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Auditing Australian construction industry's dependency on China to improve construction supply chain resilience

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Abstract: Along with the global economic growth and the prevalence of global trade, uncertain and turbulent markets can lead to construction supply chain vulnerabilities and disruptions. The recent trade tensions have focused attention on Australia's increased dependency on a wide range of essential products from China ranging from components for its mining and metal producing industries, to medical equipment and pharmaceutical goods. Since China's accession to the World Trade Organization in 2001, its success at manufacturing has resulted in the decline of manufacturing capacity in many advanced economies including Australia. Over the last decade, Australia has increased its imports of construction materials and products from China especially for aluminium windows, glass, curtain walls, flooring, tiling and joineries. The aim of this audit is to identify all construction materials and products imported into Australia and assess its dependency on China. A measure of dependency is defined based on the proportion of imported products supplied by China, net import of the commodity into Australia, and China's global market share of these products. The import audit was carried out on the United Nations Comtrade database at the 2-digit and 4-digit Harmonised System of goods and services. The audit indicates that the Australian construction industry is strategically dependent on China for numerous construction materials and products. The main goods that the Australian construction industry exhibits a strategic dependency on China are ceramic products, glass and glassware, and furniture. Adopting the Herfindahl-Hirschman measure of concentration, the import concentration was observed to be significantly higher than the export concentration globally indicating that the Australian construction sector has exhibited a significant preference for products from China over its competitors. Th research will improve the resilience of the supply of construction materials into Australia and contribute to supply chain resilience theory.

Keywords: Australia, China, Supply Chain Resilience, Strategic Dependence

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1. Introduction

Global trade and investment flows have accelerated dramatically and created enormous economic value over the last three decades [16]. The globalization has increased the interrelationship between supply chains, tightly coupling suppliers, customers, partners, distributors, manufacturers, and retailers [18]. Nowadays, global market volatility, cost differentials, technology disruption and government policies have affected the operations of global supply chains. As the application of supply chain management techniques in manufacturing industry have resulted in significant productivity improvements, better design of supply chains in the construction industry, characterised by changing and uncertain site conditions, should result in similar benefits [14]. Through its global supply chain, construction companies are exposed to risks such as supply disruptions, operational risks, building regulation risks and unpredictable events raised by different project stakeholders [1, 15]. These supply chains have been reported to face additional disruptions from the shutdown of manufacturers, delays in shipping and work restrictions on logistics workers impacting the delivery of materials to project sites. Disruptions in supply can potentially lead to project delays and consequently budget overruns [11].

Since becoming a member of the World Trade Organization in October 2001, China has exhibited unprecedented economic growth and is now a strong proponent of global trade. China has become the world's leading manufacturing centre producing many different types of products for western markets [9]. Exports from China grew by 27.9% year-on-year to US$263.92 billion in May 2021 indicating its rapid recovery from the recent pandemic [21].

According to the Australian Construction Industry Forum (ACIF), Australian construction industry is heavily reliant on imports with up to 60% of manufactured products imported from overseas, and more significantly from one country in particular, China. Previous work on construction sector imports has indicated large volumes of ceramic products, glass and glassware, iron or steel articles, and furniture related materials and products procured from China [12]. Auditing and diversifying the construction supply chain has a significant impact on adding benefits of reducing carbon intensity, upgrading environmental and labour standards, and enlarging opportunities for minority-owned businesses. [13]

The aim of this research is to improve the resilience of the Australian construction supply chain. The objective is to assess the dependency of the construction sector on imports from China by identifying and quantifying imported materials and to determine the extent of dependency on China. The findings will enable the construction companies in Australia to assess the risks of disruptions, prepare action plans and subsequently implement measures to mitigate these supply chain risks.

2. Literature Review

2.1 China’s Impact on the Australian Construction Supply Chain

The gross output value of the construction industry in China increased from US$1.124 trillion to US$3.601 trillion in the last decade. Although the annual average increase of China’s construction output eased to 5% in between 2015 and 2019, which was a decline from the high of 9% between 2010 and 2014, China remained the largest construction sector globally [4]. The China-Australia Free Trade Agreement (ChAFTA) boosted trade between these two countries with China becoming Australia's largest trading partner in 2017.

Three main motivations to source from China were economic, strategic, and environmental [6]. The primary motivation is certainly economic, which dramatically reduce the capital investment for construction clients since Chinese manufacturers operate in a market with lower labour, production, monitoring and logistics costs. Sourcing from overseas, however, introduced an increased risk in the supply chain with product qualities that occasionally fails to meet Australian standards, and the lack of intellectual property rights protection. Other issues and challenges reported were the language barriers, differences in culture and business practices, transportation delays, fluctuations in exchange rates, the lack of supply chain management systems and more elaborate inventory management [10].

2.2 Construction Supply Chain Management and Globalisation

The project-oriented nature of the construction industry requires a different perspective from conventional supply chain management concepts. Vrijhoef and Koskela [25] suggested four areas of research focus: on the interface between supply chains and the construction site; the supply chain itself, the transfer of activities from construction site to supply chain, and integration of the management of supply chain together with the construction site. Thus, supply chain management in construction is unique and often problematic [26]. The construction supply chain is often regarded as both highly interlinked and vulnerable at the same time, leading to suggestions that the sector should build resilience in the face of current and future disruptions [3].

Today, suppliers are distributed globally across numerous countries and increasingly outsource or offshore many processes resulting in a complex network of global supply, resulting in challenges to manage project stakeholders internally and externally [20]. These global supply chains are constantly challenged to achieve environmental, social, or economic performance by integrating different project stages and project stakeholders together [24]. These global supply chains are certainly more exposed to potential delayed connections and uncertainties; therefore, it requires greater effort in coordination, communication, and management [14].

2.3 Supply Chain Resilience

Research to reduce and prevent potential supply chain risks is categorised as supply chain resilience. Although resilience has been defined in several ways in the literature, the most often cited and comprehensive definition for supply chain resilience is *"capability of a supply chain to develop required level of readiness, response and recovery capability to manage disruptions risks, get back to the original state or even a better state after disruptions"* attributed to Christopher and Peck [2], and Ponomarov and Holcomb [17].

While some supply chain disruptions are external such as natural disaster and human-related disaster, other disruptions originate from within the boundaries of these supply chains. The adaption of lean initiatives and single-sourcing policies may reduce budget and improve project stakeholder coordination but leads to little spare capacity to cope with contingencies and therefore susceptible to disruptions [29]. Other researchers advised that project stakeholders that interdependency in the global supply chain should be resilient, otherwise a disruption to a single node may reduce the capacity for the entire supply chain. An example of it is the Tohoku Earthquake and Tsunami in Japan in 2011 which lead to disruptions not only in Japan but also extended to the United Kingdom, the United States, China, Canada, Australia and Thailand [22]. One of the most important way to build up resilient supply chain is to build more redundancy into supplier networks.[13] This research examines the Australian construction supply chain from the perspective of networks and partnerships [27] by assessing import concentration in several source countries particularly China.

3. Research Method

Global trade statistics are collected in the United Nations Statistics Yearbook [23], which provides an overview of the latest trends of trade in goods and services of most countries and areas in the world. The source of data for the analysis on Australia's trade in goods with the rest of the world and China's share of global exports was the United Nations Comtrade database (https://comtrade.un.org/).

All international trade in goods is classified based on the Harmonised Systems (HS) which is an internationally standardized coding system to classify all commodities from different countries since 1988. HS classified the international commodities in 2-digit, 4-digit and 6-digit coding levels. For brevity, this paper will only focus on the 2-digit and the 4-digit HS coding. It is worthwhile noting that the analysis was conducted for Mainland China which suggests that the dependency on China (including its SARs of Hong Kong and Macau, and Taiwan) may be higher than the reported results.

3.1 Assessing Australia's strategic dependency on China

The methodology to identify the extent of Australia dependence on imports from China was originated from the definition of "strategic dependence" by Rogers et al. [19]. In this context, strategic dependency means that the exporting country may have a significant impact on the importing country's overall domestic availability of the imported goods. The four criteria to identify the products that Australia is strategically dependent on China is listed as below:

C1: More than 50% of Australia imports of the commodity in the 2-digit and 4-digit coding system comes from China.

C2: Australia is a net importer of that commodity.

C3: The product or material is a necessity in the construction industry.

C4: China has greater than 30% market share of the global trade of the commodity.

The audit also attempts to examine if the imports into Australia are in line with the export market globally where the purchases are in proportion to the market shares of the respective producer countries.

Using a commonly accepted measure of market concentration, the Herfindahl-Hirschman Index (HHI), the audit attempted to compute the import concentration from China and compared it to the global export market concentration. The HHI is calculated by squaring the market share of each supply country and then summing

the resulting numbers. As such, it would range from close to zero to 10,000 where a monopoly would return a value of 10,000. HHI values of greater than 2,500 would be highly concentrated.

4. Data Analysis

4.1 Identifying strategic dependency on China

Table 1 below indicates the number of product categories that Australia imports from China according to each of the three criteria established in Section 3.2 for both the 2-digit (HS2) and 4-digit (HS4) HS codes. Out of a total of 99 product codes in the HS2, 17 were greater than 50% while 239 product codes were flagged from HS4. The second criterion was to identify the net import commodities for Australia, which means the value of imported goods is higher than its exported goods in 2018. Therefore, the data of Australian exports to the world was assessed. For criterion C2 there were 70 product codes from HS2 and 1005 product codes from HS4. The third criterion which was to identify the product types directly imported by the construction industry required substantial subjective opinions based on experience with purchasing materials in the Australian construction industry. A total of 8 product codes from HS2 and 106 product codes from HS4 were identified for C3. Intermediate products that may be required by domestic manufacturers for further processing into final goods for the construction sector were not included in this third criterion for simplicity.

Instead of computing the fourth criterion for all the product codes, the approach was to compute the intersection from the earlier three criteria of C1 AND C2 AND C3 to reduce the data processing. From this filter, only 4 and 24 product codes, respectively, remained. The fourth and final criterion was to compute the percentage of Chinese exports divided by total world exports as a measure of control over the global trade of the commodity. Finally, only 2 product categories in the HS2 and 7 products in the HS4 fulfilled all 4 criteria.

Table 1. Dependency on China for the construction sector

	C1-50%CN	C2-IMP	C3-CON	C1&C2&C3	C1&C2&C3&C4
HS2	17	70	8	4	2
HS4	239	1005	106	24	7

Therefore, the 2 main categories from HS2 are 69 ceramic products, and 94 furniture while the 7 categories in the HS4 are: 6910 Ceramic sinks, wash basins, baths, water closet pans, etc.; 7016 Glass, paving blocks, bricks, tiles, etc.; 7313 Barbed wire, twisted hoop or single flat wire, etc.; 7323 Table, kitchen, other household articles and parts, of iron or steel, etc.; 7324 Sanitary ware and parts thereof of iron or steel, 8539 Lamps; and 9403 Furniture.

4.2 Identifying the dependencies of HS2 categories

Table 2 below shows the value of imports for product codes 69 and 94 into Australia from their countries of origin and the corresponding value of exports globally from originating countries. The values of imports and global exports are ranked in descending order of value. Australia imports nearly US$900 million worth of **HS2 code 69** Ceramic products in 2018 with imports from China accounting for nearly 60% of the total while the remaining imports were from Italy followed by Spain, Malaysia, and Germany. China's global market share of this product code accounted for 38.6% of the total world export indicating its strong market position relative and Australia's reliance on a single country to supply a large proportion of its needs. Other producer and exporting countries such as Italy, Germany and Spain individually command less than 10% of the global market share further reinforcing China's deep-seated competitive advantage in this commodity. A similar situation persists for **HS2 code 94** Furniture where imports from China is close to 70% of the total with Vietnam in second position at a distant 5.5%. China's global market share in this product code was 37.5%, again exhibiting significant advantage over its competitors Germany, Poland, and Italy. The analysis indicates that there is strong evidence of strategic dependency for these two product codes.

4.3 Identifying the dependencies of HS4 categories

From a total of 106 HS4 product codes that were linked to the construction industry, only seven were assessed to fulfil all the 4 criteria for strategic dependency. In view of the space constraints, only four product codes are tabulated in ***Table 3*** as illustration of the high level of imports from China and the market share commanded by China in the global market. In all these examples, the proportion of imports from China was very high (greater than two-thirds) reflecting the extreme dependency on a single country to the near exclusion of all other producer countries. In all these examples, the second highest import country is an order

of magnitude smaller than the imports from China. China's global market share in these construction products and materials also far exceeds the 30% threshold considered for market power, with shares exceeding 50% for ceramic sinks; tables and kitchen articles from iron and steel; and lamps.

Table 2. HS2 Selected Categories Export Situation

	69 Ceramic						
Rank	Country	AU imports (USD)	%	Rank	Country	World exports (USD)	%
	World total	$889,784,892			World	$58,024,290,375	
1	China	$531,852,825	59.8%	1	China	$22,369,944,191	38.6%
2	Italy	$101,560,169	11.4%	2	Italy	$5,639,737,637	9.7%
3	Spain	$44,494,641	5.0%	3	Germany	$4,153,781,775	7.2%
4	Malaysia	$39,578,495	4.4%	4	Spain	$3,863,869,779	6.7%
5	Germany	$23,134,683	2.6%	5	USA	$2,054,115,708	3.5%
6	Vietnam	$18,473,421	2.1%	6	Japan	$1,739,032,267	3.0%
7	Thailand	$17,144,705	1.9%	7	India	$1,517,334,633	2.6%
8	USA	$14,657,183	1.6%	8	Poland	$1,335,789,967	2.3%
9	India	$13,888,070	1.6%	9	Mexico	$1,308,233,149	2.3%
10	Japan	$11,640,476	1.3%	10	Turkey	$1,079,311,998	1.9%

	94 Furniture						
Rank	Country	AU imports (USD)	%	Rank	Country	World exports (USD)	%
	World total	$5,108,449,674			World	$256,959,355,026	
1	China	$3,467,760,963	67.9%	1	China	$96,416,994,075	37.5%
2	Vietnam	$279,056,819	5.5%	2	Germany	$18,686,301,054	7.3%
3	Malaysia	$179,192,317	3.5%	3	Poland	$14,833,477,918	5.8%
4	Italy	$173,471,254	3.4%	4	Italy	$14,651,204,558	5.7%
5	USA	$152,018,967	3.0%	5	USA	$10,840,474,466	4.2%
6	Germany	$130,409,595	2.6%	6	Mexico	$10,598,021,149	4.1%
7	Indonesia	$74,171,354	1.5%	7	Viet Nam	$7,418,417,336	2.9%
8	Other Asia, nes	$58,684,746	1.1%	8	Canada	$5,776,202,660	2.2%
9	India	$56,603,015	1.1%	9	Czechia	$5,675,833,373	2.2%
10	United Kingdom	$52,477,350	1.0%	10	Netherlands	$4,933,716,408	1.9%

Another important finding is that in ALL the 2 product codes from HS2 and the 7 product codes in HS4, Australia's imports are more concentrated on China than China's share of the global market. By adopting the Herfindahl-Hirshman Index (HHI) as a measure of import concentration, the average HHI value of imports for HS2 was 4,227 compared to an export concentration of only 1,617. Similarly, the average HHI for the seven HS4 codes was 5,013 for imports and 2,541 for exports. These values indicate there is significant supply concentration for Chinese products in the Australian construction industry which far exceed the export concentration on global production.

It must also be noted that several HS4 codes exhibited nearly absolute penetration of the products from China into the Australian market. For example, 95% of 7008 Glass; multiple-walled insulating units of glass, typically used for double-glazed residential buildings and commercial office windows are sourced from China even though Chinese production only accounted for 14% of market share globally.

5. Discussion

5.1 Australian construction industry's level of dependency on China

The construction industry's strategic dependency on China reflects a similar phenomenon for the broader Australian economy [19]. In fact, Australia's dependency was the highest compared to the US, UK, Canada, and New Zealand. The primary driver for the large concentration of construction material imports from China was the significant price advantage offered. Material cost savings of up to 30% may be attained for residential projects in Australia [12]. As a result of lower cost producers in China and other locations in Asia in general, Australian manufacturers have found themselves unable to compete with the lower labour and operating costs overseas leading to deindustrialisation in some less competitive manufacturing sectors in advanced economies of the UK, US, and several countries in Western Europe.

Table 3. Example of Australia highly dependent HS4 category products selection

	6910 Ceramic sink				
Rank	Country	AU imports (USD)	%	World exports (USD)	%
	World total	166,048,110		9,786,480,552	
1	China	121,593,960	73.2%	5,878,022,258	60.1%
2	Malaysia	11,817,310	7.1%	22,763,841	0.2%
3	Italy	7,981,633	4.8%	302,884,557	3.1%
4	Thailand	5,579,181	3.4%	215,963,998	2.2%
5	Spain	4,126,849	2.5%	100,281,754	1.0%
6	Germany	3,003,024	1.8%	463,262,777	4.7%
7	Turkey	2,310,909	1.4%	258,546,728	2.6%
8	Vietnam	1,464,795	0.9%	136,581,860	1.4%
9	UAE	1,164,608	0.7%	65,074,002	0.7%
10	Czechia	898,638	0.5%	111,932,353	1.1%

	7016 Glass, tiles				
Rank	Country	AU imports (USD)	%	World exports (USD)	%
	World total	18,614,802		1,132,110,065	
1	China	12,225,852	65.7%	546,394,508	48.3%
2	Spain	2,268,250	12.2%	76,573,496	6.8%
3	India	1,261,289	6.8%	11,219,323	1.0%
4	Italy	821,901	4.4%	82,569,709	7.3%
5	Turkey	666,931	3.6%	8,511,232	0.8%
6	Germany	423,546	2.3%	33,252,783	2.9%
7	France	179,055	1.0%	8,097,957	0.7%
8	Thailand	136,521	0.7%	10,959,836	1.0%
9	Czechia	122,675	0.7%	59,159,450	5.2%
10	Indonesia	120,375	0.6%	9,413,532	0.8%
	7016 Glass, tiles				
Rank	Country	AU imports (USD)	%	World exports (USD)	%
	World total	218,699,122		12,240,683,154	
1	China	174,216,554	79.7%	7,209,198,905	58.9%
2	India	12,677,892	5.8%	523,117,346	4.3%
3	USA	4,703,399	2.2%	273,626,415	2.2%
4	Italy	4,554,983	2.1%	337,054,479	2.8%
5	France	4,351,216	2.0%	280,611,708	2.3%
6	Thailand	3,358,014	1.5%	122,721,181	1.0%
7	Germany	1,517,468	0.7%	658,681,691	5.4%
8	Vietnam	1,496,420	0.7%	163,745,030	1.3%
9	South Korea	812,545	0.4%	57,937,707	0.5%
10	Czechia	787,667	0.4%	13,361,542	0.1%
	8539 Lamps				
Rank	Country	AU imports (USD)	%	World exports (USD)	%
	World total	138,122,301		16,151,998,568	
1	China	91,329,738	66.1%	8,435,341,442	52.2%
2	Germany	8,761,890	6.3%	1,839,342,341	11.4%
3	Poland	6,596,677	4.8%	729,546,505	4.5%
4	USA	4,572,446	3.3%	614,298,107	3.8%
5	Japan	4,443,399	3.2%	561,046,850	3.5%
6	South Korean	2,183,853	1.6%	148,071,478	0.9%
7	Hungary	2,147,600	1.6%	385,189,320	2.4%
8	Italy	2,033,195	1.5%	184,361,799	1.1%
9	United Kingdom	1,915,598	1.4%	262,806,696	1.6%
10	Belgium	1,773,987	1.3%	394,351,973	2.4%

The recent supply chain disruptions caused by the closure of manufacturing plants in China in early 2020 have brought to the fore the need to build resilience into global supply chains and the high level of dependency and concentration on a single country has been the point of discussion. Several viewpoints have emerged including a radical swing away from China due to geopolitical tension to more liberal views of cooperation to improve resilience by spreading production across several manufacturing plants in China. Reshoring of American manufacturing companies from China was driven by quality and furthermore only to cater for the domestic US market [28]. Enderwick [5] proposed a rather innovative China-plus-one approach where the Chinese supplier remains the primary manufacturer while a relationship is forged with a secondary manufacturer in a different location, preferably with different shipping routes to reduce the impact of disruptions such as the recent obstruction in the Suez Canal. With Chinese wages increasing rapidly,

manufacturers are themselves relocating to other low-cost countries such as Vietnam, Cambodia, or Bangladesh for their labour-intensive manufacturing operations. Chinese and other multinational companies have been looking to diversify their operations by adding another location in Asia as China is gradually losing its cost advantage and competitiveness in comparison to other Asian nations. By adopting this model, manufacturers can reduce their operating costs, spread its production across several countries and become less vulnerable to supply chain disruptions in one location, currency fluctuations, and geopolitical risks in any one market. According to Javidan et al. [7], it is important to balance concepts of both nationalism and globalism to improve supply chain resilience. Adopting this approach, benefits from global sourcing can be attained through long-term partnerships, at the same time, nationalistic concerns can be resolved by keeping a minimum core manufacturing capacity onshore to cater to supply security.

5.2 Further research

The work reported here is part of a broader investigation into building resilience in Australia's global supply chain. Future research will assess the resilience of these global supply chains from the readiness, response, and recovery perspectives by conducting case studies on construction companies in Australia and suppliers overseas. The findings will contribute to construction supply chain resilience theory and from a practical perspective strengthen the global construction supply chain for Australian construction companies.

6. Conclusion

This audit has confirmed that at the 2-digit HS level, 2 product codes exhibited significant strategic dependency on China whereas at the 4-digit level, 7 products were flagged. These are product code 69 Ceramic products and 94 Furniture under the 2-digit code and 6910 Ceramic sink, wash basins, baths, water closets; 7016 Glass, paving blocks, bricks, tiles; 7016 Glass, tiles, 7313 Barbed wire of iron or steel, twisted hoop or single flat wire; 7323 Table, kitchen, other household articles of iron or steel; 8539 Lamps, and 9403 Furniture.

This finding confirmed the widely held suspicion that the Australia construction industry has high strategical dependency on China. Australian importers have exhibited a preference for imports from China compared to wider global supply of these commodities reflected in the higher HHI values.

The Australia construction industry should be aware of the risks of supply chain disruption from China may cause significant negative impact on the construction sector with material scarcity, schedule delays and potential cost over-runs. It is in both Australia's and China's interest to seek long-term solutions to the risk of these supply chain disruptions and explore options to build resilience in this important supply network.

References

[1]Abidin, N. A. Z., & Ingirige, B. (2018*). The dynamics of vulnerabilities and capabilities in improving resilience within Malaysian construction supply chain*. Construction Innovation.

[2]Christopher, M and Peck, H (2004) *Building the resilient supply chain*. "Logistics Management", 15(2), 1-14.

[3]CIPS (2020) Chartered Institute of Procurement & Supply. *Building supply chain resilience in the construction sector*. https://www.cips.org/PageFiles/159681/Building%20Supply%20Chain%20Resilience%20in%20the%20Construction%20Sector.pdf

[4]Construction Global (2020). *Global Perspectives: China's construction sector*. Retrieved from https://constructionglobal.com/facilities-management/global-perspectives-chinas-construction-sector

[5]Enderwick, P. (2011). *A 'China-Plus-One' strategy: The best of both worlds?*. Human Systems Management, 30(1-2), 85-96.

[6]Hung Lau, K., & Zhang, J. (2006). *Drivers and obstacles of outsourcing practices in China*. International Journal of Physical Distribution & Logistics Management, 36(10), 776-792.

[7]Javidan, M., Waldman, D. A., & Wang, D. (2020). *How Life Experiences and Cultural Context Matter: A Multilevel Framework of Global Leader Effectiveness*. Journal of Management Studies.

[8]Jia, F., & Rutherford, C. (2010). *Mitigation of supply chain relational risk caused by cultural differences between China and the West.* The International Journal of Logistics Management, 21(2), 251-270.

[9]Jia, F., & Rutherford, C. (2010). *Mitigation of supply chain relational risk caused by cultural differences between China and the West.* The International Journal of Logistics Management, 21(2), 251-270.

[10]Jiang, C., & Tian, Y. (2010). *Problems and challenges of global sourcing: A study of Chinese manufacturing enterprises*.

[11]Le-Hoai, L., Dai Lee, Y. and Lee, J.Y. (2008).“*Delay and cost overruns in Vietnam large construction projects: A comparison with other selected countries*.” KSCE J. of Civil Eng., 12(6), 367-377.

[12]Liu, J., Chan, T.K., & Hu, H. (2020). *Accessing Australia-China supply chains by Australian home builder*s. [in press] from CRIOCM 2020.

[13] Lund, S., Manyika, J., Woetzel, J., Barriball, Ed., Krishnan, M., Birshan, M., George, K., Smit, S., Swan, D., & Hutzler, K. (2020). *Risk, resilience, and rebalancing global value chains.* Mckinsey Global Institute. Retrieved from https://www.mckinsey.com/business-functions/operations/our-insights/risk-resilience-and-rebalancing-in-global-value-chains

[14]Manuj, I. and Mentzer, J.T. (2008). *Global supply chain risk management*. Journal of business logistics, 29(1), pp.133-155.

[15]O’brien, W.J. (1999). August. C*onstruction supply-chain management: a vision for advanced coordination, costing, and control*. In NSF Berkeley-Stanford Construction Research Workshop (Vol. 6). California: Stanford University.

[16]Pinkus, G., Manyika, J. & Ramaswamy, S., (2017). *Harvard Business Review: We Can't Undo Globalization, but We Can Improve It*. Harvard Business School Publication Corp.

[17]Ponomarov, S Y and Holcomb, M C (2009) *Understanding the concept of supply chain resilience*. “Logistics Management”, 20(1), 124-143.

[18]Princes, E. (2020). *Integrating ambidexterity into the modern manufacturing era of industry 4.0*. International Journal of Supply Chain Management, 9(4), 58-64.

[19]Rogers, J., Foxall, A., Henderson, M., & Armstrong, S. (2020). *Breaking the China Supply Chain: How the" five Eyes" Can Decouple from Strategic Dependency*. Henry Jackson Society.

[20]Sarkis, J. (2012). *A boundaries and flows perspective of green supply chain management*. Supply chain management: an international journal.

[21]Trading Economics (2021) *China exports 1981-2021 data*. Retrieved from https://tradingeconomics.com/china/exports

[22]Tukamuhabwa, B. R., Stevenson, M., Busby, J., & Zorzini, M. (2015). *Supply chain resilience: definition, review and theoretical foundations for further study*. International Journal of Production Research, 53(18), 5592-5623.

[23]United Nations Statistics Yearbook (2020). *Statistical Yearbook 2020 edition*. Retrieved from https://unstats.un.org/unsd/publications/statistical-yearbook/files/syb63/syb63.pdf

[24]Van Donk, D.P., van der Vaart, T., Awaysheh, A. and Klassen, R.D. (2010). *The impact of supply chain structure on the use of supplier socially responsible practices*. International Journal of Operations & Production Management.

[25]Vrijhoef, R and Koskela, L (2000) *The four roles of supply chain management in construction*. “Purchasing and Supply Management”, 6(3-4), 169-178.

[26]Wang, T K, Zhang, Q, Chong, H Y and Wang, X (2017) *Integrated supplier selection framework in a resilient construction supply chain: An approach via analytic hierarchy process (AHP) and grey relational analysis (GRA).* “Sustainability”, 9(2), 289.

[27]Wilkinson, S., Chang-Richards, A. Y., Sapeciay, Z., & Costello, S. B. (2016). *Improving construction sector resilience*. International Journal of Disaster Resilience in the Built Environment.

[28]Zhai, W., Sun, S., & Zhang, G. (2016). *Reshoring of American manufacturing companies from China*. Operations Management Research, 9(3), 62-74.

[29]Zhao, K., Kumar, A., Harrison, P., and Yen, J. (2011). *Analysing the resilience of complex supply network topologies against random and targeted disruptions*. IEEE systems journal 5(1):28-39