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## Online annex for Bulletin on “Mapping the realignment of global value chains”

This annex provides a brief description of the firm-level supply chain data used in the bulletin. Data are from S&P’s Capital IQ database. Each supplier-customer relationship is a binary variable representing the existence of a relationship, and does not include information on the size, value added or underlying products of the supply-chain connection. We include firms in the “Manufacturing”, “Mining”, and “Agriculture, Forestry, and Fishing” SIC industry classifications to capture activities related to goods manufacturing and production. Our analysis is based on two snapshots of the supply chain data – December 2021 and September 2023. The 2021 sample consists of 24,773 firms and 37,542 supplier-customer relationships, while the 2023 sample consists of 25,114 firms and 37,976 supplier-customer relationships.

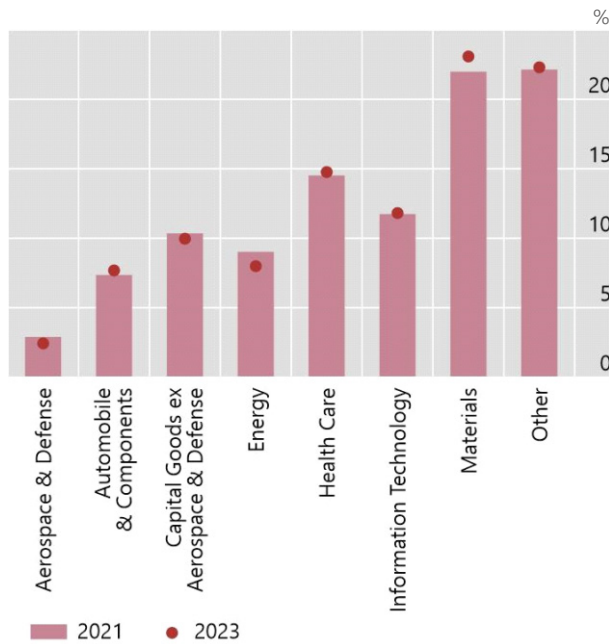
Graph A1 presents the industry and region shares of firms in the two sample periods. Looking across major industries, firms in the materials sector account for a relatively large share of the total sample, consistent with this sector’s integral role in the supply chains of other industries, along with firms in “Other” sectors, which includes industries related to food and agricultural products and textiles (Graph A1.A). By geographic location, firms in Asia-Pacific ex China, Japan and Korea (“Rest of Asia-Pacific”), Europe and the United States take up significant shares of the sample (Graph A1.B).

Graph A2 shows the 2023-sample network diagrams using different colours to highlight cross-country and within-country linkages. We can see that linkages between firms located in the same country in blue make up a good part of the direct linkages (Graph A2.A), but two-step linkages are dominated by cross-country linkages in red (Graph A2.B).

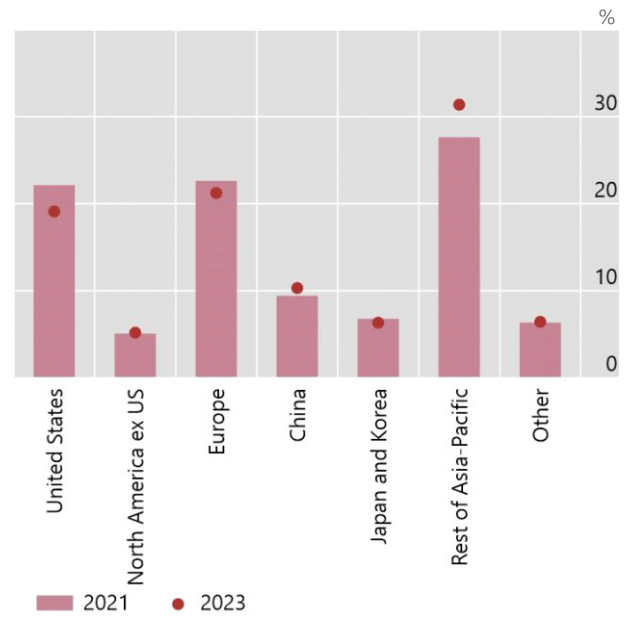
## Share of firms by industry and region

Graph A1

### A. By industry



### B. By region

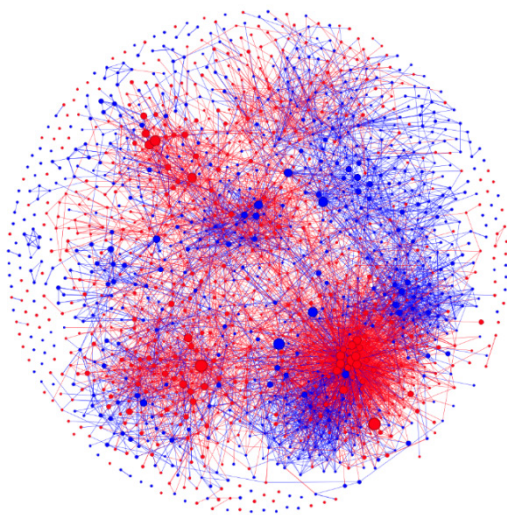


Sources: S&P Capital IQ; authors' calculations

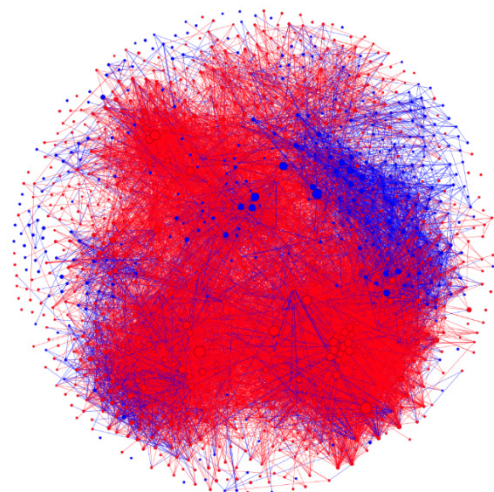
## Direct and indirect linkages by cross-country and within-country linkages

Graph A2

### A. One-step supplier-to-customer linkages



### B. Two-step supplier-to-customer linkages



Graphs show data for September 2023 and exclude nodes with less than 10 linkages. Nodes represent firms (sizes of which are proportional to a firm's importance in the overall network, measured by eigenvector centrality) and edges represent an unweighted supplier-customer relationship. Nodes with a higher number of cross-country linkages than within-country linkages are coloured in red, and blue otherwise. Edges representing cross-country linkages are coloured in red, and blue otherwise.

Sources: S&P Capital IQ; authors' calculations.

Table A1 presents the industry share of firms by region for both the 2021 and 2023 samples. Across most regions, the materials sector holds a significant share, consistent with the trend seen in the full sample (Graph A1). Looking at individual economies and regions, we can see that the auto, capital goods and information technology (IT) sectors represent substantial portions of the sample in China, Japan and Korea, and the health care sector takes up a significant portion of firms in the United States, North America and Europe.

Industry shares by region (in percent)

Table A1

	Aerospace & Defense	Automobile & Components	Capital Goods ex Aerospace & Defense	Energy	Health Care	Information Technology	Materials	Other
<u>2021</u>								
United States	2.10	4.08	6.82	17.09	7.91	3.64	32.78	25.57
North America ex US	1.91	3.03	5.10	14.81	16.08	6.13	37.18	15.76
Europe	3.75	6.71	14.50	9.10	16.54	7.37	17.47	24.57
China	0.73	12.06	13.13	3.73	8.80	23.61	24.08	13.86
Japan and Korea	1.01	18.27	16.67	1.96	8.81	21.37	16.90	15.00
Rest of Asia-Pacific	0.85	7.89	7.94	8.58	7.51	10.33	29.24	27.66
Other	2.10	4.08	6.82	17.09	7.91	3.64	32.78	25.57
<u>2023</u>								
United States	5.27	4.44	7.92	9.19	29.30	12.73	12.11	19.05
North America ex US	2.00	3.15	3.77	11.69	17.08	4.54	43.00	14.77
Europe	3.58	7.07	14.18	8.64	17.55	7.33	18.04	23.61
China	0.70	12.86	13.48	2.90	8.77	22.79	23.83	14.68
Japan and Korea	1.07	17.55	15.60	1.76	9.69	21.26	17.80	15.28
Rest of Asia-Pacific	0.93	7.75	7.79	7.30	8.13	11.63	29.03	27.44
Other	1.98	4.58	6.44	16.91	7.43	3.59	31.23	27.82

Sources: S&P Capital IQ; authors' calculations.

Table A2 presents the shares of different regions in each other's direct supplier and customer linkages for the 2021 and 2023 sample periods. Focusing on the location of suppliers, for each row in Table A2, each column presents the share of the region/economy specified in the column title as a customer to the total customers of suppliers located in the row title (and vice versa when focusing on the location of customers). For example, numbers in the first row of the 2021 section represent the shares of customers of US suppliers located in the United States, North America ex US, Europe, China, Japan and Korea, the rest of Asia-Pacific and other countries, respectively. We can see that, in general, the share of firms from the rest of Asia-Pacific in other regions' GVC linkages has increased from 2021 to 2023 (eg from 8.68% to 10.23% of customers of US suppliers), suggesting that Asia-Pacific firms are gaining importance in GVCs, consistent with trends seen in the full sample (Graph A1). On the other hand, the share of US firms in China's linkages has decreased (eg from 9.85% to 7.54% of customers of China suppliers), reflecting a realignment of GVCs between the US and China.

## Share of trade linkages by region

Table A2

	United States	North America ex US	Europe	China	Japan and Korea	Rest of Asia-Pacific	Other
<u>2021</u>							
<b>Location of suppliers</b>							
United States	60.03	4.11	16.21	3.09	4.88	8.68	3.00
North America ex US	22.10	37.76	16.95	4.47	4.75	8.88	5.08
Europe	17.08	3.00	55.75	3.84	4.27	10.92	5.15
China	9.85	1.67	12.23	51.12	4.91	18.90	1.32
Japan and Korea	13.73	1.23	9.80	4.86	54.64	14.18	1.55
Rest of Asia-Pacific	9.75	1.33	9.26	4.71	4.51	68.64	1.81
Other	10.36	4.19	18.39	1.64	2.09	8.32	55.01
<b>Location of customers</b>							
United States	52.44	3.98	16.41	3.75	6.83	14.36	2.23
North America ex US	20.66	39.14	16.58	3.65	3.51	11.24	5.20
Europe	14.47	3.12	54.71	4.75	4.98	13.93	4.05
China	7.42	2.22	10.14	53.51	6.65	19.08	0.97
Japan and Korea	9.40	1.89	9.05	4.12	59.90	14.65	1.00
Rest of Asia-Pacific	5.54	1.17	7.66	5.26	5.15	73.91	1.31
Other	10.80	3.77	20.35	2.06	3.17	11.01	48.84
<u>2023</u>							
<b>Location of suppliers</b>							
United States	56.62	4.90	16.62	3.16	5.16	10.23	3.30
North America ex US	19.81	43.62	13.59	4.60	5.05	7.90	5.44
Europe	17.84	3.21	54.96	3.01	3.24	11.32	6.43
China	7.54	1.65	9.93	53.36	3.98	22.48	1.06
Japan and Korea	12.69	1.15	9.45	4.48	54.60	15.90	1.73
Rest of Asia-Pacific	9.25	1.52	9.35	4.61	4.24	69.35	1.68
Other	9.62	4.68	16.31	1.79	2.83	6.96	57.80
<b>Location of customers</b>							
United States	48.01	4.20	17.40	3.51	6.34	18.10	2.43
North America ex US	18.87	41.97	14.20	3.49	2.62	13.51	5.35
Europe	13.77	2.82	52.39	4.52	4.61	17.87	4.02
China	6.20	2.26	6.80	57.58	5.18	20.92	1.05
Japan and Korea	9.37	2.29	6.75	3.96	58.37	17.73	1.53
Rest of Asia-Pacific	4.89	0.94	6.23	5.91	4.48	76.56	0.99
Other	9.50	3.91	21.29	1.68	2.93	11.18	49.51

Sources: S&amp;P Capital IQ; authors' calculations.

Table A3 presents the average number of within-region and cross-region trade partners by region and by outgoing linkages ("out-degree") and incoming linkages ("in-degree"). Within each time period, the mean number of within-region customers and suppliers among Asian economies significantly exceeds the number of cross-region trade partners, indicating substantial integration within the region. Comparing across the two time periods, we can see that the average number of China's linkages outside Asia has decreased, in line with the recent GVC realignment trends.

Average number of within-region and cross-region linkages by region

Table A3

	2021		2023	
	Within region	Cross-region	Within region	Cross-region
<u>Average out-degree<sup>1</sup></u>				
United States	1.45	0.85	1.44	0.94
North America ex US	1.06	0.92	1.16	0.81
Europe	1.32	1.04	1.23	1.01
China	1.58	0.53	1.57	0.40
Japan and Korea	3.44	1.23	3.12	1.04
Rest of Asia-Pacific	2.06	0.59	2.09	0.58
Other	1.07	0.85	1.10	0.78
<u>Average in-degree<sup>1</sup></u>				
United States	1.31	1.06	1.18	1.12
North America ex US	1.02	0.84	1.18	0.90
Europe	1.21	1.00	1.14	1.03
China	1.50	0.39	1.52	0.30
Japan and Korea	2.47	0.67	2.41	0.60
Rest of Asia-Pacific	1.90	0.35	1.99	0.30
Other	0.94	0.96	0.98	0.98

Region definitions follow Capital IQ's geographical classification: Africa/Middle East, Asia-Pacific, Europe, United States and Canada, and Latin America and Caribbean.<sup>1</sup> The average out-degree represents the mean number of customers for each supplier, while the average in-degree measures the average number of suppliers for each customer.

Sources: S&P Capital IQ; authors' calculations.

Table A4 presents the shares of cross-country linkages by the industry of supplier firms. Cross-country linkages are more pronounced among the two-step linkages compared to one-step linkages across all industries, consistent with the aggregate trends shown in Graph A2. Notably, the IT and auto industries emerge as two of the sectors that are most dependent on cross-country linkages.

Share of cross-country linkages by industry of supplier

Table A4

	One step	Two steps
Aerospace & Defense	55.42	73.43
Automobile & Components	53.33	77.89
Capital Goods ex Aerospace & Defense	50.68	68.52
Energy	41.24	67.60
Health Care	55.00	68.42
Information Technology	59.22	75.31
Materials	40.25	60.96
Other	46.96	65.29

Sources: S&P Capital IQ; authors' calculations.