Has Covid-19 Shaken the World Trade and China's Preeminence?

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The study compares the world trade network among the top merchandise trading countries before and during the COVID-19 pandemic. China's preeminence in world trade during the 2020 pandemic is also examined. The results reveal that the pandemic did not change the position of the countries in the world trade network during 2020, however, it drastically reduced trade density, interconnectedness, and connectivity. During 2020, China's trade preference was inclined toward intraregional trade due to the COVID-19 restrictions, which helped it regain global leadership.

I. Introduction

The COVID-19 pandemic has led to unimaginable deceleration and repercussions in international trade. The pandemic that originated in China disrupted global supply chains and caused severe contractions in trade. Most developed and developing economies are dependent on Chinese intermediate inputs. Many felt that China would lose its label of "global factory," potentially opening doors for other Asian economies. China's preeminence in global production and its role in trade are thoroughly discussed in previous works (Baldwin & Freeman, 2021; Baldwin & Tomiura, 2020).

A year after the first wave of COVID-19, in 2020, trade growth was marred by regional disparities. The COVID-19 pandemic continued to pose a threat to many countries, and the second wave of infections blocked recovery. World trade recorded a drastic reduction of 9% in 2020, with trade in goods having slumped to 6% and trade in services to 16.5% (UNCTAD, 2021a). Most economies suffered a significant drop in both exports and imports; however, an exception has been East Asia. China's trade pattern and growth were notably different from those of the rest of the world. Although Chinese exports fell in the first quarter of 2020, they regained their loss and stabilized by the second quarter, rebounding strongly and completely in the third quarter (UNCTAD, 2021b). Given these facts and the COVID-19 pandemic, the present paper examines whether China has maintained its lead, or central, position in the world trade network.

Studies on the effects of COVID-19 have emphasized different aspects of the economy, such as the financial markets (Ali et al., 2020; Narayan et al., 2021), exchange rates (Iyke, 2020), stock markets (Haroon & Rizvi, 2020), and the global trade network (Kiyota, 2021; Vidya & Prabheesh, 2020). Previous work (Vidya et al., 2020) have studied trade interconnectedness among countries before and during the onset of the COVID-19 pandemic in 2020 and find a change in the structure of the trade network at the beginning of the pandemic. The present study extends the analysis to the first wave of COVID-19 and focuses especially on China's trade predominance during the pandemic. For more details, see the in-depth literature survey on the economics of the COVID-19 pandemic by Padhan & Prabheesh (2021). Distinct from the studies mentioned, this paper focuses on the world trade network before and during the COVID-19 pandemic. Moreover, this work is one of very rare attempts to analyze the reasons for China's preeminence in world trade, even during the pandemic.

Our approach to analyzing the research issue is as follows. We apply trade network analysis to the top 25 global merchandise trading countries in 2019, that is, before the onset of the pandemic, and in 2020, that is, after the first wave. First, we find the position of each country in terms of the center and periphery of the network. Second, we analyze if China's preeminence in the world trade network has changed due to the pandemic. Third, we analyze how the pandemic has affected China's trade pattern, that is, whether it is more intra-regionally or inter-regionally inclined. We then apply bilateral trade intensity measures (intraregional import and export preferences) to China and 15 of its trade partners.

Our empirical findings are as follows: 1) The positioning of the countries in the world trade network has not changed since the first wave of the pandemic; 2) trade interconnectedness, connectivity, and density among countries were drastically reduced in 2020 compared to 2019; 3) China still occupies its central position, even after surges in the pandemic and resultant crisis; 4) China's exports surpass its imports, and it was one of the largest exporters in the world

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in 2020; and 5) China's trade preferences have shifted from inter-regional to intra-regional.

II. Data

To analyze the trade network, we use the top 25 countries in terms of global merchandise trading; the United States, Germany, China, the United Kingdom, France, the Netherlands, Italy, Belgium, Spain, Japan, South Korea, Hong Kong, Singapore, Switzerland, India, Canada, Malaysia, Mexico, Vietnam, Austria, Brazil, Ireland, Poland, Portugal, and Thailand. We obtain bilateral trade data from the CEIC Data and World Trade Organization databases. To analyze China's trade pattern, we examine its top 15 bilateral trade partners: the United States, Hong Kong, Japan, Vietnam, South Korea, Germany, the Netherlands, the United Kingdom, India, Taiwan, Singapore, Malaysia, Australia, Russia and Thailand.

III. Methodology

This study uses two methods for its analysis: a) network analysis and b) bilateral trade intensity indices.

A. Trade network analysis

A network is a mathematical description of a system at a given time in terms of nodes and links (Fagiolo et al., 2010). Every node has an in-degree and an out-degree in a network, where the out-degree is the number of outgoing edges and the in-degree is the number of incoming edges. The degrees represent trade flow. Correspondingly, the centrality parameters include closeness, eigenvector, betweenness, and density centrality. Closeness and eigenvector centrality indicate interconnectedness and connectivity, respectively. Similarly, betweenness shows the extent of regionalization. In comparison, network maps are only graphical representations. It is therefore worth adhering to the parameter results for comparisons of two periods.

We construct the network by preparing an undirected network matrix with N = 25 countries for 2019 and 2020. To estimate the network analysis of raw bilateral trade data, we calculate an export matrix in which the value of every cell is the mean export of country A to country B and the mean import of country B to country A.

B. Bilateral trade intensity indices

The bilateral trade intensity indices, indicating revealed trade preferences (RTPs), are derived from intraregional import preferences and intraregional export preferences. For a detailed discussion of this topic, see Vidya et al. (2020).

We analyze the bilateral trade intensity between countries through the RTP variable, *RTP*, which is derived from intraregional import preferences and intraregional export preferences. Lapadre & Tajoli (2014) define *RTP* as the relative bilateral trade intensity, the ratio between the difference and the sum of "homogeneous" bilateral trade intensity (HI_{ij}) and the extra-bilateral trade intensity index (HE_{ij}):
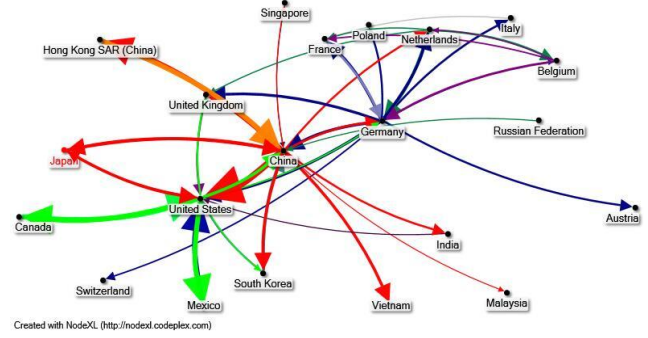
Figure 1. World merchandise trade network, 2019

The trade network map of the top 25 merchandise exporting countries in the world is provided in this plot. The thick arrows exhibit strong trade while the thin arrow lines show relatively weak trade relationships.

$$RTP_{ij} = (HI_{ij} - HE_{ij})/(HI_{ij} + HE_{ij}) \qquad (1)$$

where

$$HI_{ij} = S_{ij}/V_{ij} = (T_{ij}/T_{iW})/(T_{Oj}/T_{OW}),$$
$$HE_{ij} = (1 - S_{ij})/(1 - V_{ij})$$

,

with S_{ij} as partner country j's share of reporting country i's total trade and V_{ij} as its share of world trade. Similarly, T_{ij} is the total bilateral trade between reporting country i and partner country j, T_{iW} is the trade between reporting country i and the world, T_{Oj} is the trade between country j and the world, and T_{OW} is the total world trade. The RTP index ranges from −1 (no bilateral trade) to +1 (only bilateral trade), and the case in which it is equal to zero is called geographical neutrality.

IV. Empirical findings

A. World trade network

Figures 1 and 2 (panel A) show the network maps for 2019 and 2020, respectively. Figure 1 shows that China, the United States, and Germany are the major traders in the world, since they are central. China is at the map's epicenter, implying its global leadership during 2019. The thicker arrow lines denote strong trade flow during 2019.

Similarly, Figure 2 shows the trade network map for 2020, the year after the first wave of the pandemic. One similarity with the previous year, 2019, is China occupying the center. This result implies that the outburst of the pandemic did not change the position of the countries in the world trade network. During 2020, trade inflows and outflows among the countries were reduced. The arrows are thinner and less interconnected, and the only thick bilateral trade flows are for China, the United States, and Hong Kong.

Table 1 reports the network centrality parameters. These results show that overall trade density declined drastically, from 0.117 in 2019 to 0.0106 in 2020, which indicates that the pandemic severely impacted countries' trade flows and connectivity. The total degree (trade flows) for each country is almost the same in both years, indicating active trade flows. However, the measure of closeness, represented by the geodesic distance between countries i and j, has in-

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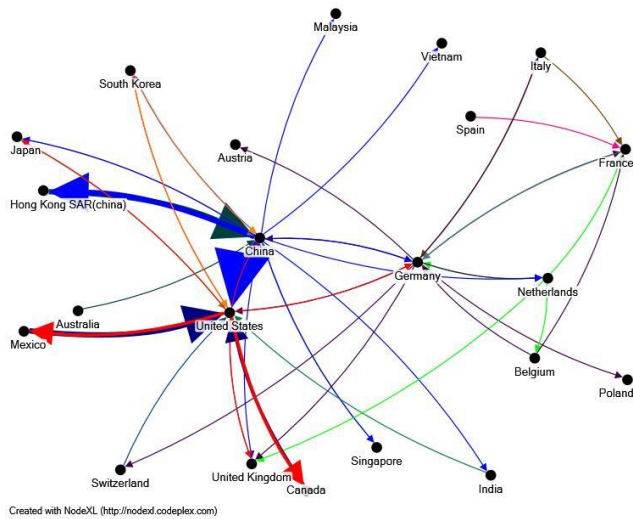
Figure 2. World merchandise trade network by 2020

This figure shows trade networks after the COVID-19 pandemic for the top merchandise exporting countries.

Table 1. Network centrality parameter values of countries, 2019 and 2020

	In-degree		Out-degree		Closeness		Eigen vector		Betweenness	
	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020
USA	15	15	11	11	0.591	0.61	1	1	0.3	0.295
Germany	10	10	11	11	0.591	0.61	0.867	0.878	0.131	0.119
China	8	8	11	11	0.619	0.625	0.588	0.45	0.192	0.178
UK	9	8	6	6	0.52	0.472	0.866	0.83	0.054	0.038
France	7	8	6	6	0.464	0.481	0.755	0.812	0.016	0.018
Netherlands	6	6	7	8	0.473	0.5	0.61	0.592	0.025	0.035
Italy	5	5	6	6	0.464	0.481	0.498	0.512	0.006	0.005
Belgium	4	4	6	6	0.456	0.472	0.511	0.522	0.003	0.003
Spain	4	4	5	5	0.413	0.424	0.429	0.441	0.026	0.025
Japan	3	4	5	5	0.456	0.463	0.306	0.288	0.029	0.034
South Korea	3	3	5	5	0.456	0.463	0.306	0.287	0.01	0.011
Singapore	1	1	5	5	0.456	0.463	0.095	0.076	0.026	0.025
India	2	2	2	1	0.4	0.391	0.101	0.078	0.06	0.033
TRADE DENSITY	0.117	0.106								

This table illustrates the network centrality measures for top merchandise trading countries in the world. The description of the terms in the table are: In-degree (exports), out-degree (imports), closeness (interconnectedness), eigen vector (measure of geodesic distance among countries), and betweenness (shortest path of connectivity between two countries). We only report data for 13 countries because for the remaining 12 countries there are zero values.

creased compared to 2019. This finding shows that the pandemic spread has increased geodesic distances between countries, that is, closeness has been reduced.

The measure of eigenvector centrality indicates how important a node is to the nodes around it; that is, it is a measure of interconnectedness. Compared to 2019, there is a marked reduction in this measure in 2020. Similarly, betweenness is a measure of dependency. The values of betweenness have dropped for the United States, Germany, China, the United Kingdom, Italy, Belgium, and India, indicating that pandemic has reduced trade integration.

B. Trade intensity measures of China and its partners

The trade intensity indices calculated for China and its partners show that China's export preferences are rising, and its import preferences are falling. Before the pandemic, in 2019, China exhibited strong import and export preferences in terms of the United States, Hong Kong, Vietnam, South Korea, the Netherlands, India, Singapore, and Thailand. However, after the pandemic spread, China's trade preference shifted to East and Southeast Asia. Table 2 shows the country's export preferences in 2020 with re-

Table 2. Bilateral trade intensity indices for China and its top 15 trading partners

Countries	2019			2020		
	Import preference	Export preference	RTP	Import preference	Export preference	RTP
USA	0.39	0.48	0.28	0.12	0.20	0.018
Hong Kong	0.52	0.64	0.34	0.57	0.70	0.38
Japan	0.27	0.41	**0.18**	0.21	0.32	0.10
Vietnam	0.11	0.31	0.11	0.16	0.22	0.09
South Korea	0.12	0.44	0.13	0.15	0.31	0.11
Germany	0.1	0.14	0.001	0.001	0.09	-0.01
Netherlands	0.2	0.43	0.12	0.12	0.21	0.03
UK	0.13	0.29	0.023	0.12	0.37	0.15
India	0.13	0.56	0.32	0.1	0.23	-0.1
Taiwan	0.12	0.34	0.07	0.001	0.19	0.001
Singapore	0.20	0.38	0.13	0.10	0.31	0.12
Malaysia	0.002	0.13	0.001	0.001	0.17	-0.01
Australia	0.2	0.16	0.014	0.001	0.002	-0.013
Russia	0.1	0.11	0.001	0	0.08	-0.002
Thailand	0.21	0.38	0.13	0.2	0.25	0.03

The table shows measures of bilateral trade intensity indices for China and its top 15 trading partners. The intra-regional export preferences and import preferences show measurements of China's preferences for its trading partners. The revealed trade preference (RTP) is reported for each of the years, 2019 and 2020.

gional partners such as Hong Kong (0.70), Japan (0.32), Vietnam (0.22), South Korea (0.31), and Singapore (0.31). The respective RTP values also show that trade with regional partners is positive and trade outside the region is either reduced or negative. Hence, we can summarize that China's trade pattern shifted toward intraregional after the first wave of COVID-19. Increasing trade and an intraregional trend for China are also found in 2020 (Harding, 2020; Nicita & Razo, 2020). This regionalization trend has helped China maintain its preeminence in world trade.

V. Conclusion

Although the COVID-19 pandemic originated in China in December 2019 and impacted the country's trade, China's relative position in trade network has not drastically changed. The network parameters show a considerable re-duction in trade density within a year. Similarly, trade integration among the countries analyzed was greatly reduced, and the geodesic distances between them has increased. China's trade pattern changed in favor of intraregional trade after the pandemic spread in 2020. China's RTPs toward regional partners shifted toward East and Southeast Asia, becoming negative for its other trade partners. This could be the reason for China's preeminence in world trade, even when the world is only slowly recovering from the restrictions of the COVID-19 pandemic. During this crisis, countries should initiate and promote international cooperation and reciprocity. Eliminating undue restrictions and barriers to trade will help revamp global supply chains and smooth the flow of goods and services.

References

Ali, M., Alam, N., & Rizvi, S. A. R. (2020). Coronavirus (COVID-19)—An epidemic or pandemic for financial markets. *Journal of Behavioral and Experimental Finance*, *27*, 100341. https://doi.org/10.1016/j.jbef.2020.100341

Baldwin, R., & Freeman, R. (2021). Trade conflict in the age of Covid-19. *VoxEU*. https://voxeu.org/article/trade-conflict-age-covid-19

Baldwin, R., & Tomiura, E. (2020). Thinking ahead about the trade impact of COVID-19. In *Economics in the Time of COVID-19* (p. 59).

Fagiolo, G., Reyes, J., & Schiavo, S. (2010). The evolution of the world trade web: a weighted-network analysis. *Journal of Evolutionary Economics*, *20*(4), 479–514. https://doi.org/10.1007/s00191-009-0160-x

Harding, R. (2020, November 2). *Asia: Trade briefing*. http://www.gtreview.com/supplement/GTR-Asia 2020/Asia-trade-brief

Haroon, O., & Rizvi, S. A. R. (2020). COVID-19: Media coverage and financial markets behavior—A sectoral inquiry. *Journal of Behavioral and Experimental Finance*, *27*(100343). https://doi.org/10.1016/j.jbef.2020.100343

Iyke, N. B. (2020). The disease outbreak channel of exchange rate return predictability: Evidence from COVID-19. *Emerging Markets Finance and Trade*, *56*(10), 2277–2297. https://doi.org/10.1080/1540496X.2020.1784718

Kiyota, K. (2021). The COVID-19 Pandemic and the World Trade Network. *Economic Research Institute for ASEAN and East Asia*, *ERIA Discussion Paper, 365*.

Lapadre, P. L., & Tajoli, L. (2014). Emerging countries and trade regionalization: A network analysis. *Journal of Policy Modeling*, *36S*, S89–S110.

Narayan, P. K., Phan, D. H. B., & Liu, G. (2021). COVID-19 lockdowns, stimulus packages, travel bans, and stock returns. *Finance Research Letters*, *38*, 101732. https://doi.org/10.1016/j.frl.2020.101732

Nicita, A., & Razo, C. (2020, April 27). *China: The rise of a trade titan*. https://unctad.org/news/china-rise-trade-titan

Padhan, R., & Prabheesh, K. P. (2021). The economics of COVID-19 pandemic: A survey. *Economic Analysis and Policy*, *70*, 220–237. https://doi.org/10.1016/j.eap.2021.02.012

UNCTAD. (2021a). *Trade trends under COVID-19 pandemic*. https://unctad.org/system/files/official-document/ditctab2020d4_en.pdf

UNCTAD. (2021b, February). *Global trade update*. https://unctad.org/system/files/official-document/ditcinf2021d1_en.pdf

Vidya, C. T., & Prabheesh, K. P. (2020). Implications of COVID-19 pandemic on the global trade networks. *Emerging Markets Finance and Trade*, *56*(10), 2408–2421. https://doi.org/10.1080/1540496x.2020.1785426

Vidya, C. T., Prabheesh, K. P., & Sirowa, S. (2020). Is trade integration leading to regionalization? Evidence from cross-country network analysis. *Journal of Economic Integration*, *35*(1), 10–38. https://doi.org/10.11130/jei.2020.35.1.10