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Industrial chain value chain topic

Great power strategic competition, networked interdependence and structural power in global value chains*

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Abstract: How does the strategic competition between great powers affect the distribution of power in the global value chain and the changes in the international power pattern reflected by the distribution of power? How does the securitization of economic issues and the weaponization of interdependence affect the changes in the network structure of the global value chain? Based on UIBE - GVC - Indicators database, ADB - MRIO 2021 database and GDELT big data. This article uses complex network analysis methods and multi-dimensional panel fixed effects models to empirically test the Sino-US strategic relationship, The U.S.'s threat perception towards China, Sino-U.S. trade friction and other systems The impact of factors on the international power structure and network structure in global value chains based on networked interdependence. The results show that China's network centrality and structural importance in global value chains have increased, the relative decline of the United States, the Changes in relative power among countries and the narrowing of the power gap among countries have not changed the "center-periphery" pattern and the power-law distribution characteristics of "the strong get stronger" in the global value chain network. The United States has in-degree centrality and betweenness centrality. Its strong performance and its inherent and high structural importance in global service trade and high-tech fields have given the United States more coercive power and the power base to weaponize interdependence and securitize economic issues. Sino-US strategic competition It is significantly negatively correlated with the structural power in the global value chain network, and has a greater negative impact on value-added exporting countries than value-added importing countries. Although Sino-US strategic competition has not weakened the degree centrality of the global value chain network, it has significantly It has significantly weakened the "center-periphery" pattern of the global value chain and the intermediary centrality of some countries in the global value chain network. Keywords: global value chain network interdependence structural power China-US strategic competition economic issues securitization interdependence

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How does the strategic competition between major powers affect the distribution of power in the global value chain, the relative strength between major powers reflected by the distribution of power, and the changes in the international power structure? In the long-term strategic competition between China and the United States, economic issues have become securitized, and interdependence has been weaponized (weaponized interdepenned). nce), how do the decline of Sino-US strategic relations, the rise of the United States' perception of China's "threat", the persistence of Sino-US trade frictions, and Sino-US competition in high-tech fields affect the network structure and power changes of the global value chain? ÿ

Based on UIBE-GVC-Indicators database, ADB-MRIO 2021 database and GDELT big data, this paper uses complex network and structural power. The theoretical framework is empirical, and the structural power distribution in the global value chain network based on networked interdependence is examined. and changes in the international power pattern and network structure mapped by structural power distribution. This paper also uses a multidimensional panel fixed effects model to empirically test the strategic competition between China and the United States, the two most structurally influential powers, on the power pattern of the global value chain. and the influence of network structure.

A basic concept and literature review

Structural power in global value chains arises from the global value chain network structure based on networked interdependence. A country's high degree of network centrality in the global value chain network structure and its scale, location, participation, and network center The high structural importance represented by sex gives the country the power base to weaponize interdependence and securitize economic issues.

(1) Networked interdependence and structural power in global value chains. Power is a

core topic in the study of international politics and international relations. Whether it is new structuralism, new institutionalism or constructivism, they all combine the system-level The distribution of power—the distribution of strength, institutions, and ideas—is the core independent variable in the international system. However, it is different from the traditional

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ÿ In the context of long-term strategic competition between China and the United States, China-U.S. strategic relations, the United States' perception of threats to China, Sino-U.S. trade frictions, and Sino-U.S. competition in high-tech fields themselves can to a large extent reflect the relationship between China and the United States as two major powers. The intensity of strategic competition between China and the United States during the sample period of this article (2000-2021), the Sino-US strategic relationship measured by the annual average of the Global Events, Language and Tone Database (GDELT) project from 2000 0 363 down to 0 099ÿ in 2021. The United States' perception of China, measured by the annual average of the GDELT project AvgTone, dropped from 1729 in 2000 to - 0287ÿ in 2021. The data comes from Th e GDELT Project https: / / www gdeltproject org [2023 - 05 - 23]

ÿ The distribution of power, system distribution (institutional power) or concept distribution (ideational power) in the international system all belong to structural power. The international system structure of structural realism, the institutional structure of neo-institutionalism or the conceptual structure of constructivism will all affect it. The behavior of states is an important source of structural power. See [US] Kenneth Waltz, translated by Xin Qiang: "International Political Theory", Shanghai: Shanghai People's Publishing House, 2017, pp. 84-107. [US] Robert Keohane, translated by Su Changhe and others: «After Hegemony: Cooperation and Conflict in World Political Economy», Shanghai: Shanghai People's Publishing House, 2012, pp. 17-45, [US] Alexander Winter Author, translated by Qin Yaqing: "Social Theory of International Politics", Shanghai: Shanghai People's Publishing House, 2014, pp. 94-138, Author: Qin Yaqing: "Relationship Theory of World Politics", Shanghai: Shanghai People's Publishing House, 2021, Pages 305 - 364

Compared with unitary power theories such as "strength is power", the network power in the global value chain and the relational power based on binary interdependence are more socialÿ, and the non-balanced nature of the network structure and the asymmetry of interdependence Structural power in global value chains with a micro-foundation is derived from the connectivity, system determinism (network structure shapes behavior) and resource distribution (power originates from the structure or the structure generates power) of the global value chain network structure. When divided into two categories : When the relational power brought about by the asymmetry of meta-interdependence is aggregated at the "position" in the network structure to the overall impact of the position on the entire network structure, a structure occupying a specific position in the global value chain network structure is formed. Sexual power. In a nutshell, structural power in global value chains is a kind of power that originates from and shapes the network structure.ÿ

(2) Networked interdependence and weaponized interdependence. The

structural power of states in the global value chain network comes from the state's relative position in the structure relative to others. The location of states and asymmetries in the flow and concentration of resources in specific locations—that is, networked interdependence The asymmetry of interdependence ÿ In a compound interdependence model based on binary interdependence, the asymmetry of interdependence gives the less dependent party more coercive power, and the sensitivity and vulnerability of interdependence This will make the party with greater dependence bear more adjustment pressure, greater loss probability and opportunity cost. ÿ In a higher-dimensional global value chain network based on networked interdependence and overall dependence, ÿ A country's high degree of network centrality in the network, especially intermediary centrality or intermediary powerÿ, and high structural importance endow the country with the ability to cut off network links.

ÿ See Robert O Keohane and Joseph S Nyeÿ Jr , Power and Interdependence Don: ÿLongmanÿ 201ÿ [US] Joseph Nye Jr., [Canada] Written by David Welch, translated by Zhang Xiaoming: «Understanding Global Conflict and Cooperation: Theory and History», Shanghai: Shanghai People's Publishing House, 2012 ÿ Pages 290-313ÿ

ÿ [US] Written by Susan Strange, translated by Yang Yuguang and others: «State and Market» (2nd edition), Shanghai: Shanghai People's Publishing House, 2019, pp. 20-24, Ren Lin, Sun Zhenmin: «Economic Security Hegemonic and hegemonic networked power», Published in "World Economy and Politics", Issue 6, 2021, Pages 83-109. Zhuo

ÿ Ye: «Coupling of Structural Power and International Institutional Complexity—Based on Sino-US Institutional Interaction Comparison of positive and negative cases», Published in "World Economy and Politics", Issue 4, 2023, Pages 126-155, Pang Xun, He Qingqian: "Structural Power in Global Value Chains and the Evolution of the International Pattern", Published in« Chinese Social Sciences», Issue 9, 2021, Pages 26-46.

ÿ Zhuo Ye: «Coupling of Structural Power and International Institutional Complexity—Comparison of Positive and Negative Cases Based on Sino-US Institutional Interaction», published in «World World Economics and Politics», Issue 4, 2023, Pages 133-135.

ÿ David A Baldwinÿ "Interdependence and Power: A ÿConceptual Analysis"ÿ in International Organ izationÿ Vol 34ÿ No 4ÿ 1980ÿ pp 471 - 506 is different from structural realism and other more

ÿ emphasis on national strength. In complex network analysis, network centrality (centrality) is often used to measure a country's position and power in the network structure. Network centrality is further divided into degree centrality (degree centrality) and closeness centrality (closeness centrality). ntraity) and betweenness centrality (betweenness centrality)ÿ in global value In the chain network, the higher the degree centrality of a country means that the country has stronger resource acquisition capabilities in the global value chain and the influence on other actors in the network. The higher the closeness centrality of a country, it means that the country has stronger degree centrality. The higher the degree of centrality of a country in the network and the stronger its influence. The higher the intermediary centrality of a country, the stronger the country's ability to control the flow of factors or cut off connections. See Yang Song, Francis Written by Ka B Keller and Zheng Lu, and translated by Cao Likun and Zeng Feng: "Social Network Analysis: Methods and Applications", Beijing: Social Science Literature Press, 2019.

and the power and ability to weaponize interdependence, securitize economic issues, and network sanctions against other actors. ÿ Take the value chain competition between China and the United States in the global semiconductor field as an example. It is exactly what the United States does in the two aspects of production equipment and chip design. The single center and absolute technological leadership it possesses gives the United States a high degree of intermediary centrality and intermediary power in the global semiconductor hierarchy network. The latter means that the United States can threaten to stop providing products or technology licenses to other nodes in the network, and impose sanctions on other nodes. Actors carry out network sanctions ÿÿ

(3) Changes in power between China and the United States and changes in the international power pattern in the global value chain. Changes in the international power pattern in the global value chain are first reflected in the distribution and structure of power among major powers. The distribution of power reflects the changes in power among major countries. China and the United States are the most connected countries in the global value chain. As two major countries with structural influence, some research has found that over the past 20 years (1990-2015), the power distribution of two countries in the global value chain has shown an obvious relationship of “one goes down and the other goes up”. The pattern trend also shows obvious "multi-polarization" and "rising in the east and falling in the west" trends. However, the international power pattern in the global value chain mapped by the distribution of power still maintains a high degree of "center-periphery" pattern. Global value Structural power in the chain network is still highly concentrated in a few countries such as China, the United States and Germany. However, some studies have found that although China has a high degree of structural importance and scale advantages in global manufacturing and commodity trade networks, the United States It still maintains strong intermediary centrality and system control capabilities in the global service trade network, advanced manufacturing and high-tech fields. It still maintains the structural advantages of a “single center”, extremely high intermediary power and networked sanctions in some key technical links. The coercive power of other countries. At least in the field of global value chains, the United States still has a high degree of network centrality and structural importance. The inherent structural advantages of the United States in the global service trade network, advanced manufacturing and high-tech fields offset its global manufacturing Industry,

ÿ See Henry Farrell and Abraham L Newman's "Weaponiz" ed Interdependence: How Global Economic Network rks Shape State Coercion" Ecologyÿ Vol 44ÿ No 1ÿ 2019 ÿ pp 42 - 79ÿ Ren Lin and Sun Zhenmin: «Economic Securitization and Hegemonic Network Power»ÿ «World Economy and Politics», Issue 6, 2021, pp. 83-109. Wu Xian: «Structural Limitations of New Networked Sanctions», published in «World Economy and Politics», Issue 11, 2022, pp. 132- Page 158, Page 164

ÿ Compared with the absence of central points in flat networks, hierarchical networks in complex network topologies often have only one or a few central points. See Thomas Oatley et al. The Political Economy of Global Finance: A Net work Model"ÿ in ÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿ 11ÿ ÿÿÿÿÿ 2013ÿ ÿÿÿÿ 3 - 153. Wu Xian: "Structural Limitations of New Networked Sanctions", published in "World Economy and Politics", Issue 11, 2022, pp. 132 - 158. Liu Hongzhong: "Hegemony" Support and Transcendence - The Political Economy of Global Value Chain Competition in High-tech Industries», published in "World Economy and Politics", Issue 2, 2023, pp. 128-154.

ÿ Pang Xun, He Qingqian: "Structural Power in Global Value Chains and the Evolution of the International Pattern", published in "Chinese Social Sciences", 2021 Issue 9, Pages 26 - 46

ÿ Yu Nanping: "The Shaping and Impact of Global Value Chains on International Power", published in "Chinese Social Sciences", Issue 12, 2022, pp. 120-137, Wu Xian: "Structural Limitations of New Networked Sanctions" Published in "World Economy and Politics", Issue 11, 2022, Pages 152-153.

The decline of structural power in the commodity trade network. It is the high degree of network centrality and structural power that the United States still has in networks such as the global value chain that allows the United States to still maintain power despite the relative decline of material power or the relative decline of hegemony. Can exert a sustained and strong influence in the global value chain and other fields ÿÿ

2 Networked interdependence and sources of power in global value chains

The power in the global value chain comes from the networked interdependence in the global value chain and the imbalance of the network structure based on the asymmetry of interdependence. Empirically examining the distribution of power in the global value chain and the changes in the international power pattern Previously, this article first used complex network analysis methods to measure and examine the network structural characteristics of global value chains and a country's power in the global value chain that is jointly determined by network structural characteristics, the location of nodes (countries) and their connection methods. Source and natureÿ

(1) Networked interdependence in global value chains The power

in global value chains first originates from the value-added network connections between different countries (regions) in the global value chain network with added value as the core. It is precisely the relationship between different countries that The binary interdependence constitutes the micro-foundation of networked interdependence and network structure in the global value chain. The asymmetry, sensitivity and vulnerability of networked interdependence endow different positions (nodes) in the network structure. , different power advantages of different actors. ÿ The chord diagram in Figure 1 shows the value added data calculated based on UIBE-GVC-Indicators and ADB-MRIO 2021. Global value chain network connection relationship based on added value. Among them, the arc represents the value-added connection between one country and other countries, the intensity of the arc represents the value-added between one country and other countries, and the arc length of the circle reflects the scale of added value of each country and its importance in the global value chain network. As shown in Figure 1, from 2000 to 2020, the United States and Germany have always occupied the network center or axis position in the global value chain network. The most significant change during this period is that China replaced Japan as the center or axis of the global value chain topological network. One of the three major network centers

In addition to changes in network structure, the arc length of the chord diagram in Figure 1 also shows the changes in the scale advantage of different countries in the directed weighted network of global value chains from 2000 to 2021. Among them, China's export added value has successively exceeded that of Japan, Germany and the United States, and increased from US$214.487 billion in 2000 to US$280 trillion in 2021, accounting for 322% of global export value added in 2000.

ÿ Luo Hang, Li Boxuan: «International Structural Analysis and National Power Measurement—Network Analysis Based on Big Data», published in «World Economy and Politics», Issue 6, 2021, pp. 48-82.

ÿ ÿÿÿÿÿ ÿÿÿÿÿÿÿ ÿÿÿ ÿÿÿÿÿÿÿ ÿ ÿÿÿÿÿÿÿ “ÿÿÿÿÿÿÿÿÿ ÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿ: ÿÿÿ ÿÿÿÿÿÿ ÿÿÿÿÿÿÿÿ ÿÿÿÿÿÿÿÿ ÿÿÿÿÿ ÿÿÿÿÿ ÿÿÿÿÿÿÿÿ”ÿ ÿÿ ÿÿÿÿÿÿÿÿÿÿÿÿÿÿ ÿÿÿÿÿÿÿÿÿ ÿÿÿ ÿÿÿ ÿÿ ÿÿ ÿÿÿÿÿ ÿÿ ÿÿ ÿ ÿÿ

rose to 1285% in 2021. The added value of imports has successively exceeded that of Japan and Germany, and has risen from US$173.977 billion in 2000 to US$234 trillion in 2021. Its proportion of global import added value has also increased from US$173.977 billion in 2000. 3.18% increased to 12.28% in 2021. ÿ During the same period, the added value of U.S. exports and imports increased from US$730.285 billion and US$1.08 trillion in 2000 to US$2.02 trillion and US$2.93 trillion in 2021, respectively. billion U.S. dollars, and its share in global export and import added value has also increased from 2000 to 2000. ÿ 10.97% and 19.64% in 2021 dropped to 9.23% and 15.38% in 2021 ý It is worth mentioning that although China's export added value in the weighted network of global value chains has ranked first in the world since it surpassed the United States in 2010, The added value of imports of the United States has remained No. 1 in the world over the past 20 years and has continued to rise. It is the asymmetry of the U.S.'s huge domestic market and network structure that gives the United States more power in the networked interdependence of global value chains. advantages and the power base to network sanctions other countries or weaponize interdependence in certain circumstances.ÿ

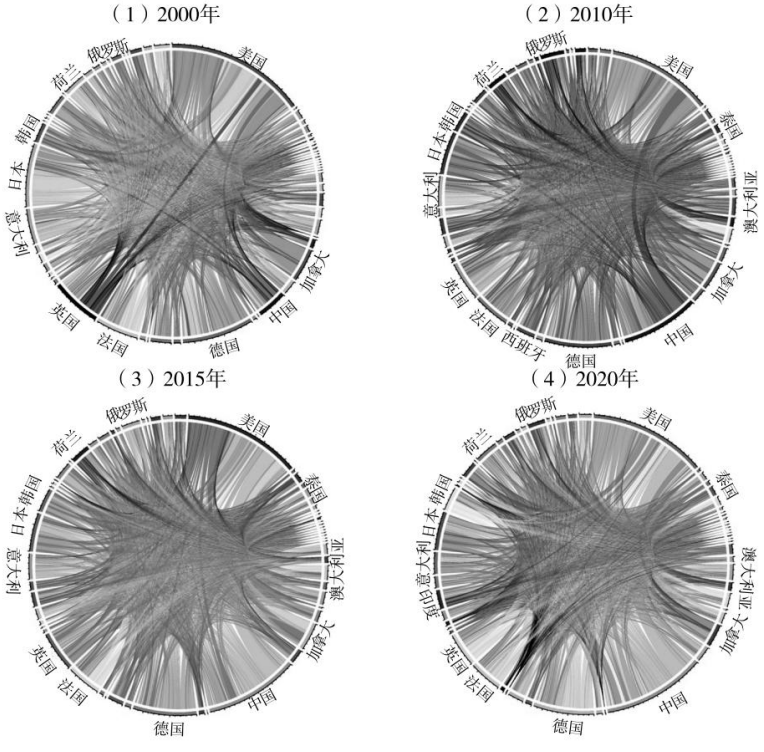

Figure 1 Global value-added trade network connection relationships

Data source: Calculated and drawn based on UIBE - GVC - Indicators, ADB - MRIO 2021 database related data.

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ÿ Wu Xian: "Structural Limitations of New Networked Sanctions", published in "World Economy and Politics", Issue 11, 2022, Pages 132-158, Page 164.

A country's power in the global value chain network not only depends on the network structure of the global value chain, network strength and the country's scale advantage, but also depends on the way the country is embedded in the global value chain and the degree of participation in the global value chain, at least as far as the global value chain is concerned. At present, Germany and the United States, among the three major hubs in the world, still have a higher status index in the global value chain than China. They are closer to the upstream or front-end industry position in the global value chain than China. This empirical fact This means that the United States and Germany have a stronger ability to obtain added value in the global value chain network and have a more significant driving force and influence on the entire value chain network system. This is why the United States and Germany can maintain their status as global value chain hubs for a long time. and a very important reason for structural influence. ÿ From the perspective of the extent to which countries participate in or are embedded in global value chains ÿ, Germany's global value chain participation index is significantly higher than that of China and the United States. However, the United States' forward participation is significantly higher. of Germany and China, and Germany's backward participation is significantly higher than that of China and the United States. Among them, Germany's global value chain participation index increased from 399% in 2000 to 509% in 2021, while China and the United States respectively It increased from 30.26% and 35.53% in 2000 to 35.04% and 39.05% in 2021. The above data means that compared with China and the United States, Germany has more connections with other participants in the global value chain network. This characteristic fact is also consistent with Germany's long-term stable and rising structural position in the global value chain.ÿ

(2) Degree centrality and direct power in the global value chain have both system and relational characteristics. In the directed weighted network of the global value chain, a country's power in the global value chain network is related to its role in the global value chain. The position in the chain and how it is connected,

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ÿ This article uses the global value chain status index to measure the way a country is embedded in the global value chain. The higher the index, the more dependent the country is on the global value chain. is close to the upstream link of the global value chain. The specific calculation formula is: GVC ps ∓ ln 1 + IVit / Eit ( )ÿ ÿÿ ÿ ÿ FVit / Eit) ÿ where ÿ ÿÿit is country i t is the indirect added value of exports in year t. FVit represents the foreign added value of country i's exports in year t. Eit represents the total exports of country i in value added in year t. See Koopman R ÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿeiÿÿ "ÿÿÿÿÿÿÿÿÿÿ - Jin ÿÿÿÿ" ue- added and Double Counting in Gross Exports"ÿ in American Economic Review Review 104ÿ No 2ÿ 2014ÿ p p ÿÿÿÿÿÿÿÿ ÿÿÿ uyer - Driven Global Commodity Chains: How U S Re Tailers Shape Overseas Production Networks"ÿ in Gary Gereffi and Miguel Korzeniewicz (eds)ÿCommodity Chains and Glob al Capitalismÿ London: Greenwood Publishing G ÿÿÿ ÿÿÿ ÿ 1994ÿ ÿ 97 Global value chain participation is often used to measure the degree of a country's embeddedness in the global value chain. The higher the index, the higher the country's involvement in the network

The closer the economic ties between China and other countries are, the specific calculation formula is as follows: GVC pt ÿ ÿÿÿ / – ÿ FVit ÿ Where, IVit is the indirect added value Eit of country i's exports in year t ; FVit represents the foreign added value of country i's exports in year t; Eit represents the total exports calculated in value added of country i in year t. ÿ

ÿ Calculated based on UIBE - GVC - Indicators related data, see UIBE - GVC - Indicators s http: / / gvcdb uibe edu cn / gvc html [2023 - 05 - 23] See Pang Xun, He Qingqian:

ÿ «Structures in global value chains Sexual Power and the Evolution of the International Pattern», published in "Chinese Social Sciences" Issue 9, 2021, Page 39.

Connection density, connection strength and connection objects are closely related. ÿ It is the position distribution of countries in the global value chain that constitutes the network structure of the global value chain itself. And whether a country's power in the global value chain network is based on binary interdependence Relational power and network power based on networked interdependence, or structural power at a more macro level (although the three power elements are at different levels), are all defined by the location of the power source - location Different actors have different powers. ÿ This article uses complex network analysis indicators such as degree centrality, eigenvector centrality and betweenness centrality to examine the network structure characteristics of global value chains, the positions and origins of countries in the network structure. The network structural characteristics, location and connection methods jointly determine a country's source of power and influence in the global value chain.

Propertiesÿ

Degree centrality is the total number of direct connections that a node has in the network. It is often used to measure the power status and influence distribution of nodes in the network. Corresponding to degree centrality, direct power is often used to measure A node's behavioral capabilities, resource acquisition capabilities and regional importance or influence in the network. ÿ The higher the degree centrality of a country in the global value chain network, the higher its core position in the global value chain. The higher the country's resource acquisition capabilities in the global value chain and its influence on other actors in the network, that is, its direct power. In directed networks, degree centrality is often divided into out-degree centrality (out - degree). and in-degree centrality (in - degree). The higher the out-degree centrality of a country in the directed weighted network of the global value chain, it means that the country's influence in the global value chain is stronger. The in-degree centrality of a country is The higher the degree centrality, the greater the country's importance or attractiveness in the global value chain.

Figure 2 reports the changes in degree centrality, that is, direct power, in the global value chain network between the three network hubs of China, the United States, and Germany and Japan (the former hub) from 2007 to 2021. As shown in the figure, 2007-2021 During the year, China's out-degree centrality surpassed the United States and Germany to rank first in the world. This is also consistent with China's status as the world's largest commodity trading country and the largest exporter. The United States' in-degree centrality has always ranked first in the world. This is also consistent with the fact that the United States, as the world's largest market

ÿ Pang Xun, Quan Jiayun: "Returning to the relational context of power - network analysis and measurement of national social power", published in "World Economy and Politics", Issue 6, 2015, pp. 39-64. See Qin Yaqing Author: «Relational

ÿ Theory of World Politics», Shanghai: Shanghai People's Publishing House, 2021, pp. 342-343. See Yang Song, Francesca B. Keller, Zheng Lu, also translated by

ÿ Cao Likun and Zeng Feng: «Social Network Analysis: Methods and Applications» Beijing: Social Science Literature Press, 2019 Pang Xun and Quan Jiayun: "Returning to the relational context of power - network analysis and

ÿ measurement of national social power", published in "World Economy" and Politics», Issue 6, 2015, Page 46. Relevant indicators are calculated using the social network analysis software UCINET. For details, please refer to [US]

ÿ Robert A. Hanneman and Mark Riddell, translated by Chen Shirong and Zhong Yuna: « Social Network Analysis Method: Application of UCINET » Beijing: Intellectual Property Press, 2019

matches the status of the market provider. In terms of specific fields, China's out-degree centrality in global manufacturing and commodity trade and in-degree centrality in services are higher than other countries in the network, while the United States is higher in manufacturing and goods trade than other countries in the network. The in-degree centrality in the industry and commodity trade fields and the out-degree centrality in the service industry both rank first in the world. China's strong performance in out-degree centrality gives China more influence in the global value chain network. The strong performance of the United States in in-degree centrality gives the United States more coercive power in the asymmetric interdependence pattern of the global value chain. The different performances of China and the United States in out-degree centrality and in-degree centrality further strengthen the Asymmetric interdependence pattern in the global value chain network structure.

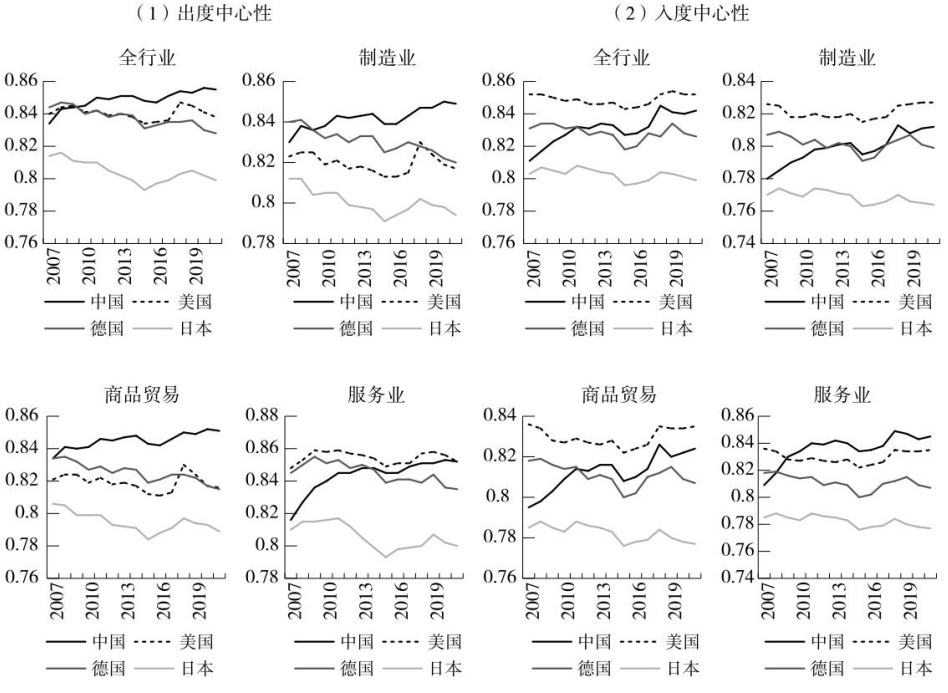

Figure 2 Degree centrality and direct power in global value chains (2007-2021)

Data source: Calculated based on UIBE - GVC - Indicators, ADB - MRIO 2021 database related data.

(3) Eigenvector centrality and access power and leverage power in global value chains

Eigenvector centrality is often used to measure the number of indirect relationships a node has in the network and its overall influence in the network. A The eigenvector centrality of a node not only depends on the centrality of the node, but also depends on the centrality of the connected nodes. In other words, the higher the eigenvector centrality of a node, not only means that the node has high centrality, but also means that the node is connected to

Most nodes also have high centrality. Corresponding to the eigenvector centrality are access power and leverage power. Access power measures the overall influence of a node in the entire network, while leverage power reflects a The "center-edge" status of a node in the network is different from the direct power derived from degree centrality. A node's direct and reliable relationship with important central nodes in the network will also become the source of power for this node. ÿÿ

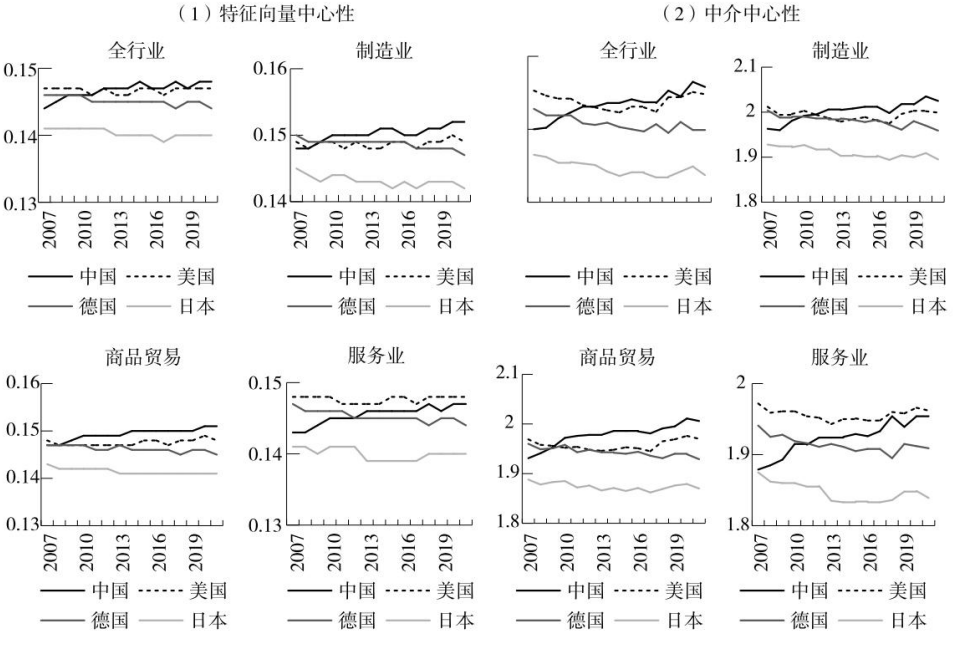

Figure 3 Eigenvector centrality and betweenness centrality in the global value chain (2007-2021)

Data source: Based on UIBE - GVC - Indicators, ADB - MRIO 2021 database related data calculation made.

In the global value chain network, the higher the value of a country's eigenvector centrality, the higher the degree of centrality and the stronger the influence of the country in the global value chain network. The lower the value, the higher the country's centrality in the global value chain network. The higher the degree of marginalization in the value chain network, the weaker the influence. Figure 3 (1) shows the changes in the eigenvector centrality, access power and leverage power of each country in the global value chain network. From the figure It can be seen that China's current eigenvector centrality in the global value chain network, that is, access power and leverage power, is higher than that of global or regional hub centers such as the United States, Germany, and Japan. From the global value chain perspective,

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From the perspective of participation patterns, China has higher centrality and overall influence in the manufacturing and commodity trade fields, while the United States has higher centrality and overall influence in the service industry.

(4) Betweenness centrality and intermediary power in global value chains. Betweenness

centrality is often used to measure the ability or degree of control of a node in the network over resources in the network. In the global value chain network, the intermediary center of a country is The higher the centrality, the stronger the country's ability to control the flow of factors, and the more critical the country's hub or bridge position in the network. Corresponding to betweenness centrality is intermediary power, a country's betweenness centrality in the network. The higher the intermediary centrality of a country in the network, the stronger the country's intermediary power to enhance, block or cut off connections. In other words, the higher the intermediary centrality of a country in the network, the country will convert its hub status and bridge position into coercive power or will mutually influence each other. Rely on weaponized capabilities

The stronger

Figure 3 (2) reports the changes in the weighted betweenness centrality and intermediary power of China, the United States, Germany and Japan in the global value chain network measured by flow betweenness centrality. ÿ As shown in the figure, currently China The betweenness centrality in the global value chain network is comparable to that of the United States. Although the betweenness centrality of the United States has experienced a decline in the past 20 years, in recent years

However, it has shown a clear trend of recovery. In terms of specific fields, the intermediary centrality of China in the manufacturing and commodity trade fields and the United States in the service industry is higher than that of other countries in the network. It is worth mentioning that the United States has higher intermediary centrality in the manufacturing industry. Although the intermediary centrality in the fields of industry and commodity trade is currently lower than that of China and the United States in 2000, the intermediary centrality of the United States in these two fields has shown a U-shaped reversal in recent years. Just as far as time is concerned, In terms of nodes, this reversal trend is highly consistent with the reshoring of the U.S. manufacturing industry and Sino-U.S. trade frictions and other events.

Power distribution in the three global value chain network systems and changes in the international power pattern

The source of power in the global value chain also shapes the structure. The distribution of power in the global value chain and the changes in the international power pattern reflected by the distribution of power are not only reflected in the power balance between major powers, that is, changes in important positions, but also in the changes in important positions. It is reflected in the dynamic changes in the structural characteristics of the global value chain network represented by the centrality of nodes and the overall distribution of structural power.

ÿ Some scholars call this behavior of using the asymmetry and intermediary status of the network to block or cut off connections the "chokepoint effect". See Henry Farre ll and Abraham L Newman ÿÿÿÿÿÿÿÿ ÿÿÿÿÿÿÿ Networks Shape State Coercion"ÿ in Internati onal Securityÿ Vol 44ÿ No 1ÿ 2019ÿ pp 42 - 79

(1) Relative power distribution and ebb and flow among major powers.

The changes in the international power pattern in the global value chain network are first reflected in the power distribution and relative power changes among major powers. Compared with the relational power in binary interdependence at the micro level, The structural power of the state in the global value chain arises from the networked interdependence in the gain dimension based on the directional flow of added value in the global value chain. Referring to the research of Pang Xun and He Qingqian, this article considers country i in the global value chain. Complete Structural power in the global value chain is defined as the country's structural power as a value-added exporter and its increased Value is the sum of the structural power of the importing country. The specific calculation formula is as follows:

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Among them, $SP^{ÿ}_{ÿÿ}$ is the structural power of country i as a value-added exporting country. The specific calculation formula is The sum of the logarithm of the added value exported by country i as a share of exports from all other countries in the network:

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In the above formula, $VA^{ÿ}_{ijt}$ represents the added value of country i's exports to country j in year t. Ejt represents the situation where country j Export share in the year. In order to avoid adding a value of $^{ÿ}_{ijt}$ produces negative infinity when t = 0. This paper uses logarithmic transformation 1 when VA.

$\text{ÿÿ} \; {}^{ÿ}_{ÿÿ}$ is the structural power of country i as a value-added importing country. The specific calculation formula is country i from The logarithmic sum of the value added of imports from all other countries in the network as a share of the latter's exports:

$$\text{ÿÿ} \; {}^{ÿ}_{ÿÿ} \quad \text{ÿ ÿÿÿÿ ÿÿÿ} \quad \text{æ} \; \frac{\text{ÿÿ ÿ}^{ÿ}_{ÿÿ}}{\text{ÿÿÿ}} \; \text{And} \; \text{ÿ ÿ} \; \text{Ö ø} \tag{ÿ}$$

In the above formula, $^{ÿ}_{ijt}$ represents the added value of country i's imports from country j in year t. Ejt represents the value added of country j in year t. VA's export share is

Figure 4 shows the calculated value-added data of China, the United States and Germany, the three most structurally influential countries, based on the value-added data of the two databases UIBE-GVC-Indicators and ADB-MRIO 2021. Network Hub Japan in Structural power changes in global value chains. As shown in Figure 4, the United States still has a high degree of structural importance in the global value chain network. Although the structural power of the United States as a value-added exporting country and in the fields of manufacturing and commodity trade have The structural power of the United States is lower than that of China. However, the structural power of the United States as a value-added importing country and the structural power in the service industry has always ranked first in the world in the past 20 years. The United States has strong leadership in technology, finance, intellectual property, law, education and consulting. Its power advantages in other fields allow the United States to control the global value chain network despite the relative decline of its hegemony.

ÿPang Xun, He Qingqian: "Structural Power in Global Value Chains and the Evolution of the International Pattern", published in "Chinese Social Sciences", 2021 Issue 9, 2016, pages 35-36.

In particular, the global service trade network maintains strong control and influence. As the world's largest importer of goods trade and the world's largest service trader, the United States can still rely on its hub position in the global value chain network and its role as an intermediary. A strong performance in terms of power, through market access, export controls, cutting off connections, etc., to control and constrain other actors in the network, allowing actors in a disadvantaged position in the network to bear more adjustment pressure and opportunity costs, so as to continue to maintain the U.S. Structural importance in global value chain networksÿÿ

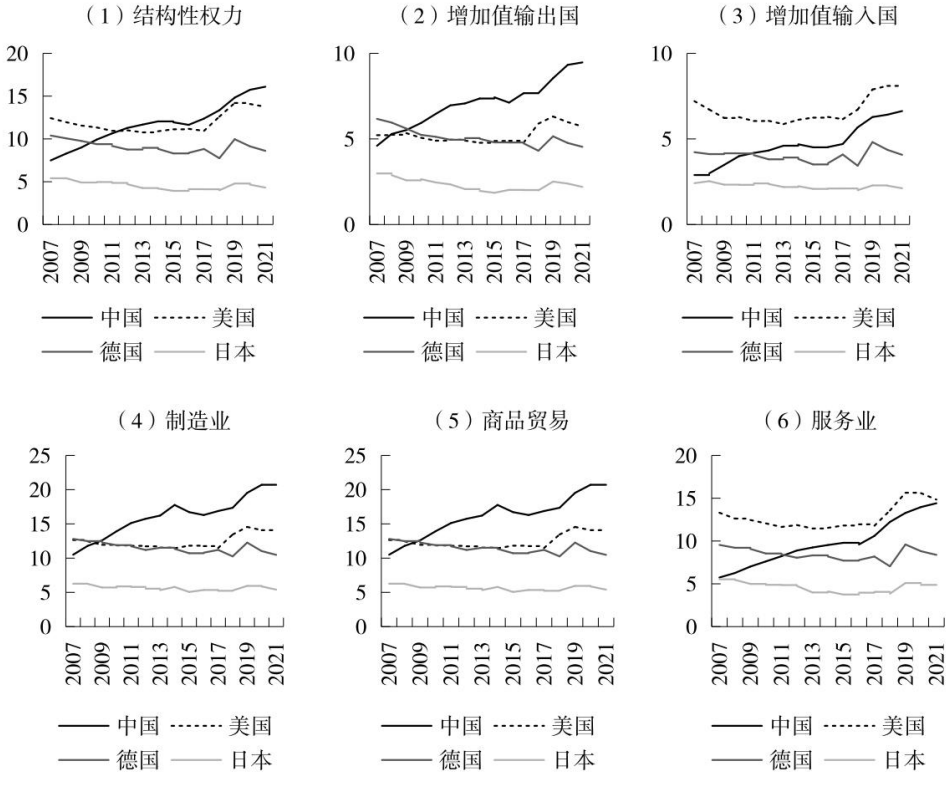

Figure 4 Structural power of major powers in global value chains (2007-2021)

Data source: Calculated based on UIBE - GVC - Indicators, ADB - MRIO 2021 database related data.

The most significant change in Figure 4 is the rise of China's structural power in the global value chain network. However, unlike the United States as a value-added importing country and its structural importance in the global services trade network, China's rise in structural power in the global value chain network comes more from China

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As value-added exporting countries, their structural power is rising and their structural importance in the manufacturing and commodity trade fields is rising. Compared with commodity trade, global service trade is subject to the path of "directed weighting" and "link preference" in the network. The impact of dependence is even more obvious. ÿ The huge "network precipitation" and "stickiness" that the United States already has in the global service trade network also make it difficult for China to change the network in the short term as it does in the global manufacturing and global commodity trade networks. It is difficult to shake the structural dominance of the United States in the global services trade network due to the link preferences of other actors.

Another significant change in Figure 4 is the recovery of the United States' structural power in the fields of manufacturing and commodity trade. Compared with the rising trend of China's structural power in the global value chain network and Germany's relatively stable structural importance, Although the structural power of the United States in the global value chain network has also experienced a period of decline, and although China and the United States have also shown a certain ebb and flow relationship, judging from the power recovery trend of the United States in recent years, at least globally In the field of value chain, it is difficult to say that the hegemony of the United States has already declined or has begun to decline. Judging from the Sino-US trade friction and Sino-US competition in the high-tech field, the United States has strong competitiveness in aerospace, navigation and avionics, material processing, advanced computing, and artificial intelligence. Key and emerging technology fields such as intelligence, chips, and semiconductor manufacturing technologies still have a high degree of network centrality, structural importance, and technology monopoly. With their high intermediary centrality in the global high-tech industrial chain and value chain, and other factors in the network, Actors have asymmetric dependence on the U.S. market or one-way dependence on U.S. technology. The United States still has the ability to unilaterally cut off network links and weaponize interdependence in the global high-tech or advanced manufacturing fields. It still has the ability to weaponize interdependence in some key emerging technology fields. Possess extremely strong system control capabilities and the ability to sanction other actors in the networked system.ÿ

(2) Distribution of network centrality and changes in network structure in global value chains.

Changes in the international power pattern in global value chains are not limited to the contrast and growth of structural power among major powers. It also depends on the characteristics and evolution rules of the network structure. ÿ The evolution of network structure is determined by

ÿ Yu Nanping: "The Shaping and Impact of Global Value Chains on International Power", published in "Chinese Social Sciences", Issue 12, 2022, No.

ÿ ÿ Wang Jinbo: «Institutional distance, cultural differences and power factors in Sino-US trade frictions—a quantitative study based on US foreign trade dispute data from 1980 to 2018», published in «Contemporary Asia-Pacific», Issue 2, 2020, No. 40 - Page 74, Song Guoyou, Zhang Jiteng: «Strategic Competition, Export Control and Sino-US High-tech Products Trade», published in "World Economy and Politics", Issue 3, 2023, pp. 2-31, Wu Xian: «New Networking Structural Limitations of Sanctions», published in "World Economy and Politics", Issue 11, 2022, Pages 132-158 + 164.

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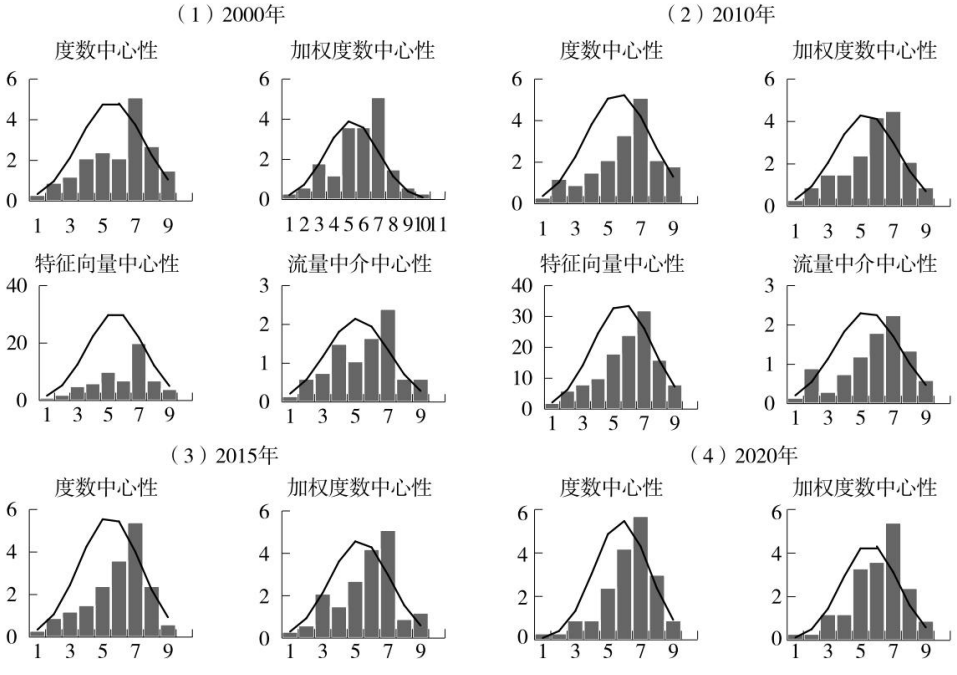
It is jointly determined by the fitness (fitness) of a certain connection change direction and the centrality of the node. ÿ In the global value chain network, a country's fitness in the network is often related to the country's resource endowment, technology, and manufacturing capabilities (global value chain network). Factor productivity), capital intensity, market size, intellectual property, business environment and many other financial, technological, economic and institutional variables are closely related. A country's network centrality not only depends on the country's adaptability, but also depends on the network centrality. The fitness of other actors, network centrality, and changes in global value chain network structure.

Figure 5 shows the changes in the network structure characteristics of the global value chain represented by the distribution of degree centrality, eigenvector centrality, and flow centrality. Judging from the distribution of network centrality in four periods, we can see that over the past 20 years ÿ Generally speaking, the network centrality of global value chains has always shown an obvious negative skew distribution (negative skewness distribution) characteristics. Compared with the normal distribution ÿ A negatively skewed distribution has a long left tail, the mean is smaller than the median Figure ÿ This negative skew distribution characteristic of global value chain network centrality means that countries with greater power in the global value chain network

The proportion is relatively large



ÿSee [US] Albert-Laszlo Barabasi, translated by Shen Huawei and Huang Junming: "Barabasi Network Science", Zhengzhou: Henan Science and Technology Press, 2020, pp. 248-256, Ginestra Bianconi and Albert - László Barabásiÿ "Competit" ion and Multiscaling in Evolving Networks"ÿ i n Europhysics Lettersÿ Vol 54ÿ No 4ÿ 2001ÿ pp 436 - ÿÿÿÿ

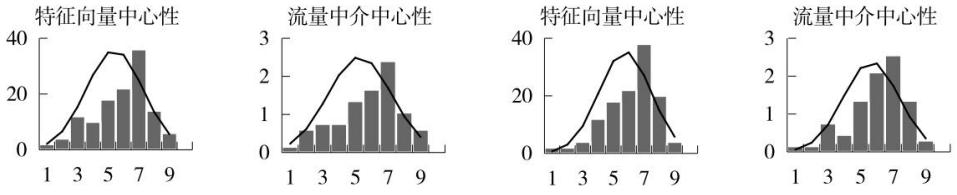


Figure 5 Network structure changes in global value chains

Data source: Calculated based on relevant data from ADB-MRIO 2021 database.

A phenomenon worthy of attention is that during the sample period of this article (2000-2021), whether it is the distribution of degree centrality, eigenvector centrality, or flow betweenness centrality, the difference between the median and the mean shows an obvious difference. There is a downward trend. Among them, the difference between the median and the mean of degree centrality dropped from 0.03 in 2000 to 0.01 in 2021. The differences between the median and the mean of eigenvector centrality and flow betweenness centrality were respectively It dropped from 0 03 and 0 04 in 2000 to 0 01 and 0 02 in 2021. ÿ In a negatively skewed distribution, the smaller the difference between the median and the mean means the smaller the difference between the extreme values on both sides of the median. Specifically When it comes to global value chains, the narrowing of the difference between the median and the average in the time dimension means the narrowing of the power gap between countries. This empirical fact shows that although major powers such as the United States and Germany have always maintained their dominance in the global value chain network, With a high degree of network centrality, China's network centrality in the global value chain is also on the rise. However, the global value chain network system does not show a trend of over-concentration of power to the network center. One possible reason is that globalization has development, the increased participation of developing countries, the collective rise of emerging economies represented by China, and the relative decline of the United States have more or less narrowed the "extreme values" in the global value chain network, that is, the gap between

center countries and peripheral countries. power gap. (3) The distribution of structural power in the global value chain and changes in the international power pattern. The changes in the international power pattern in the global value chain are not only reflected in the power balance between major powers, that is, changes in important structural positions and changes in network structures. The evolution is also reflected in the overall distribution and changing trends of structural power in the global value chain network. Figures 6 (1) - 6 (2) report the various types of structural power in the global value chain measured by the Gini coefficient from 2007 to 2021. The overall distribution of power and the changing trend of the international power pattern mapped by the overall distribution. It can be seen from the figure that between 2007 and 2021, the Gini coefficients of structural power in various types, industries and years in the global value chain are all. It is above 0 6 and showing an overall upward trend. This shows that the global value chain is a network with uneven d

ÿData source: The author calculated based on the relevant data of UIBE-GVC-Indicators and ADB-MRIO 2021 database.

It is highly concentrated in a few countries, and the international power pattern in the global value chain reflected by the distribution of power shows a high degree of "center-periphery" pattern. ÿ In terms of specific fields, the structural power distribution in the global manufacturing network The degree of inequality is higher than that in the global trade network of goods and services. An empirical fact worthy of attention in Figures 6 (1) - 6 (2) is that before and after 2018, the Gini coefficient of various structural powers There is an obvious jump in the time series. From a time point perspective, the emergence of this jump is closely related to the Sino-US trade war that began in March 2018. A possible explanation is that the occurrence of Sino-US trade frictions and the relationship between Sino-US strategies Escalating competition has intensified the unequal distribution of power in global value chain networks.

Figures 6 (3) - 6 (6) further show the overall distribution of structural power in the global value chain at four time nodes in 2000, 2010, 2015 and 2020. Judging from the distribution of the four time nodes, The overall distribution of structural power in the global value chain shows obvious power law distribution (power law) characteristics, with a long right tail. This long-tail distribution means that the structural power of most countries in the global value chain network are very small, and only a handful of countries have very large structural power. This long-tail distribution also shows from the side that over the past many years, China's continuous rise in network centrality and structural power in the global value chain has not changed but has It may strengthen the "center-periphery" pattern of the global value chain network. A possible theoretical explanation is that the global value chain is a scale-free network (scale-free network), and China, as a newly added node (joined in 2001) As the time node of the World Trade Organization (China has rapidly integrated into the global value chain network), it will always give priority to connecting to nodes with high network moderate values (such as the United States and Germany), and as time goes by, China's network is getting higher and higher. Adaptability also makes China gradually become the target of active or priority connection by other nodes, thereby strengthening the power law distribution phenomenon that already exists in the global value chain network. ÿ It is the growth, priority connectivity and scale-free nature of the global value chain network . The dynamic aggregation rather than static evolution characteristics of the network allow the global value chain network to present a power law distribution characteristic of "the strong get stronger".

ÿ For similar research and conclusions, see Pang Xun and He Qingqian: "Structural Power in Global Value Chains and the Evolution of the International Pattern", published in "China Chinese Social Sciences», Issue 9, 2021, Pages 41-43.

ÿ A scale-free network is a network whose degree distribution obeys or is close to a power law distribution. It is different from a random network. A scale-free network has growth and preferential connectivity. Growth refers to the addition of new nodes and the increase in the number of network nodes. Increasing, preferential connectivity means that newly added nodes always tend to preferentially choose to connect to nodes with a high number of connections in the network. The network dynamic evolution model of Albert-Laszlo Barabá believes that growth and preferential connectivity are the two most fundamental reasons why the scale-free network distribution presents a power law distribution. See [US] Albert-Laszlo Barabasi, translated by Shen Huawei and Huang Junming: «Barabasi Network Science», Zhengzhou : Henan Science and Technology Press, 2020, pp. 191-255.

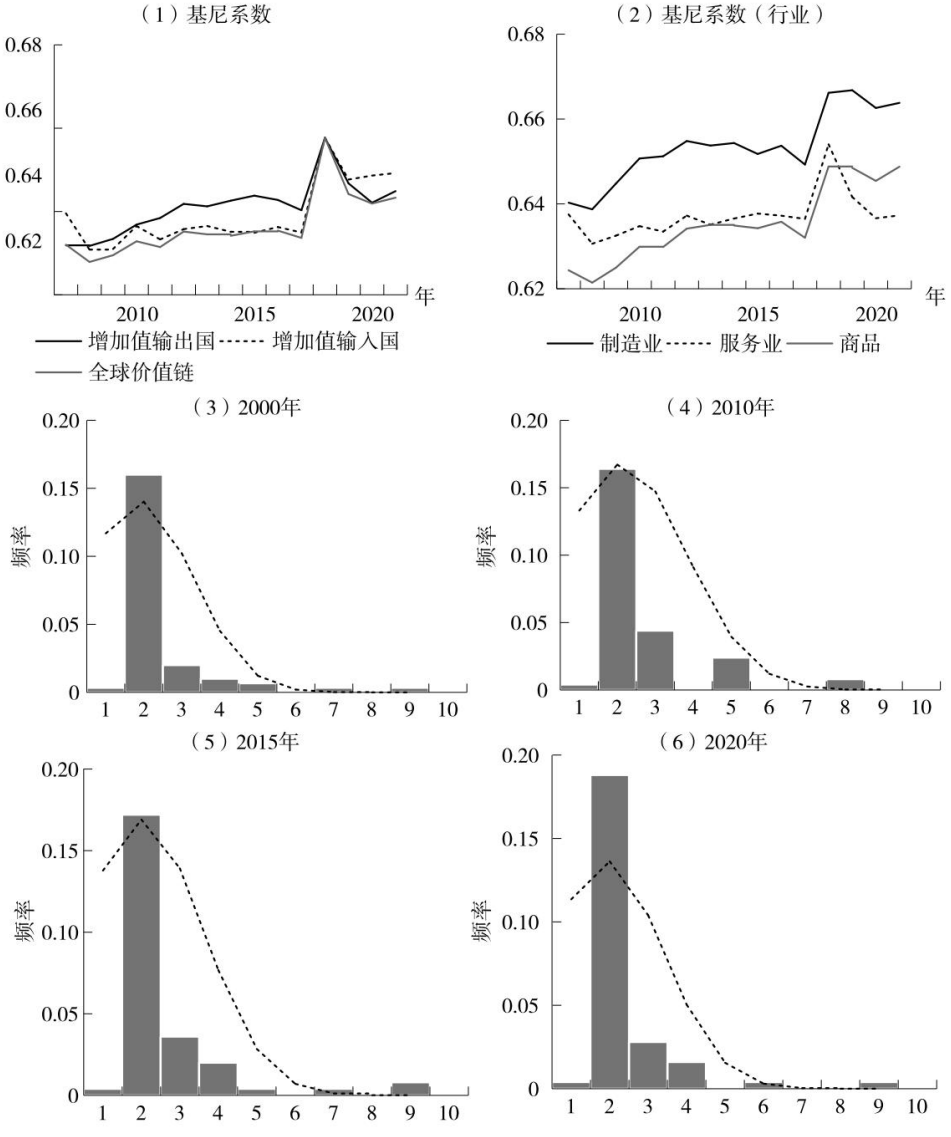


Figure 6 Structural power distribution in the global value chain network (2000, 2007-2021)

Note: Frequency is the ratio of frequency to the total number of sample data. Frequency refers to the number of data contained in each group after the samples are grouped. Data source: Calculated based on relevant data from the ADB-MRIO 2021 database.

4. Sino-US strategic competition and changes in the international power structure in the global value chain

How strategic competition among great powers affects the distribution of power in global value chains and what is mapped by the distribution of power

What are the changes in the international power structure? Taking the structural power of countries in the global value chain as the explained variable and Sino-US strategic competition as the core explanatory variable, this paper uses a multi-dimensional panel fixed effects model to empirically test how the strategic competition of great powers affects the global value chain. network structure and international power patterns in Changes

(1) Data and variable 1

explained variable

Based on the export value-added data of UIBE-GVC-Indicators and ADB-MRIO 2021 database, this article uses the structural power and network centrality of countries (regions) in the global value chain as the explained variables to conduct empirical research. Examining the impact of major power strategic competition on global value chains The influence of network structure and power structure. ÿ The sample covers 62 countries or regions in 15 years (2007-2021). ÿ

2 Core explanatory variables

(1) Sino-U.S. strategic relationship: This article uses the Global Database of Events, Language and Tone (GDELT) Goldstein annual average of China (U.S.) versus U.S. (China) events to measure Sino-U.S. strategic relations. ÿ As the power gap between China and the United States continues to narrow, China In the context of the intensifying strategic competition between the United States and the United States, Sino-U.S. relations themselves can to a large extent reflect the intensity of strategic competition between China and the United States. ÿ In order to facilitate the interpretation, comparison and understanding of the regression coefficients, this article performs reverse processing on the annual mean value of Goldstein ÿ After reverse processing, the larger the value, the more intense the strategic competition

between China and the United States. (2) The U.S.'s threat perception towards China: This article uses the AvgTone annual average of the GDELT database's U.S.-China incidents to measure the U.S.'s threat perception towards China. Know ÿÿ In order to facilitate the solution of regression coefficients

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ÿ The calculation method of structural power and network centrality is as mentioned above. The original value used to calculate network centrality and structural power is For value chain data, see UIBE GVC database ÿ http: / / gvcdb uibe edu cn / g vc html [2023-05-23]

ÿ UIBE-GVC-Indicators and ADB-MRIO 2021 database export value-added data covers 2000, 2007-2021 Years, taking into account the consistency of panel data, this paper eliminates the data of 2000 in the empirical test.

ÿ The value range of Goldstein is [-10, 10]. The higher the score, the higher the degree of cooperation between a country and other countries. ÿ Vice versa The higher the degree of conflict. During the sample period of this article, the annual average Goldstein value of U.S. incidents against China dropped from 0,363 in 2000 to The data of 0 099 in 2021 comes from The GDELT Projectÿ "GDELT 1 0 Event Data base". http: // data gdeltproject org [2023 - 05 - 23] Cao Wei:

Politics»ÿ[J]ÿChoosing Sides or Hedging——The Choice of Asia-Pacific Countries in the Context of Sino-US Strategic Competition», published in «World Economy and Issue 2, 2021, pages 47-77.

ÿ The value of AvgTone is in the range of [-100, 100]. The larger the value, the more positive a country's perception of other countries is. The smaller the value, the more positive a country's perception of other countries is. Indicates the more negative a country's perception of other countries. During the sample period of this article, the annual AvgTone average value of the United States' response to China events increased from 2000 to 2000. 1 729 dropped to -0 287 in 2021. The data comes from The GDELT Project ÿ "GDELT 1 0 Event Database". http: / / data ÿÿÿÿÿÿÿÿÿÿÿÿ ÿÿÿ [ÿÿÿÿ ÿ ÿÿ ÿ ÿÿ]

Interpretation, comparison and understanding, this article also performed reverse processing on AvgTone's annual average. After reverse processing, the larger the value, the higher the U.S.'s perception of China's threat. Some studies believe that the main source of the U.S.'s containment of China in the high-tech field is Regarding the U.S.'s perception of China as a threat, ÿ empirical research also found that the changes in power between China and the United States and the intensification of Sino-U.S. strategic competition not only strengthened the U.S.'s perception of China as a threat, but also profoundly affected and shaped other countries (regions) in the international system.) Perception of China and choice preferences and strategic orientation between China and the United States ÿÿ

(3) Sino-US trade friction: This variable is a dummy variable. The value is 1 in 2018 and later, and 0 for others. Sino-US trade friction is the result of the joint action of systemic incentives and domestic factors in the United States. It is the strategic competition between China and the United States in the international economic field. ÿEmpirical research also found that the tariff cost effect and trade diversion effect of Sino-US trade friction have brought huge welfare losses to China and the United States, while also affecting global value.

The income distribution pattern and power structure of the chain have also caused a great impact.

ÿ 3 Control variables

In order to better identify the causal relationship between the strategic competition between China and the United States and the network structure and power structure of the global value chain, this article also calculates a country's market size (logarithm of GDP) and foreign direct investment stock (logarithm)ÿ , the network strength of free trade agreements signed by a country with foreign countriesÿ, and the total factor production of a country

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ÿ Song Guoyou, Zhang Jiteng: «Strategic Competition, Export Control and Sino-US High-Tech Products Trade», published in «World Economy and Politics», Issue 3, 2023, pp. 2-31. Pang Qin: «The role of third countries in the Sino-US economy Research on Choice Preferences in Competition», Published in "World Economy and Politics", Issue 4,

ÿ 2022, Pages 30-61. Wang Jinbo: "Can the "One Belt and One Road" Initiative Improve China's National Image", Published in "World Economy and Politics" ÿ Issue 2, 2022, Pages 4-31. Cao Wei: «Choose Sides or Hedging—The Choice of Asia-Pacific Countries in the Context of Sino-US Strategic Competition», published in «World Economy and

ÿ Politics», Issue 2, 2021, Pages 47 - 77 Wang Jinbo: «Institutional distance, cultural differences and power factors in Sino-US trade frictions—a quantitative study based on US foreign trade dispute data from 1980 to 2018», published in "Contemporary Asia-Pacific",

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ÿ The data comes from UNCTAD STAT unctad org / EN/ [2023-05-23] This paper uses the degree centrality of a country in the global free trade

ÿ agreement network to measure the free trade agreements signed by the country.

Network strength, original data comes from Design of Trade Agreements (DESTA) Databas e httptps: / / www designoftra deagreements org [2023 - 05-23]

rate level ÿ, a country's trade ties with China and the United States ÿ, a country's tendency to choose sides or hedging between China and the United States ÿ, a country's alliance with the United States (dummy variable) ÿ and the "Belt and Road Initiative" Variables such as partnership (dummy variable)ÿ are included in the model to control the relationship between a country and China and the United States and the impact of some of the country's own characteristic variables on the global value chain network structure and

power pattern. (2)

Measurement The model is based on the export value-added data of UIBE-GVC-Indicators and ADB-MRIO 2021 database. This article uses a multi-dimensional panel fixed effect model to empirically test the impact of strategic competition among major countries on the global value chain. The influence of power structure. The specific model design is as follows:

$$GVCit = ÿ + ÿXit + ÿYit + ÿi + ÿj + ÿt + ÿit \text{ where} \quad (4)$$

ÿ GVCit is the explained variable; countries involved (Region) i Structural power, degree centrality, eigenvector centrality in the global value chain network a series of power measurement indicators such as intermediary centrality and betweenness centrality . ÿj is the industry fixed effect, ÿt is the time fixed effect, ÿit is the error term.

ÿ Some studies have found that a country's total factor productivity has a significant positive impact on the country's export upstream status in the global value chain. See Ni Hongfu and Wang Haicheng: «The position of enterprises in the global value chain and its structural changes», ed. «Economic Research», No. 2, 2022, Pages 107-124, Data comes from PWT 10 01 https: / / www rug nl / ggdc / p Roductivity / pwt / [2023-05-23]

ÿ This article uses the proportion of a country's bilateral trade volume with China (the United States) in the country's GDP to measure the country's trade ties with China (the United States) and its economic dependence on China (the United States). The trade data comes from UN Comtrade Database. https: / / comtradeplus unorg / TradeFlow [2023-05-2 ÿ]ÿ ÿÿÿ data comes fromÿÿÿÿÿÿÿÿÿÿData ÿÿÿÿÿÿÿÿÿ: // ÿÿÿÿÿÿÿÿ tat unctad org / EN/ [2023-05-23] The preference for choosing sides is one country versus China The Goldstein annual

ÿ mean of the event is subtracted from the Goldstein annual mean of the country's events in the United States. The hedging propensity is the square of the side-taking propensity. The data comes from The GDELT Pr ojetÿ "GDELT 1 0 Event Database". http://datagdel tprojet org [2023-05 - 23] Some studies have found that in the strategic competition between the

ÿ United States and China, alliance pressure and the "alignment effect" are also significantly affecting the relations and economic and trade policies of U.S. allies with China. See Wu Xinbo: «U.S. Pressure and Allies' Relations with China Economic and Trade Policy», Published in "World Economy and Politics", Issue 1, 2022, Pages 76-102, Wang Xueying: "Why the Moon Shines in the Ditch - A Quantitative Study on the Relations between U.S. Allies towards China", Published in "World Economy" and Politics», Issue 3, 2023, pp. 92-124. Some research has found that

ÿ the value chain optimization effect of the "Belt and Road Initiative" can significantly enhance the division of labor status of co-building countries in the global value chain. Another research has found that, While "One Belt, One Road" will significantly strengthen the trade links between the participating countries, it will also have a positive role in promoting the specialization of each country's division of labor model in the global value chain network. See Dai Xiang and Song Jie: « " The Optimization Effect of the Global Value Chain of the Belt and Road Initiative - Based on the Perspective of the Improvement of the Division of Labor in the Global Value Chain of Participating Countries Along the Belt and Road», published in "China Industrial Economy", Issue 6, 2021, Pages 99-117, Liu Youjin, Zhou Jian , Zeng Xiaoming: «The mutually beneficial and symbiotic relationship between China and the countries along the "Belt and Road" industrial transfer», published in "China Industrial Economy", Issue 2, 2023, pp. 55-73, Zhang Hui, Yan Qiangming, Li Jingjing: « " The Belt and Road Initiative promotes the shared effects of international trade», published in "Economic Research", Issue 5, 2023, Pages 4-22. The "Belt and Road" partnership data comes from the China Belt and Road Network: «Has signed a joint agreement with China List of countries that have signed cooperation documents on the Belt and Road Initiative » 77298 html [2023-05-23]

(3) Benchmark regression results

Table 1 gives the baseline response to how strategic competition between China and the United States affects structural power in global value chains.

The results are summarized. As shown in Table 1, Sino-US strategic relationship, US threat perception to China, Sino-US trade frictions

The regression coefficients of variables such as friction are all significantly negative at the 1% level, which means that the strategic relationship between China and the United States is declining.

That is, the intensification of strategic competition between China and the United States, the rise of the United States' perception of China's "threat" and the rise of Sino-US trade frictions.

Sustainability is significantly negatively related to the structural power distribution in global value chains. This empirical result shows that China

Strategic competition between the two most structurally influential powers, the United States, will not only weaken the two countries' positions in global value chains

The structural importance of other countries or regions in the network will also be weakened. This empirical result

The results also mean that the impact of China-US strategic competition on the global value chain is systemic. The two major powers China and the United States

The weakening of structural importance in global value chains does not necessarily mean that other countries or regions in the network

The growth of structural power. Judging from the size of the regression coefficient, Sino-US strategic relations continue to decline.

That is to say, the intensification of strategic competition between China and the United States has a greater negative impact on structural power in the global value chain than that between China and the United States.

Trade friction and the negative impact of the United States on China's threat perception. This empirical fact means that the system

The negative effect of pressure on the global value chain is greater than the negative effect of economic factors and cognitive factors.

Table 1 Sino-US strategic competition and structural power in global value chains

	Model 1 Model 2 Model 3 Model 4 Model 5 Model 6					
Sino-US strategic relations	ÿ ÿ ÿÿÿÿ ??? (ÿ ÿÿÿ)	ÿ ÿ ÿÿÿÿ ??? (ÿ ÿÿÿ)				
America versus China threat perception			ÿ ÿ ÿÿÿÿ ??? (ÿ ÿÿÿ)	ÿ ÿ ÿÿÿÿ ??? (ÿ ÿÿÿ)		
Sino-US trade friction					ÿ ÿ ÿÿÿÿ ??? (ÿ ÿÿÿ)	ÿ ÿ ÿÿÿÿ ??? (ÿ ÿÿÿ)
control variables	no	yes	no	yes	no	yes
time fixed effects	yes	yes	yes	yes	yes	yes
Industry fixed effects	yes	yes	yes	yes	yes	yes
Country fixed effects	yes	yes	yes	yes	yes	yes
Observations	ÿÿÿÿÿÿ	ÿÿÿÿÿÿ	ÿÿÿÿÿÿ	ÿÿÿÿÿÿ	ÿÿÿÿÿÿ	ÿÿÿÿÿÿ
ÿ ÿ	ÿ ÿÿÿÿ	ÿ ÿÿÿÿ	ÿ ÿÿÿÿ	ÿ ÿÿÿÿ	ÿ ÿÿÿÿ	ÿ ÿÿÿÿ

Note: The values outside the brackets are coefficients, and the values inside the brackets are robust standard deviations. ****, *** and * respectively indicate ÿ 5% and 10% significance at the 1% level.

Source: Self-made by the authorÿ

(4) Heterogeneity and Robustness Analysis

Table 2 shows the strategic competition between China and the United States on value-added exporting countries and value-added importing countries in the global value chain.
The influence of structural power. Judging from the empirical results, the decline of Sino-US strategic relations (China-US strategic competition
(increased level of competition), the United States' perception of China's "threat", Sino-U.S. trade friction and other variables and added value
There is a significant negative correlation between the structural power of exporting countries and value-added importing countries. In comparison, the strategic competition between China and the United States
competition, the United States' perceived threat to China, and the impact of Sino-U.S. trade friction on the structural power of value-added exporting countries.
The negative impact is greater than the negative impact on value-added importing countries. This empirical result is also consistent with China as the largest
The status of value-added exporting countries and the United States as the largest value-added importing country and the asymmetry of interdependence are comparable.
It is consistent with the United States and takes advantage of its status as the largest importer of added value and its interdependent asymmetric initiative.
The policy of initiating trade friction against China and imposing network sanctions on China in the high-tech field are consistent with the facts.

Table 2 Sino-US strategic competition and structural power in global value chains (flow of added value)

	value-added exporting countries			value-added importing country		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Sino-US strategic relations	ÿ ÿ ÿÿÿ ÿÿÿ (ÿ ÿÿÿ)			ÿ ÿ ÿÿÿ ÿÿÿ (ÿ ÿÿÿ)		
America versus China "Threat" perception		ÿ ÿ ÿÿÿ ÿÿÿ (ÿ ÿÿÿ)			ÿ ÿ ÿÿÿ ÿÿÿ (ÿ ÿÿÿ)	
Sino-US trade friction			ÿ ÿ ÿÿÿ ÿÿÿ (ÿ ÿÿÿ)			ÿ ÿ ÿÿÿ ÿÿÿ (ÿ ÿÿÿ)
control variables	yes	yes	yes	yes	yes	yes
time fixed effects	yes	yes	yes	yes	yes	yes
Industry fixed effects	yes	yes	yes	yes	yes	yes
Country fixed effects	yes	yes	yes	yes	yes	yes
Observations	ÿÿÿÿÿ	ÿÿÿÿÿ	ÿÿÿÿÿ	ÿÿÿÿÿ	ÿÿÿÿÿ	ÿÿÿÿÿ
ÿ ÿ	ÿ ÿÿÿ	ÿ ÿÿÿ	ÿ ÿÿÿ	ÿ ÿÿÿ	ÿ ÿÿÿ	ÿ ÿÿÿ

Note: The values outside the brackets are coefficients, and the values inside the brackets are robust standard deviations. ****, *** and * respectively indicate ÿ 5% and 10% significance at the 1% level.

Source: Self-made by the authorÿ

Table 3 shows the impact of strategic competition between China and the United States on value-added exporting countries in different industries in the global value chain.
The influence of structural power. As shown in Figure 3, the decline of Sino-US strategic relations and the US's "threat" towards China
The rising awareness of "threat" and the continuation of Sino-US trade friction will have an impact on the global manufacturing industry of value-added exporting countries.
Structural power in networks, commodity trade networks, and service trade networks has a significant negative impact
(The regression coefficients are all significantly negatively correlated at the 1% level). In comparison, the strategic competition between China and the United States has increased

The negative impact of exporting countries' structural power in global manufacturing networks is greater than that on global goods.

and the negative impact of service trade networks.

Table 3 Sino-US strategic competition and various types of structural power in the global value chain (industry, value-added exporting country)

	manufacturing			merchandise			Serve		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Sino-US strategy relation	ÿ ÿ ÿÿÿ ÿÿÿ (ÿ ÿÿÿ)			ÿ ÿ ÿÿÿ ÿÿÿ (ÿ ÿÿÿ)			ÿ ÿ ÿÿÿ ÿÿÿ (ÿ ÿÿÿ)		
United States versus China "threat" cognition		ÿ ÿ ÿÿÿ ÿÿÿ (ÿ ÿÿÿ)			ÿ ÿ ÿÿÿ ÿÿÿ (ÿ ÿÿÿ)			ÿ ÿ ÿÿÿ ÿÿÿ (ÿ ÿÿÿ)	
Sino-US trade friction			ÿ ÿ ÿÿÿ ÿÿÿ (ÿ ÿÿÿ)			ÿ ÿ ÿÿÿ ÿÿÿ (ÿ ÿÿÿ)			ÿ ÿ ÿÿÿ ÿÿÿ (ÿ ÿÿÿ)
Control variable	yes	yes	yes	yes			Yes	Yes	Yes		yes
fixed time effect	Yes	yes	yes	yes			Yes	Yes	Yes		yes
Industry fixed effect	Yes	yes	yes	yes			Yes	Yes	Yes		yes
Country fixed effect	Yes	yes	yes	yes			Yes	Yes	Yes		yes
Observed value	32970	ÿÿÿÿÿ	ÿÿÿÿÿ		ÿÿÿÿÿ	ÿÿÿÿÿ	ÿÿÿÿÿ	ÿÿÿÿÿ	ÿÿÿÿÿ	ÿÿÿÿÿ	
ÿ ÿ	ÿ ÿÿÿ	ÿ ÿÿÿ	ÿ ÿÿÿ		ÿ ÿÿÿ	ÿ ÿÿÿ	ÿ ÿÿÿ	ÿ ÿÿÿ	ÿ ÿÿÿ	ÿ ÿÿÿ	

Note: The values outside the brackets are coefficients, and the values inside the brackets are robust standard deviations. ****, *** and * respectively indicate ÿ 5% and 10% significance at the 1% level.

Source: Self-made by the authorÿ

Table 4 shows the impact of strategic competition between China and the United States on the added value input countries in different industries in the global value chain.

The influence of structural power. From the empirical results, Sino-US strategic relations and the threat of the United States to China

Cognition, Sino-US trade friction and the role of value-added importing countries in the global manufacturing network, commodity trade network,

The structural power in the service trade network is significantly negatively correlated at the 1% level. From the size of the regression coefficient

Judging from the significance and significance, the strategic competition between China and the United States has an important impact on the structural rights of value-added importing countries in the field of commodity trade.

The negative impact of force is greater than that of the manufacturing and service industries. From the empirical results in Tables 3 and 4, it can be seen that

Sino-US strategic competition has a greater impact on the structural power of value-added exporting countries than on value-added importing countries.

Impactÿ

Table 4 Sino-US strategic competition and various types of structural power in the global value chain (industry, value-added importing country)

	manufacturing			merchandise			Serve		
	Model 1 Model	2 Model 3 Model 4	Model 5 Model 6	Model 7 Model 8 Model 9					
Sino-US strategy relation	ÿ ÿ ÿÿÿ ÿÿÿ (ÿ ÿÿÿ)			ÿ ÿ ÿÿÿ ÿÿÿ (ÿ ÿÿÿ)			ÿ ÿ ÿÿÿ ÿÿÿ (ÿ ÿÿÿ)		
United States versus China The "threat" cognition		ÿ ÿ ÿÿÿ ÿÿÿ (ÿ ÿÿÿ)			ÿ ÿ ÿÿÿ ÿÿÿ (ÿ ÿÿÿ)			ÿ ÿ ÿÿÿ ÿÿÿ (ÿ ÿÿÿ)	
Sino-US trade friction			ÿ ÿ ÿÿÿ ÿÿÿ (ÿ ÿÿÿ)			ÿ ÿ ÿÿÿ ÿÿÿ (ÿ ÿÿÿ)			ÿ ÿ ÿÿÿ ÿÿÿ (ÿ ÿÿÿ)
control variables	yes	yes	yes	yes	yes	yes	yes	yes	yes
fixed time effect	yes	yes	yes	yes	yes	yes	yes	yes	yes
Industry fixed effect	yes	yes	yes	yes	yes	yes	yes	yes	yes
Country fixed effect	yes	yes	yes	yes	yes	yes	yes	yes	yes
Observations	ÿÿÿÿÿ	ÿÿÿÿÿ	ÿÿÿÿÿ	ÿÿÿÿÿ	ÿÿÿÿÿ	ÿÿÿÿÿ	ÿÿÿÿÿ	ÿÿÿÿÿ	ÿÿÿÿÿ
ÿ ÿ	ÿ ÿÿÿ	ÿ ÿÿÿ	ÿ ÿÿÿ	ÿ ÿÿÿ	ÿ ÿÿÿ	ÿ ÿÿÿ	ÿ ÿÿÿ	ÿ ÿÿÿ	ÿ ÿÿÿ

Note: The values outside the brackets are coefficients, and the values inside the brackets are robust standard deviations. ****, *** and * respectively indicate ÿ 5% and 10% significance at the 1% level.

Source: Self-made by the authorÿ

Table 5 further shows the impact of Sino-US strategic competition on the network structure of the global value chain. From the model Judging from the regression results of Model 1-Model 6, Sino-US strategic competition has not weakened the degree of the global value chain network. Centrality, and the impact on in-degree centrality is greater than the impact on out-degree centrality. This empirical result shows that Clearly, the persistence of strategic competition between China and the United States has not weakened but strengthened the role of some actors in the global value chain. central position in the network and influence on other actors in the network. This empirical result is also consistent with the U.S. The return of manufacturing, the resurgence of U.S. structural power in global value chain networks, and U.S. containment The strategic goals of China and the United States are consistent with each other. From the regression results of Model 7-Model 12, the strategic competition between China and the United States It is significantly negatively correlated with the eigenvector centrality and betweenness centrality of the global value chain network. This means that Although the strategic competition between China and the United States has not weakened the degree centrality of the global value chain, it has significantly weakened the degree centrality of the global value chain. The "center-periphery" pattern of the value chain and the intermediary power of some countries in the global value chain network. This This empirical fact is also related to the "decentralization" in the global value chain network after the Sino-US trade friction in 2018. Chineseization" and "De-Sinicization" phenomena are consistent with each other.

Table 5 Sino-US strategic competition and changes in network structure of global value chains

	out-degree centrality			in-degree centrality		
	Model 1 Model 2 Model 3 Model 4 Model 5 Model 6					
Sino-US strategic relations	ÿ ÿÿÿ ÿ (ÿ ÿÿÿ)			ÿ ÿÿÿ ÿÿÿ (ÿ ÿÿÿ)		
America versus China "Threat" perception		ÿ ÿÿÿ ÿ (ÿ ÿÿÿÿ)			ÿ ÿÿÿ ÿÿÿ (ÿ ÿÿÿÿ)	
Sino-US trade friction			ÿ ÿÿÿ ÿ (ÿ ÿÿÿÿ)			ÿ ÿÿÿ ÿÿÿ (ÿ ÿÿÿÿ)
control variables	yes	yes	yes	yes	yes	yes
time fixed effects	yes	yes	yes	yes	yes	yes
Industry fixed effects	yes	yes	yes	yes	yes	yes
Country fixed effects	yes	yes	yes	yes	yes	yes
Observations	ÿÿÿÿÿ	ÿÿÿÿÿ	ÿÿÿÿÿ	ÿÿÿÿÿ	ÿÿÿÿÿ	ÿÿÿÿÿ
ÿ ÿ	ÿ ÿÿÿ	ÿ ÿÿÿ	ÿ ÿÿÿ	ÿ ÿÿÿ	ÿ ÿÿÿ	ÿ ÿÿÿ
	Eigenvector centrality			betweenness centrality		
	Model 7 Model 8 Model 9 Model 10 Model 11 Model 12					
Sino-US strategic relations	ÿ ÿ ÿÿÿ ÿÿÿ (ÿ ÿÿÿ)			ÿ ÿ ÿÿÿ ÿÿÿ (ÿ ÿÿÿ)		
America versus China "Threat" perception		ÿ ÿ ÿÿÿ ÿÿÿ (ÿ ÿÿÿÿ)			ÿ ÿ ÿÿÿ ÿÿÿ (ÿ ÿÿÿÿ)	
Sino-US trade friction			ÿ ÿ ÿÿÿ ÿÿÿ (ÿ ÿÿÿÿ)			ÿ ÿ ÿÿÿ ÿÿÿ (ÿ ÿÿÿÿ)
control variables	yes	yes	yes	yes	yes	yes
time fixed effects	yes	yes	yes	yes	yes	yes
Industry fixed effects	yes	yes	yes	yes	yes	yes
Country fixed effects	yes	yes	yes	yes	yes	yes
Observations	ÿÿÿÿÿ	ÿÿÿÿÿ	ÿÿÿÿÿ	ÿÿÿÿÿ	ÿÿÿÿÿ	ÿÿÿÿÿ
ÿ ÿ	ÿ ÿÿÿ	ÿ ÿÿÿ	ÿ ÿÿÿ	ÿ ÿÿÿ	ÿ ÿÿÿ	ÿ ÿÿÿ

Note: The values outside the brackets are coefficients, and the values inside the brackets are robust standard deviations. ****, *** and * respectively indicate ÿ 5% and 10% significance at the 1% level.

Source: Self-made by the authorÿ

Five conclusions

This paper uses complex network analysis methods and multidimensional panel fixed effects models to empirically examine the Sino-US war

The impact of systemic factors such as strategic competition and the United States' threat perception to China on the international power structure and network structure in global value chains based on networked interdependence has led to the following research conclusions. (1) Presentation of global value chain networks A clear "center-periphery" pattern has emerged, with power highly concentrated in a few countries represented by China, the United States and Germany, the three most structurally influential powers. (2) China's network in the global value chain The rise of centrality and structural power, the relative decline of the United States, the changes in relative strength among major powers, and the narrowing of the power gap between countries have not changed the power-law distribution characteristics of "the stronger gets stronger" in the global value chain network structure. (3) The United States' strong performance in in-degree centrality, betweenness centrality and eigenvector centrality and its structural importance in the global value chain network give the United States more It has more coercive powers and a power base that weaponizes interdependence and securitizes economic issues. (4) The rise of China's network centrality and structural power in global manufacturing and commodity trade networks has not changed the role of the United States in global services. The inherent structural advantages in the trade network and the high degree of intermediary centrality and structural importance in the global high-tech and advanced manufacturing fields. (5) Sino-US strategic competition (the decline of Sino-US relations, the rise of the United States' threat perception to China) (6) The strategic competition between China and the United States has a greater negative impact on the structural power of value-added exporting countries in the global manufacturing network than on other fields. It also has a negative impact on the structural power of value-added importing countries in the field of commodity trade. The impact is greater than the negative impact on other fields. (7) Although the strategic competition between China and the United States has not weakened the degree centrality of the global value chain network, it has significantly weakened the "center-periphery" pattern of the global value chain and the role of some countries in the global value chain. network

Betweenness centrality or intermediary power in

In view of the strategic competition between China and the United States, the two most structurally influential powers, on the power in global value chains, There is a significant negative impact on the power structure and network structure, in order to effectively weaken the negative impact of the weaponization of interdependence and the securitization of economic issues on the global value chain, and also in order to effectively prevent the emergence of new "security dilemmas" in the field of global value chains. "Hostility spiral", it is necessary for China to work with other actors in the network to transform the structural influence and coercive power in the global value chain into more social shaping power. Considering the long-term nature of China-US strategic competition China should also continue to improve its network centrality in the global value chain network, especially its in-degree centrality and the structural power of value-added importing countries, while reframing Sino-US relations and re-deconstructing the Sino-US strategic narrative to effectively Reduce the impact of Sino-US strategic competition, securitization of economic issues, and weaponization of interdependence on China's network centrality and structural importance in the global value chain.

(Editor Shi Peiran)