

Supplementary Materials for

Triad analysis of global energy trade networks and implications for energy trade stability

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Table S1. Normalized Z-scores of triad significance profiles referenced in the manuscript

Table S2. List of countries by cluster, identified through K-means clustering

Supplemental references

Table S1. Normalized Z-scores of triad significance profiles referenced in the manuscript

Network	Source	Triad Number												
		1	2	3	4	5	6	7	8	9	10	11	12	13
biological signal processing superfamily	[1] #	-0.213	-0.330	0.078	-0.255	-0.510	0.020	0.128	0.135	0.410	0.515	0.035	0.145	0.100
human social network superfamily	[1] #	-0.185	-0.210	-0.170	-0.350	-0.170	-0.530	0.148	0.081	0.340	0.150	0.075	0.295	0.525
global agricultural trade	[2]	-0.154	-0.326	0.106	-0.141	-0.263	-0.564	0.051	-0.128	0.276	0.300	-0.134	-0.049	0.495
cargo shipping - average	[3] @	-0.219	-0.208	-0.130	-0.328	-0.323	-0.518	0.107	0.045	0.227	0.212	0.110	0.299	0.454
ant colony communications	[4]	0.025	-0.330	-0.099	-0.210	-0.270	-0.390	0.410	0.000	0.030	0.150	0.058	0.145	0.005
energy trade - aggregate	*	-0.221	-0.254	0.086	-0.343	-0.274	-0.542	0.084	-0.087	0.283	0.290	-0.145	0.222	0.380
energy trade - coal	*	-0.144	-0.364	0.028	-0.219	-0.371	-0.509	0.108	-0.085	0.162	0.333	-0.113	0.309	0.370
energy trade - oil	*	-0.397	-0.201	0.053	-0.479	-0.110	-0.346	0.137	-0.097	0.488	0.189	-0.222	0.126	0.266
energy trade - LNG	*	-0.259	-0.265	-0.097	-0.393	-0.342	-0.466	0.156	-0.111	0.270	0.258	0.114	0.251	0.335
energy trade - GNG	*	-0.283	-0.354	-0.182	-0.319	-0.405	-0.319	0.206	0.003	0.273	0.379	0.116	0.147	0.311
energy trade - country cluster 1	*	-0.300	0.107	0.354	0.135	-0.112	-0.066	0.009	0.058	0.218	0.010	0.054	0.164	0.087
energy trade - country cluster 2	*	0.032	-0.133	-0.037	-0.239	-0.132	-0.431	0.103	-0.099	0.253	0.211	-0.130	0.143	0.310
energy trade - country cluster 3	*	-0.287	0.034	-0.263	-0.098	-0.487	-0.039	0.102	-0.037	-0.012	-0.090	-0.056	0.009	-0.008
energy trade - country cluster 4	*	0.125	-0.297	-0.028	-0.239	0.169	-0.070	-0.067	-0.052	-0.104	0.311	-0.095	0.010	0.014
energy aggregate, drop 25% nodes	*	-0.221	-0.239	0.079	-0.309	-0.253	-0.557	0.082	-0.075	0.270	0.252	-0.136	0.224	0.417
energy aggregate, drop 50% nodes	*	-0.294	-0.236	0.041	-0.372	-0.240	-0.495	0.110	-0.055	0.345	0.221	-0.116	0.208	0.340
energy aggregate, drop 75% nodes	*	-0.255	-0.202	0.084	-0.324	-0.189	-0.401	0.113	-0.151	0.283	0.151	-0.083	0.199	0.260
energy aggregate, drop 80% nodes	*	-0.150	-0.202	0.147	-0.170	-0.204	-0.386	-0.003	-0.059	0.204	0.286	-0.124	0.041	0.341
energy aggregate, drop 90% nodes	*	0.019	-0.046	0.053	-0.002	-0.074	-0.030	-0.042	0.251	0.022	0.219	0.040	0.021	0.629

Notes:

- composite TSPs calculated in [4] from multiple TSPs in [1]

@ - average TSP calculated by the authors of this study from multiple TSPs in [3]

* - developed by the authors as part of this study

Table S2. List of countries by cluster, identified through K-means clustering

Country or autonomous area	cluster
Albania	1
Algeria	1
Andorra	1
Angola	1
Argentina	1
Azerbaijan	1
British Indian Ocean Territory	1
Burundi	1
Côte d'Ivoire	1
Cabo Verde	1
Cambodia	1
Cameroon	1
Chad	1
China	1
Comoros	1
Congo	1
Costa Rica	1
Cyprus	1
Equatorial Guinea	1
Eritrea	1
Ethiopia	1
French Polynesia	1
Gabon	1
Ghana	1
Iraq	1
Laos	1
Libya	1
Maldives	1
Malta	1
Mongolia	1
Mozambique	1
Namibia	1
Nigeria	1
Norway	1
Papua New Guinea	1
Saint Barthelemy	1
San Marino	1
Serbia	1
Somalia	1

South Sudan	1
Sri Lanka	1
State of Palestine	1
Sudan	1
Sweden	1
Timor-Leste	1
Trinidad and Tobago	1
Uzbekistan	1
Venezuela	1
Yemen	1
Australia	2
Austria	2
Bangladesh	2
Belarus	2
Belgium	2
Bolivia	2
Botswana	2
Brazil	2
Brunei Darussalam	2
Bulgaria	2
Canada	2
China, Hong Kong SAR	2
Colombia	2
Croatia	2
Czech Republic	2
Denmark	2
Egypt	2
El Salvador	2
Estonia	2
France	2
Germany	2
Hungary	2
India	2
Indonesia	2
Ireland	2
Italy	2
Japan	2
Kazakhstan	2
Kuwait	2
Latvia	2
Lithuania	2

Malaysia	2
Myanmar	2
Netherlands	2
New Zealand	2
North Macedonia	2
Oman	2
Pakistan	2
Peru	2
Philippines	2
Poland	2
Portugal	2
Qatar	2
South Korea	2
Russia	2
Singapore	2
Slovakia	2
Slovenia	2
Spain	2
Switzerland	2
Tajikistan	2
Thailand	2
Tunisia	2
Ukraine	2
United Kingdom	2
USA	2
Viet Nam	2
Zambia	2
Afghanistan	3
American Samoa	3
Anguilla	3
Armenia	3
Benin	3
Burkina Faso	3
Central African Republic	3
Chile	3
Cook Islands	3
North Korea	3
Democratic Rep of the Congo	3
Dominica	3
Gambia	3
Greenland	3

Guinea	3
Iran	3
Jamaica	3
Kiribati	3
Liberia	3
Mali	3
Marshall Islands	3
Mauritania	3
Montenegro	3
Nauru	3
New Caledonia	3
Nicaragua	3
Niger	3
Panama	3
Pitcairn	3
Moldova	3
Romania	3
Samoa	3
Sao Tome and Principe	3
Saudi Arabia	3
Sierra Leone	3
South Africa	3
Syria	3
Togo	3
Tokelau	3
Tonga	3
Turks and Caicos Islands	3
Tuvalu	3
Uruguay	3
Vanuatu	3
Antarctica	4
Antigua and Barbuda	4
Aruba	4
Bahamas	4
Bahrain	4
Barbados	4
Belize	4
Bermuda	4
Bhutan	4
Bosnia Herzegovina	4
Cayman Islands	4

China, Macao SAR	4
Cuba	4
Curaçao	4
Djibouti	4
Dominican Republic	4
Ecuador	4
Eswatini	4
Fiji	4
Finland	4
Georgia	4
Gibraltar	4
Greece	4
Grenada	4
Guatemala	4
Guyana	4
Haiti	4
Honduras	4
Iceland	4
Israel	4
Jordan	4
Kenya	4
Kyrgyzstan	4
Lebanon	4
Lesotho	4
Luxembourg	4
Madagascar	4
Malawi	4
Mauritius	4
Mexico	4
Morocco	4
Nepal	4
Paraguay	4
Rwanda	4
Saint Kitts and Nevis	4
Saint Lucia	4
Saint Maarten	4
Saint Vincent and the Grenadines	4
Senegal	4
Seychelles	4
Suriname	4
Turkey	4

Turkmenistan	4
Uganda	4
United Arab Emirates	4
Tanzania	4
Zimbabwe	4

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