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PAPER

Micro-aspects of mega-regional integration: value networks in global economic governance and clustering space

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Abstract. The paper deals with a new approach to the clustering of world economies with respect of their inclusion to global value networks. The goal of the paper is to study micro-aspects of global economic integration and to question on whether GVCs foster mega-regionalization. World bank enterprises survey data covering 2005-2017 on specific indicators describing reporting countries' enterprises openness to global economy and OECD-EORA GVC-related indicators were used for research purposes. Methodologically paper is split into several parts: first part is devoted to the analysis of the evolution of country's involvement into global economy from micro-aspects; the second part represents the first attempt to group countries with respect to openness to trade as a key in PTAs signing; the third part represents clustering of economies for 2011 and 2017 separately as well as analyses how similar they are in their respective progress in chosen indicators between these two time-periods. It was found that the higher the use of foreign inputs by firms- the more frequent is the reporting on customs and trade procedures, as well as access to finance, being the main obstacles, supporting the fact that countries try to set up international partnerships and enter foreign markets via starting local production. Using Kendall rang correlation as a base for cluster analysis and performing clustering on the base of growth terms of indicators chosen, it was shown that regional character of clustering persists (pool of Latin American countries, African countries, CEE, Asia countries are clearly observed) with minor exclusions, and non-trivial links between regions are in place.

It could be concluded that there is a high possibility of empirically tested relation between micro-motivation behind global value chains functioning and neo-regionalism in the form of mega-regions set-up.

Keywords: global value networks; global economy; mega-regionalization; cluster analysis.

JEL Classification: F02; F55; F15.

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Introduction

Nowadays, the phenomena of global values networking is accompanied by process of mega-regionalization. Both these processes link countries not only of different regions but of different continents shifting global economic power from world-centrist landscape to dissipative global structures. In case of global value networks business became global being able to influence situation not only within specific country, but outside national borders. Thus, it raises the question on whether we could be claim that global business means global economic governance. At the same time, mega-regional unions, created to fill in the gap of current multilateralism, represent another opposite of one/two-centric world and inherent to it global rules and ordering, e.g. global economic governance. The goal of the paper is to test empirically what goes first- global value chains or mega-regional unions in order to evolve in the essence and meaning of global economic governance as dissipative world structure which corresponds better to current global economic landscape.

Literature review

The broad literature is devoted to various issues of functioning of both global value chains and networks functioning and mega-regionals. At the same time, only few researches try to investigate interrelations between these both modern phenomena.

Ricardo-Melendez-Ortiz mentions that mega-regionals are those partnerships where its counterparties may serve as GVCs' hubs (Baldwin R., 2014). Peter Draper and Salim Ismail in their turn believe that TPP and TTIP integration could make African economies more integrated into global value chains.

Deborah Kay Elms (2014) considering Asia discusses how mega-regionals in the region would foster global value chains functioning. The researcher concludes that bigger agreements (e.g. mega-regional ones) need to include more members for firms entering GVCs getting benefits from this in terms of lower costs and bigger returns to scale. Another objection is a high degree of PTAs overlapping making whole multilateral system confusing and complicating firms' operation. Thus, the influence of mega-regionals over GVCs is ambiguous at this point of time.

Investigating general PTAs it was found that indeed there is a positive correlation between GVC trade and the depth of trade agreements (World bank, OECD and WTO, 2017).

Taking into account that it was shown that preferential trade agreements positively influenced GVCs expansion (Blanchard, E. and X., Matschke, 2015) and the lag between number of PTAs and GVCs scope we can assume that global integration proceeds in several steps "PTAs-GVC/GVN-mega-regionals" reflecting increasing sophistication of global economic system and deepening of degree of economic integration.

It is claimed that negotiations on mega-regional agreements are associated with governance of value chains at systemic level (Stephenson Sh. and A. Pfister, (2016), suggesting that they are the response to the value chains expansion. The goal of the paper is to test how current global economy segregation at mega-level could be

explained in micro-terms and which landscape it takes if we consider firms openness to global economy. The results of the paper would fill in the lack of research on the respective relation between GVCs as a proxy to global value networks and mega-regionals as a type of global economic governance, as well as to consider how global value networks themselves represent one of the forms of global economic governance.

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	Argumentation of inclustion into consideration	Variables
Percent of firms having their own Web site	The guarantee of access to the company information from the side of international counterparties	web2011 web2017
Percent of firms identifying access to finance as a major constraint	In conditions of financial globalization, positive response witnesses the low level of inclusion into GVN	accfin2011 accfin2017
Percent of firms identifying customs and trade regulations as a major constraint	The indicator reflects the inclusion of local business into international trade flows	custtrade2011 custrade2017
Percent of firms using material inputs and/or supplies of foreign origin	The direct indicator of inclusion in GVN	forinp2011 forin2017
Percent of firms using technology licensed from foreign companies	The direct indicator of inclusion in GVN	forlict2011 forlict2017
Percent of firms with an internationally-recognized quality certification	The indirect indicator of inclusion in GVN	intqcert2011 inqcert2017
Percent of firms with an annual financial statement reviewed by external auditors	The indirect indicator of inclusion in GVN/ The guarantee of access to the company information from the side of international counterparties	extaud2011 extaud2017
Proportion of total inputs that are of foreign origin (%)	The direct indicator of inclusion in GVN	percfirinp2011 perfirinp2017

Proportion of total sales that are exported directly (%)	The direct indicator of inclusion in GVN / The indicator reflects the inclusion of local business into international trade flows	expdir2017 (the indicator is available for period after 2011)

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

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 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.

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.

At first stage the summary statistics is represented, and correlation analysis of chosen indicators is conducted, the correlation matrix is constructed.

Secondly, the change in respective indicators between 2011 and 2017 are to be analyzed to assess the progress of specific countries in entering global value chains.

At third stage, preliminary grouping of countries with respect to growth rates of chosen indicators will be done.

At forth stage, cluster analysis based on growth rates will be performed.

Results

Summary statistics and correlation analysis

The next table represents the summary statistics on chosen indicators allowing making preliminary conclusions.

Table 2. Summary statistics of chosen indicators

Variable	Obs	Mean	St:Dev.	Min	Max
web2011	92	31,65	22,02	0	80,50
web2017	92	32,63	27,20	0	91,00
expdir2017	92	4,09	4,80	0	18,40
forinp2011	92	33,23	20,24	0	93,20
forin2017	92	24,36	20,46	0	70,10
extaud2011	92	41,66	25,68	0	96,60

extaud2017	92	32,29	26,72	0	88,70
inqcert2011	92	14,65	10,43	0	43,50
inqcert2017	92	11,49	12,56	0	53,40
forlict2011	92	12,70	9,90	0	41,00
forlict2017	92	11,08	9,75	0	36,90
percfir~2011	92	54,32	28,00	0	100,00
perfiri~2017	92	40,28	30,74	0	90,70
custtra~2011	92	14,72	11,97	0	58,40
custrade2017	92	10,88	12,38	0	50,80
accfin2011	92	25,92	17,83	0	75,00
accfin2017	92	16,95	17,15	0	69,10
gvc2011	92	32000000	99500000	0	866000000
gvc2017	92	32900000	106000000	0	931000000

Source: calculated by author with the aid of Stata10

We could observe an increase in average share of firms reporting having personal Web-site or having internationally recognized certification during 2011 and 2017. For other indicators- share of foreign inputs in total inputs used by firms, percent of firms having external audit, foreign licenses, firms using foreign inputs, mentioning customs and trade procedures and access to finance as main obstacles in their activity,- their values decreased alongside with increase in inclusion into global value chains proxied by GVC indicator.

This testifies for both deeper macro-integration in form of regional trade agreements and financial globalization as well as for deeper micro-integration in form of inclusion into global value networks, which made new use of foreign inputs, licenses and external audits not necessary.

Interestingly, the standard deviation increased for most of indicators testifying for raising divergence between countries, which is in line with general consideration regarding world of different speeds.

Continuing considering the argument on relation between changes in different indicators describing country's inclusion into global economy, we proceed with correlation analysis (Table 3).

Table 3. Correlation matrix on indicators representing inclusion of countries into global economy

	expdir2017	forin2017	extaud2011	extaud 2017	inqcert2011	inqcert2017	forlict2011	forlict2017	percfirinp2011	perfirinp2017	custrade2017	accfin2011	accfin2017	GVC2017
web2011			0,54		0,68		0,51		0,60					
web2017	0,71	0,65		0,61		0,79		0,64		0,75				
expdir2017		0,60				0,64				0,61				
forinp2011			0,57						0,91					
forin2017				0,56				0,54		0,96	0,58		0,61	
extaud2017					0,51				0,70					
intqcert2011								0,57		0,64	0,55		0,53	
inqcert2011							0,56							
inqcert2017								0,55		0,51				
forlict2017										0,62				
perfirinp2017											0,61		0,64	
custrade2011												0,68		
custrade2017													0,84	
GVC2011														0,99

Source: estimated by author with the use of Stata10

The table represents only those coefficients that take value higher than 0.5, empty rows and columns are deleted from table. The results obtained are consistent: the fact of country's firm having personal web-site in respective years positively correlates with all indicators describing country's openness to global economy (share of sales exported directly, firms having external audit, internationally recognized certification,

using foreign inputs etc.) The specific attention should be paid to quite high positive correlation coefficients between share of total sales exported directly and percent of foreign inputs in total inputs and percent of firms having international recognized certification- 0.6 and 0.64, respectively. This allows us guessing on the existence of relationship of fact of being included into GVC influencing the fact of trade facilitation and even entrance into trade blocks.

The fact of having significant share of foreign inputs in total inputs prior to 2011 is positively related to external audits after 2011 (0,57)- either international counterparties asks for reporting or deeper inclusion into production networks results in set-up of officially registered international companies.

Another interesting observation- the higher the use of foreign inputs-the more frequent reporting on customs and trade procedures as well as access to finance being the main obstacles. This observation is in line with general consideration that in conditions of trade or fiancé limitations, countries try to set up international partnerships and enter foreign markets via starting local production.

The same reasoning could be used for explaining positive relation between the share of companies having foreign licenses and customs/trade and finance obstacles (0.57, 0.55 and 0.53, respectively). It should be noted that customs and trade obstacles are highly associated with challenges of access to finance (0,84). At this stage no specific direct relation between the degree of country's inclusion into GVCs (gvc2011 or gvc 2017) and other indicators was found, while indirectly the results obtained testify for this.

Testing for progress in country's inclusion into global value networks. To proceed with our analysis lets' compute the growth rates of each indicator under consideration and form several country groups. This would allow us to test whether the progress in entering GVN relates somehow to the changes in indicators signifying inclusion into global economy.

Assuming that the main reason of countries entering global value networks is to avoid barriers to trade, lets' sort the group of countries with respect to this indicator's growth rate and split the whole set of countries into several groups comparable in size.

Table 4. Average in-group growth rates

	countries	custrade2017/2011	Web 2017/2011	expdir2017/2011	forlict2017/2011	extaud2017/2011	intqcert2017/2011	forin2017/2011	perfirinp2017/2011	accfin2011/2011	Gvc 2017/2011
Group1	Pakistan Tanzania Mali Honduras Nigeria Ghana Afghanistan Malawi Indonesia Cote d'Ivoire	2,79	2,31	2,20	2,16	1,60	1,48	1,45	1,37	1,04	0,99

Group2	Uganda Nepal Mauritania Lithuania Lesotho Bolivia Ecuador Dominican Republic Croatia Paraguay	1,35	1,46	1,49	1,45	1,15	1,09	0,89	0,92	1,45	1,01
Group3	Kenya Philippines Bhutan Namibia Slovak Republic Kyrgyz Republic Zambia Senegal Russian Federation Mongolia Vietnam	0,87	1,44	1,04	0,98	0,89	1,00	0,92	0,90	0,96	1,02
Group4	Cameroon Nicaragua Bulgaria Armenia Hungary Poland Romania Madagascar Swaziland El Salvador Estonia Niger Montenegro Bangladesh	0,65	1,44	1,25	1,54	0,93	1,36	0,97	1,02	0,65	1,01
Group5	Congo Albania Bosnia and Herzegovina Macedonia, FYR Czech Republic Turkey Tajikistan Latvia Ukraine Kazakhstan Georgia Slovenia Azerbaijan Uzbekistan	0,27	1,57	0,98	0,88	0,95	1,17	0,94	0,94	0,59	1,00
	St.dev.	*0,45*	*0,06*	*0,23*	*0,33*	*0,12*	*0,15*	*0,03*	*0,05*	*0,39*	*0,01*
Note	*Set.dev for groups constructed on base of forlict2017/2011*	*0,14*	*0,08*	*0,07*	*0,20*	*0,12*	*1,24*	*0,07*	*0,34*	*0,32*	*0,01*
Note.	*Set.dev for groups constructed on regional base*	*0,43*	*0,32*	*0,07*	*0,22*	*0,43*	*0,40*	*0,06*	*0,40*	*0,18*	*0,03*

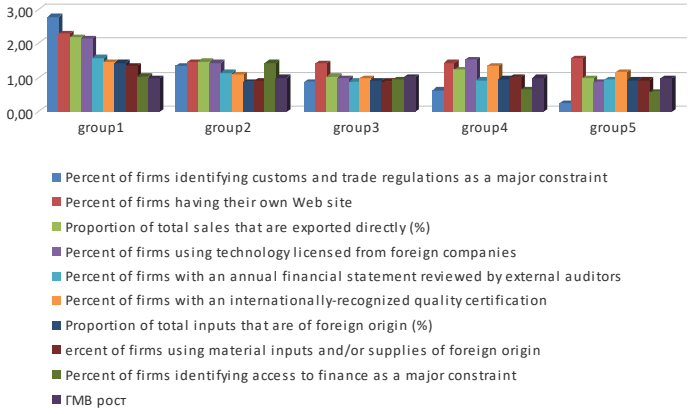
Source: developed and calculated by author

As it could be seen from the table, the grouping performed on the base of changes in percent of firms reporting customs and trade challenges as main obstacle gives results representative for other indicators as well, e.g. the sorting performed on other indicators would give the sane groups, several exclusions are: access to finance (groups 1 and 2), percent of sales exported directly and percent of firms using foreign licensed technologies (groups 3 and 4 and 2 and 4 respectively).

Average standard deviations calculated on the base of other groupings showed to be

higher than the base one allowing us concluding that this criterion is more consistent.

Figure 1. Grouping of countries with respect to growth rates of countries' firms' inclusion into global economy



Source: constructed by author

As it is clearly seen, the second group of countries is rather homogeneous in terms of growth rates of different indicators – standard deviation between indicators' growth rates constituted 0.24, in-group deviation for other group of countries is 0.6. This group is represented almost exclusively by Latin America countries reporting positively on chosen indicators on average in 23% cases more often in 2017 than in 2011.

Interestingly, in first group the highest progress was observed in firms reporting customs and trade limitations as main obstacle, which is a bad sign; for second and the fivth group this is percent of firms having personal web-site that increased the most, for second group- the proportion of total sales exported directly, and for the forth- percent of firms using technology licensed from foreign companies.

In order to better understand how different countries behave in conditions of deepening globalization including globalization of production, let's conduct cluster analysis, which would be based on a balanced weighted estimation of comprehensive linkages between countries including all indicators under study.

Elaborating on countries' grouping with the aid of cluster analysis

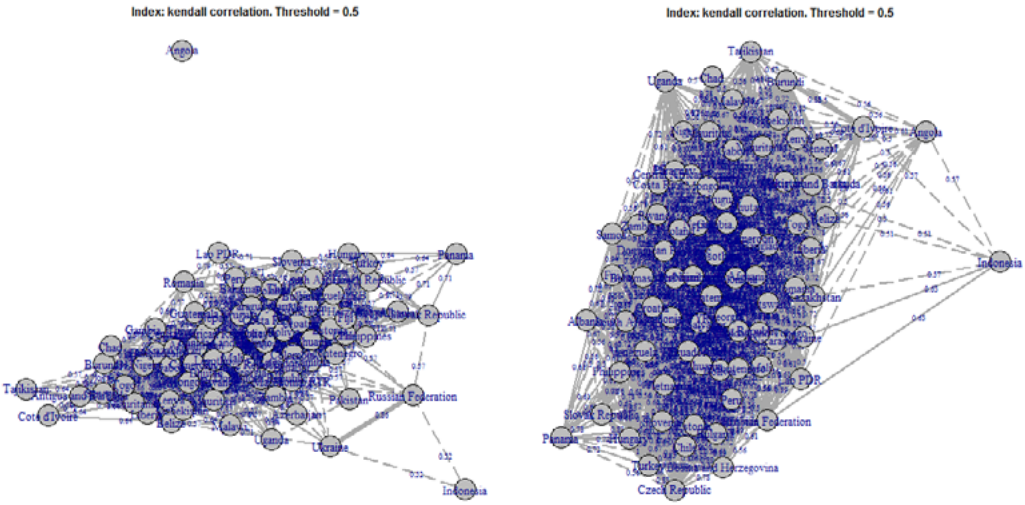
For research purposes we suggest using Kendall rang correlation. Based upon this criterion we perform clustering in several steps. First, we consider clustering of countries with respect to the degree of their inclusion into global economy as on the end of 2011 both taking into account the degree of their inclusion into global value networks and without taking it into account. This gives us an insight on how countries could be grouped with respect to after-crisis conditions.

Second, we perform the same types of clustering using indicators' values as on the end of 2017. This is to be done in order to assess whether economic disposition of countries under consideration have changed between 2011 and 2017.

Finally, we conduct clustering based on the extent of the progress in countries' inclusion into global economy, dividing respective indicators' values as of 2017 by those of 2011.

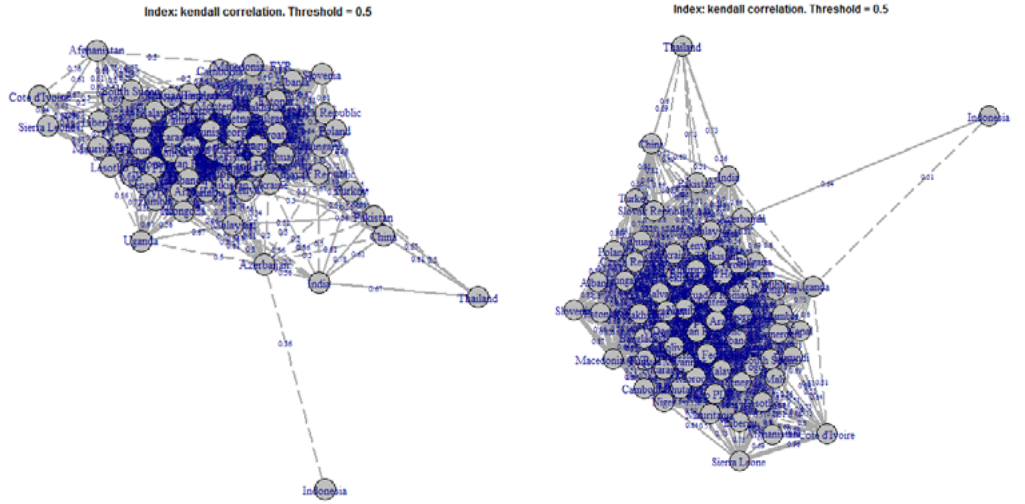
This would allow us concluding on convergence trends in global economy.

Figure 2. Clustering of countries with respect to the degree of their inclusion into global economy, as on the end of 2011



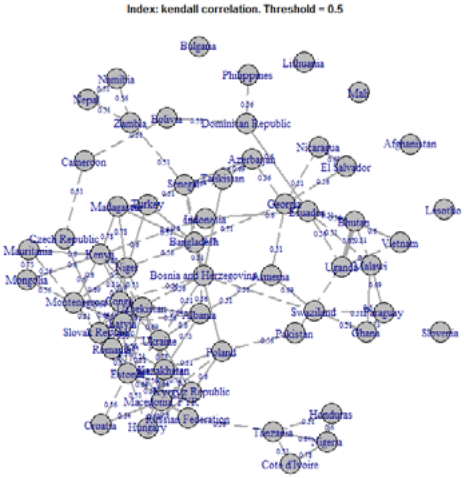
Using the above mentioned method of clustering, at figure 2 we could see the clustering of chosen countries as on the end of 2011, using separately list of ten indicators representing firm responses related to their inclusion into global economy (left side of figure) and this list of indicators plus GVC value (right side of figure 2). In both cases Indonesia is set aside from the whole group of world economies. West European countries form the specific hub of countries, the same is true for Latin America, Africa and Asia, Russian Federation is more integrated into economic ties on the right part of figure. At that point of time, we could claim that global economy was being in process of clusters formation, with no evident separate sub-groups being detected.

Figure 3. Clustering of countries with respect to the degree of their inclusion into global economy, as on the end of 2017



Performing the same analysis on the respective values of indicators chosen for the period after 2011, we observe some changes- Thailand with India, China and Pakistan forms new cluster of economies in Asia, as well as Sierra Leone- in Africa (additional cluster of Afghanistan is evidently observed at the left part of the fig.3. It could be concluded, that as on the end of 2017 clustering of global economy, with respect to formation of global value networks, is at the stage of active formation.

Figure 4. Clustering of countries with respect to the progress of their inclusion into global economy, 2017 to 2011



To assess how similar the countries are in terms of their progress in inclusion into global value networks, clustering on the base of growth in chosen indicators was performed. Regional character of clustering persists (pool of Latin American countries, African countries, CEE, Asia countries are clearly observed) with minor exclusions, and non-trivial links between regions were shown. This allows us assuming mega-regional character of global value networks, which could be hypnotized as a precondition for the formation of mega-regionals.

Conclusion

Unprecedent expansion of global value networks, preferential trade agreements and broader and deeper mega-regionalization made us look for the relation between micro-aspects of potential GVCs' members functioning neo-clustering of global economy. Basing on World Bank and UNCTAD-Eora databases it was shown that covering 92 world economies it was shown that between 2011 and 2017 changes in global economy structure took place. First of all, it was found that the higher the use of foreign inputs by firms-the more frequent is the reporting on customs and trade procedures, as well as access to finance, being the main obstacles. This observation is in line with general consideration that in conditions of trade or finance limitations, countries try to set up international partnerships and enter foreign markets via starting local production. Second, grouping of countries with respect to progress in reporting difficulties with

trade and customs procedures showed that countries entering specific blocks are almost all from the same geographic region, testing for high importance of regional factor in firms' external openness. Finally, using Kendall rang correlation as a base for cluster analysis and performing clustering on the base of growth terms of indicators chosen, it was shown that regional character of clustering persists (pool of Latin American countries, African countries, CEE, Asia countries are clearly observed) with minor exclusions, and non-trivial links between regions are in place.

Thus, it could be concluded that there is a high degree of possibility of empirically tested relation between micro-motivation behind global value chains functioning and neo-regionalism in the form of mega-regions set-up.

The research results are limited to countries included into consideration which is associated with data availability. Further research in the are could be directed on testing whether GVCs leads to the creating of mega-regional unions or mega-regional unions lead to expansion of global value networks.

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