

Network Spillover: Global Value Chains, Economic Security and the Emergence of Defense Cooperation Agreements

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October 2025

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- Over 600 bilateral DCAs have been signed globally as of the mid-2010s (Kinne 2020; 2024).
- DCAs now outnumber formal defense alliances by a wide margin.

- What are drivers of the DCAs proliferation?
- What are factors facilitating interstate security cooperation?

- **Key argument: the increasingly globalized production network exposes states and firms to more vulnerabilities, which entails a more flexible, comprehensive form of security cooperation.**

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- Enabling non-state, especially private actors to involve in some related military - economic activities.
- Low to medium commitment cost, high expected returns → appealing to smaller states.

⇒ DCAs are not only more efficient and sustainable but also more inclusive than traditional security alliances, within the context of increasingly interdependent global production network.

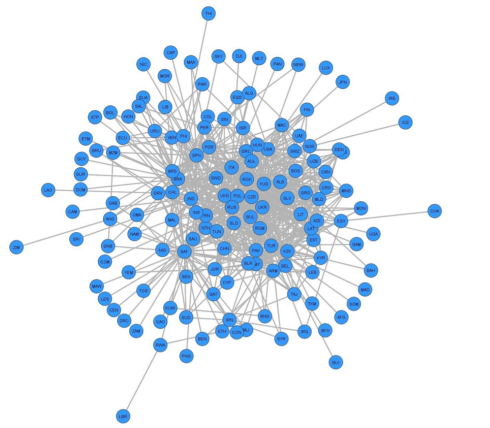


Figure: A Snapshot of the Global DCA Network, 2018

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⇒ The rationale for DCAs depends on the patterns of integration into the network → variation in the likelihood of forming DCAs across different types of integration.

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 - Suppliers: high dependence on foreign markets → breakdowns of any linkages are extremely consequential.
 - Buyers: difficult to find alternatives if key partners are disrupted by militarized conflicts.

Hypothesis 1: Countries with a higher degree of forward participation in the supply chains will be more likely to sign DCAs than countries with a lesser degree.

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 - ↑ backward participation, ↑ foreign value-added embedded in their gross exports.
 - Once highly backward-integrated actors encounter disruption, shocks propagate quickly to other nodes in the network.

Hypothesis 2: Countries with a higher degree of backward participation in the supply chains will be more likely to sign DCAs than countries with a lesser degree.

- Unit of analysis: Dyad-year
- DV: 1 if the dyad forms a DCA in a given year, 0 otherwise
- IVs: GVC forward and backward trade in a given year (with transformation to be compatible with the network analysis).
- Control variables: distance between states, regime type similarity, CINC (Composite Index of National Capability) similarity, GDP similarity, and the dyadic alliances.
- Network variables:
 - Transitivity: the tendency of states to establish ties with friends of friends
 - Degree centrality: preferential attachment.

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 - Simulating network evolution via actor-level utility functions
- Main datasets: World Integrated Trade Solutions + DCA from Kinne (2020), from 1992 to 2010.

- Both coevolutionary SAOMs converge well, giving us confidence that the models capture the dynamics well.
- Only strong backward GVC ties significantly predict DCA formation, indicating that states heavily dependent on foreign inputs seek defense cooperation to stabilize exposure.
- Both broad and strong forward ties increase the likelihood of DCA formation, suggesting that export-oriented integration promotes institutionalized security linkages.

Results: Backward Integration

Table: GVC Backward

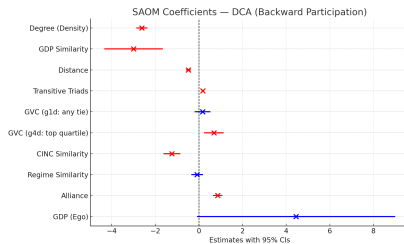
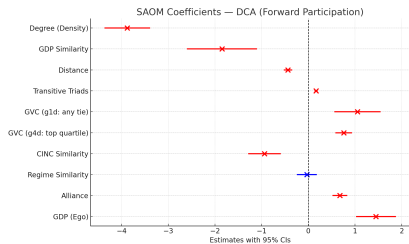
	Parameter	Estimate	Std. Error	t-ratio
Rate Parameters — DCA				
0.1	Rate parameter period 1	1.9014	0.2261	
0.2	Rate parameter period 2	2.9492	0.2885	
0.3	Rate parameter period 3	2.1549	0.2084	
0.4	Rate parameter period 4	2.7238	0.2249	
0.5	Rate parameter period 5	2.5865	0.1986	
0.6	Rate parameter period 6	2.4439	0.1981	
Rate Parameters — g1d (all positive GVC ties)				
0.7	Rate parameter period 1	2.1164	0.1298	
0.8	Rate parameter period 2	2.4757	0.1396	
0.9	Rate parameter period 3	1.5009	0.1031	
0.10	Rate parameter period 4	2.0833	0.1239	
0.11	Rate parameter period 5	1.4445	0.0964	
0.12	Rate parameter period 6	1.2674	0.0911	
Rate Parameters — g4d (top-quartile GVC ties)				
0.13	Rate parameter period 1	1.2989	0.1419	
0.14	Rate parameter period 2	1.1846	0.1374	
0.15	Rate parameter period 3	0.9416	0.1117	
0.16	Rate parameter period 4	1.7888	0.1803	
0.17	Rate parameter period 5	1.4768	0.1590	
0.18	Rate parameter period 6	1.3075	0.1432	
Other Parameters — DCA				
1	eval degree (density)	-2.6134	0.1151	
2	eval transitive triads	0.1776	0.0133	
3	eval distancenet	-0.4804	0.0451	
4	eval alliancenet	0.8601	0.0987	
5	eval gdpnet ego	4.4520	2.3036	
6	eval gdpnet similarity	-2.9929	0.6730	
7	eval regimenet similarity	-0.0851	0.1233	
8	eval cincnet similarity	-1.2400	0.1842	
9	eval g1d (to DCA)	0.1654	0.1700	
10	eval g4d (to DCA)	0.6856	0.2155	
Other Parameters — g1d				
11	eval outdegree (density)	-1.7091	0.0472	
12	eval reciprocity	0.2205	0.0698	
13	eval dcad (to g1d)	1.4415	0.1492	
Other Parameters — g4d				
14	eval outdegree (density)	-1.1269	0.0564	
15	eval reciprocity	0.3287	0.1424	
16	eval dcad (to g4d)	0.5991	0.1338	
Overall maximum convergence ratio: 0.2805				

Results: Forward Integration

Table: GVC Forward

	Parameter	Estimate	Std. Error	t-ratio
Rate Parameters — DCA				
0.1	Rate parameter period 1	2.4588	0.2745	
0.2	Rate parameter period 2	2.6473	0.2488	
0.3	Rate parameter period 3	1.9615	0.1780	
0.4	Rate parameter period 4	2.5434	0.1977	
0.5	Rate parameter period 5	2.4368	0.1875	
0.6	Rate parameter period 6	2.3386	0.1758	
Rate Parameters — g1d (all positive GVC ties)				
0.7	Rate parameter period 1	1.8043	0.1186	
0.8	Rate parameter period 2	1.6405	0.1110	
0.9	Rate parameter period 3	2.2854	0.1443	
0.10	Rate parameter period 4	2.6106	0.1505	
0.11	Rate parameter period 5	0.2492	0.0386	
0.12	Rate parameter period 6	0.6729	0.0644	
Rate Parameters — g4d (top-quartile GVC ties)				
0.13	Rate parameter period 1	4.4697	0.1739	
0.14	Rate parameter period 2	3.8203	0.1610	
0.15	Rate parameter period 3	2.1229	0.1172	
0.16	Rate parameter period 4	2.7961	0.1339	
0.17	Rate parameter period 5	2.2230	0.1174	
0.18	Rate parameter period 6	1.7806	0.1071	
Other Parameters — DCA				
1	eval degree (density)	-3.8779	0.2432	
2	eval transitive triads	0.1650	0.0111	
3	eval distancenet	-0.4359	0.0398	
4	eval alliancenet	0.6749	0.0747	
5	eval gdpnet ego	1.4481	0.2119	
6	eval gdpnet similarity	-1.8495	0.3773	
7	eval regimenet similarity	-0.0303	0.1028	
8	eval cincnet similarity	-0.9376	0.1718	
9	eval g1d (to DCA)	1.0522	0.2464	
10	eval g4d (to DCA)	0.7584	0.0849	
Other Parameters — g1d				
11	eval outdegree (density)	-1.6084	0.0682	
12	eval reciprocity	3.5657	0.0735	
13	eval dcad (to g1d)	-0.6989	0.3602	
Other Parameters — g4d				
14	eval outdegree (density)	-1.4358	0.0253	
15	eval reciprocity	1.9245	0.0426	
16	eval dcad (to g4d)	1.0400	0.1478	
Overall maximum convergence ratio: 0.2292				

Results



- Running the analysis on the rest of the time horizon
- Getting firm-level data + firm level analysis
- In-depth cases study
- More robustness check
- Looking at some other network statistics to get more evidence

Thank you for listening!