Marianna Sávai (ed) 2024: Green and Digital Transitions: Global Insights into Sustainable Solutions, Szeged, 10.14232/gtk.gdtgiss.2024.7

Comparison of the TiVA and traditional data based on income groups in the gravity models application

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This article continues the line of research by Fertő et al. (2022) and aims to find if there are any differences between Trade in Value-Added (TiVA) data and traditional data of international trade in the gravity model application when 66 OECD and non-OECD countries are grouped by income level. In addition, the paper also examines differences in gravity model factors between high-income vs. low- and middle-income countries in international trade. In the gravity model application, fixed effects and PPML methods are applied with a 3-year interval. According to the results, the differences between TiVA and traditional data are still minor for both income groups. Additionally, it is found that distance and language have a greater influence on the exports of low and middle-income countries, while shared borders, colonial history, and regional trade agreements are the factors that exert more impact on the exports of high-income countries.

Keywords: global value chains, trade in value-added data, gravity models, high-income countries, low-income countries, middle-income countries

1. Introduction

In recent years, there have been significant changes in the structure of global economy, which have led to the emergence of Global Value Chains (GVCs) as a means of analyzing these changes. GVCs are a series of processes involved in the production of a product or service, with each step adding value to the final output and taking place in different countries. GVCs have resulted in an increase in the use of intermediate inputs in cross-border transactions, as opposed to final goods, which increase has traditionally been emphasized in international trade frameworks. This has led to the development of a new method for analyzing trade based on value added, which is different from the traditional method of measuring trade value based on gross value. Researchers have combined data from customs agencies with domestic input-output tables to form worldwide input-output tables to track the movement of value-added trade across nations. The use of value-added data can provide valuable insights into the generation of domestic value added through the export of goods or services, which is essential for development strategies and industrial policies.

The aim of this study is to investigate the potential differences between traditional data and value-added data in the application of gravity models. The paper also examines the differences in gravity model trade cost factors between high-income vs. low- and middle-income countries. Panel data of 43 high-income and of 23 low- and middle-income countries are used to conduct the research through structural gravity models in OLS fixed effects and PPML methods. The paper is structured as follows: after the introduction in the present section, the second section reviews the previous literature on this topic, the third section examines the methodology, and the fourth section presents the results. Finally, the fifth section concludes the paper.

2. Literature review

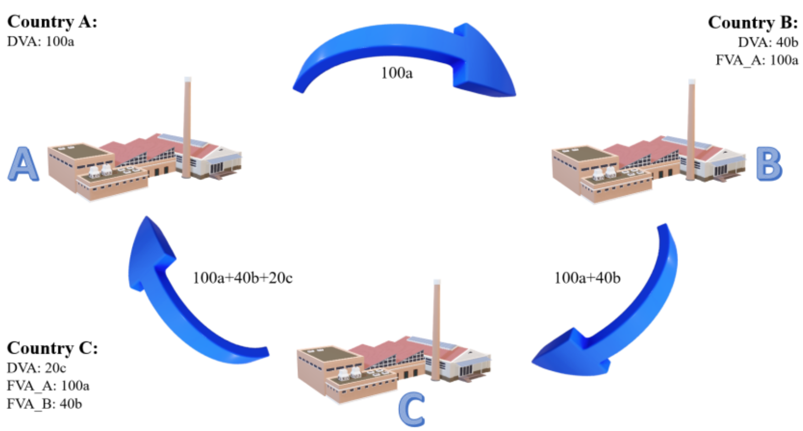
Nowadays, labels that indicate the country of origin on manufactured goods have become obsolete symbols of a former period, and the majority of products in certain industries are identified as being "Made in the World" (Antràs, 2020). Initially proposed by Gereffi et al. (2001), the notion of Global Value Chains (GVCs) was originally designed to examine the governance arrangements of industries that manufacture for international markets. Nowadays, examining the structural transformations taking place in the world economy has gained widespread popularity as a tool, as stated by Gereffi (2019). Global value chains refer to a sequence of activities involved in manufacturing a product or providing a service, which is at the end of the process sold to customers. Each step adds value to the final product, and at least two steps are completed in different countries. When a company carries out at least one step in a GVC, it is said to be participating in the GVC. Meanwhile, Buckley and Ghauri (2004) define GVCs as networks that are dispersed globally and created by companies with varying goals. These networks collaborate to perform tasks that have traditionally been completed by a single organization.

One way to view the rise of GVCs is to see it as an increase in the use of intermediate inputs for transactions across borders rather than final goods, as traditionally emphasized in international trade frameworks. If a nation imports a small number of intermediates and exports a significant portion of intermediate exports to third countries, it is concentrating on upstream activities. Examples of relatively upstream activities are the creation of raw materials and intangibles like research and development or the design of industrial products. Conversely, downstream activities refer to the assembly of processed products or post-sales customer services and are characterized by high importation of intermediates and low exportation of intermediate exports to third countries. Furthermore, the global economy can be divided into two types of economies: "headquarter" economies, which have a small number of imported intermediates in their exports, and "factory" economies, which have a high proportion of imported intermediates in their exports. Moreover, based on the participation of countries, GVC trade can be divided into two categories: backward participation and forward participation. Backward participation involves a country exporting products that contain value from imported materials. Forward participation, on the other hand, happens when a country exports products that are not entirely consumed by the importing country, however, are included in their exports to other countries.

In the present day, the inclusion of imported intermediate goods in exports is a significant aspect of the manufacturing procedure, resulting in a substantial increase in gross exports compared to domestic value-added counterpart (Amador–Cabral, 2017). The concept of trade analysis based on value added is a relatively new method that has gained significance in studying international economic cooperation. This approach differs greatly from the traditional method of measuring trade value based on gross value and has become essential in empirical research. Javorsek and Camacho (2015) argue that analyzing trade value only in terms of finished goods does not paint an accurate picture of global relationships since the importance of intermediate product trade has increased, while trade in finished goods has decreased.

To understand how this concept works, Figure 1 illustrates trade in value added. According to the figure, country A exports a product that has a value of 100. Thus, 100a is the domestic value added of country A on a product that is exported to country B. Furthermore, country B imports a product that has 100a value and adds its own 40b value, and exports it to the country C. In this export, 40b is the domestic value added of country B, while 100a is the foreign value added. Finally, country C imports a product from country B with 140 values in total, of which 100 of them belongs to country A, and only 40 of them belongs to country B. Moreover, country C adds its final 20c domestic value and exports the product to the country A. Conventional measures of trade show total global exports and imports as 400 (100+140+160), however only 160 (100+40+20) of value added has been generated in the production. Conventional measures also show that country A has a trade deficit of 160 with country C, despite the fact that A is the chief beneficiary of country C's consumption. Furthermore, the figure also depicts that protectionist measures of country A on imports from country C could harm its own exporters and hence competitiveness. Thus, trade in value-added data can prevent any mistakenly accepted policies that can harm local industries. Moreover, by providing information at the level of specific industries, it is possible to provide insights into other areas too, such as the contribution of the service sector to international trade, which in traditional data their contributions could be underestimated.

Figure 1. Illustration of trade in value added



Source: own construction

What has been lacking is a systematic attempt to mainstream the development of statistics in this area. To track the movement of value-added trade across nations, a group of researchers has combined data from customs agencies with domestic input-output tables to form worldwide input-output tables. The recently introduced databases provide a comprehensive and uniform account of the interdependence of production in numerous nations on imports, which are frequently subjected to additional processing and then exported. The most commonly used global input-output tables, abbreviated as WIOTs, include the World Input-Output Database (WIOD), spearheaded by a team of researchers at the University of Groningen; the OECD TiVA database; and the Eora Global Supply Chain Database, which was created by a group of researchers at the University of Sydney. On March 15, 2012, the OECD and WTO joined forces to develop a database of Trade in Value-Added (TiVA) indicators and to mainstream their production within the international statistics system. The first preliminary results from this initiative were released on January 16, 2013 (Ahmad, 2013). In essence, the TiVA method provides insight into the intensity of the relationship between domestic and foreign markets in terms of the value-added content of traded goods. Furthermore, the database provides statistics on both gross trade and value-added trade of selected OECD and non-OECD countries from 1995 to 2018. The database includes data on both total trade and trade in specific goods and services. The usage of the database can help us better understand how much domestic value-added is generated by the export of goods or services in a country is crucial for development strategies and industrial policies. Furthermore, looking at trade from a value-added perspective also allows to better reveal how upstream domestic industries contribute to exports, even if those same industries have little direct international exposure. Gross trade statistics, for example, reveal that less than one-quarter of total global trade is in services, however, in value-added terms, the share is significantly higher (Ahmad, 2013).

There are several authors who employed TiVA data in their research. For example, according to the research on value-added trade in the chemical industry in Poland and Hungary conducted by Folfas and Udvari (2019), both countries actively engage in production fragmentation and the global value chain. However, they depend more on intermediaries from wealthier nations rather than on domestically produced semi-products with high domestic value-added content. Moreover, according to Escaith and Gaudin (2014), where value-added data from 53 countries was included, there is a relatively strong relation between GDP and several trade in value-added indicators. Conversely, there is a marked negative correlation between total gross exports' foreign content and foreign value added in both services and manufacturing exports. In contrast, the total domestic content in total gross exports exhibits the highest correlation coefficient, particularly regarding domestic value added in primary and manufacturing exports, as anticipated. On the other hand, some researchers applied both traditional and domestic value-added data and compared them. For instance, Power (2012) observes that in several developed countries, the ratio of exports to GDP is similar to the ratio of domestic value-added exports to GDP. In contrast, in emerging economies, there is a substantial gap between these two ratios, indicating that their exports have a higher proportion of foreign value-added content. Furthermore, Fertő et al. (2022) compared these two data sets in a gravity model application for the 66 OECD and non-OECD countries and found that there is no great difference between obtained coefficients. In the next section, I will continue their line of research and try to find if we can observe any difference between traditional and TiVA data when 66 countries are divided into two categories based on their income level.

3. Methodology

In international trade, the "Gravity Equation" has been remarkably consistent throughout time and across a diverse sampling of nations and methodologies. It is one of the most reliable and consistent empirical regularities in economics. The notion of gravity models was first proposed by Tinbergen (1963). The first article that delivered a micro foundation of the gravity equation was Anderson (1979), where the theoretical base of the equation emerged. The classic gravity equation of international trade is a model that describes trade flow by the GDP of the home and partner nations, which are directly proportional, as well as a trade barrier in the form of distance between them, which is inversely proportional.

In recent decades, the gravity model has been developed further, and nowadays, mainly the structural gravity model is used. The structural gravity equation is expressed as follows:

$$X_{ij} = \frac{Y_i E_j}{Y}\left(\frac{\varphi_{ij}}{\Omega_i P_J}\right)^{(1-\sigma)} \qquad (1)$$

where X_{ij} describes exports from countries i to j, while Y_iEj/Y represents the theoretical level of smooth trade between countries i and j if there were no trade costs, and $(\varphi_{ij}/\Omega_iP_j)^{(1-\sigma)}$ represents the comprehensive effects of trade costs that cause a difference between realized and smooth trade.

According to Baldwin and Taglioni (2014), the gravity model works well for bilateral trade in all goods, final goods, and intermediate inputs when the evaluation encompasses a large number of countries. Furthermore, Greaney and Kiyota (2020) also observe that the structural gravity equation functions very well in representing bilateral trade in final goods and intermediate inputs.

The most common method of calculating the gravity model is to make it linear by taking logarithms, then estimating the resultant log-linear model using Ordinary Least Squares (OLS). This strategy, while being simple to construct, in the existence of heteroskedasticity, the log-linearized model's OLS estimator can be both biased and inefficient. Another issue with log-linearization is that it is inconsistent with the presence of zeros in trade data, which has resulted in a number of undesirable solutions, such as removing the zero-trade pairs from the sample, adding small numbers, and further nonlinear modifications of the dependent variable.

To solve these problems, Silva and Tenreyro (2006) recommended employing the Poisson Pseudo Maximum Likelihood (PPML) estimation approach to estimate the gravity model straight from the multiplicative form. Silva and Tenreyro (2006) show significant evidence that estimate methods based on the log-linearization of the gravity equation suffer from serious misspecification, which makes it difficult to discuss the findings, regardless of whether fixed effects are employed in the model specification, as Anderson and Van Wincoop (2003) recommended. Meanwhile, PPML-estimated models exhibit no symptoms of misspecification. This method was used on cross-sectional data at first, and, afterward, using panel data, Westerlund and Wilhelmsson (2011) investigated the impact of using both OLS and PPML techniques on gravity equation estimates on simulated and actual data. They also come to the conclusion that Poisson estimation is preferable; furthermore, they specifically recommend using Poisson fixed effects estimation to estimate the gravity equation.

The primary objective of the present study is to determine whether the use of TiVA data instead of gross trade data in gravity model applications produces different outcomes, especially when categorizing countries based on their income levels. Another aim is to explore the extent to which trade from these two country groups responds to cost factors in the gravity model. To achieve these objectives, two major databases were utilized in this study. The first one is the CEPII database, which provides data on trade cost variables used in the gravity model estimations. The second one is the TiVA database, jointly created by the OECD and WTO, which contains data on both gross trade and value-added trade from a total of 66 countries, including 38 OECD and 28 non-OECD nations, covering the period from 1995 to 2018. In this study, these 66 countries were grouped into two income categories, namely, high-income countries (HIC) vs. low- and middle-income countries (LMIC), resulting in two panel data covering the period from 1995 to 2018, with 43 (43 exporters, 66 importers) and 23 (23 exporters, 66 importers) nations in the HIC and LMIC groups, respectively. Table 1 represents the list of variables and their sources.

Table 1. List of variables and sources

Variable	Name of variable	Source of variable
X	Export	OECD-TiVA
DIST	Distance	CEPII
CNTG	Contiguity	CEPII
LANG	Language	CEPII
CLNY	Colony	CEPII
RTA	Regional Trade Agreement	CEPII

Source: own construction

In this study, I follow the recommendations of Yotov et al. (2016) and employ the methodology used in Fertő et al. (2022). Thus, first, the panel data with a 3-year interval were utilized in OLS estimations with fixed effects as the initial step to overcome outward and inward multilateral resistance terms, as described in formula (2):

$$lnX_{ij,t} = \pi_{i,t} + \chi_{j,t} + \beta_1 lnDIST_{ij} + \beta_2 CNTG_{ij} + \beta_3 LANG_{ij} + \beta_4 CLNY_{ij} + \beta_5 RTA_{ij} + \varepsilon_{ij,t} \quad (2)$$

where the natural logarithm of bilateral trade from exporting country *i* to importing country *j* at time *t* is shown as $lnX_{ij,t}$. Additionally, the natural logarithm of the geographical distance between the two countries is represented as $lnDIST_{ij}$, while the presence or absence of a shared border, official language, historical colonial ties, and regional trade agreement are captured through dummy variables known as $CNTG_{ij}$, $LANG_{ij}$, $CLNY_{ij}$, and RTA_{ij}, respectively. In the meantime, the exporter- and importer-time fixed effects, denoted as $\pi_{i,t}$ and $\chi_{j,t}$ respectively, serve to manage both observed and unobserved characteristics associated with exporters and importers that can influence bilateral trade. Finally, $\varepsilon_{ij,t}$ is error term. In addition, I used the PPML approach, which is the most recommended, as depicted in equation (3):

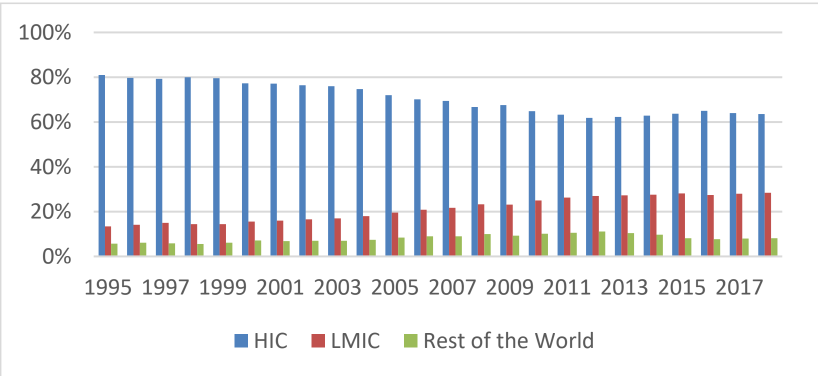
$$X_{ij,t} = exp(\pi_{i,t} + \chi_{j,t} + \beta_1 lnDIST_{ij} + \beta_2 CNTG_{ij} + \beta_3 LANG_{ij} + \beta_4 CLNY_{ij} + \beta_5 RTA_{ij}) \times \varepsilon_{ij,t} \quad (3)$$

PPML method is employed due to its ability to address heteroscedasticity and the challenges of zero trade flow in bilateral trade. In order to apply this method, exporter- and importer-time fixed effects are included in estimation (3), in a multiplicative form. Additionally, to ensure the robustness of the results, the same procedures were repeated using a 5-year interval.

4. Results

Prior to analyzing the calculation results, it is worth examining the extent to which sample countries are represented in global trade. Proportions of total domestic value-added exports of HIC, LMIC, and the rest of the world countries in international trade from 1995-2018 are illustrated in Figure 2. Despite HICs having the largest share of global trade throughout the period, their proportion dropped gradually from 81% to 62% by 2012 and then remained stable at around 64%. On the other hand, the share of LMICs in international trade increased steadily from 13% to 28%, with China playing a crucial role in this increase. Meanwhile, the proportions of exports from the rest of the world, which includes more than 130 countries, fluctuated between 6% and 11% during the given period. Thus, the chosen sample in this study represents the overwhelming majority of the world trade.

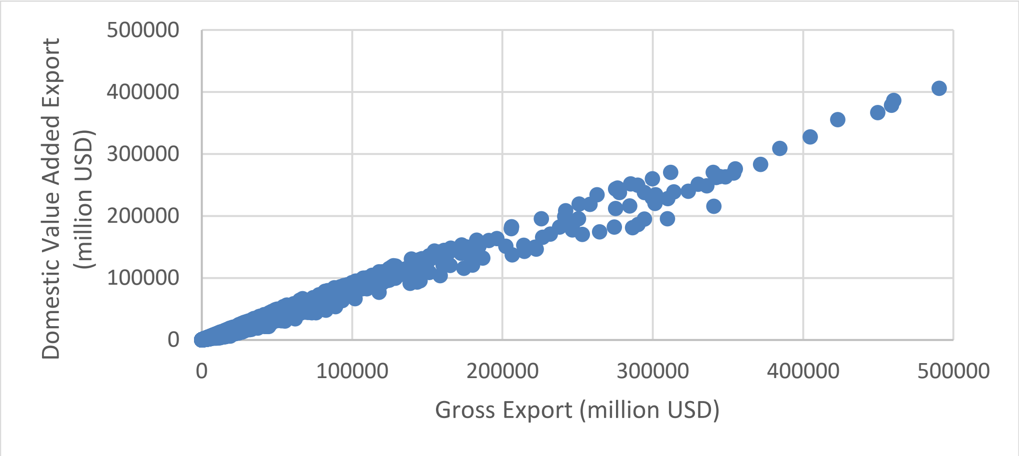
Figure 2. Shares of total domestic value-added exports of HIC, LMIC, and rest of the world in international trade from 1995 to 2018



Source: own construction based on OECD-TiVA database

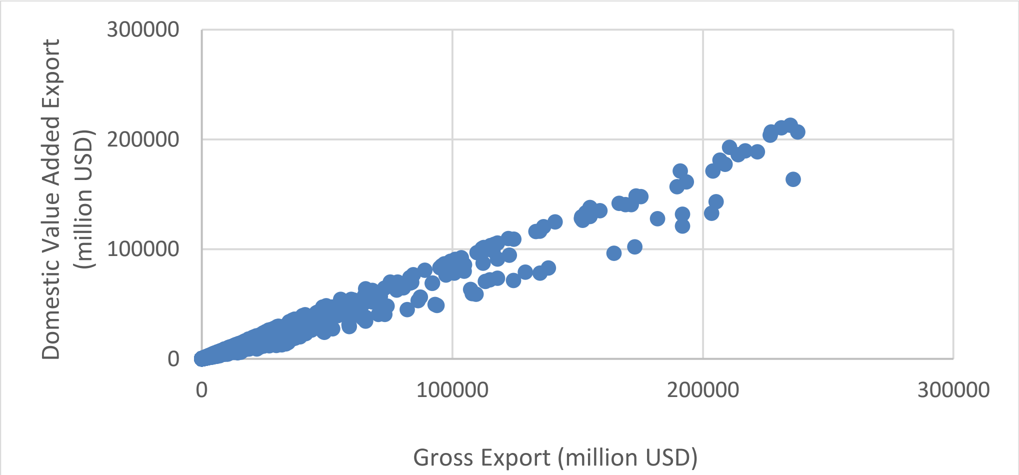
The relationship between domestic value-added export data and gross export data for both HICs and LMICs is depicted in Figures 3 and 4, respectively. As shown in both figures, there is a robust and positive correlation between the two types of data. This implies that value-added exports and gross exports move closely together in both country groups. However, there is a noticeable discrepancy in the export data for HICs in the middle range, as depicted in Figure 3, while in the case of LMICs, it is observable in the lower range, as seen in Figure 4.

Figure 3. Relationship between domestic value-added exports data and gross exports data for HICs, 1995-2018



Source: own construction based on OECD-TiVA data

Figure 4. Relationship between domestic value-added exports data and gross exports data for LMICs



Source: own construction based on OECD-TiVA data

Table 2 presents the findings of my research in comparison to the study conducted by Fertő et al. (2022). The first four columns of the table showcase the results of Fertő et al. (2022) for a total of 66 countries, whereas the following four columns display my findings for 43 high-income countries and the final four columns depict the results for 23 low- and middle-income countries. The results in the table aim to determine whether there are any differences between the traditional gross export (GE) data and the domestic value-added exports (DVA) data of TiVA when used in gravity model estimations employing OLS fixed effects (FES) and PPML methods.

Table 2. Research results for the 3-year interval in comparison to the results of Fertő et al. (2022)

	Fertő et al. (2022)				HIC and LMIC with 3-year interval							
	GE		DVA		HIC GE		HIC DVA		LMIC GE		LMIC DVA	
	FES	PPML	FES	PPML	FES	PPML	FES	PPML	FES	PPML	FES	PPML
Distance	-0.950**	-0.674**	-0.945**	-0.655**	-0.944**	-0.629**	-0.941**	-0.611**	-1.021**	-0.748**	-1.010**	-0.739**
	(0.011)	(0.012)	(0.011)	(0.012)	(0.013)	(0.013)	(0.013)	(0.014)	(0.019)	(0.022)	(0.019)	(0.023)
Contiguity	0.305**	0.224**	0.312**	0.238**	0.367**	0.354**	0.373**	0.359**	0.348**	0.078+	0.363**	0.108*
	(0.035)	(0.025)	(0.034)	(0.026)	(0.042)	(0.028)	(0.041)	(0.029)	(0.058)	(0.043)	(0.058)	(0.044)
Language	0.446**	0.185**	0.449**	0.194**	0.385**	0.124**	0.389**	0.146**	0.497**	0.227**	0.500**	0.227**
	(0.022)	(0.027)	(0.022)	(0.028)	(0.026)	(0.031)	(0.026)	(0.032)	(0.038)	(0.041)	(0.037)	(0.042)
Colony	0.519**	-0.026	0.518**	0.009	0.616**	0.088	0.604**	0.099	0.471**	0.008	0.479**	0.087
	(0.048)	(0.074)	(0.047)	(0.072)	(0.060)	(0.087)	(0.059)	(0.083)	(0.075)	(0.117)	(0.075)	(0.111)
RTA	0.174**	0.244**	0.171**	0.253**	0.191**	0.300**	0.191**	0.304**	0.127**	0.174**	0.117**	0.185**
	(0.018)	(0.026)	(0.018)	(0.027)	(0.025)	(0.030)	(0.025)	(0.032)	(0.029)	(0.048)	(0.029)	(0.051)
Constant	5.004**	7.067**	5.061**	6.659**	5.322**	11.622**	5.146**	11.295**	5.535**	11.668**	6.188**	11.434**
	(0.334)	(0.278)	(0.361)	(0.283)	(0.423)	(0.417)	(0.430)	(0.424)	(0.431)	(0.349)	(0.366)	(0.345)
Observations	34180	34320	34135	34320	22280	22360	22261	22360	11900	11960	11874	11960
R2	0.900	0.916	0.900	0.915	0.905	0.925	0.904	0.923	0.901	0.944	0.902	0.946
Exporter-time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Importer-time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
RESET test (p-value)	0.0000	0.1127	0.0000	0.1582	0.0000	0.0002	0.0000	0.0009	0.3377	0.0000	0.6146	0.0000

Standard errors in parentheses
*+ p<0.10, * p<.05, ** p<.01"*

Source: own construction based on Fertő et al. (2022) and own computation

In view of the data in Table 2, it is evident that the differences between the two datasets are negligible for both categories of countries based on their income levels. Additionally, the signs of variables align with expectations: distance negatively impacts exports, while factors such as contiguity, language, colonial history, and regional trade agreements positively affect exports for both country groups. Apart from the colony in PPML, the results are statistically significant. The insignificant result for the colony can be attributed to the declining influence of colonial impact. My findings are consistent with those of Fertő et al. (2022). Moreover, it is worth mentioning that, aside from the RTA variable, the variable coefficients obtained through the PPML approach are lower compared to those of the OLS FES method. To further test the robustness of the results, the calculations are repeated at 5-year intervals, and the results are presented in Table 3. The recalculation affirms that the differences remain minor. However, this time not only the colony but also the contiguity indicator in the PPML method for LMICs produced insignificant results, while all the signs remained as expected when it is calculated in a 5-year interval.

Furthermore, this investigation provides insights into the impact of cost variables on the exports of countries belonging to various income categories. As per the findings presented in Table 2, LMICs are more sensitive to distance and language factors than HICs. Specifically, the exports of LMICs display a greater negative response to increasing distance and a more positive response to sharing the same language than those of HICs. In contrast, HICs benefit more from sharing a border, having a shared colonial history, and being part of a regional trade agreement, all of which have a more favorable impact on their exports than on those of LMICs.

Table 3. Research results for the 5-year interval

	HIC GE		HIC DVA		LMIC GE		LMIC DVA	
	FES	PPML	FES	PPML	FES	PPML	FES	PPML
Distance	-0.937**	-0.634**	-0.933**	-0.615**	-1.008**	-0.761**	-0.995**	-0.753**
	(0.016)	(0.017)	(0.016)	(0.018)	(0.024)	(0.028)	(0.024)	(0.029)
Contiguity	0.365**	0.349**	0.370**	0.354**	0.355**	0.052	0.376**	0.083
	(0.052)	(0.036)	(0.052)	(0.037)	(0.074)	(0.054)	(0.073)	(0.056)
Language	0.372**	0.128**	0.379**	0.150**	0.494**	0.239**	0.499**	0.239**
	(0.032)	(0.040)	(0.032)	(0.041)	(0.047)	(0.052)	(0.047)	(0.054)
Colony	0.624**	0.104	0.611**	0.115	0.482**	0.022	0.481**	0.109
	(0.075)	(0.111)	(0.075)	(0.107)	(0.092)	(0.156)	(0.092)	(0.146)
RTA	0.208**	0.302**	0.210**	0.309**	0.133**	0.133*	0.122**	0.143*
	(0.031)	(0.039)	(0.031)	(0.041)	(0.037)	(0.059)	(0.037)	(0.062)
Constant	13.575**	11.670**	5.166**	11.328**	13.020**	12.004**	6.059**	11.773**
	(0.271)	(0.436)	(0.432)	(0.445)	(0.315)	(0.520)	(0.389)	(0.526)
Observations	13925	13975	13919	13975	7445	7475	7426	7475
R2	0.905	0.922	0.905	0.920	0.903	0.943	0.904	0.944
Exporter-time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Importer-time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
RESET test (p-value)	0.0000	0.0006	0.0000	0.0024	0.739	0.0000	0.3126	0.0000

Standard errors in parentheses

* $p<.05$, ** $p<.01$"

Source: own computation

5. Conclusion

To conclude, the concept of Global Value Chains has gained widespread popularity as a tool to examine the structural transformations taking place in the world economy. Incorporating imported intermediate products into exports is a crucial element of the manufacturing process, leading to gross exports being significantly higher than their domestic value-added counterpart. The concept of trade analysis based on value added is a relatively new method that has gained significance in studying international trade. Meanwhile, the concept of gravity models in international trade has been consistent over time and across nations. The models have been developed from the basic notion of trade flow between countries that is directly proportional to their GDP and inversely proportional to the trade barrier in the form of distance between them. Nowadays, the structural gravity model is the most commonly used method to calculate gravity models.

The study aims to determine whether the use of TiVA data instead of gross trade data in gravity model applications produces different outcomes, especially when categorizing countries based on their income levels, and explores the extent to which trade from these two country groups responds to cost factors in the gravity model. The study employs panel data with 3-year and 5-year intervals and uses OLS estimations with fixed effects to overcome outward and inward multilateral resistance terms, and the PPML method to overcome heteroscedasticity and the challenges of zero trade flow in bilateral trade. In general, the results show that high-income countries had the largest share of global trade, while their proportion decreased gradually over time, while the share of low- and middle-income countries in international trade increased steadily, with China playing a crucial role in this increase. The study has also found that there is a robust and positive correlation between the two types of data, and the differences between the two datasets are negligible for both categories of countries based on their income levels. These results coincide with the findings of Fertő et al. (2022). The findings have further revealed that LMICs are more sensitive to distance and language factors than HICs, while HICs benefit more from sharing a border, having a shared colonial history, and being part of a regional trade agreement. Overall, the study provides valuable insights into the impact of various factors on the exports of countries belonging to different income categories. It is possible that greater differences may emerge when examining results at the industry level, and further research in this area could be fruitful.

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