need some suitable instruments for our estimation. However, we have a set of institutional variables, such as trade openness and infrastructure, which we shall assume them as strictly exogenous. However, we shall first rely on internal instruments as described by Arellano and Bond (1991), and these internal instruments are the suitable lags of dependent and explanatory variables. If there are unobserved country effects, such as $E[X_{it}, \eta_t] \neq 0$, the internal instruments (lagged values of regressors) are not valid for equation (1). So, we need to take the first difference of equation (1) to eliminate the country specific effects.

$$y_{it} - y_{it-1} = (1 + \alpha)(y_{it-1} - y_{it-2}) + (X_{it} - X_{it-1}) + (\varepsilon_{it} - \varepsilon_{it-1}) \quad (2)$$

Here, we are assuming that time-varying error term ε_{it} is not serially correlated and explanatory variables X_{it} are exogenous (i.e., they are uncorrelated with time-varying error term in their future realization), which means that lagged values of endogenous and exogenous variables can be used as valid instruments. In other words, for Difference-GMM estimator we assume that:

$$E[y_{i, t-s}(\varepsilon_{i,t} - \varepsilon_{i, t-1})] = 0 \text{ for } s \geq 2; t = 3, \dots, T \quad (3)$$

$$E[X_{i, t-s}(\varepsilon_{i,t} - \varepsilon_{i, t-1})] = 0 \text{ for } s \geq 2; t = 3, \dots, T \quad (4)$$

The above conditions describe the Difference-GMM estimator. Although it is very simple, it has some limitations as well. For instance, when the explanatory variables are persistent over the period, lagged values at their level form are considered as weak instruments in differences for regression analysis (Alonso-Borrego & Arellano, 1999; Blundel & Bond, 1998). Another problem with difference estimator is related to its measurement error, such as differencing may increase the bias due to error in variables with decrease in the signal-to-noise ratio and create small sample bias (Griliches & Hausman, 1986).

Considering the above limitations, we use a SYS-GMM estimator, which combines the regression in difference and level forms (Arellano & Bover, 1995; Blundell & Bond, 1998). Here, we have the same instruments as above, but we need to use the lagged values of corresponding variables for regression in levels. The appropriate use of these instruments is based on the assumption that there is no correlation between difference values of the corresponding variables and country-specific effects. Simply we assume that:

$$\begin{aligned} E[y_{i, t+p} * \eta_i] &= E[y_{i, t+q} * \eta_i] \text{ and} \\ E[X_{i, t+p} * \eta_i] &= E[X_{i, t+q} * \eta_i] \text{ for all } p \text{ and } q \end{aligned} \quad (5)$$

Using equation (5), we can drive additional movement conditions for levels regression as follows:

$$E[(y_{i, t-1} - y_{i, t-2}) * (\eta_i + \varepsilon_{i,t})] = 0 \quad (6)$$

$$E[(X_{i, t-1} - X_{i, t-2}) * (\eta_i + \varepsilon_{i,t})] = 0 \quad (7)$$

Following the arguments of Arellano and Bond (1991) and Arellano and Bover (1995), we used the above moment conditions to apply Generalized Method of Moments (GMM) procedure to find consistent parameters of our interest and asymptotic variance-covariance. These parameters can be generated by the following formulas:

$$\hat{\omega} = (\bar{X}' \bar{Y}' \hat{\Omega}^{-1} \bar{Y}' \bar{X}' \bar{Y}' \hat{\Omega}^{-1} \bar{Y}')^{-1} \quad (8)$$

$$\text{AVAR}(\hat{\omega}) = (\bar{X}' Y \hat{\Omega}^{-1} Y' \bar{X})^{-1} \quad (9)$$

where $\hat{\omega}$ is the vector of our parameters (α and β) and \bar{y} is the dependent variable with differences and levels forms, \bar{X} is the vector of explanatory variables (y_{it-1} , X_i) stacked in differences and levels form, Y is the matrix of all instruments obtained from the moment conditions and $\hat{\Omega}$ is the estimate of variance-covariance matrix.

The consistency of our GMM estimators depends on the validity of the above explained moment conditions. Arellano and Bond (1991) suggested two basic specification tests to check the validity of moment conditions (i.e., Sargan test for over-identification of instruments) and tests the overall validity of our instruments by examining the sample analog of our moment conditions during the estimation process. We need to reject the null hypothesis for our model to be authentic. Furthermore, the validity of additional moments conditions required by the system estimator, as compared to the difference estimator, can be verified by using Sargan difference test. The second test to examine the error term serial correlation (i.e., our null hypothesis) is that the error term is serially uncorrelated, and likewise Sargan test, the rejection of null hypothesis lends support to our model. In the system estimation specification, we check that the regression residual (differenced error term) of differences has second order serial correlation. In our case, the first order-serial correlation of difference error term is expected unless the error term in level form follows its random walk. Differenced residual second order serial correlation indicates that error term in levels form is serially correlated with moving average of order one (i.e., AR(1)) and this situation would call for a use of higher-order lags as instruments.

Thus far, our discussion has been limited to internal instruments. For the purpose of efficiency, a set of external instruments has been used for experimentation to rule out the possibility that invalid instruments do not drive GVCs and institutional effects. Following Eicher and Leukert (2009) and Ignatenko et al., (2019), we shall experiment with a set of external instruments provided by institutional and demography variables, where they inferred that variations in institutions and GVCs participation are explained by trade openness and quality of infrastructure. Hence, for this study, GVCs participation and institutions' lagged values would be dropped and replaced by the current and lagged values of the external instruments during the regression process. For addressing the problem of endogeneity, trade openness and quality of infrastructure would be used as an external instrument. It has been argued that it is this study's contribution to use a set of external instruments and get trade openness and quality of infrastructure, which would solve the problem of endogeneity of both GVCs participation and institutions.

5. Results and discussion

The simple correlational analysis among economic freedom index, GDP per capita, GVC participation and their corresponding interaction is given as follows (Figure 2).

Boffa et al. (2019) found that the GVCs-GDP correlation depends on how the GVCs are integrated such that, although increased integration could lead to an

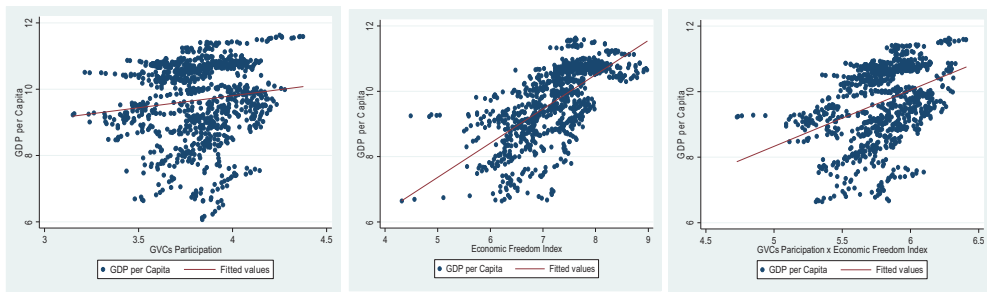


Figure 2. Simple correlations between GVCs Participation, Economic Freedom Index and GDP per capita.

Source: OECD TIVA (2018), WDI (2016) and Fraser Institute (2016)

increase in GDP per capita but this effect eventually vanishes as income levels rise. Kummritz et al. (2017) reported that backward participation through manufacturing increases GDP, while both forward and backward participation can cause similar growth in GDP per capita in the case of services. However, these correlational studies have three limitations: The data the studies use is not up to date, as most of the studies use data only up to 2011; no specifications are provided related to the types of institutions/policies that improve GDP per capita through GVC participation; and they contain no assessment of GVC participation and institutions' parameter heterogeneity to find a common set of instruments across countries.

This study analyzes the effects of GVC participation and its institutional facilitation on economic development. Economic growth has been discussed with respect to the effects of GVC participation and the effects of institutional facilitation of GVCs. Four standard growth elements suggested by Calderón and Liu (2003) and Guzman et al. (2018) were also considered in the analysis as control variables: a human capital indicator, R&D expenditure, the real effective exchange rate, and financial development. We used a sixty-country panel data set over the period from 2000 to 2016, consisting of more than 1000 observations for the analysis (Table 1).

It is important to note that GVCs participation-GDP per capita and institutional facilitation-GDP per capita correlations are positive and are found to be 0.2191 and 0.6672, respectively. Furthermore, a positive correlation with the value of 0.2998 is observed between GDP per capita and the GVCs participation-economic freedom index interaction.

Using various estimation methods, we augmented the model regression with the synthetic indices of institutional facilitation and GVC participation, as reported in Table 2. The results in column 1 and 2 show a significant, positive coefficient for the institutional measure and GVC participation. While coefficients obtained through the use of time-effects are high, they are closer to within-group estimators in terms of magnitude. The regressors' potential endogeneity is ignored in both of these estimators. The signs for the standard growth determinants are according to our expectations, except the R&D indicator, which has an insignificant but positive coefficient. The potential endogeneity of growth determinants, which are control variables, and the institutional and GVC participation indices are not corrected by these estimators. The Difference-GMM- estimator is employed in our model to address the

Table 1. Correlation structure of variables in baseline specification.

Correlation Table	1	2	3	4	5	6	7	
GDP per capita	1.0000							
Human Capital	0.7499	1.0000						
Research and Development	0.5963	0.5578	1.0000					
Real Effective Exchange Rate	0.0615	-0.0613	0.0391	1.0000				
Financial Development	0.7598	0.5377	0.6442	0.0624	1.0000			
GVCs Participation Index	0.2191	0.1610	0.1635	0.0198	0.2203	1.0000		
Economic Freedom	0.6672	0.5881	0.4542	0.1474	0.5355	0.1095	1.0000	
GVCs Participation Index \times Economic Freedom Index	0.2998	0.2193	0.1987	0.0467	0.2698	0.9903	0.2463	1.0000

Source: Author's own calculations.

endogeneity problem. The results show that institutional facilitation and GVC participation have a significant and positive coefficient, while the order in which magnitude is shown for these variables is almost the same as that of the common time effects, but the coefficients of GVCs and the institutional measure are low compared to the ones in column 5. In addition, the over-identification restrictions (Sargan Test) and second-order correlation (AR-2) do not show any indications of misspecifications.

As shown through our preferred estimate (SYS-GMM along with external instruments) in Table 2, the coefficient for GVC participation is positively significant, indicating that GVC participation contributes positively to economic growth. The question that arises concerns the importance of this contribution: The results suggest that a 1 percent increase in GVC participation will increase economic growth by 0.2367 percentage points when the other factors are constant. Our findings are in line with the findings by Chaines (2013) that industrial upgrading opportunities can be used through the contribution that GVC participation makes to GDP per capita growth.

Our study's findings are also in line with Taguchi (2018), who revealed a positive significant relationship between growth in GDP per capita and GVC participation in both developing and developed countries. Moreover, our results show that the coefficient of the economic freedom index, which we use as a proxy for institutional facilitation, is also positive and significant and is consistent with the results for GVC participation and growth. This result suggests that a 1 percent increase in the economic freedom index would raise GDP per capita by 0.4505 percentage points. Our results for the impact on growth of the interaction between institutional facilitation and GVC participation are according to our expectations: The coefficient of the interaction term is positively significant, indicating that a 1 percent increase in GVC participation, accompanied by well-functioning domestic institutions, would increase growth in GDP per capita by 0.4265 percentage points. In its totality, this effect is significantly stronger than the effect that GVC participation alone has on growth. Aggregating the data could lead to an ecological fallacy, which would result in false conclusions, but in focusing on institutional determinants of economic growth, our study found that an ecological fallacy posed no threat to our results because the aggregate and individual measures are highly correlated. In addition, the validity of our results is supported by numerous empirical studies on the use of institutional

Table 2. GVCs participation and economic growth: panel regression with baseline specification by using different estimation techniques.
Dependent Variable: GDP per capita at constant 2010Sample of 60 countries, 2000–2016 (annual data)

Variables/Method	Country-Effects (1)	Time-Effects (2)	GMM (Diff) (3)	GMM (SYS) With Internal Instruments (4)	GMM (SYS) With External Instruments (5)
L1.GDP per capita	–	–	0.9638 (0.037)***	0.9409 (0.031)***	0.9105 (0.075)***
Human Capital	1.5564 (0.231)***	0.5942 (0.251)**	0.1593 (0.074)**	0.1251 (0.188)	0.5951 (0.406)*
R&D Expenditure	0.0114 (0.020)	-0.0037 (0.016)	0.0009 (0.003)	0.0154 (0.009)*	0.0260 (0.015)*
Real Effective Exchange Rate	0.2168 (0.077)***	0.1666 (0.082)**	0.0739 (0.025)***	-0.0322 (0.027)	0.0545 (0.048)
Financial Development	0.2449 (0.068)***	0.2223 (0.072)***	0.0088 (0.025)	0.0439 (0.018)**	0.1070 (0.046)**
GVCs Participation	0.4848 (0.112)***	0.3681 (0.261)*	0.5284 (0.237)**	0.0314 (0.073)	0.2367 (0.134)*
Economic Freedom	0.5432 (0.266)**	0.6320 (0.221)***	0.3346 (0.111)***	0.3347 (0.096)***	0.4504 (0.111)***
GVCs Participation × Economic Freedom	0.4848 (0.083)***	0.5203 (0.140)***	0.3142 (0.145)**	0.1412 (0.061)**	0.4265 (0.102)***
Constant	4.1213 (0.688)***	5.5846 (1.372)***	0.5708 (0.281)*	0.2096 (0.300)	-0.5214 (0.365)*
R ²	0.6821	0.7050	–	–	–
No. of Observations	1,000	1,000	882	942	942
Significance Test (p value)	–	–	6.41 (0.699)	8.53 (0.577)	5.04 (0.753)
-Sargan Test	–	–	-0.54 (0.588)	-1.51 (0.130)	-1.01 (0.313)
-Second Order Correlation	–	–	–	–	–

Note: The coefficients are rounded to four decimals. Numbers in parenthesis are corrected standard errors. The SYS-GMM estimation results presented in columns [4] and [5] by using internal and external instruments. In column [4] we use lagged level and lagged difference of our explanatory variables as internal instruments. In column [5], for economic freedom determinants we use quality of infrastructure and trade openness as our external instruments. *** denotes significance level with $p < 0.01$, ** denotes significance level with $p < 0.05$ and *denotes significance level with $p < 0.10$.
 Source: Author's own calculation.

Table 3. Correlation Structure of dimensions of institutional facilitation interacting with GVCs participation and GDP per capita.

	1	2	3	4	5	6
GDP per Capita	1.0000					
GVCs Index \times Size of Government	0.1687	1.0000				
GVCs Index \times Property Rights Protection	0.6677	0.2961	1.0000			
GVCs Index \times Sound Money	0.4294	0.4300	0.8066	1.0000		
GVCs Index \times Freedom to Trade Internationally	0.3850	0.5010	0.8477	0.9193	1.0000	
GVCs Index \times Regulation	0.4127	0.5484	0.8414	0.8693	0.9070	1.0000

Source: Author's own calculations.

measures (e.g., Hussain & Haque, 2016). Fischer (2010) inferred that any aggregate measure is more robust to national differences in terms of economy and culture, and we use both aggregation and dispersion techniques for institutional indices to avoid misinterpretation. Our results show that economic freedom has the third-largest effect on growth of GDP per capita and is significant at the 1% level.

Both GVC participation and economic freedom have positive effects on growth, but neither solely determines a country's growth. Our results show that the interaction term of GVC participation and economic freedom is highly significant at conventional levels, a finding that is in agreement with Mohan (2016), who found that value chain actors may be restricted by local institutions if access to markets and inputs is restricted, thus reducing the benefits of upgrading and integrating into GVCs. Our results also suggest that a 1 percent change in GVC participation, when it is facilitated by domestic legal and economic institutions, would raise GDP per capita by 0.4265 percentage points, and the coefficient is significant at the 1% level. The diagnostic tests in Table 2 lend support to the study's choice of instruments and model specification. The sign and statistical significance of the coefficients of our variables of interest—GVC participation, economic freedom, and their interaction term—are consistent across different estimates (i.e., positive and significant).

A number of studies have explained the correlational and theoretical relationships among GDP per capita growth, GVC participation, and institutional facilitation. Table 3 presents the simple correlations among GDP per capita and the interaction terms of GVC participation and economic freedom's individual dimensions. The table shows that GVC participation, interacting with economic freedom's dimensions and correlating with GDP per capita, is significant enough to explain their relationship with the dependent variable.

To maintain clarity, henceforth we use only the coefficients and their significances for the interaction between GVC participation and the variables for the dimensions of economic freedom. Table 4 shows the results for GVC participation and its interaction with the five dimensions of economic freedom. As the table shows, the coefficients of four of the five dimensions' interactions with GVC participation are positive and significant at various levels. In light of these results, we can reject the null hypothesis that, when institutions interact with GVC participation, they do not modify the latter's economic contributions. As outlined earlier, GVC participation's economic contribution can be increased through institutional facilitation. These findings are in line with Criscuolo et al. (2016), who suggest that GVC participation has implications for growth by encouraging firms to specialize in their productive tasks.

Table 4. GVCs Participation, Individual Dimensions of Economic Freedom and Economic Growth: Panel Regression with Baseline Specification Using SYS-GMM.

Dependent Variable: GDP per capita at constant 2010 Sample of 60 countries, 2000–2016 (annual data)

Variables/Model	1	2	3	4	5
L1.GDP per capita	0.9330 (0.030)***	0.8625 (0.067)***	0.9290 (0.016)***	0.9251 (0.049)***	0.8794 (0.048)***
Human Capital	0.6007 (0.372)*	1.0589 (0.791)*	0.1720 (0.224)	1.0816 (0.613)*	0.7825 (0.607)
R&D Expenditure	0.0347 (0.016)**	0.0597 (0.033)*	0.0350 (0.017)**	0.0552 (0.029)*	0.0644 (0.030)**
Real Effective Exchange Rate	0.1024 (0.059)*	0.0297 (0.066)	0.1324 (0.056)**	0.0588 (0.062)	0.0276 (0.068)
Financial Development	0.2251 (0.079)***	0.3060 (0.107)***	0.0918 (0.062)*	0.3031 (0.086)***	0.2416 (0.084)***
GVCs Participation*Size of Government	0.0527 (0.037)*				
GVCs Participation*Property Rights Protection		0.2344 (0.103)**			
GVCs Participation*Sound Money			0.0115 (0.081)		
GVCs Participation*Freedom to Trade Internationally				0.1345 (0.053)***	
GVCs Participation*Regulations					0.2402 (0.101)**
No of Observations	942	933	931	933	933
Sargan Test	7.93 (0.542)	1.95 (0.464)	13.54 (0.140)	5.15 (0.821)	4.80 (0.851)
AR(2)	-0.89 (0.374)	-0.57 (0.568)	-1.22 (0.224)	-0.19 (0.852)	-0.68 (0.499)

Note: The coefficients are rounded to four decimals. Numbers in parenthesis are corrected standard errors. The SYS-GMM estimation results presented above are by using external instruments. All the regressions include constant term and diagnostic tests (e.g., Sargan Test and AR(2)). Each row constitutes a separate regression. *** denotes significance level with $p < 0.01$, ** denotes significance level with $p < 0.05$ and *denotes significance level with $p < 0.10$.
Source: Author's own calculation.

A government that facilitates and supports GVC participation through economic freedom changes the economic contribution of GVC participation, but the extent to which GVC participation is currently being facilitated and supported at an institutional level is above the growth-optimization level. The significance of the interaction between the dimensions of economic freedom and GVC participation can be seen as a robustness check of our previous findings.

When interacting with GVC participation, most of the dimensions of economic freedom, while controlling for the human capital indicator, R&D expenditure, the real effective exchange rate, and financial development, have positive and significant impacts on the growth of GDP per capita. It is not in the scope of this study to discuss findings from our analysis of the individual dimensions in detail, but since the interaction coefficients between GVC participation and the size of government, the legal system and property rights protection, the freedom to trade internationally, and regulations are positive and significant, they appear to capture factors that contribute to GVC participation's ability to increase growth in GDP per capita. However, the interaction between GVC participation and access to sound money conveys no relevant information.

Economists and policy makers should be clear about the difference between the intended and real effects of GVCs-augmented institutional policy measures. Various effects on the growth of GDP per capita occur simultaneously as a result of institutional facilitation and GVC participation. We argue that, with an increase in institutional facilitation of GVC participation comes an increase in GDP per capita and that this relationship is positive across the various data ranges and models used.

6. Conclusion and policy implications

This paper presents an empirical analysis of the role of institutional facilitation in modifying the impact of GVC participation on the economic growth of developed and developing countries. The analysis is carried out on the basis of the regression of the GVCs-augmented growth equation, incorporating data from sixty countries over the 2000–2016 period. Numerous instrumental variable techniques were employed to prevent endogeneity and the study's results were obtained using a framework that avoids reverse causation. These results also survived statistical tests like AR(2) and Sargan test for autocorrelation and over-identification, respectively, as these tests indicated no signs of misspecification of the model. The findings are in accordance with our expectations: The level of GVC participation has a positive and significant impact on GDP per capita growth, and institutional facilitation of GVC participation can positively modify this impact. These results reflect causal, not coincidental effects of GVC participation and the interaction between GVCs and institutional facilitation on economic development of the countries under analysis.

Our findings are in accordance with the GVC theory that domestic institutions can help countries to participate in GVCs. We add to the theory and its implications for economic development that an increase in the freedom of legal and economic institutions increases the economic contribution of GVC participation in both developed and developing countries. Moreover, on the basis of these findings, we conclude

that the path for economic development passes through GVC participation and that this path is more attractive if a country ensures the integrity of domestic legal and economic institutions as they relate to the agents involved in value chain activities.

The study's policy recommendation is based on its most important finding, that GVC participation complemented by institutional facilitation increases growth in GDP per capita. This finding suggests that an increase in GVC participation, when supported and facilitated by well-functioning domestic institutions, is the key ingredient in integrating the domestic economic system with the international trading system, which is essential for economic development. Therefore, the countries we analyzed should increase the freedom and integrity of their domestic legal and economic institutions to facilitate GVC participation, which would increase their level of economic development.

More sophisticated and precise policy recommendations for domestic institutional arrangements in regard to the effect of GVC participation on economic development would be useful. There is space for further analysis at the region and industry levels that would make way for future discussion on the differences between developed and developing countries.

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Appendix A. Variables description and data sources

Variables	Definition	Sources
GDP per Capita	It measures a nation's gross domestic product per capita. The variable is adjusted for purchasing power parity and is expressed in 1000s of US Dollars.	World Bank, World Development Indicators
Human Capital Development Index	It is based on the average years of schooling from Barro and Lee (BL, 2013) and an assumed rate of return to education, based on Mincer equation estimates around the world (Psacharopoulos and Patrinos, 1994).	Penn World Table 9.0
Research and Development Expenditure (R&D)	Gross domestic expenditure on research and development as percentage of GDP.	OECD TiVA Database
Real Effective Exchange Rate	Real effective exchange rate is the nominal effective exchange rate (a measure of the value of a currency against a weighted average of several foreign currencies) divided by a price deflator or index of costs.	World Bank, World Development Indicators
Financial Development	It is based on the level of development of financial institutions and financial markets in terms of their efficiency, access and depth.	International Monetary Fund (IMF)
GVCs Participation Index	Country's participation in global value chains is defined as the sum of the both forward participation and backward participation divided by its gross exports.	OECD TiVA Database
Economic Freedom Index	EFI measures the degree of economic freedom in the nations using the scale from 1 to 10.	The Fraser Institute
1. Size of Government	N/A	The Fraser institute
2. Legal System and Property Rights	N/A	The Fraser Institute
3. Sound Money	N/A	The Fraser Institute
4. Freedom to Trade Internationally	N/A	The Fraser Institute
5. Regulation	N/A	The Fraser Institute

Appendix B. Summary statistics

Variables	Observations	Mean	Std. Dev.	Minimum	Maximum
GDP per Capita	1,020	26062.750	22324.87	428.506	111968.400
Human Capital	1,020	2.946	0.515	1.540	3.809
Research and Development Expenditure	1,020	1.953	0.632	0.030	4.289
Real Effective Exchange Rate	1,020	102.759	23.917	42.660	276.777
Financial Development	1,020	0.542	0.210	0.041	1.00
GVCs Participation	1,020	46.746	9.455	23.355	79.440
Economic Freedom Index	1,000	7.232	0.711	4.32	8.980

Source: Author's own calculations.

Appendix C. Area and components of the economic freedom index of the world developed by Fraser Institute

1. **Size of Government: Expenditures, Taxes and Enterprises**
 - a. General government consumption spending as a percentage of total consumption
 - b. transfer and subsidies as a percentage of GDP
 - c. Government enterprises and investment as a percentage of GDP
 - d. Top marginal tax rate (and income threshold to which it applies)
2. **Legal Structure and Security of Property Rights**
 - a. Judicial independence: The Judiciary is independent and not subject to interference by the government or parties in disputes (GCR)
 - b. Impartial courts: A trusted legal framework exists for private business to challenge the legality of government actions or regulation (GCR)
 - c. Protection of intellectual property (GCR)
 - d. Military interference in rule of law and the political process (ICRG)
 - e. Integrity of the legal system (ICRG)
3. **Access to Sound Money**
 - a. Average annual growth of the money supply in the last five years minus average annual growth real GDP in the last ten years
 - b. Standard inflation variability in the last five years
 - c. Recent inflation rate
 - d. Freedom to own foreign currency bank accounts domestically and abroad
4. **Freedom to Trade Internationally**
 - a. Taxes on international trade
 - Revenue from taxes on international trade as a percentage of exports plus imports
 - Mean tariff rate
 - Standard deviation of tariff rate
 - b. Regulatory trade barriers
 - Hidden imports barriers: No barriers other than published tariffs and quotas (GCR)
 - Costs of importing: The combined effect of imports tariffs, license fees, bank fees, and the time required for the administrative red-tap raises costs of importing equipment by (10 = 10% or less, 0 = more than 50%) (GCR)
 - c. Actual size of trade sector compared to expected size.
 - d. Difference between official exchange rate and black market rate
 - e. International capital market controls
 - Access of citizens to foreign capital markets and foreign access to domestic capital markets (GCR)
 - Restrictions on the freedom of citizens to engage in capital market exchange with foreigners-index of capital controls among 13 IMP categories

5. Regulation of Credit, Labor and Business

- a. Credit markets regulations
 - Ownership of banks: Percentage of deposits held in privately owned banks
 - Competition: Domestic banks face competition from foreign banks (GCR)
 - Extension of credit: Percentage of credit extended to private sector
 - Avoidance of interest rate controls and regulations that lead to negative real interest rates
 - Interest rate controls: Interest rate controls on bank deposits and/or loans are freely determined by the markets (GCR)
- b. Labor market regulations
 - Impact of minimum wage: The minimum wage, set by law, has little impact on wages because it is too low or not obeyed (GCR)
 - Hiring and firing practices: Hiring and firing practices of companies are determined by private contract (GCR)
 - Share of labor force whose wages are set by centralized collective bargaining (GCR)
 - Unemployment benefits: The unemployment benefits system preserve the incentive to work (GCR)
 - Use of conscripts to obtain military personal
- c. Business regulations
 - Practice controls: Extent to which businesses are free to their own prices
 - Administrative conditions and new businesses: Administrative procedures are an important obstacle to starting a new business (GCR)
 - Time with government bureaucracy: Senior management spends a substantial amount of time dealing with government bureaucracy (GCR)
 - Starting a new business: Starting a new business is generally easy (GCR)

Appendix D. List of countries under analysis

Argentina	Latvia
Australia	Luxembourg
Austria	Malaysia
Belgium	Malta
Brazil	Mexico
Brunei Darussalam	Morocco
Bulgaria	Netherlands
Cambodia	New Zealand
Canada	Norway
Chile	Peru
China	Philippines
Colombia	Poland
Costa Rica	Portugal
Croatia	Romania
Cyprus	Russia
Czech Republic	Saudi Arabia
Denmark	Singapore
	South Africa
Estonia	Slovak Republic
Finland	Slovenia
France	Spain
Germany	Sweden
Greece	Switzerland
Hungary	Thailand
Iceland	Tunisia
India	Turkey
Indonesia	United Kingdom
Ireland	United States
Israel	Viet Nam
Italy	
Japan	
Korea	
