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PAPER

Modelling countries' inclusion into global value networks and testing its influence over mega-regional unions existence

Alla V. Kobylianska*

Abstract The paper is devoted to the modelling of the relationship between global value networks functioning and existence of mega-regional unions. The goal of the paper is to test an influence of firm' openness to global economy on global value chains and after global value chains functioning on mega-regional unions existence. Using World bank enterprises survey data covering 2005-2017 on specific indicators describing countries' enterprises openness to global economy and OECD-EORA GVC-related indicators specific OLS and probit models were testing, including testing GVC in 2017 and in 2011 on openness to global economy indicators, change in GVC's participation on changes in openness to global economy, probability of being mega-regional member on GVC in 2017, 2011 and 2005 respectively, the same for different megaregions (TTP, TTIP, RCEP, SHOSS, BRICS), the reverse relation between GVCs' participation and fact of being mega-regional member. Most of models have high explanative power, coefficients before independent variables are statistically significant and have right signs. It was concluded that more time remote progress in GVC's participation has more effect over the probability of entering mega-regional unions. Reversely, mega-regional unions' membership does not influence expansion of GVCs directly, but rather captures country specific effects. The research results are limited to countries under consideration and models used. Further researches could be concentrated on the elaboration of mutual dependence of GVCs and mega-regionals. It is suggested to include time variable indicating moment of being included into mega-regional union in order to test the instant effects over global value networks functioning. Moreover, it is advised to instrument dummy variable "megaregion" by country related economic indicators (GDP, FDI, etc.) to see whether it make difference over regression results.

Keywords: global value networks, global economy, mega-regionalization, modelling, probit, OLS.

JEL Classification: F02, F55, F15

A. V. Kobylianska* (✉)

* PhD in International economics, Associate professor, Professor at Department of Agrologistics and Supply Chain Management, Kharkiv Petro Vasylenko National Technical University of Agriculture, Kharkiv, Ukraine

E-mail: akobylyanskaya@eerc.kiev.ua

Introduction

Recent decades were marked by unprecedented changes in the form of global economic being. MNC were partly replaced by global value chains and networks. According to different researches this process started in mid-1990 and was suggested for consideration first in works by Gereffi (1994). At the beginning, terms such as global production chains, global commodity chain, global supply chain were in wide use. Lately, in early 2000 value approach had begun replacing its predecessors from general use. Inherited from Porter (1985, 1986) the term was further elaborated in Dicken et al. (2001) supplied by networking analysis which is suggested to better suit global economy essence.

As Baldwin (2012) mentions, global value chains unbundled at least in two stages, each of them was associated with progress in infrastructure- in first cases with advances in transportation and telecommunications, in second- with ICT. The sophisticated mix of local and global alongside with changing global economic landscape (industrialization of South, increased divergence in incomes) and emerging possibilities to get economic rent using global disparities were aligned by new political economy of liberalization. It was marked by ubiquitous refuse to use restriction on external trade, FDI or off-shore business set-up.

The last observation gives us the first attempt to link global value chains expansion with the changes in world trade policies and global economic governance, in whole.

Mega-regional unions, as the latest sophisticated form of global economic governance, act as the most similar, in terms of global economy covering, networking character of economic liaisons, to global value chains and networks.

Even considering the primary form of international economic integration, Ricardo Mendez states that “new RTAs are organized around a set of deeper integration issues that fosters transnational collaborative production and global value chains” (Melendez-Ortiz, 2014). He claims that mega-regionals, in their turn, go much deeper into writing rules that underpin global value chains.

Kobylianska (2019) revealed that rise of GVCs is positively followed by an increase in number of PTAs in place.

However, unstoppable complication of global economic being and inability of PTAs and other integration initiatives, which do not go beyond specific geographic region and are based heavily on WTO/GATT ruling currently experiencing serious crisis, do not fit the global nature and global needs of global value chains and networks.

From this perspective mega-regional unions could serve as a tool of governing global economy from the perspective of global value chains and networks.

Despite wide literature devoted separately to GVCs and global value networks and to mega-regional unions, there is a lack of research dealing with the investigation of the link between these two phenomena. Current paper is aiming at filling lack of this kind of works.

Thus, the goal of the paper is to assess how global value chains functioning is linked to existence of mega-regionals.

Data

To meet the goal of the paper, the research is primarily based on World Bank indicators and researches, namely: the data on enterprises survey is used in order to proxy the intention of the country to enter global value networks. This data covers period from 2005 to 2017 and the whole set of emerging markets and developing economies including global cities. Such indicators were used for research purposes:

Table 1. Indicators of country inclusion into global value networks

	Name of indicator	Variables	Measure
Independent variables	Percent of firms having their own Web site	web2011 web2017	%
	Percent of firms identifying access to finance as a major constraint	accfin2011 accfin2017	
	Percent of firms identifying customs and trade regulations as a major constraint	custtrade2011 custrade2017	%
	Percent of firms using material inputs and/or supplies of foreign origin	forinp2011 forin2017	%
	Percent of firms using technology licensed from foreign companies	forlict2011 forlict2017	%
	Percent of firms with an internationally-recognized quality certification	intqcert2011 inqcert2017	%
	Percent of firms with an annual financial statement reviewed by external auditors	extaud2011 extaud2017	%
	Proportion of total inputs that are of foreign origin (%)	percfirinp2011 perfirinp2017	%
	Proportion of total sales that are exported directly (%)	expdir2017 (the indicator is available for period after 2011)	%
Dependent variable	GVC	GVC2005 GVC2011 GVC2017	USD th

Source: developed by author based upon World Bank. Enterprise survey (World Bank)

As the data is gathered by World bank based upon interviews conducted once in 5-6 years on a random base (e.g. Nigeria responded in 2006 and 2012, while Poland – in 2010 and 2015 respectively), the additional operations were taken, and for each

indicator chosen supplementing proxies were constructed - one covering respective interview results available for countries for the period up to 2011, another one- from 2012 up to 2017.

On the other side the GVC indicator of UNCTAD-EORA database (UNCTAD-EORA) is used to measure the inclusion of a country into global value networks.

Additional dummy variables taking values 0 or 1 and representing the fact of the country being the member of one of biggest mega-regional unions (TTP, TTIP, Shanghai economic cooperation organization, BRICS, RCEP, EU) were constructed. Dummy variable "megaregion" represents the whole set of cases when the country is the member of any of mentioned unions.

The data was cleared to avoid missed values, so that we ended with the sample of 92 countries.

Methodology

The research is conducted in several stages.

First, general OLS will be tested estimating dependence of the inclusion into global value networks on a list of chosen indicators separately for two periods: 2012-2017 and 2005-2011, as well as growth of GVCs on growth of independent variables. This would help us to understand how increasing openness of firms' to global economic conditions influences global value networks functioning.

We expect that share of foreign inputs in total input, percent of firms having external audit, percent of frim using foreign licensed technologies, quality certifications positively influence global value chains inclusion, while customs and trade obstacles and share of sales exported directly- negatively. The latter is the reason why firms and countries seek for more comprehensive trade agreements, including mega-regional ones.

Logically the second step is testing probit model for the fact of being mega-regional member on deepness of inclusion into global value networks and respective indicators' growth rates.

The results will be used to conclude on whether mega-regions' existence is driven by GVCs.

Results

Testing dependence of countries' inclusion into global value networks on firms' openness to global economy

Using general OLS: $GVCi=a+bXi+e$,

where Xi - set of indicators of countries' inclusion into global economy from table 1, i - year under consideration, let's estimate dependence of inclusion into global value networks on openness of firms to global markets in 2017 and 2011 respectively.

In order to avoid multicollinearity only such indicators, as: expdir2017 extaud2017, incert2017, forinp2017, custrtrade2017 are used as the respective correlation coefficients are less than 0,8 (Table2).

Table 2. Correlation matrix on indicators representing inclusion of countries into global economy

	web2011	web2017	expdir2017	forinp2011	forin2017	extaud2017	intqcert2011	inqcert2011	inqcert2017	forlict2017	perfirinp2017	custtrade2011	custrade2017	GVC2011
expdir2017	0,71													
forin2017	0,65	0,60												
extaud2011	0,54			0,57										
extaud 2017	0,61				0,56									
inqcert2011	0,68					0,51								
inqcert2017	0,79	0,64												
forlict2011	0,51								0,56					
forlict2017	0,64				0,54		0,57		0,55					
percfirinp2011	0,60			0,91		0,70								
perfirinp2017	0,75	0,61			0,96		0,64		0,51	0,62				
custrade2017					0,58		0,55				0,61			
accfin2011												0,68		
accfin2017					0,61		0,53				0,64		0,84	
GVC2017														0,99

Source: estimated by author with the use of Stata10.

Thus, Table 3 represents OLS estimation results for the dependence of countries' inclusion to global value chains on indicators describing local firms' openness to global economy.

Table 3. Dependence of inclusion into global value networks on openness of countries' firms to global markets in 2012-2017.

*gvc2017=const+b*expdir2017+b*forin2017+b*extaud2017+b*inqcert2017 +b*forlict2017+b*custrade2017+b*gvc2011*

Source	SS	df	MS		Number of obs	92
					F(7, 84)	=11679.98
Model	1.0172e+18	7	1.453,10E+18		Prob > F	= 0.0000
Residual	1.0451e+15	84	1.244,10E+14		R-squared	= 0.9990
					Adj R-squared	= 0.9989
Total	1.0182e+18	91	1.118,90E+17		Root MSE	= 3.5e+06
gvc2017	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
expdir2017	-213783.5	118352.1	-1.81	0.074	-449139.6	21572.72
forin2017	34497.09	30964.07	1.11	0.268	-27078.35	96072.53
extaud2017	39155.59	20124.1	1.95	0.055	-863.3905	79174.57
inqcert2017	82589.85	48551.96	1.7	0.093	-13961.04	179140.7
forlict2017	-63749.99	52284.67	-1.22	0.226	-167723.8	40223.81
custrade2017	-27225.7	42238.16	-0.64	0.521	-111220.9	56769.51
gvc2011	1.059177	.0045712	231.71	0.000	1.050087	1.068268
_cons	-2236305	649226	-3.44	0.001	-3527362	-945248

Source: estimated by author in Stata10.

Model was modified via including of gvc2011 into regression, as in the first appearance the explicative power of model was too low. While in current case R-squared is high (0.99) signifying high fit of the model. The coefficients before such indicators, as: the share of sales exported directly in 2017, share of firms having international quality certificates both in 2011 and 2017, inclusion into global value chains in 2011, -are significant and have right signs, the same is true for constant. The constant takes negative value showing that without influence of all indicators the inclusion of countries into global value chains in 2017 would take opposite direction.
For comparison purposes lets perform the same type of analysis for GVC2011 (Table 4).

Table 4. Dependence of inclusion into global value networks on openness of countries' firms to global markets in 2005-2011

*gvc2011=a+b1*web2011+b2* forinp2011+b3* extaud2017+b4* inqcert2011+b5* forlict2011 +b6*custtrade2011+b7* accfin2011*

Source	SS	Df	MS		Number of obs	= 92
					F(7, 84	= 2.24
Model	1.4144e+17	7	2.026,00E+16		Prob > F	= 0.0391
Residual	7.5924e+17	84	9.038,60E+16		R-squared	= 0.1570
					Adj R-squared	= 0.0868
Total	9.0068e+17	91	9.897,60E+16		Root MSE	= 9.5e+07
gvc2011	Coef.	Std. Err.	T	P>t	[95% Conf.	Interval]
web2011	373538.7	671495.5	0.56	0.579	-961803.8	1708881
forinp2011	-1147946	667881.6	-1.72	0.089	-2476102	180209.8
extaud2011	-442677.4	543119.8	-0.82	0.417	-1522731	637375.9
inqcert2011	-92400.55	1421592	-0.06	0.948	-2919392	2734591
forlict2011	-448022	1295918	-0.35	0.730	-3025098	2129054
custtra~2011	-229488.2	1176971	-0.19	0.846	-2570024	2111047
accfin2011	-690759.4	786551.1	-0.88	0.382	-2254902	873383.8
_cons	1.05e+08	2.38e+07	4.41	0.000	5.77e+07	1.52e+08

Source: estimated by author in Stata10.

To avoid multicollinearity problem some indicators was also excluded from consideration. This model has low explicative power (0.16) and only two coefficients are statistically significant (that of the share of foreign inputs in total inputs in 2011 and of constant value). An increase in the share of foreign inputs in total inputs by 1 p.p. was leading to decrease in country's participation in GVC by average 1148 USD mln prior 2011.

To compare, once we include gvc2005 indicating country's inclusion into global value networks, we get considerably higher R-squared (Table 5).

Table 5. Dependence of inclusion into global value networks on openness of countries' firms to global markets in 2005-2011

*gvc2011=a+b1*web2011+b2* forinp2011+b3* extaud2017+b4* inqcert2011+b5* forlict2011 +b6*custtrade2011+b7* accfin2011+b8*gvc2005*

Source	SS df	MS		Number of obs	= 92
				F(8, 83)	= 580.08
Model	8.8486e+17	8	1.16,10E+18	Prob > F	= 0.0000
Residual	1.5826e+16	83	1.96,70E+15	R-squared	= 0.9824
				Adj R-squared	= 0.9807
Total	9.0068e+17	91 9.8	9,76E+17	Root MSE	= 1.4e+07

Source	SS df	MS			Number of obs	= 92
gvc2011	*Coef.*	*Std. Err.*	*t*	*P>t*	*[95% Conf.*	*Interval]*
web2011	-74882.57	97794.04	-0.77	0.446	-269391	119625.8
forinp2011	118603.7	99103.11	1.2	0.235	-78508.37	315715.9
extaud2011	22039.94	79234.64	0.28	0.782	-135554.6	179634.4
inqcert2011	-192399.9	206482.5	-0.93	0.354	-603085.2	218285.4
forlict2011	230207.5	188536.2	1.22	0.226	-144783.4	605198.3
custtra~2011	114608.7	171035.5	0.67	0.505	-225574.1	454791.4
gvc2005	2.627729	.0420833	62.44	0.000	2.544027	2.711431
_cons	-1.04e+07	3922555	-2.64	0.010	-1.82e+07	-2567370

Source: Source: estimated by author in Stata10.

In this case, any of the coefficients, unless those before gvc2005 and constant, is statistically significant. Still the signs before statistically significant coefficients are the same as in model estimated for 2017. Higher coefficient before gvc2005(Table5) than before gvc2011 (Table4) evidenced for the lower pace of getting involved into global economy, meaning that the biggest expansion occurred before 2011. This evidence supports the results obtained in Kobylianska (2019), especially taking into account the fact that biggest economies experienced decrease in GVC participation after 2018.

To elaborate on our analysis lets' test how progress in countries' GVCs participation depends on changes in indicators describing local firms' openness to global economy (Table 6). For this additional growth indicators for GVC from 2017 to 2011- GVC71, share of foreign inputs in total inputs (grforinp), percent of firms having international certification (grinqcert), external auditing (grextaud), foreign llicensed technology (grforlict), percent of firms having personal web-site (grweb), percent of firms reporting customs and trade obstacles as important challengies in conducating international activities (grcusttr) and GVC growth from 2005 to 2011 (gr15).

Table 6. Estimating development of GVCs' participation

Source	SS df	MS			Number of obs	= 75
					F(7, 67)	= 3.63
Model	.1254	7	.01791		Prob > F	= 0.0022
Residual	.3304	67	.00493		R-squared	= 0.2752
					Adj R-squared	= 0.1994
Total	.4558	74	.0061		Root MSE	= .07022
gvc71	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
grforinp	.0542039	.0234437	2.31	0.024	.0074101	.1009
grextaud	.0239985	.0191799	1.25	0.215	-.0142846	.0622

Source	SS df	MS			Number of obs	= 75
grinqcert	-.0023065	.0154708	-0.15	0.882	-.0331862	.0285
grcusttr	-.0093953	.0167548	-0.56	0.577	-.042838	.0240
grforlict	-.0049565	.0091847	-0.54	0.591	-.0232893	.01337
gr15	-.0217145	.0150523	-1.44	0.154	-.0517591	.00833
grweb	.0090638	.0154504	0.59	0.559	-.0217754	.0399
_cons	.976733	.0341514	28.60	0.000	.9085664	1.0449

Source: Source: estimated by author in Stata10.

R-squared equals 0,28 which is considerable low, still growth in share of foreign inputs used in production positively influenced expansion of GVC between 2011 and 2017 (1 p.p. increase led to additional 0,05 change in growth of GVC).

Testing probability of being included into mega-regional unions on GVCs participation. Basing on previous results, claiming that the correlation links are more tough in case of GVC and number of RTAs in next periods than in case of GVC and number of RTAs in current period, let's test the hypothesis that gvc's expansion leads to the creation of mega-regions. As gvc2017, gvc2011 and gvc2005 are highly correlated (correlation coefficient are even higher than 0.99), lets' first test probit model of probability entering in mega-regions on GVC in different periods.

Table 7. Dependence of mega-regions existence on member-country's inclusion into global value networks in different periods- probit models testing

	Megaregion (1)	Megaregion (2)	Megaregion (3)
Gvc2017	6.36e-10		
Gvc2011		1.94e-09	
Gvc2005			2.39e-09*
Log likelihood	-57.66	-57.55	-56.69
Prob > chi2	0.1336	0.1166	0.0408
Pseudo R2	0.0191	0.0209	0.0356
Number of observations	92	92	92

Source: estimated by author in Stata10.

It is evident that the deepness of inclusion into global value chains only in 2005 has an effect on the fact of being mega-regional country-member (the coefficient is statistically significant ofr 2005 , not for 0211 and 2017) meaning that more distant in time GVCs' participation has more influence on being mega-regional member.

Table 8. Dependence of mega-regions existence on progress in member-country's participation in global value networks - probit models testing (marginal effects).

	Megaregion (1)	Megaregion (2)	Megaregion (3)
GVC change during 2017 -2011	2.02**		
GVC change during 2011-2005		.04	
GVC change during 2017-2005			.11

Source: estimated by author in Stata10.

The models testing results showed that change in GVC between 2011 and 2017 has positive significant effect over possibility of being mega-regional member. If we compare this to the results of previous model, we can conclude that changes of 2005 influenced general global economic landscape, having a prolonged impact over 2011, while drastic changes appeared between 2011 and 2017.

To support the results obtained lets' take into account country and regional specifics and test our model for separate megaregions (TTP, TTIP, SHOSS, BRICS, RCEP, EU) (Table 9).

Table 9. Dependence of specific mega-regions existence on member-country's inclusion into global value networks- probit models testing (marginal effects).

	TTP	TTIP	SHOSS	BRICS	RCEP	EU
gvc2017						
gvc2011						
gvc2005	9.84e-10	1.01e-09	1.51e-09*	6.3e-10	3.44e-09**	9.94e-10
Log likelihood	-11.49	-30.46	-29.29	-4.88	-25.21	-34.78
Prob > chi2	0.0016	0.1280	0.0307	0.0008	0.0007	0.1934
Pseudo R2	0.3013	0.0366	0.0738	0.6309	0.2515	0.0237
Number of observations	92	92	92	92	92	92

Source: estimated by author in Stata10.

Table 9 represents the results of separate testing of the fact of being member of some of mega-region on the deepness of country's inclusion into global value networks in 2005. Only SHOSS and RCEP membership showed being dependent on gvc2005 at statistically significant level supporting the idea of active development of both mega-regionalism and global value chains in Asian region. The impact is rather low, however it exists.

Table 9. Dependence of specific mega-regional unions existence on progress in member-country's participation in global value networks – probit models testing (marginal effects).

	TTP	TTIP	SHOSS	BRICS	RCEP	EU
GVC change during 2017 -2011		.87**			1.29***	.97**
GVC change during 2011-2005						
GVC change during 2017-2005			.07 *		.079*	

Source: estimated by author in Stata10. Note only statistically significant results are repoted.

As expected, in most of the cases (TTIP, RCEP, EU) we got positive statistically significant results for growth in GVCs' participation between 2017 and 2011, as well as support for our hypothesis on importance of GVCs' participation in 2005.

To conclude on results obtained, lets' test the reverse relationship between mega-regional functioning and GVC's participation. To start with we need to test future models' parameters for possible multicollinearity (Table 10).

Table 10. Correlation matrix on indicators representing the inclusion of countries into mega-regional unions and global value networks.

	gvc 2017	gvc 2011	gvc 2005	Mega-region	TTP	RCEP	BRICS	SHOSS
gvc2017	1							
gvc2011	0.99	1						
gvc2005	0.99	0.99	1					
Mega-region	0.16	0.17	0.23	1				
TTP	0.54	0.54	0.53	0.07	1			
TTIP	0.12	0.13	0.18	0.49	-0.07			
RCEP	0.41	0.41	0.43	0.45	0.25	1		
BRICS	0.64	0.65	0.62	0.13	0.26	0.12	1	
SHOSS	0.33	0.33	0.29	0.42	0.10	0.19	0.33	1

Source: estimated by author.

Correlation analysis results showed that we could've expect existence of influence of TTP and BRICS over GVC inclusion, at the same time we could not include these indicators simultaneously into the model as independent variables as respective correlation coefficients between them are higher than 0.5 (marked grey). The same is true for simultaneous use of EU and TTIP in model.

At first step, we regress gvc2017, gvc2011, gvc2005 on "megaregion" variable- in each of three cases we got extremely low explanative power of models and insignificant coefficients before independent variable, notifying that fact of being member of mega-regional unions does influence inclusion into GVC, at least directly. Thus, our previous conclusions on absence of reverse influence of megaregional over GVCs are reliable.

Once we include into the model variable indicating previous deepness of inclusion into global value networks (such as GVC2011 while regressing GVC2017 or GVC2005 for GVC2011), we obtained that these variables alongside with "megaregional" variable both have significant impact over the next state of country's inclusion into global value networks (Table 11). The explanative power of models increases by almost 33% (e.g. comparing equation 3 to 4 and equation 7 to 8).

Table 11. OLS-testing dependence of deepness of inclusion into global value networks on membership in mega-regions.

	gvc2017 (1)	*gvc2017 (2)*	*gvc2017 (3)*	*gvc2017 (4)*	*gvc2017 (5)*	*gvc2011 (6)*	*gvc2011 (7)*	*gvc2011 (8)*
gvc2011	1.06**			1.06**				
gvc2005		2.77***			2.77***	2.61**		2.62***
megaregion	-1774368*	-1.38e+07***				-1.14e+07**		
TTP			1.77e+08**				1.66e+08 ***	
TTIP(EU)			7.72e+07**	-1553529	-1.92e+07***		7.42e+07***	-1.69e+07***
SHOSS			3.67e+07	918532.5	1.35e+07 **		3.32e+07	1.16e+07**
BRICS			2.97e+08**				2.82e+08***	
RCEP			8.94e+07**	241153.4	-1.11e+07*		8.39e+07***	-1.11e+07**
_cons	-619736.6	-496093.8	-7564556	-1109902 **	-3183284	71804.71	-6109555	-1961916
Prob > F	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
R-squared	0.99	0.99	0.68	0.99	0.97	0.98	0.67	0.98
Number of observations	92	92	92	92	92	92	92	92

Source: estimated by author in Stata10.

At the same time variable megaregion has negative sign meaning that inclusion into

mega-regional union has rather negative effect, possibly testifying for erosion of the need to cooperate internationally in production process while the external markets are free for access. Another interesting result is that GVC2005 has higher coefficient than GVC2011, supporting previous results of bigger power of more remote developments.

Moreover, in case of gvc2017, once gvc2011 is included all other coefficient became insufficient, allowing us concluding that gvc2011 captures all country-specific effects (compare models 3 and 4). The same is not true than we include gvc2005 into the models, both while regressing gvc2017 and gvc2011 on gvc2005 and mega-regional dummies (models 4 and 5 and 7 and 8).

Meaning that prior 2011 countries' specific characteristics had influence over their inclusion into global value chains.

It should be noted that the coefficients obtained are pretty similar for gvc2017 and gvc2011- to confirm this statement please consider models (3) and (7), (2) and (6), (5) and (8): the coefficients are almost equal (for 2017 are higher than for 2011); signs before coefficients are the same, the fact of being included or possibility of being included into TTIP and RCEP has both negative effect over GVC's participation in 2017 and in 2011.

Nevertheless, we could not claim existence of mutual dependence of GVC and mega-regional unions as without using previous values of GVC the respective coefficients are insignificant. The change in significance is mostly driven by specific characteristics of countries included into consideration and captured by "mega-regional variable" (e.g. it could be GDP volume and growth, volume of FDI etc.).

To end up out consideration lets test the degree of being included into GVC on respective progress prior reporting year (Table 12).

Table 12. OLS-testing dependence of deepness of inclusion into global value networks on previous progresses

	gvc2011 (1)	P>t	gvc2017 (2)	P>t
GVC growth 2011 to 2005	1.05e+07	0.584		
GVC growth 2017 to 2011			1.63e+08	0.253
megaregion	3.49e+07	0.116	2.75e+07	0.265
_cons	-3445196	0.939	-1.37e+08	0.323
Prob > F	0.0321		0.1615	
R-squared	0.0101		0.0406	
Number of observations	91		91	

Source: estimated by author in Stata10.

Both models have low explanative power, unlike in Table 11 both coefficients before mega-regional dummy and GVCs' growth indicators are statistically insignificant supporting our assumption on importance of country specific characteristics and their change as a result of GVCs inclusion or mega-regions participation.

Table 13. OLS-testing dependence of progress in deepness of inclusion into global value networks on previous progresses

	GVC growth 2017 to 2005 (1)	GVC growth 2017 to 2011 (2)
GVC growth 2011 to 2005	.9880682***	-.0018654
ttp	-.0412594	-.0199676
ttip	.1441485**	.0669722**
brics	.0325456	-.0023587
rcep	.2183186***	.0955117***
shoss	.0142699	.0191761
_cons	-.0457281	.9715018***
Prob > F	0.0000	.0058
R-squared	0.9049	0.1905
_cons	91	91

Source: estimated by author in Stata10.

Model (1) has high explanative power (0.9), as in case of table 11 previous progress in GVC participation and fact of being possible member of TTIP and member of RCEP has positive impact over GVC growth between 2017 and 2005.

Conclusions

Current research showed high degree of dependence of global value networks functioning on firms' openness to global economy as well as positive influence of GVCs' country participation over probability of being included into mega-regional agreement.

Specifically, it was shown that in 2017 GVCs' participation was negatively dependent on share of foreign inputs in total inputs and positively dependent on previous participation in GVC. The same is true for GVCs' participation in 2005.

Higher coefficient before gvc2005 than before gvc2011 (Table4) evidenced for the lower pace of getting involved into global economy, meaning that the biggest expansion occurred before 2011. Testing growth in GVCs' participation between 2011 and 2017 on respective set of indicators related openness to globnal economy, it was

shown that the model has low explanative power, thus this issue should be elaborated in further researches.

As a results of probit modelling, it became evident that the deepness of inclusion into global value chains only in 2005 has an effect on the fact of being mega-regional country-member (the coefficients are statistically significant in model for 2005 indicator , not for 2011 and 2017) meaning that more distant in time GVCs' participation has more influence on being mega-regional member.

The models testing results showed that change in GVC between 2011 and 2017 has positive significant effect over possibility of being mega-regional member. Separately testing the fact of being member of some of mega-region on the deepness of country's inclusion into global value networks in 2005, we got that only SHOSS and RCEP membership showed being dependent on GVC in 2005 at statistically significant level supporting the idea of active development of both mega-regionalism and global value chains in Asian region. The impact is rather low, however it exists.

As expected, in most of the cases (TTIP, RCEP, EU) we got positive statistically significant results for growth in GVCs' participation between 2017 and 2011, as well as support for our hypothesis on importance of GVCs' participation in 2005.

While testing for reverse relationship between mega-regional functioning and GVC's participation, we concluded on the fact that dummy "megaregion" captures country specific characteristics, as used solely without additional independent variables this dummy has not statistically significant effect for GVCs' functioning neither in 2017 nor in 2011.

The research results are limited to countries under consideration and models used. Further researches could be concentrated on the elaboration of mutual dependence of GVCs and mega-regionals. It is suggested to include time variable indicating moment of being included into mega-regional union in order to test the instant effects over global value networks functioning. Moreover, it is advised to instrument dummy variable "megaregion" by country related economic indicators (GDP, FDI, etc.) to see whether it make difference over regression results.

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