Testing World Systems Theory in 2000s

An Application of Block Modeling Approach

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Introduction

Human society is a complex web of interactions that spurs multitude effects on the individual participants as well as the network as a whole. In sociology, there are two prevalent views of a analyzing a network: interactionism and structuralism. While interactionism focuses on individual characterization, thought process and individual level relationships, structuralism focuses on the structures on the institutional level that guide individual roles. Interactionist viewpoint in network analysis theory is exemplified in works of Mark Granovetter on strength of ties and Ivan Chase who discussed interaction hierarchy through chicken pecking order. Notable thinkers that emphasized on the role of social structure on human behavior, include Karl Marx, who emphasized on two level class structure and Georg Simmel who extended the alter orientation on family.

In world economic theory, some, such as, development theorists or modernization theorists, look at nations as individual units of analysis while others, such as, world systems theorists argue that structural position of nations is important in globalization and macroeconomic studies. In this paper, I will review the background of world systems theory and a popular network analysis method, block-model approach, that is used to systematically determine the structural position of a nation. I will then replicate the approach used by Ronald Breiger to determine the positions of 1972 OECD nations in his work, "Structures of Economic Interdependence Among Nations", to analyze how has the structural position of major economically contributing nations has evolved in the recent times. Considering, that new major economies, such as, China, have emerged onto the

world scene, I hypothesize to see a shift in which countries form the core nations, yet the coreperiphery structure of world systems still exists.

Literature Review

World system theory, largely credited to Immanuel Wallerstein, is a line of thinking that encourages economic or social analysis from a total world wealth and event standpoint rather than using nations or isolated events for such analysis. Specifically, regarding economic development of nations, much like dependency theory, world system theory disagrees with the, "linear notion that the historical growth of Western societies represents the pathway of development for the contemporary Third World" (Nemeth and Smith 518). Instead, the inherent structure of capitalist global economy would maintain the inequality and status quo.

In the 1950s and 60s, Latin American scholars questioned the tenets of modernization theory that promoted the spread of rational thinking, capitalist ideology and democratic institutions to build the foundation for the economic advancement of all nations. They argued that countries remained underdeveloped due to the structure of international relations and not an inherent cultural or economic characteristic. While the dependence theorists emphasized on two-way relations between wealthy, advanced, imperial nations and less developed, colonized nations, the world system theorists extended this two-partition thinking into a grid of interdependence that can be divided into unequal exchange relations of necessary bulk commodities. Wallerstein theorizes that countries can be divided into three positions: "core states appropriate the surplus of the world economy as a whole and in particular of those states located in the periphery, which produce lower-ranking (labor intensive) goods, while states located in the semiperiphery are 'both exploited and exploiters' (Breiger 354).

While core-semiperiphery-periphery division of the world gained acceptance, there was a lack of unified consensus on which countries held this position. In 1979 paper by Snyder and Kick, focused on a multinetwork analyses to find the structural positions of countries. They combine the world system theory with block model analysis to evaluate the structural positions that nations hold in world trade. Snyder and Kick, critique that the world systems theory, prior to their work, lacked operational rigor for classifying nation's position in the system or even structural necessity of three-tiered model in a capitalist world economy (the dominant world system for decades, according to Wallerstein). Additionally, previous regression analyses required a choice between focusing on poor countries to test the "effect of economic or cultural imperialism on economic growth" or include all available data for all nations leading to dubious arguments like Rubinson's claim that, "a nation's exports and imports (as a percentage of the GDP) puts the state and its economic actors in a position of less power and control in the world economy" (Snyder and Kick 1101). These are refuted in the economic standings of countries like USA and Japan. Finally, they urge that previously utilized indicators such as investment dependence or trade concentration do not completely represent the nation's position as they "do not fully specify the institutional locus of transnational flow" (Snyder and Kick 1102). To address this, Snyder and Kick, conduct a multinetwork, block-model analysis on data from 118 countries for four important networks: trade flows, military interventions, diplomatic exchanges, and conjoint treaty memberships. Their analysis strongly supported the world systems theory.

Snyder and Kick utilized the block-model approach of Breiger, White, and Boorman. Consequently, Ronald Breiger built on their work of block model analysis of world system theory, by using different international trade networks to determine a nation's structural position. Breiger proposed that, "a block-model approach to international trade assigns states to positions according

to the structural similarity of nations' imports and exports to all other states, across various types of economic exchange, rather than on the basis of definitional aggregation" (Breiger 357). Breiger's main objective was also to operationalize procedures to identify core, semi-peripheral, peripheral nations based only on trade networks and determine if the core-periphery structures allowed competing centers. Additionally, he intended to explore "the distinctive elements of core-periphery structure in contrast to other ideal type structures that might characterize international exchange" and determine if different exchange networks presented the same results (Breiger 355). Since, Beiger's approach and results from "Structures on Economic Interdependence Among Nations" forms the basis of this paper, the following section of this paper his method in detail.

Following Breiger's approach of using relational interaction of nations through international trade, Nemeth and Smith, also focus on international commodity exchanges in their paper, "International Trade and World System Structure". The authors expand on Breiger's work by using the same UN Comtrade data but include all nations with a population of over a million (86 countries in total) and do not arbitrarily pick the commodities. Instead, they use a principal component analysis on all commodities and reduce to five categories of commodity groups. Using CONCOR block-model technique, Nemeth and Smith also uncover the core countries in accordance to world systems theory. The paper ends with recommend future work on longitudinal data to test the pattern of trade in different periods but attest that the empirically method is valid for understanding world system structure. Nonetheless, they conclude that empirical analysis is a tool to understand modern world, but it should be used with in-depth comparative study.

Scholarly work refining the world systems theory, both qualitative and empirically, is extensive. However, here the focus was on key works that used the network analysis method of block-modelling to uncover the structural position of nations in world systems.

Methodological Foundation

In this paper, the method from Breiger's *Structures of Economic Interdependance Among Nations* will be replicated. He conducts a block model analysis of the import and export of 24 nations (OECD nations of 1972 and Israel) for selected commodities. In his study, Breiger formed exchange network matrix for agricultural products, raw materials, manufactured goods and energy resources. The focus of the study is to find groups of nations that are structurally like each other and "examine the possibly distinctive patterns that these blocks induce on the original network data" (Breiger 357).

Breiger creates a 24 by 24 matrix of countries import and export for each of the trade networks. He binarizes this matrix, by only considering the highest fifth of the interior cell values and then rearranges and partitions the rows and columns using block-model method. Robust block model algorithms for structural equivalence is a contribution by Harrison White, Scott Boorman and Ronald Breiger through their paper, *Social Structure from Multiple Networks. I. Blockmodels of Roles and Positions.* From this analysis, a distinct core-periphery pattern emerges that bears resemblance to the 118-country analysis of Snyder and Kick. However, he argues that world system theorist would not accept this empirical evaluation based on binarized trade data of one commodity as countries have unequal exchanges in import and export and that the results imply that the "world is bound together by a few core states" (Breiger 364).

To address this concern, Breiger uses Schwartz's technique to net out unequal exchange. For the network data, "row and column means were subtracted from each matrix, leaving residuals from an additive, two-way analysis of variance model" (Breiger 365). Positive values indicated statistical interactions, while negative values represented the opposite. This method was applied to a single correlation matrix created by multiple networks: agricultural products, raw materials,

manufactured goods. The block model algorithm used to cluster countries is, CONCOR (Convergence of Iterated Correlations), "a divisive hierarchical clustering procedure that continuously splits actors into successively smaller groups" (Nemeth and Smith 532). The eigen structure of the resulting matrix was examined and plotted to reveal geographical clustered nations with insight of historical events. Here Breiger, does urge to conduct a time series analysis to see how the positions differ in light of world economic events, such as, formal entry of UK into European Common Market. Breiger examines the correlations between the four matrices to establish that each of the trade matrices are quite different from each other. Therefore, to find any additional asymmetries, it is important to run a four block CONCOR partition to each of the networks. The correlation matrices are adjusted as previously described.

The study concludes that the core-periphery structure identified by Snyder and Kick holds but "adjusting for the total import and export levels of each country, ... [reveals] the existence of multiple competing core" (Breiger 375). In the network diagrams (from Dr. Padgett's notes) shown below, the pattern of competing core can be seen. USA, UK and Germany form the core while countries like Japan, Sweden and France form connections with additional countries but interesting do not overlap in trade between each.

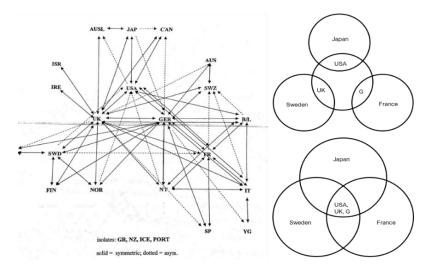
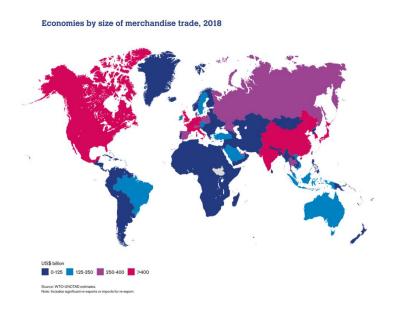


Figure 1 Network Diagram Created by Dr.Padget to Represent Breiger's 1972 Study

Data

This study will use data collected and maintained by Organization for Economic Cooperation and Development (OECD), an organization that "work[s] on establishing international norms and finding evidence-based solutions to a range of social, economic and environmental challenges" (OECD) They have a large database of international trade statistics that has been collected for more than 60 years. Beiger chose to limit his study to 24 OECD nations of 1972 and Israel, since most of the world trade was accounted by them. However, that is no longer the case. The OECD has expanded to include 13 additional countries and non-OECD countries like India, China and Brazil, participate in world trade at a scale that cannot be ignored. According to world trade statistics, the merchandise trade was valued at US\$ 19.67 trillion in 2018 and China was the leading merchandise trader (World Trade Statistics). The map shown below highlights the participation of countries in the merchandise trade. In 2018, "developing economies had a 44% share in world merchandise trade" (World Trade Statistics 14). In contrast, when Breiger conducted his study for 1972, the highly industrialized OECD nations, accounted "for over 70 percent of the world totals in 1972" (Breiger 360)



For this study, import-export trade data is collected from UN Comtrade database for the same commodity codes that Breiger used, 0, 2, 3, 6 (whose description can be found in the table below), for the years, 1972, 2007, 2008, 2013 and 2018.

Table 1 SITC Code Description for Data Collected

Commodity SITC Section Code	Description
0	Food and live animals
2	Crude materials, inedible, except fuels
3	Mineral fuels, lubricants and related materials
6	Manufactured goods classified chiefly by material

To determine the world structure in recent times, the latest data available, year 2018, will be used. However, "world systems analysis is directed to studies of social change in which the system itself is open to dynamic alterations", therefore, a temporal analysis is done to evaluate, "the stability or fluidity of structure" (Nemeth and Smith 556). The year 2008 gives a picture of the world ten years prior. However, given that the year 2008 marked a major global financial crisis, to account for any situational differences, years 2007 and 2013 are considered to determine the structure of world in the recent times. For the year 1972, only the original countries from Breiger's study are considered to replicate the results that Breiger found to benchmark the analysis process and account for any discrepancy in methodology.

Method

The same steps derived from Ronald Breiger's approach to world system analysis is applied to each of the five years of datasets. Before applying the block model analysis, a rigorous data extraction and preparation is conducted. From the UN Comtrade database, the import-export data

for each of the countries in consideration, in each of the years, is individually downloaded. Then, for each year in consideration, the data is cleaned and combined into one dataframe in Python's Jupyter notebook. The combined dataframe is then cleaned to retain the commodity exchange with only the countries in consideration. That is, only the countries in OECD and India, China, Brazil (OECD and Israel for 1972) are retained for creating the matrix of reporter and partner nation. Additionally, any data for export, re-export and re-import are removed. Nemeth and Smith point out, referring to works of Duran and Linnemann, that, "only import data are used because, as a result of number of factors, reports on imports and exports do not always match perfectly and there is reason to believe that import figures are more accurate" (Nemeth and Smith 526). This discrepancy is observed in the data extracted in this study and since, Breiger's method to address this is not clear, this study utilizes the import-data-only approach of Nemeth and Smith. Finally, all the country names are standardized.

Using Pandas Groupby command and filtering by commodity code in Python, the cleaned data is converted into a 39 by 39 (24 by 24 for 1972) matrix for each of the four international exchange networks. Additionally, since Breiger considers "only the highest fifth of interior cell values" in the first step in analysis, matrices that code 1 for the top fifth value and 0 for rest are also created. The data for each of the trade matrices is thus prepared and saved in csv format for block model analysis.

The block model analysis is conducted in a software specialized for network analysis – UCINET. The csv files are loaded into matrix editor and converted to UCINET native files and analyzed using UCINET's CONCOR block model analysis. For all the years in consideration, three types of analysis is conducted: determine the correlation among the four trade networks;

conduct block model analysis on each of the binarized trade network; and conduct multinetwork analysis on combined trade networks.

For single matrix analysis, a standard CONCOR block model with 3 part split is applied to each of the binarized trade networks to generate a block model partition and density matrix. For the multinetwork analysis, first, the rows for all four trade exchange matrices are joined and a correlation matrix is created for the combined network. The CONCOR block model analysis is run on this correlation matrix. Additionally, just as Breiger had adjusted for different intensities of trade using the method proposed by Schwartz, a matrix normalization is conducted on the rows and columns of the joined matrix using mean. A block model analysis is then also conducted on the correlation matrix of the normalized matrix.

Results

Correlation among Trade Matrices

				1972 C	orrelation	Matrix				
				raw72	man72	enr72	agr72			
			raw1972	1	0.868	0.795	0.683			
			man1972	0.868	1	0.835	0.759			
			enr1972	0.795	0.835	1	0.851			
			agr1972	0.683	0.759	0.851	1			
	2008 C	orrelation	Matrix				2018 C	orrelation	Matrix	
	agr2008	enr2008	man2008	raw2008			agr2018	enr2018	man2018	raw2018
agr2008	1	0.724	0.591	0.415		agr2018	1	0.703	0.694	0.348
enr2008	0.724	1	0.563	0.354		enr2018	0.703	1	0.519	0.229
man2008	0.591	0.563	1	0.334		man2018	0.694	0.519	1	0.436
raw2008	0.415	0.354	0.334	1		raw2018	0.348	0.229	0.436	1
	2007 C	orrelation	Matrix				2013 C	orrelation	Matrix	
	agr2007	enr2007	man2007	raw2007			agr2013	enr2013	man2013	raw2013
agr2007	1	0.757	0.605	0.509		agr2013	1	0.718	0.674	0.318
enr2007	0.757	1	0.593	0.461		enr2013	0.718	1	0.529	0.228
man2007	0.605	0.593	1	0.415		man2013	0.674	0.529	1	0.283
raw2007	0.509	0.461	0.415	1		raw2013	0.318	0.228	0.283	1

Figure 2 Comparison of Correlations among Trade Matrices for all Years

Part 1: Density Matrix for Binarized Trade Networks (See Appendix for Block Models)

De	ensity Matı	rix for Man	ufactured (Good in 19	72
	1	2	3	4	5
1	0	0.667	0	0	0
2	0.667	0.167	0	0	0
3	0.1	0.133	0.65	0.1	0
4	0	0	0.1	0	0
5	0	0	0	0	0

	Density N	latrix for R	aw Materia	ls in 1972	
	1	2	3	4	5
1	0.333	0.444	0.111	0.111	0
2	0.556	0	0	0.111	0
3	0.222	0	0.333	0.556	0
4	0.111	0.111	0.444	0	0
5	0	0	0	0	0

	Density	Matrix for	Agricultura	al Products	in 1972	
	1	2	3	4	5	6
1	0.667	0	0.083	0	0	0
2	0	0	0	0	1	0
3	0	0	0.333	1	0	0
4	0	0	1	1	0	0
5	0	1	0	0	0	
6	0	0	0	0	0	0

	Density Ma	atrix for En	ergy Produ	cts in 1972	
	1	2	3	4	5
1	0	0	0	0	0
2	0	0.2	0.083	0	0.417
3	0	0	0	0.667	0.75
4	0	0	0.5	0	0
5	0	0.5	0.25	0	0

Figure 3 Density Matrix with Positive Values Highlighted (1972)

								٦								
	australia	1.000	0.292	0.290	0.350	0.153	0.278									
1								1	australia	1.000	0.390	0.427	0.344	0.482	0.359	
11	ireland	0.292	1.000	0.608	0.343	0.089	0.151	5	denmark	0.390	1.000	0.706	0.773	0.803	0.758	0.721
12	israel	0.290	0.608	1.000	0.413	0.591	0.603	9	greece	0.427	0.706	1.000	0.817	0.753	0.828	0.984
10	iceland	0.350	0.343	0.413	1.000	0.243	0.207	16	norway	0.344	0.773	0.817	1.000	0.761	0.927	0.827
								11	ireland	0.482	0.803	0.753	0.761	1.000	0.785	0.784
14	japan		0.089			1.000		6	finland	0.359	0.758	0.828	0.927	0.785	1.000	0.839
4	canada	0.278	0.151	0.603	0.207	0.878	1.000	10	iceland	0.467	0.721	0.984	0.827	0.784	0.839	1.000
								17	portugal	0.464	0.741	0.975	0.863	0.812	0.888	0.993
3	belgium-luxembourg	0.039	0.127	0.395	0.162	0.187	0.145	21	turkey	0.452	0.711	0.990	0.816	0.769	0.831	0.994
8	germany	-0.037	0.057	0.364	0.076	0.147	0.134	12	israel	0.469	0.708	0.946	0.818	0.847	0.845	0.971
9	greece	0.149	0.169	0.502	0.277	0.202	0.165	18	spain	0.430	0.745	0.873	0.719	0.804	0.731	0.879
7	france	0.025	0.108	0.446	0.215	0.152	0.100	24	yugoslavia	0.382	0.665	0.957	0.777	0.687	0.776	0.932
2	austria	0.053	0.172	0.357	0.244	0.075	0.039									
18	spain	0.270	0.465	0.655	0.495	0.390	0.429	19	sweden	0.063	0.420	0.306	0.384	0.355	0.575	0.310
13	italy	0.058	0.114	0.436	0.224	0.217	0.182	2	austria	0.145	0.518	0.668	0.666	0.454	0.653	0.596
20	switzerland	0.105	0.375	0.619	0.304	0.170	0.158	20	switzerland	0.048	0.380	0.468	0.572	0.464	0.612	0.411
15	netherlands	0.072	0.151	0.433	0.264	0.132	0.107									
22	united kingdom	-0.000	-0.060	0.394	0.220	0.493	0.346	13	italy	-0.416	-0.331	-0.362	-0.386	-0.454	-0.409	-0.462
24	yugoslavia	0.085	0.066	0.332	0.298	0.166	0.114	7	france	-0.459	-0.368	-0.484	-0.443	-0.514	-0.495	-0.559
21	turkey	0.171	0.133	0.373	0.248	0.100	0.123	8	germany	-0.372	-0.371	-0.397	-0.446	-0.367	-0.376	-0.384
	· .							3	belgium-luxembourg	-0.475	-0.450	-0.508	-0.462	-0.529	-0.458	-0.591
5	denmark	0.233	0.616	0.450	0.526	0.121	0.128	15	netherlands	-0.380	-0.276	-0.446	-0.406	-0.440	-0.466	-0.512
19	sweden	0.073	0.308	0.389	0.259	0.092	0.119									
17	portugal	0.277	0.544	0.750	0.549	0.300	0.321	4	canada	-0.000	-0.326	-0.382	-0.366	-0.234	-0.339	-0.310
16	norway	0.147	0.435	0.566	0.355	0.234	0.199	14	japan	-0.093	-0.288	-0.287	-0.283	-0.213	-0.301	-0.210
23	usa	0.381	0.103	0.188	0.021	0.083	-0.014	22	united kingdom	-0.272	-0.054	-0.163	-0.095	-0.296	-0.125	-0.109
6	finland	0.123	0.471	0.554	0.259	0.138	0.169	23	usa	0.148	-0.301	-0.272	-0.212	-0.203	-0.277	-0.256
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Figure 4 Part of CONCOR Blockmodel for Multinetworks (non-normalized on left and normalized on right)

Part 1: Density Matrix for Binarized Trade Networks (See Appendix for Block Models)

	D	ensity Matı	ix for Man	ufactured	Good in 20	18			D	ensity Matı	rix for Agric	ultural Pro	ducts in 20	18	
	1	2	3	4	5	6	7		1	2	3	4	5	6	7
1	0.6	0.229	0	0.133	0	0	0	1	0.667	0.667	0.042	0.111	0.25	0	0
2	0.229	0.095	0	0.016	0	0	0	2	0	0	0	0	0	0	0
3	0	0	0	0.148	0	0	0	3	0	0	0.018	0.292	0	0	0
4	0.089	0.016	0	0.333	0	0.056	0	4	0.056	0.083	0.354	0.433	0	0	0
5	0	0	0	0	0	0	0	5	0.667	0	0	0	0.167	0	0
6	0	0.071	0	0.056	0	0	0	6	0	0	0	0	0	0.5	0
7	0	0.071	0	0	0	0	0.5	7	0	0	0	0	0	0	0
															_
		Density N	1atrix for R	aw Materia	als in 2018					Density M	atrix for En	ergy Produ	ıcts in 2018	1	
		1	2	3	4	5				1	2	3	4	5	
	1	0	0	0.146	0.025	0			1	0	0.233	0.208	0.111	0	
	2	0.375	0.233	0.25	0.067	0			2	0.067	0.35	0.017	0	0	
	3	0.042	0.028	0.033	0.1	0			3	0.208	0.15	0.038	0.083	0	
	4	0.025	0	0.4	0.65	0			4	0.111	0.133	0.194	0	0	
	5	0	0	0	0	0	Ì		5	0	0	0	0	0	

Figure 5 Density Matrix with Positive Values Highlighted (2018)

										_								
1	australia	1 000	0.325	0 050	0.629	0.401	 I a zac	0.095	0.003	1	australia	1.000 0.	255 0.102	0.839	0.488	-0.023	-0 155	-0 166
39	usa	0.325	1.000	0.279	0.029	0.164		-0.007	0.089	39	usa		000 0.045		0.069	-0.023		
4	brazil	0.323		1.000	0.731	0.436		0.226	0.089	31	rep. of korea			-0.033	0.160	0.017		
6	chile	0.629	0.246	0.731		0.480	0.432		0.213	4	brazil	1	186 -0.033		0.570	0.096		
27	new zealand	0.401	0.164	0.436	0.480	1.000	0.069	0.113	0.050	6	chile			0.570	1.000	-0.127		0.083
2,	new Zealand									ľ	CHILLE							
31	rep. of korea	0.306	0.207	0.248	0.432	0.069	1.000	0.289	0.462	5	canada	-0.023 -0.	121 0.017	0.096	-0.127	1.000	0.266	0.330
5	canada	0.095	-0.007	0.226	0.222	0.113	0.289	1.000	0.363	7	china	-0.155 -0.	036 0.197	-0.109	-0.195	0.266	1.000	0.752
7	china	0.003	0.089	0.080	0.213	0.050	0.462	0.363	1.000	17	india	-0.166 -0.	204 0.363	-0.108	0.083	0.330	0.752	1.000
17	india	0.155	0.070	0.254	0.489	0.117	0.613	0.528	0.835	13	germany	-0.235 -0.	199 -0.000	-0.201	-0.135	-0.118	0.180	0.185
19	israel	0.005	-0.017	0.104	0.243	0.014	0.442	0.401	0.874	25	mexico	-0.088 -0.	170 0.015	-0.020	0.008	0.722	0.445	0.563
21	japan	0.180	0.170	0.220	0.640	0.093	0.724	0.190	0.425	21	japan	-0.026 0.	020 0.621	-0.031	0.491	-0.066	0.188	0.471
25	mexico	0.111	0.008	0.207	0.360	0.189	0.327	0.781	0.580									
										29	poland	-0.372 -0.	231 -0.275	-0.387	-0.310	-0.442	-0.271	-0.407
9	denmark				0.059		-0.012		0.108	26	netherlands	-0.161 -0.				-0.141		
14	greece	0.093		0.143	0.166	0.080		0.169	0.336	12	france	-0.323 -0.				-0.272		
15	hungary		-0.028		0.011			-0.024	0.194	34	spain	-0.270 -0.				-0.249		
3	belgium	-0.041		0.018	0.032			0.103	0.247	3	belgium	-0.291 -0.				-0.177		
13	germany		-0.058	0.015	0.144			0.075	0.352	2	austria	-0.384 -0.				-0.464		
37	turkey		0.068		0.271			0.238	0.547	20	italy	-0.360 -0.				-0.205		
29	poland		-0.011		0.022			-0.018	0.180	38	united kingdom	-0.184 -0.	143 -0.020	-0.203	-0.301	-0.077	-0.220	-0.224
11	finland austria	0.207		0.296	0.265			0.141	0.362									
12	austria france	-0.015		0.045	0.073			0.024	0.289 0.285	11	finland	-0.316 -0.				-0.560		
32	slovakia									9	denmark	-0.378 -0.				-0.519		
24	luxembourg	-0.004		-0.002	-0.049 0.037			-0.034 0.016	0.136 0.305	14	greece	-0.356 -0.				-0.513		
16	iceland	-0.045		-0.003		0.126		0.010	0.125	23	lithuania	-0.352 -0.				-0.464		
26	netherlands	-0.025	0.019		-0.011		-0.011		0.040	24	luxembourg	-0.396 -0.				-0.556		
8	czechia	-0.020		0.014				-0.001	0.237	16	iceland	-0.353 -0.				-0.516		
36	switzerland	-0.030	0.040	0.012		0.030		0.001	0.237	18	ireland	-0.342 -0.				-0.476		
	united kingdom	0.120	0.076	0.166	0.085	0.007		0.289	0.214	27	new zealand	-0.040 -0.				-0.406		
30	portugal	-0.011			0.090		0.117	0.236	0.309	28	norway	-0.182 -0.				-0.121		
35	sweden	-0.016		0.057	0.135		0.195	0.083	0.293	10	estonia	-0.338 -0.				-0.502		
34	spain		0.020	0.131		0.090	0.077	0.140	0.219	8	czechia	-0.409 -0.				-0.528		
33	slovenia		-0.016		0.008			0.001	0.241	22	latvia	-0.339 -0.				-0.510		
20	italy				0.138		:	0.137		32	slovakia	-0.386 -0.				-0.536		
	1001)									15	slovenia	-0.378 -0.				-0.540		
28	norway	-0.020	0.047	-0.017	-0.032	-0.018	-0.003	0.093	-0.010	35	hungary sweden	-0.409 -0.				-0.569		
23	lithuania	-0.039			-0.029		-0.009		-0.025	36	sweden switzerland	-0.440 -0.				-0.518 -0.561		
18	ireland	-0.015		0.020				0.027	0.021	36		1						
10	estonia		-0.098		0.004		-0.030			19	turkey	-0.408 -0.				-0.503		0.407
22	latvia		-0.067	0.061	0.014	-0.034	-0.030	-0.019	0.040	30	israel portugal	-0.478 -0. -0.414 -0.				-0.223 -0.465		
		· 								36	portugal	-0.414 -0.	202 -0.1/6	-0.456	-0.155	1 -0.465	-0.465	-0.300

Figure 6 Part of CONCOR Blockmodel for Multinetworks (non-normalized on left and normalized on right)

Part 1: Density Matrix for Binarized Trade Networks (See Appendix for Block Models)

	D	ensity Mat	ix for Man	ufactured	Good in 20	08			De	ensity Matr	ix for Agric	ultural Pro	ducts in 20	08	
	1	2	3	4	5	6	7		1	2	3	4	5	6	7
1	0.5	0	0	0	0	0	0	1	0.05	0.133	0	0	0	0	0
2	0	0	0	0	0	0.083	0	2	0.6	0.333	0	0	0.417	0	0
3	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0
4	0	0	0	0	0.121	0	0	4	0	0	0	0	0	0.119	0
5	0	0.045	0	0	0.345	0.076	0.061	5	0	0.083	0	0	0	0.036	0
6	0	0	0	0.056	0.152	0.067	0	6	0	0	0	0.143	0.286	0.762	0.0
7	0.667	0	0	0	0.03	0.111	0.83	7	0	0	0	0.167	0	0.143	0
							ī								
		Density N	latrix for R	aw Materia	als in 2008				Dens	ity Matrix f	or Energy I	Products in	2008		
		1	2	3	4	5	<u> </u>		1	2	3	4	5	6	
	1	0.2	0.05	0	0	0	<u> </u>	1	0.036	0	0	0.143	0	0	
		0.55	0.143	0	0.063	0		2	0	0	0.389	0.571	0	0	
	2	0.55				0		3	0	0.444	0	0.016	0	0	
	3	0.55	0	0	0.025	U	1								
			0.016	0 0.15	0.025	0	İ	4	0.161	0.5	0.032	0.571	0.143	0	
	3	0	-	-				4 5	0.161	0.5	0.032	0.571 0	0.143	0	

Figure 7 Density Matrix with Positive Values Highlighted (2008)

										. —									
										1	australia	1.000	0 020	-0.063	0 F00	-0.090	0 142	0.210	0.614
1	australia	1.000	0.134	0.225	0.637			0.273	0.240	21	japan	0.028	1.000	0.283		-0.108		0.219	0.152
21	japan	0.134	1.000	0.698	0.238	0.342	0.596	0.153	0.073	7	china	-0.063	0.283	1.000	-0.052			-0.018	0.132
31	rep. of korea	0.225	0.698	1.000	0.225	0.299	0.459	0.130	0.143	4	brazil	0.599	0.025	-0.052		0.210	0.123	0.213	0.711
4	brazil	0.637	0.238	0.225	1.000	0.811		0.310	0.291	5			-0.108	0.209	0.210	1.000			-0.140
17	india	0.642	0.342	0.299	0.811		0.555	0.287	0.226	25	canada mexico	-0.142		0.123	0.150		1.000		-0.140
6	chile	0.421	0.596	0.459		0.555		0.321	0.346	39	mexico usa	0.219	0.060	-0.018		-0.161		1.000	0.177
39	usa	0.273	0.153	0.130	0.310	0.287	0.321	1.000	0.177	17	india	0.614				-0.140		0.177	1.000
27	new zealand	0.240	0.073	0.143	0.291	0.226	0.346	0.177	1.000	17	India	0.614	0.152	0.225	0.711	-0.140	-0.210	0.1//	1.000
5	canada	0.070	0.134	0.235	0.424	0.231	0 161	-0.020	0.096 l	13	germany	-0.207	-0 005	0 135	-0 199	-0.118	-0 167	-0 155	-0 060
19	israel	0.015	0.134	0.233	0.424	0.534		-0.012	0.060		united kingdom	-0.216							
7	china	0.093	0.328	0.374	0.233	0.489		0.110	0.177	3	belgium					-0.150			-0.204
25	mexico	0.038	0.117	0.213	0.392	0.193		-0.020		26	netherlands	-0.123							
23	mexico	0.038	0.117	0.213	0.352	0.155	0.141	-0.020	0.100	20	nechel Iunus								
9	denmark	-0.035	-0.004	-0.018	0.069	0.030	0.052	-0.006	0.147	12	france	-0.250	-0.174	-0.007	-0.196	-0.188	-0.223	-0.143	-0.181
14	greece	-0.000	0.086	0.098	0.203	0.259	0.285	0.045	0.174	20	italy	-0.256	-0.080	0.080	-0.283	-0.191	-0.214	-0.112	-0.206
15	hungary	-0.069	0.020	-0.008	0.055	0.080	0.116	-0.016	-0.009 İ	34	spain	-0.121	-0.182	-0.216	-0.099	-0.343	-0.338	-0.096	-0.098
3	belgium	-0.026	0.086	0.085	0.113	0.162	0.158	0.024	-0.002	28	norway	-0.079	-0.132	-0.182	-0.177	-0.103	-0.100	-0.045	-0.155
13	germany	-0.071	0.156	0.137	0.058	0.194	0.186	-0.039	-0.046 İ	2	austria	-0.223	-0.130	-0.183	-0.342	-0.544	-0.518	-0.130	-0.215
18	ireland	-0.019	-0.019	-0.025	0.103	0.051	0.036	-0.001	0.271										
29	poland	-0.058	0.069	0.026	0.062	0.089	0.157	0.004	0.011	16	iceland	-0.081	-0.077	-0.500	-0.282	-0.633	-0.511	-0.088	-0.125
11	finland	-0.008	0.154	0.164	0.150	0.223	0.204	0.033	-0.040	14	greece	-0.094	-0.085	-0.482	-0.286	-0.643	-0.524	-0.098	-0.118
2	austria	-0.040	0.097	0.072	0.082	0.149	0.217	0.034	-0.003	11	finland	-0.217	-0.124	-0.343	-0.399	-0.591	-0.514	-0.173	-0.220
12	france	-0.043	0.088	0.084	0.166	0.207	0.168	0.024	0.069	10	estonia	-0.076	-0.071	-0.500	-0.270	-0.602	-0.479	-0.089	-0.119
32	slovakia	-0.065	-0.003	-0.022	-0.033	0.028	0.034	-0.051	-0.095	18	ireland	-0.098	-0.107	-0.474	-0.235	-0.584	-0.487	-0.098	-0.133
24	luxembourg	-0.043	0.110	0.081	0.052	0.183	0.232	0.044	-0.024	23	lithuania	-0.087	-0.088	-0.520	-0.278	-0.587	-0.460	-0.097	-0.139
16	iceland	-0.034	0.005	-0.015	0.065	0.059	0.105	0.029	0.214	24	luxembourg	-0.147	-0.103	-0.478	-0.376	-0.720	-0.612	-0.118	-0.168
26	netherlands	-0.008	-0.010	-0.004	0.091	0.064	0.015	0.016	0.038	6	chile	0.279	0.433	-0.110	0.248	-0.436	-0.419	0.174	0.294
8	czechia	-0.051	0.057	0.031	0.043	0.107	0.137	0.011	-0.043	22	latvia	-0.077	-0.074	-0.502	-0.277	-0.616	-0.492	-0.094	-0.121
37	turkey	0.166	0.192	0.195	0.375	0.527	0.372	0.113	0.119	27	new zealand	0.002	-0.060	-0.443	-0.180	-0.588	-0.468	-0.034	-0.056
33	slovenia	-0.044	0.050	0.037	0.038	0.123	0.198	0.015	-0.041	9	denmark	-0.125	-0.121	-0.446	-0.259	-0.577	-0.491	-0.111	-0.176
30	portugal	-0.034	0.052	0.064	0.104	0.150	0.163	0.020	-0.023	29	poland	-0.227	-0.153	-0.381	-0.379	-0.646	-0.592	-0.161	-0.276
35	sweden	-0.047	0.140	0.130	0.090	0.168	0.176	0.013	-0.080	8	czechia	-0.195	-0.142	-0.356	-0.377	-0.643	-0.573	-0.140	-0.219
36	switzerland	-0.034	0.157	0.135	0.076	0.177	0.230	0.052	0.016	31	rep. of korea	0.110	0.624	0.101	-0.063	-0.129	-0.137	0.011	0.053
20	italy	-0.041	0.167	0.136	0.115	0.202	0.241	0.054	0.038	32	slovakia	-0.123	-0.104	-0.473	-0.333	-0.644	-0.536	-0.127	-0.161
34	spain	0.049	0.056	0.036	0.247	0.234	0.240	0.059	0.109	33	slovenia	-0.099	-0.086	-0.492	-0.311	-0.660	-0.541	-0.100	-0.137
										15	hungary					-0.689			
10	estonia						-0.058			35	sweden	-0.243	-0.106	-0.288	-0.395	-0.568	-0.526	-0.173	-0.231
23	lithuania	-0.055		-0.053	0.042			-0.035	-0.088	36	switzerland	-0.214	-0.083	-0.302	-0.406	-0.667	-0.604	-0.128	-0.206
28	norway	-0.002			-0.000		-0.052	0.023	-0.065	37	turkey	-0.079	-0.111	-0.353	-0.249	-0.712	-0.616	-0.118	0.012
	united kingdom		0.097	0.126		0.176			-0.053	19	israel	-0.186	0.107	0.340	-0.218	-0.227	-0.203	-0.206	0.238
22	latvia	-0.060	-0.051	-0.051	-0.009	-0.017	-0.057	-0.079	-0.126	30	portugal	-0.135	-0.111	-0.431	-0.310	-0.622	-0.514	-0.116	-0.145

Figure 8 Part of CONCOR Blockmodel for Multinetworks (non-normalized on left and normalized on right)

Part 1: Density Matrix for Binarized Trade Networks (See Appendix for Block Models)

	De	ensity Matr	rix for Man	ufactured (Good in 20	07			De	ensity Matı	rix for Agric	ultural Pro	ducts in 20	07	
	1	2	3	4	5	6	7		1	2	3	4	5	6	
1	0.583	0	0	0	0	0.063	0	1	0	0	0	0	0	0	
2	0	0	0.2	0	0	0		2	0.25	0	0	0.083	0	0.25	0.3
3	0	0	0	0	0	0	0	3	0	0	0	0	0	0	
4	0.05	0	0	0.05	0.218	0.15	0.4	4	0	0	0	0	0.104	0	
5	0	0	0	0	0.3	0	0	5	0	0	0	0.167	0.607	0.188	0.3
6	0.25	0	0	0.15	0.045	0.083	0	6	0	0	0	0	0	0	0.3
7	0	0	0	0.2	0.045	0	0.5	7	0.5	0	0	0	0	0.5	
		Density N	latrix for R	aw Materia	ıls in 2007]		Dens	ity Matrix f	for Energy	Products in	2007		I
		Density M	latrix for R 2	aw Materia 3	als in 2007 4	5			Dens 1	ity Matrix f	for Energy	Products in	2007	6	
	1		1	aw Materia 3 0.033		5		1	-	T .			1	6	
	1 2	1	2	3	4	-		1 2	1	2	3	4	5		
		1 0.2	2 0.024	3 0.033	4 0	0			1 0.036	2	3	4 0.161	5	0	
	2	0.2 0.405	2 0.024 0.167	3 0.033 0.114	4 0 0.102	0		2	0.036 0	2 0 0	3 0 0.35	0.161 0.571	5 0 0	0	- - -

Figure 9 Density Matrix with Positive Values Highlighted (2007)

1	australia	1.000	0.198	0 254	0.626	0.609	0.477	0.285	0.259			4 000 0 000 0 452 0 500 0 452 0 404 0 000 0 505 0 004
21	iapan				0.020	0.428	0.610	0.283	0.726	21	australia iapan	1.000 0.090 0.163 0.599 -0.152 -0.181 -0.092 0.605 0.201 0.090 1.000 0.637 0.045 -0.016 -0.075 0.246 0.196 0.063
39	usa	0.254		1.000	0.269		0.289	0.182	0.132	31		0.163 0.637 1.000 -0.001 0.044 0.028 0.057 0.075 0.008
4	brazil	0.626	0.296		1.000		0.581	0.349	0.310	4	brazil	0.599 0.045 -0.001 1.000 0.165 0.099 0.004 0.710 0.162
17	india	0.609	0.428		0.825	1.000	0.562	0.249	0.390	5	canada	-0.152 -0.016 0.044 0.165 1.000 0.962 0.323 -0.020 -0.164
6	chile	0.477	0.610	0.289	0.581	0.562		0.355	0.496	25	mexico	-0.181 -0.075 0.028 0.099 0.962 1.000 0.168 -0.121 -0.179
27	new zealand	0.285	0.087		0.349		0.355		0.151	7	china	-0.092 0.246 0.057 0.004 0.323 0.168 1.000 0.279 -0.010
										17	india	0.605 0.196 0.075 0.710 -0.020 -0.121 0.279 1.000 0.098
31	rep. of korea	0.259	0.726	0.132	0.310	0.390	0.496	0.151	1,000	39	usa	0.201 0.063 0.008 0.162 -0.164 -0.179 -0.010 0.098 1.000
5	canada	0.068	0.225	-0.020	0.461	0.391	0.242	0.125	0.391			
19	israel	0.043	0.362	-0.007	0.377	0.652	0.318	0.098	0.373	38	united kingdom	-0.223 -0.164 -0.156 -0.201 0.123 0.131 -0.077 -0.223 -0.138
7	china	0.127	0.451	0.128	0.356	0.606	0.418	0.249	0.405	13	germany	-0.221 -0.028 -0.123 -0.191 -0.070 -0.138 0.160 -0.066 -0.137
25	mexico	0.031	0.181	-0.022	0.404	0.315	0.190	0.123	0.351	3	belgium	-0.230 -0.155 -0.238 -0.227 -0.149 -0.194 -0.001 -0.244 -0.126
										26	netherlands	-0.122 -0.185 -0.246 -0.104 -0.123 -0.141 -0.153 -0.199 -0.088
18	ireland	-0.018	-0.013	0.010	0.155	0.067	0.028	0.308	-0.026	20	italy	-0.273 -0.095 -0.232 -0.283 -0.157 -0.197 0.114 -0.231 -0.083
14	greece	0.006	0.133	0.014	0.328	0.386	0.336	0.195	0.151			
15	hungary	-0.072	0.020	-0.008	0.101	0.105	0.138	-0.012	-0.002	36	switzerland	-0.116 -0.158 -0.131 -0.322 -0.672 -0.600 -0.396 -0.240 -0.103
3	belgium	-0.027	0.124	0.029	0.179	0.228	0.231	0.013	0.129	35	sweden	-0.155 -0.156 -0.145 -0.307 -0.570 -0.526 -0.319 -0.238 -0.139
13	germany	-0.050	0.175	-0.013	0.136	0.275	0.234	-0.028	0.165	34	spain	-0.108 -0.227 -0.254 -0.076 -0.330 -0.315 -0.242 -0.168 -0.093
8	czechia	-0.053	0.058	0.017	0.080	0.136	0.161	-0.050	0.038	12	france	-0.241 -0.193 -0.276 -0.158 -0.213 -0.255 0.006 -0.170 -0.122
29	poland	-0.056	0.072	0.016	0.111	0.130	0.186	0.013	0.034	29	poland	-0.132 -0.222 -0.208 -0.304 -0.675 -0.599 -0.469 -0.312 -0.135
11	finland	0.002			0.192	0.295	0.269	-0.029	0.190	2	austria	-0.162 -0.197 -0.210 -0.283 -0.565 -0.535 -0.257 -0.262 -0.108
2	austria	-0.031	0.109	0.051	0.152		0.265	0.005	0.090	28	norway	-0.069 -0.137 -0.130 -0.193 -0.104 -0.072 -0.216 -0.158 -0.073
12	france	-0.033	0.104		0.234		0.198	0.082	0.107			
32	slovakia	-0.073		-0.036			0.073		-0.014	11	finland	-0.107 -0.182 -0.112 -0.327 -0.611 -0.533 -0.391 -0.231 -0.136
24	luxembourg	-0.033			0.123	0.248	0.303		0.101	23	lithuania	0.057 -0.142 0.022 -0.168 -0.608 -0.455 -0.599 -0.135 -0.078
16	iceland		-0.003	0.028	0.110		0.130	0.249	-0.022	24	luxembourg	-0.005 -0.184 -0.056 -0.272 -0.737 -0.601 -0.590 -0.188 -0.092
26	netherlands	-0.004	0.008	0.008	0.145	0.117	0.049	0.062	0.002	6	chile	0.426 0.437 0.303 0.316 -0.303 -0.321 -0.085 0.269 0.169
36	switzerland	:		0.068	0.145	0.236	0.270	0.027	0.139	14	greece	0.043 -0.157 -0.001 -0.173 -0.646 -0.497 -0.571 -0.122 -0.091
37	turkey	0.115	0.190	0.098	0.401		0.372		0.207	18	ireland	0.023 -0.171 -0.051 -0.116 -0.591 -0.471 -0.553 -0.149 -0.076
38	united kingdom	-0.015	0.134		0.216	0.260	0.138		0.199	9	denmark	-0.010 -0.185 -0.090 -0.160 -0.586 -0.475 -0.525 -0.196 -0.091
30	portugal	-0.027			0.179	0.194	0.158		0.101	10	estonia	0.067 -0.138
35	sweden				0.170		0.252		0.151	8	czechia	-0.088 -0.207 -0.146 -0.294 -0.650 -0.559 -0.454 -0.246 -0.117
34	spain			0.056	0.280		0.264		0.071	22 32	latvia	0.061 -0.143 0.018 -0.177 -0.612 -0.459 -0.602 -0.135 -0.078
33	slovenia	-0.040	0.051		0.092	0.169	0.252		0.049	33	slovakia	0.004 -0.172 -0.044 -0.244 -0.662 -0.526 -0.572 -0.181 -0.104
20	italy	-0.034	0.197	0.079	0.183	0.281	0.280	0.045	0.173	15	slovenia	0.041 -0.158 -0.006 -0.205 -0.671 -0.525 -0.590 -0.150 -0.081 0.006 -0.186 -0.052 -0.223 -0.698 -0.558 -0.602 -0.194 -0.101
	222									16	hungary iceland	0.060 -0.145 0.011 -0.172 -0.640 -0.490 -0.596 -0.139 -0.069
23	lithuania			-0.086		-0.028			-0.025	27	new zealand	0.150 -0.124 0.049 -0.061 -0.590 -0.447 -0.514 -0.062 -0.015
9	denmark	-0.030				0.054		0.169	-0.020	37	new Zealand turkev	0.013 -0.222 -0.105 -0.173 -0.721 -0.612 -0.460 -0.054 -0.116
28 10	norway	-0.012			0.001		-0.040		0.006	19	israel	-0.117 0.086 0.104 -0.034 -0.046 -0.097 0.423 0.367 -0.214
22	estonia latvia			-0.073 -0.063			-0.060		-0.003 -0.011	30	portugal	-0.022 -0.197 -0.054 -0.208 -0.586 -0.451 -0.518 -0.185 -0.110
122	Iatvia	1 -0.042	-0.028	-0.003	Ø.058	0.052	-0.053	-0.115	1 -0.011	100	por cugar	0.022 0.15, 0.054 0.200 0.500 0.451 0.510 -0.105 -0.110

Figure 10 Part of CONCOR Blockmodel for Multinetworks (non-normalized on left and normalized on right)

	Density	Matrix for	Manufact	ured Good	in 2013		Density Matrix for Agricultural Products in 2013								
	1	2	3	4	5	6		1	2	3	4	5	6		
1	0.5	0.04	0	0.057	0.1	0	1	0.024	0.071	0	0	0	0		
2	0.12	0.1	0.025	0.171	0	0	2	0.571	0.5	0	0	0	0		
3	0.025	0	0.286	0.25	0	0	3	0	0	0	0	0	0		
4	0.057	0.114	0.071	0.214	0	0	4	0	0	0	0.018	0.125	0.458		
5	0	0	0	0.071	0	0	5	0.048	0	0	0.083	0	0.444		
6	0	0	0	0	0	0	6	0.048	0	0	0.667	0.444	0.833		
														_	
							7	0	0	0	0.125	0.333	0		
	-			-	-	1	7		-	_			0		
	-	/atrix for R		-	-]	7		0 ity Matrix f	_			0		
	-			-	5		7		-	_			6		
1	Density N	/atrix for R	aw Materia	als in 2013	5		1	Dens	ity Matrix f	or Energy	Products in	2013			
	Density N	/latrix for R	aw Materia	als in 2013 4				Dens 1	ity Matrix f	or Energy	Products in	2013	6		
1	Density N	Matrix for R	aw Materia 3 0.083	als in 2013 4 0	0		1	Dens 1 0	ity Matrix f	or Energy	Products in 4	2013 5 0	6		
1 2	Density N 1 0.036 0.286	### Addrix for R	3 0.083 0.31	als in 2013 4 0 0.25	0		1 2	Dens 1 0 0	ity Matrix f 2 0 0.067	or Energy 3	Products in 4 0.233 0.306	2013 5 0	6 0 0		
1 2 3	Density N 1 0.036 0.286 0.063	### Addrix for R 2 0 0.167 0.024	3 0.083 0.31 0.033	als in 2013 4 0 0.25 0.042	0 0		1 2 3	Dens 1 0 0 0 0	ity Matrix f 2 0 0.067 0.148	3 0 0.148	Products in 4 0.233 0.306 0.056	2013 5 0 0	6 0 0		

Figure 11 Density Matrix with Positive Values Highlighted (2013)

1	australia	1.000	0.424	0.874	0.571	0.407	0.280	0.089	1	australia	1.000	0.358	0.862	0.363	0.084	-0.022	-0.149
39	usa	0.424	1.000	0.457	0.339	0.283	0.131	0.009	39	usa	0.358	1.000	0.371	0.128	-0.056	-0.115	-0.039
4	brazil	0.874			0.650	0.461	0.164	0.255	4	brazil	0.862	0.371	1.000	0.387	-0.142	0.099	-0.111
6	chile	0.571	0.339	0.650	1.000	0.388	0.509	0.180	6	chile	0.363	0.128	0.387	1.000	0.323	-0.260	-0.075
27	new zealand	0.407	0.283	0.461	0.388	1.000	0.086	0.080									
	-								31	rep. of korea	0.084	-0.056	-0.142	0.323	1.000	-0.040	0.199
31	rep. of korea	0.280	0.131	0.164	0.509	0.086	1.000	0.239	5	canada	-0.022	-0.115	0.099	-0.260	-0.040	1.000	0.151
5	canada	0.089	0.009	0.255	0.180	0.080	0.239	1.000	7	china	-0.149	-0.039	-0.111	-0.075	0.199	0.151	1.000
7	china	0.000	0.090	0.100	0.284	0.079	0.409	0.268	17	india	0.045	-0.110	0.023	0.247	0.426	0.190	0.588
17	india	0.319	0.184	0.403	0.594	0.159	0.612	0.483	21	japan	0.022	0.029	0.004	0.580	0.611	-0.102	0.272
19	israel	0.000	-0.015	0.121	0.298	0.017	0.417	0.307	25	mexico	-0.118	-0.170	0.005	-0.203	-0.031	0.927	0.224
21	japan	0.205	0.185	0.250	0.703	0.112	0.700	0.149									
25	mexico	0.065	0.010	0.236	0.234	0.112	0.258	0.947	9	denmark		-0.268				-0.565	
									10	estonia		-0.252				-0.547	
9	denmark	0.001	0.004	0.083	0.035	0.144	-0.032	-0.017	32	slovakia		-0.287				-0.564	
14	greece	0.058	0.020	0.088	0.067	0.036	0.016	0.024	14	greece		-0.250		0.072		-0.544	
15	hungary	-0.050	-0.034	0.016	0.023			-0.028	15	hungary		-0.292				-0.598	
3	belgium	-0.026	0.055	0.058	0.084		0.156	0.108	22	latvia		-0.255				-0.554	
13	germany	-0.033		0.045	0.152		0.170	0.035	8	czechia		-0.288				-0.560	
18	ireland	-0.002		0.054	0.025		-0.030	0.005	18	ireland		-0.245				-0.508	
29	poland	-0.046		0.028	0.047			-0.010	19	israel		-0.350					0.375
11	finland	0.124	0.105	0.204	0.211		0.175	0.167	11	finland		-0.290			:	-0.583	
2	austria	-0.024	0.015	0.038	0.080		0.066	0.002	2	austria		-0.254				-0.492	
12	france	-0.018	0.004	0.098	0.099	0.048	0.077	0.099	35	sweden		-0.288				-0.553	
32	slovakia				-0.027		-0.017		23	lithuania		-0.278				-0.461	
24 16	luxembourg	-0.048	0.026	0.006	0.083		0.097		24	luxembourg		-0.276				-0.594	
35	iceland sweden	-0.036	0.001		0.070		-0.008		16	iceland		-0.256				-0.560	
		0.000		0.075	0.135			0.047	30	portugal		-0.293				-0.532	
8 37	czechia turkev	-0.033 0.386	-0.004 0.232	0.016 0.516	0.047 0.434		0.042	-0.005 0.184	37	new zealand turkev		-0.093 -0.248				-0.502 -0.671	
33	slovenia	-0.042			0.434			-0.017	29	poland		-0.248				-0.504	
30	portugal	0.012	0.028	0.109	0.104		0.023		34	poland		-0.220			:	-0.322	
20	italy	-0.026	0.034	0.109	0.161		0.159	0.100	33	slovenia		-0.220				-0.574	
36	switzerland	-0.020	0.027		0.101		0.138	0.030	36	switzerland		-0.297				-0.586	
34	spain	0.018		0.023				0.109	1 30	SWICZELIANU	-0.432	-0.257	-0.510	-0.005	-0.037	-0.566	-0.210
	Spain .							3.103	12	france	1 -0.308	-0.232	-0.268	-0.247	1 -0.207	-0.256	-0.045
10	estonia	-0.019	-0.075	-0.005	-0.042	-0.082	-0.037	-0.028	3	belgium		-0.126				-0.151	
22	latvia	-0.020			-0.038		-0.052		26	netherlands		-0.053				-0.093	
23	lithuania				-0.065		0.003		13	germany				-0.106	-0.018		
28	norway	-0.024			-0.042		0.012		28	norway		-0.063				-0.159	
38	united kingdom	0.032	0.074	0.120	0.069	-0.025	0.122			united kingdom		-0.150			-0.180		
26	netherlands	-0.010	0.044	0.024	-0.021	-0.003	-0.006		20	italy		-0.209			-0.126		0.130

Figure 12 Part of CONCOR Blockmodel for Multinetworks (non-normalized on left and normalized on right)

Discussion

The results of this study are represented in two main ways: a block model partition and density matrix (found in the results section and appendix). The block model partition helps determine which countries are subset together based on the equivalence in their trading pattern. While the density matrix is a quick way to visualize how the partitions relate to each other. A density matrix "is a matrix that has positions rather than individual actors as its rows and columns, and the values in the matrix are the proportion of "choices" that are present from the actors in the row position to the actors in the column position" (Faust and Wasserman 13). With these results, it is possible to evaluate if the countries still form the core-periphery pattern and which countries form the core.

When the results of the benchmark study of 1972 data are compared with Breiger's results (included in the appendix), it is evident the results are not identical. For instance, the normalized block model from the combined networks in this study groups UK with USA, Canada and Japan while Breiger's study groups UK with Australia. The differences in subsets of partition can be observed in Figure 4 and Figure 34. This pattern is evident in other results obtained for binarized trade networks as well as density matrix: the nations are partitioned in a similar manner but not the same.

The reasons for these differences could be the choice of data or an unintentional difference in methodology from Breiger's original work. For instance, in this study, the network of trade exchanges is created using import data to address discrepancies in values but Breiger might have used another approach that is not explicitly stated in his paper, leading to differences in outcome. Additionally, this study utilizes UCINET's generation of correlation matrix and normalization, that could be different from the steps employed by Breiger, leading to discrepancies in calculation.

Although the resulting nations are not identical from Breiger's work and this study, the methodology applied in this benchmark analysis is deemed credible because there are limited number of countries that are partitioned differently and the density matrix for manufactured goods (Figure 3), follows a similar pattern to the mean value trade within and between blocks in Breiger's analysis (Figure 33). As seen in Figure 13, the block model image of binarized manufacturing network in 1972, the nations in core have extensive trade among themselves compared to the ones on the outside. The missing piece of information from this image is the distinction that emerges from including the values that are exports only. Nonetheless, given that the benchmark analysis indicates an existence of core-periphery pattern in density matrices and produces similar nations in core, the methodology and data is used to explore the recent data.

The results in 2018

Future Work

By looking at the

Look at intellectual transfers and control of information and financial markets "Unequal exchange initially created and continuously maintains the structural division Add link to github

Conclusion

Through meticulous review and application of Ronald Breiger's approach in identifying positions of OECD nations in Network analysis in sociology requires strong theoretical reasoning and methodological implications.

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Table 2 Complete List of Countries in Consideration

INCLUDED BY BREIGER	COUNTRY	YEAR OF ACCESSION
*	AUSTRIA	1961
*	BELGIUM	1961
*	CANADA	1961
*	DENMARK	1961
*	FRANCE	1961
*	GERMANY	1961
*	GREECE	1961
*	ICELAND	1961
*	IRELAND	1961
*	LUXEMBOURG	1961
*	NETHERLANDS	1961
*	NORWAY	1961
*	PORTUGAL	1961
*	SPAIN	1961
*	SWEDEN	1961
*	SWITZERLAND	1961
*	TURKEY	1961
	UNITED	
*	KINGDOM	1961
*	UNITED STATES	1961
*	ITALY	1962
*	JAPAN	1964
*	FINLAND	1969
*	AUSTRALIA	1971
	NEW ZEALAND	1973
	MEXICO	1994
	CZECHIA	1995
	HUNGARY	1996
	KOREA	1996
	POLAND	1996
	SLOVAKIA	2000
	CHILE	2010
	ESTONIA	2010
*	ISRAEL	2010
	SLOVENIA	2010
	LATVIA	2016
	LITHUANIA	2018
	BRAZIL	Not OECD
	CHINA	Not OECD
	INDIA	Not OECD

1	australia	I	1	1	I	I	1
23	usa	i		1 1	i	i	i i
						' 	
4	canada	1	ı		I	I	I I
14		11	1		i	i	i i
13	italy		i		i	i	i i
	,						
3	belgium-luxembourg	I	1		1 1	I	I I
15	netherlands		i		1 111	İ	i i
8	germany	1	İ	1	11 11	İ	i i
22	united kingdom	İ	İ		1	1	i i
7	france	İ	i	1	1 1	1	i i
						·	·
11	ireland					1	
20	switzerland	ĺ	ĺ		ĺ	İ	į į
16	norway	ĺ	ĺ		1	Ì	į į
19	sweden	ĺ	ĺ		1	İ	į į
							·
6	finland	1			I	1	
12	israel	ĺ	ĺ		ĺ	İ	į į
9	greece	İ	ĺ		ĺ	İ	i i
5	denmark	ĺ	ĺ		ĺ	İ	į į
18	spain	İ	ĺ		ĺ	İ	į į
2	austria	İ	İ		İ	İ	i i
21	turkey	İ	ĺ		İ	İ	i i
10	iceland	İ	İ		İ	İ	i i
17	portugal	i	i		İ	İ	i i
24	yugoslavia	İ	İ		İ	İ	į į
	, ,						

Figure 13 CONCOR Block Model for Manufactured Goods - 1972

1 australia 1 1	
4	
14	
22 united kingdom	
22 united kingdom	
16	
3 belgium-luxembourg	
8	
8 germany 1 1 1 1 1 1 1 1 1	
13 italy 1 1 1 1 1 1 1 1 1	
15 netherlands 1	
7 france 1 1 1	
7 france 1 1 1	
19 sweden 1	
c (:-1	
6 finland	
5 denmark	
12 israel	
2 austria	
9 greece	
17 portugal	
18 spain	
20 switzerland	
21 turkey	
10 iceland	
11 ireland	
24 yugoslavia	

Figure 14 CONCOR Block Model for Raw Materials - 1972

1	australia	l l	1	1		l	I	l .	I I
14	japan	1	-	1	i		i	i	i
4	canada	*		1			¦	l	
23	usa	1	1 1	-		1	 	1	
23	usa	1 1	1 1		1	1	ı	1	1
5	denmark	1			1	1	 I	1 1	I I
11	ireland	1					! !	1 1	
11	II etallu	1			ı		ı	1 1	1
,	belgium-luxembourg	1				1	1 1	1	 I I
15	netherlands	1			l		1 1	1	
13		!				1	1 1	!	
13	italy	ı			I		1 1	I	l l
7	fnanca	1				1 1 1 1	 I 1	1	 I I
7	france	!				111	1	!	
8	germany	ı			I	1 1 1	1	I	
22	united kingdom	ı			1 1		I	I	l l
_	64-14								
6	finland	!			ļ		!	!	
12	israel	!					ļ	!	!
9	greece	!					!	!	
16	norway	!					!		
2	austria								
18	spain								
19	sweden								
20	switzerland								
21	turkey								
10	iceland						l		
17	portugal				l i		I		l İ
24	yugoslavia				l i		I		l İ
	- 0								·

Figure 15 CONCOR Block Model for Agriculture Products – 1972

1	australia	
5	denmark	
9	greece	
10	iceland	- 1
11	ireland	- 1
6	finland	- 1
17	portugal	
21	turkey	
12	israel	
18	spain	
24	yugoslavia	
7	france	1
13	italy	1
2	austria	1
20	switzerland	- 1
3	belgium-luxembourg	1
15	netherlands	1
16	norway	1 1
23	usa	1
4	canada	
22	united kingdom	!
14	japan	- 1
19	sweden	!
8	germany	

Figure 16 CONCOR Block Model for Energy Products – 1972

1	australia		1 1		 I			 I							·		
					!			!	!						!	- !	. !
21	japan			1													
31	rep. of korea	1		1		1	1	l	1						1		
7	china	1	1		1				1								
39	usa	1	1		1	1 1	1 1		1		1	1		1			
4	brazil	1		1				I	l						1	- 1	- 1
6	chile	i		1	i 1			i	i						i i	i	i
17	india	1 1		1	i -		1	i	i						i i	i	i
5	canada	1 -		1	i		-	i	i						i	i	i
20	italy	1		1	l				¦	1					1	- 1	- 1
34	spain	1			1		1			1							- 1
25		1			1		1	!	!						1	- 1	- 1
25	mexico	1		1	1			I	I						1	- 1	- 1
20		1											4		1		
36	switzerland				1			!		1			1		1	- !	!
8	czechia				!			ļ.	!				1		!!!	. !	. !
2	austria	1						l	l				1		1	- 1	
	united kingdom			1				l				1		1			
9	denmark										1						
12	france	1		1			1	l	l		1	1	1	1			
28	norway	İ			İ			İ	İ						i i	į.	i
26	netherlands	i		1	i			i	1	1	1		1	1	i i	i	i
13	germany	i		1	i			i	1			1		1	i i	i	i
3	belgium	i		-	i			i	1	1		1		-	i i	i	i
18	ireland	1			i			i	1	_	-	-	•		1 1	- 1	- 1
35	sweden	1			ŀ						1						- 1
25	Sweden	1						1	ı		1				1 13		- 1
29	poland	ī			ī			I	1				-		I I	1	
24	luxembourg	1			l				!						1	- 1	- 1
23	lithuania	1			1											- 1	- 1
		1						!							!	- !	- !
10	estonia	!			!			!	!						!	. !	!
33	slovenia	1						!							1 !	- !	. !
14	greece				!			!							!	ļ	ļ
22	latvia	1			1										1		
32	slovakia							I							1		
16	iceland	1													1		
15	hungary	1													I i	ĺ	į.
27	new zealand				1				l						i i	i	i
								· 									
11	finland	1			l l			I	1					1	1	- 1	1
30	portugal				i		1	i	i					-	i i	i	i
	Po. 10801																
19	israel	1			ı			I	ı						I I	- 1	1
37	turkey				i .	1		i							1	- 1	- 1
27	curkey	'						1					_		1 1	ا ۔۔۔۔	ا'

Figure 17 CONCOR Block Model for Manufacturing – 2018

1	australia	I	1 1	I	I	1 1		l l
39	usa	1 1	1111	1	İ	11		i i
7	china	1 1	1 11	İ	1 1	1 1		i i
				· 				'
4	brazil	I	I .	I	I	1 1		l I
17	india	i	İ	İ	İ	i i	i	i i
6	chile	i	İ	İ	İ	i i	i	i i
27	new zealand	İ	İ	İ	İ	i i	i	i i
3	belgium				111	I I		
9	denmark	ĺ	į .		1	i i		
29	poland				1	i i		
2	austria		1		1	1 1		
20	italy		1	1	111	I I		
34	spain		1		111			
8	czechia		1		1	I I		
36	switzerland		1		1			
30	portugal			1				
13	germany	1	1	111111 1	1 1		- 1	
26	netherlands		1	1 1	1 1 1			
12	france	ĺ	İ	1 11 1	11 1	i i		i i
18	ireland	ĺ			1	i i		
38	united kingdom			1 1 1	1111	i i		
31	rep. of korea		1					l I
5	canada	1				1		
25	mexico	1						
21	japan	1 1 1	1			1		
35	sweden						1	
28	norway							
23	lithuania		!			!!		
10	estonia	!	!			!!		
14	greece		!			!!		
22	latvia	!	!			!!		!!,
24	luxembourg	!	!			!!		ļ ļl
33	slovenia					!!!		!
15	hungary			!	!	!!		!
16	iceland	!		!	!	!!!		!
32	slovakia	!	!	!	!	!!!		!
37	turkey		!	!	!	!!!		!
19	israel					!!		
11	finland	I	I	I	I	1 1		l l

Figure 18 CONCOR Block Model for Agriculture Products – 2018

1	australia	I	I.	I	I	I I
11	finland	i	i		i	i
25	mexico		i	1	i	i
27	new zealand		<u> </u>	1		
5	canada	i	i	1 1	i	
6	chile			1 1		
37	turkey			1 1		
	united kingdom			1 1 1	1	
38	united kingdom	 	! 	1 1 1	1 +	
31	rep. of korea	1 11	1 1	1 1	I	I I
7	china	11111111	1 1 11	1 1	1	i
21	japan	1 11	1	1 1	1	i
28	norway	1	1		i	i
17	india	1 1	i	1	i	
34	spain		i	1 1	1	i
34	Spain					
4	brazil	I	I .	I	l l	I I
2	austria	i	i	i	1	i i
35	sweden	i	i		i -	i i
39	usa	1 1	1	1	1	i i
29	poland	1 1	1		1	i i
8	czechia	i	i	i	_	i i
·	CECCHIA	' 	' 	' 	' 	
12	france	I	I	1	1111	I I
26	netherlands	i	i	1	1 1	i i
13	germany	1	i	111111	111 1	i i
20	italy	i -	i	11 1	1 1	i i
3	belgium	i	i	1	111	i i
	8	' 	· 	 		·
24	luxembourg	I	I	I		l I
23	lithuania	İ	İ	İ	į	i i
9	denmark	İ	İ	İ	į	i i
10	estonia	İ	İ	İ	į	i i
14	greece	į	İ	İ	į	į į
22	latvia	į	İ	İ	į	i i
32	slovakia	į	İ	İ	į	i i
33	slovenia	İ	İ	İ	į	į i
15	hungary	İ	İ	İ	İ	i i
16	iceland	į	İ	İ	į	j i
36	switzerland	i	i	İ	i	j i
18	ireland	i	i	i	i	i i
19	israel	i	i	i	i	i i
30	portugal	i	i	i	i	į i
	,	'				'

Figure 19 CONCOR Block Model for Raw Materials – 2018

1	australia	I	1		ı					I .	1
25	mexico	i	1		i		1			i	i i
5	canada	i	1		i		1			i	i i
4	brazil	i	1		i		_			i	i i
13	germany	i	1		111	1	1 1	1 1	1 1 1	1 1	i i
17	india	i	1 1			1	1			i	i i
-		, 	, 		' 						
31	rep. of korea	I	1 1 1		I					I	1
21	japan	İ	1 1		i					i	i i
7	china	1 1	11	1	i		1			i	i i
19	israel	İ	į		i					i	i i
6	chile	İ	İ		İ					İ	i i
			· 								·
11	finland		I		l						
36	switzerland	1									
26	netherlands	1	1			1					
15	hungary	1	l								
3	belgium	1			1					1	
8	czechia	1									
39	usa	11111	1111	1		1		1			1
29	poland	1	1								
20	italy		1							1	
2	austria	1	ļ								
34	spain	1	1					1		1	
35	sweden	1	l								
12	france	1	1		ļ	1		1	1	!	!!!
30	portugal								1		!
38	united kingdom	1	1		1	1			1		1
24	luxembourg	 I								1	I I
28	norway		!		!					-	
23	lithuania	l I	!		! !						
14	greece		<u> </u>		!					1	
18	ireland		!		 						
32	slovakia				 					1	
33	slovania		¦								
9	denmark	l I			 						
22	latvia				1					1	
27	new zealand		! !		I I						
37	turkey										
10	estonia										
16	iceland										
10	Icerand	I .	1		1					1	1

Figure 20 CONCOR Block Model for Energy Products – 2018

1	australia	I	1 1					
17	india	1	i i					
30	portugal						1	
11	finland							
14	greece	!	!!					
15	hungary	!	!!					
16	iceland	!						
23	lithuania	!	!!!					
37	turkey	!						
10	estonia	!	!!!					
33	slovenia	!						
22	latvia	!	!!!					
32 27	slovakia	!						
	new zealand	!						
19	israel	!	!!!					
8	czechia	I	1 1					
29	poland	1	1 1	 	I	1		
29	austria	1				1		
36	switzerland	1				1 1		
36	SWITZERIANU				l 	1 1		
24	luxembourg	I .	1 1	1		1		1
26	netherlands	i	i i	İ		1111 1 1		i i
3	belgium	i	i i		i	1 11 1 1		i i
12	france	i	i i	i	i	11 11 1 1		i i
28	norway	i	i i		i			i i
39	usa	i	i i	İ	i	1111 1 1	1 1111	11
35	sweden	i	1 1		i	1 1		
13	germany	i	i - i			1111 1		i i
9	denmark	i	i i	i	i	1 1		i i
18	ireland	i	i i			1		i i
	united kingdom	i	i i			1 11 1		i i
			·	' 				
25	mexico	I	1 1	1		1 1		
6	chile	l l				1		
5	canada	İ	i i			11 1		
20	italy	1	i		1		l	l İ.
4	brazil	İ	į į			1	j	į į
34	spain	1	l i			11 1	1 1	ı i
31	rep. of korea							1
7	china						1	1 1
21	japan	1				1	1	1 1

Figure 21 CONCOR Block Model for Manufacturing – 2008

1	australia	I			I		I I
39	usa	11	1	1	i	i	i i
5	canada	i 1	i		i	i	i i
4	brazil	j 1	i		i	i	i i
6	chile		i		i	i	i i
		' 			' 	' 	
31	rep. of korea	111111	1 1	1	I	I	I I
7	china	11111	1 1	1 1 1	i	1	i i
17	india	1 1	1 -		i	· -	i i
28	norway	1	i		i	i	i i
37	turkey				i		i i
21	japan		1		i		i i
25	mexico		1		i		i i
34	spain		i		i	11 1	i
54	Spain		<u>'</u>		' 		<u>'</u> '
29	poland	I	1		I		1
8	czechia						i
2	austria					1	1
35	sweden					1	1
9	denmark						1
9	denmark	I	1		I	I	1
12	france	1	1		I	111	1
30	portugal	1				111	1
13	germany	111	1		1 1 1 1 1 1	1 11 1	1
26	germany netherlands	1 1 1	1		111111		!
3	netneriands belgium	1 1	}			1 1 1 1	1
24		1			!	1 1	!
	luxembourg						!
20	italy	1 1			1	1 1	!
38	united kingdom	111	l .		I	1 1	1
	2.00						1
23	lithuania	!					!!!
27	new zealand	!					!!!
10	estonia	!	!				!!!
14	greece	!			!		!!!
22	latvia	!					!!!
32	slovakia	!					!!!
33	slovenia	!	ļ		!	!	!!
15	hungary	ļ.	!		!	ļ	į į
16	iceland	Į.	1			ļ.	į į
36	switzerland	I					1
18	ireland						1
19	israel	I					1
11	finland	I			l		1

Figure 22 CONCOR Block Model for Raw Materials - 2008

1	australia	1		I			
6	chile		i	i			i i
25	mexico		1	i			i i
27	new zealand		-				i i
5	canada		1				
,	Callada						
21	japan	11 1	1	I	l .	1 1	1 1
31	rep. of korea	1	1			1	
39	usa	11111	1			1 1	
39	usa	, , , , , ,		I		11	1 1
23	lithuania	I		I	I		1 1
10	estonia						
32	slovakia						
22	latvia						
17	india						
14	greece						
15	hungary						
16	iceland						
33	slovenia						
11	finland						
19	israel						
24	luxembourg			I			
9	denmark						1
8	czechia						1
36	switzerland						1
28	norway						
2	austria						1
29	poland			l			1
18	ireland						1
4	brazil						
7	china		1				
37	turkey			l			
3	belgium						1 11
26	netherlands					1	1 1111
20	italy				1		1 111
34	spain						1 11 1
12	france					1	1111 11
13	germany			ļ	1 1 11	1111	11111
38	united kingdom			I	1	1 1	111111
35	sweden				1 1		1
30	portugal			l			1

Figure 23 CONCOR Block Model for Agricultural Products – 2008

1	australia	I	ı	l				 ı		1			1	1
21	japan	1						i .		11			i .	
31	rep. of korea	1 1						i .		1 1			i .	
4	brazil	±						i .		1			i .	
5	canada	! !						1		1 1			1	1
25	mexico	!						1		1			1	1
								1					!	
17	india							!		1			1	!
19	israel	l	l					1					1	1
30		 I						 				4	1	1
	portugal			1 4 4	4	4		 ١.,	4			1	!	
13	germany	l	1	1 1	1	1	1 .	 1	1 .	1 1	1	1 1	1	1
26	netherlands	 I	1 1					 1			1		1	1
26	netneriands austria		1 1					1			1		!	
9	austria denmark							1					!	
			1					!					!	!
36	switzerland		1					!					1	!
15	hungary	!	1					!					!	! !
35	sweden	!	1					!					!	! !
8	czechia		1					!					!	!
29	poland		1					!					!	!!!
11	finland			l				l					1	
								 						1
12	france		1					!	1		1	1 1	!	!!!
20	italy		1	1				1		1		1	!	!!!
7	china	1 1	1					!		1			1	!!!
39	usa	1111111	1					!	1		1	1	!	!
3	belgium	!		1				1		1		1	!	!
34	spain	!	1						1				!	!
38	united kingdom		1					1	1	1 1	1			1
6	chile	l		l				I					I	1
24	luxembourg	 I	I					 					1	1
23	lithuania							1					1	1
28		! !						1					1	
18	norway							1					1	
	ireland	!						!					!	!
32	slovakia	!	!					!					!	
33	slovenia							!					!	!
14	greece							!					!	!
22	latvia	!						!					!	!
27	new zealand	!	!					!					ļ.	!
37	turkey	!						!					!	!
10	estonia	ļ						ļ.					!	
16	iceland	l		l				l					I	

Figure 24 CONCOR Block Model for Energy Products – 2008

1	australia	1										I			
17	india	1 1	İ	İ	İ	i	İ					İ			İ
31	rep. of korea	111 1	İ	İ	İ	i	İ					İ			Ĺ
7	china		i	İ	i	i	i					1			İ
															÷
30	portugal	1		l .	1										
															-
15	hungary		ļ.	!	!							!			ļ
14	greece	!	!		!							!			ļ.
23	lithuania	!	ļ.	!	!							ļ			ļ.
37	turkey	!	!		!							!			ļ
10	estonia		ļ	ļ											Ļ
33	slovenia														
22	latvia														
32	slovakia	1													
27	new zealand														
19	israel	1													
16	iceland	1	1												
8	czechia	İ	İ		ĺ	İ	İ					ĺ	ĺ		Ĺ
															-
39	usa	1			1		1 1			1	1	1 1	1 1	1 1	
2	austria								1						
34	spain					- 1	1		1					1 1	
36	switzerland	1							1		1				
29	poland	1				- 1			1						
															-
24	luxembourg	1					1								
3	belgium						1	1	1	1	1				
28	norway	1													
26	netherlands					- 1	1 1		1	1	1				
13	germany		1				1 1	1		1	1				
9	denmark		1		ĺ		1								
11	finland	İ	İ	İ	İ	ĺ	İ					İ	ì		Ĺ
38	united kingdom	İ	i	İ	İ	i	1 1	1	1		1	İ			İ
12	france	i	i	İ	i	i	11			1		i	i		i.
18	ireland	i	i	i	i	i	1			1		i			i.
35	sweden	i	i	i	i	i	1		1	1 1		i			i
		·										· 	:		-
6	chile	1	1	1	1							1	L		ı
21		1 11	İ	İ	İ	i						į į			Ĺ
4	brazil	i	i	İ	1	i	i					i			İ
5	canada	i	i	i	1	i	1			1		i			i
_	-		·	· 								· 	:		-
25	mexico	I	1	1	1			1				I		1	ı
20	italy		i	İ		1	i					İ		_	İ
	,		·												1

Figure 25 CONCOR Block Model for Manufacturing – 2007

1	australia	I	I	1	l											Т
6	chile	İ	İ	İ	İ			İ					ı	į		İ
27	new zealand	İ	İ	İ	ĺ			İ					ı	į		Ĺ
		· 														÷
31	rep. of korea	1	l	I										1	1	1
35	sweden					1									1	
21	japan		I											111	1	
32	slovakia	ĺ	l	I			1									ı
																-
24	luxembourg															
36	switzerland															
10	estonia															ı
11	finland															
22	latvia	l														L
23	lithuania	I														П
14	greece	İ	İ	İ	ĺ			İ					ı	į		ï
15	hungary	i	İ	İ	i			i					ı	į		i.
33	slovenia	i	i	i	i			i					i	i		i
17	india	i	i	i	i			i					ı	i		i
16	iceland	i	i	i	i			i					i	i		i
19	israel		i	i	i			i					ı	i		i
	25.002	' 	' 					' 							' 	Ė.
29	poland	I	I	I	I				1							T
2	austria	i	i	i	i				1				ı	i		i
9	denmark	i	i	i	i			i	1				i	i		i
18	ireland	i	i	i	i			i	_			1	ıi	i		i
37	turkey	i	i	i	i			i					ì	i		i
8	czechia	i	i	i	i				1				ı			i
	CZCCIIZO		' 		' 			' 							' 	Ŀ
34	spain	I	I	I .	I			ı	1	1	1 1	1		1	1	ī
13	germany	i	i	i	11	1 1	1	1		1	1	1	i	11 İ		i
-3	belgium	i	i	i	i				1			1	i			i
20	italy	i	i	i	1			1				1	ı	i		i
30	portugal	i	i	i				1	_		_	-	ı	i		i
12	france	i	i	i	i				1 1	1		1 1	ď	1		i.
26	netherlands		i	i					1 1		1		١,	1		ï
	united kingdom			ŀ		1 1			1 1		1	1	- 1	1	1	ł
50	united Kingdom	I 	I 	I 									!	1 1		Ŀ
5	canada	l .	I	I	ı			ı						1	1	ī
7	china	i	i	i	i								ı	i	1	
4	brazil	i	i	i	i			i					ı		1	i
25	mexico	i	i	i	i			i					ď		1	i
23	mex100												!			Ž.
28	norway	I	I	I	I			ı						1		ī
39		111	i	i	i			i					i	1111		i
-					' 			<u>.</u>						1		Ĺ

Figure 26 CONCOR Block Model for Agriculture Products – 2007

1	australia	l .		T.		I .	I.	I I
39	usa	i	1 1 1	1		1	i	i
25	mexico	i 1		i -		i -	i	i i
6	chile	i -		i		i	i	i i
5	canada	1		i			i	i i
37	turkey	1		i		į	į	i i
17	india	1	1					
7	china	1 1	1 1	1 1	1 1	1	1	
31	rep. of korea	1 1	1 1	1	1	1		
28	norway	ĺ	1	İ		ĺ	İ	i i
21	japan	1 1	1 1	1		1	İ	l i
11	finland	1		į .			1	1
34	spain	1		1		1	1 1 1	
29	poland			1				
8	czechia			1				
4	brazil		1	1				
35	sweden							
2	austria			1			1	
	united kingdom	1	1			1 1	1 1	
12	france					1	1 1 1	
13	germany	1	1			11111	111111	
26	netherlands	1				1	1 1	
20	italy	1				1 1	1 1	
30	portugal			1			ļ	
3	belgium					1	1 1 1	
24	luxembourg	!		!		!		
23	lithuania	!		!		!	!	!
9	denmark	!		!		!		!
10	estonia	!		!				
14	greece	!		!				
27	new zealand	!		!				
32	slovakia	!					!	
33	slovenia	!					!	
15	hungary	!		!		!		
22	latvia	!				!	!	
36	switzerland	!		!		!	!	
18	ireland	!		!		!	!	
19	israel	!		!			!	
16	iceland	I		I		I	I	ı l

Figure 27 CONCOR Block Model for Raw Materials – 2007

1	australia		1	I		1	1 1	
21	japan	1				1 1	1	
31	rep. of korea	1		i		1 1	i i	
4	brazil	*		i		1	ii	
5	canada			i		1 1	i i	
25	mexico			i		1	i i	
17	india			i		1 1	i i	
19	israel			i		1 -	i i	i
30	portugal		1	I		1	1 1	
13	germany		i	11	11111	1111111	i i	i
								:
26	netherlands		1	I		1	1 1	1
2	austria	i	1	İ		İ	i i	į
9	denmark	į	1	İ		İ	i i	į
32	slovakia		1	İ		İ	i i	i
15	hungary		1	ĺ		İ	i i	i
35	sweden		1	l		İ	1 1	
8	czechia		1	l		1	1 1	1
36	switzerland		1			1		I
29	poland		1			1	1 1	I
11	finland						l I	I
20	italy		1			1 11		I
12	france		1			1 111		
39	usa	1111111	1			1 1 1 1 1		
7	china	1 1	1			1	1	
34	spain		1			11 1	!!	
3	belgium			1		1 1 1	!!	Į.
38 ı	united kingdom		1	l		11111		
6	chile		l	I		I	1 1	I
						 I		
14 24	greece					!		
	luxembourg					!		
18 28	ireland					!		
33	norway slovenia					!		
23	slovenia lithuania					!		
23	lithuania latvia							
27	new zealand					!		
37	new zealand turkey							
10	estonia			1				
16	iceland					<u> </u>		
10	rcerand		I	! 		!	ı I	

Figure 28 CONCOR Block Model for Energy Products – 2007

1 21	australia						
	japan				1		
31	rep. of korea				1		
17		1	1				
37	turkey	1			l	1	I I
_	chile						
6 7	china china	1 1	11		1 1		
			1.1				
4	brazil	1			1		
5 25	canada	!			1 1 1 1		
25	mexico	I		1	1		I I
20	italy		I I	1 1			I I
18	ireland			1	1		
13	germany			1 1	111		
36	switzerland			1 1	1 1 1		
26	netherlands	1		1 1 1	111		
3	belgium			1 1 1			
2	austria			1			
12	france	i	i	1 11	1 11 1		
12	Trunce						
34	spain	I	1 1		l		I I
11	finland	İ	j i		İ		i i
38	united kingdom	į	j i	1 1	1 11		i i
39	usa	1 1	111	1 1	1 1		i i
9	denmark	į	j i	į	1		i i
28	norway	ĺ	İ		İ		i i
35	sweden	ĺ	İ		1 11		i i
14	greece						
30	portugal				1		
24	luxembourg						
29	poland						
8	czechia						
23	lithuania						!
32	slovakia						
33	slovenia						
15	hungary						
22	latvia						
27	new zealand						
10	estonia						
19	israel						
16	iceland	I	l l		I		I I

Figure 29 CONCOR Block Model for Manufacturing – 2013

1	australia	1				
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4	brazil		i	i		i i i
5	canada	i	1			i i i
27	new zealand	i	_			i i i
17	india		i			
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31	rep. of korea	1 1	1 1			
7	china	1 111	1			
39	usa	1111111	1			
33	usa	1 1 1 1 1 1 1	ı ±	I	l 	'
10	estonia	I	I.	I	I	
37	turkey		i			
14	greece					
15	hungary					
22	latvia					
32	slovakia			I I		
11	finland		!			
	israel	!	!			
19			!			
24	luxembourg		!			
16	iceland		!			
23	lithuania		ļ.			
33	slovenia		I	l		
9	denmark		!			1 1
3	belgium		!			1 1 1 1
20	italy		!		1	1 1 1 1
8	czechia		!			1 1
36	switzerland	!	ļ.			1
2	austria		!			1
34	spain					1 1 1
29	poland		l	l		1
28	norway		!			
18	ireland		!			1 1 1
26	netherlands	1	I	I	1 1	111
12	france	 I				
			!		11 1 1	
13	germany	1	!		111 1111	1 1
38	united kingdom	I	I .	I	111 11	11 11
35	sweden	 I	I	 I	1	1 1
30	portugal		i		1	*
30	portugat	·	!	! 	·	'

Figure 30 CONCOR Block Model for Agriculture Products – 2013

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5	canada	i.									i					i	1					i.					i i
6	chile	i.									i					i						i					i i
37	turkey	i.									i					i	1					i					i i
17	india		1					1			l					i .	1					i.					i
17	Illuta		٠.					<u>.</u>							 	! 											l
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20	italy	i.	-					-			-			_			1					i.	1			1	i
21	japan	i.	1				1	1			1						1					i.	1			_	i i
28	norway		1				1	1			1					*	•					H					
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29	poland	i.									l					l						i.				1	i i
35	sweden															l						ł					
8	czechia															l						1					
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26	netherlands	i.									i					i ī	1					i.			1		i i
3	belgium	i.	1								i					i	1					i	1			1	i i
13	germany		-				1				i					i 1			1	1	1			1		•	i i
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24	luxembourg															ı						1					1
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19	israel	!														!						!					!
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Figure 31 CONCOR Block Model for Raw Materials – 2013

1	australia	I	1	1		1	
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5	canada	İ	İ	İ		1 1	i i i
4	brazil	İ	İ	i		1	i i i
37	turkey	i	i	i		1	i i i
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21	japan	I	1 1	1		1 1	1 1
31	rep. of korea	i	1	i		1	i i i
17	india	i	i	i		1 1	i i i
6	chile	i	i	i		i	i i i
19	israel	i	i	i		i	i i i
13	germany	i	i	1111	11111	111111	i i i
	8						
2	austria	I	1	1		I	1 1
11	finland	i	i	i		i	i i i
36	switzerland	i	j 1	i		i	i i i
15	hungary	i	1	i		i	i i i
26	netherlands	i	1	i		1	i i i
8	czechia	i	i i			i -	i i i
34	spain	i	j 1	i		1 1	i i i
29	poland	i	1	i			i i i
35	sweden	i	1			i	i i i
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20	italy	I	1	1		1 1	1 1
12	france	İ	1		1	1 11	i i i
3	belgium	İ	j 1		1	1 1 1 1	i i i
7	china	i	11111 1	i		j 1	i i i
38	united kingdom	i	i 1	i		11111 1	i i i
39	usa	111	111111	i		1 11	i i i
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30	portugal	I	1	1	1	1	
			·			· 	·
24	luxembourg		1				
23	lithuania		1				
28	norway	İ	İ	İ		İ	
9	denmark	İ	İ	İ		İ	i i i
32	slovakia	İ	İ	i		İ	i i i
33	slovenia	İ	İ	i		İ	i i i
14	greece	i	i	i		i	j j
22	latvia	i	i	i		i	i i i
27	new zealand	i	i	i		i	i i i
18	ireland	i	i	i		i	i i i
10	estonia	i	i	i		i	i i
16	iceland	i	i	i		i	i i
	30020110	'	' 			' 	

Figure 32 CONCOR Block Model for Energy Products – 2013

Dei	Density Matrix for all networks in 1972							
	1 2 3 4							
1	0.383	0.289	0.233	0.357				
2	0.289	0.878	0.186	0.158				
3	0.233	0.186	0.579	0.398				
4	0.357	0.158	0.398	0.499				
Dei	nsity Matri	x for all net	works in 20	018				
	1	2	3	4				
1	0.455	0.17	0.036	-0.003				
2	0.17	0.543	0.163	0.02				
3	0.036	0.163	0.477	0.139				

Density Matrix for all networks in 2008							
	1 2 3 4						
1	0.351	0.208	0.076	-0.011			
2	0.208	0.527	0.13	0.12			
3	0.076	0.13	0.478	0.149			
4	-0.011	0.12	0.149	0.257			

0.02

0.139

0.155

-0.003

Density Matrix for all networks in 2007							
	1	1 2 3 4					
1	0.377	0.267	0.105	-0.014			
2	0.267	0.5	0.148	0.052			
3	0.105	0.148	0.482	0.154			
4	-0.014	0.052	0.154	0.336			

Density Matrix for all networks in 2013							
	1 2 3 4						
1	0.485	0.187	0.044	-0.01			
2	0.187	0.485	0.125	0.057			
3	0.044	0.125	0.46	0.152			
4	-0.01	0.057	0.152	0.29			

Density Matrix for all networks in 1972 (Normalized)						
	1 2 3 4					
1	0.771	0.438	-0.445	-0.231		
2	0.438	0.488	-0.114	-0.302		
3	-0.445	-0.114	0.392	-0.125		
4	-0.231	-0.302	-0.125	0.159		

Density Matrix for all networks in 2018 (Normalized)							
	1 2 3 4						
1	0.268	-0.015	-0.251	-0.257			
2	-0.015	0.26	-0.15	-0.312			
3	-0.251	-0.15	0.345	0.192			
4	-0.257	-0.312	0.192	0.702			

Density Matrix for all networks in 2008 (Normalized)							
	1 2 3 4						
1	0.131	-0.122	-0.184	-0.256			
2	-0.122	0.206	0.167	-0.129			
3	-0.184	0.167	0.198	0.106			
4	-0.256	-0.129	0.106	0.629			

Density Matrix for all networks in 2007 (Normalized)							
	1 2 3 4						
1	0.139	-0.136	-0.246	-0.219			
2	-0.136	0.236	0.131	-0.172			
3	-0.246	0.131	0.338	0.284			
4	-0.219	-0.172	0.284	0.681			

Density Matrix for all networks in 2013 (Normalized)							
	1 2 3 4						
1	0.411	-0.005	-0.257	-0.215			
2	-0.005	0.272	-0.299	-0.128			
3	-0.257	-0.299	0.7	0.043			
4	-0.215	-0.128	0.043	0.211			

Breiger's Results

8. Germany	-11	IIII	IIII	IIII	-I	
22. UK	I-I	-III	III-	IIII	IIIII	
23. USA	II-	III		Ļ	III	
2. Austria						
3. Belg./Lux.	III	11	I-I-			
7. France	III	-1-1	III-			
13. Italy		-II-				
15. Netherl.		-III				
19. Spain		I-				
21. Switzer.	II-	-				
	11	Ľ	L	L		L
24. Yugosla.		1				_
Denmark				I		
Finland	II-			I		
17. Norway	III			I		
20. Sweden	III	I-		III~		
1. Austral.	-I-				I	
4. Canada	-II					 -
11. Ireland	-I-					 -
12. Israel	I					
14. Japan	III		L		II	
Greece				Γ		1
Iceland						
New Zea.						r
Portugal			h	 		r

Mean Values of Trade Within and Between Blocks (\$ millions)

	Block I	Block 2	Block 3	Block 4	Block 3	BIOCK 0
Block 1	483	(407)	246)	(30)	$\overline{23}$	32
Block 2	(33)	<u> </u>	$\overline{\mathfrak{W}}$	44	28	14
Block 3	(89)	(108)	19	21	11	5
Block 4	(77)	36	24	① 9	11	5
Block 5	(48)	19	11	8	45	12
Block 6	22	8	3	6	5	0

Computed from the original (non-binarized) data and rounded. Mean values in excess of \$100 million have been circled. Compare the pattern of circled values to the 'center-periphery' pattern of Figure 1.

Figure 34 Results of Binarized Manufacture Network Data by Breiger

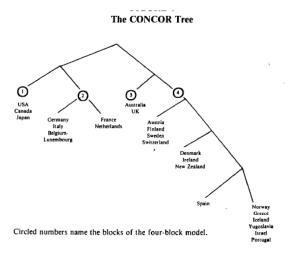


Figure 35 Concor Tree From Breiger's Result

TABLE 2
Correlations among the Trade Matrices Employed in this Study*

	Agricultural products	Raw materials	Manufactured goods	Energy
Agricultural products	1.000	0.579	0.591	0.470
Raw materials		1.000	0.524	0.661
Manufactured goods			1.000	0.584
Energy resources				1.000

Figure 36 Correlations Matrix from Breiger's Study