

Post-Covid Scenario of Container Market: Impact of The Scarcity of Empty Shipping Containers Over High Prices of Commodities In the Global Supply Chain Environment

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Abstract

Seaborne trade, particularly containerized trade, was expected to suffer a significant decline at the outbreak of the coronavirus of the 2019 (COVID-19) pandemic. Due to the reason that supply chains are obliged to import various items and resources from China to meet consumer demand for commodities such as medical equipment, home office supplies, and computer equipment. As China recovered from months of trade suspension, an imbalance was developed, with the country sending around three containers for every one imported. Furthermore, the container crisis reflects a slowdown and delays in the maritime supply chain because of pandemic-related strains, such as port labor shortages, port congestion (also due to blank sailings), and capacity constraints in the truck and other inland transportation systems. Due to a lack of empty containers, backlog at ports resulted in freight prices surpassing record highs by the end of 2020 and early in 2021. The surge in freight prices was felt in various developing countries, including Africa and Latin America. As a result, shipping and container rates skyrocketed, resulting in prolonged delays for businesses, the total cost of ownership (TOC), and thus the price of commodities. Therefore, this paper emphasizes over repercussions of constraints on the whole maritime supply chain and propose measures for dealing with potential future container shortage.

Keywords: Container market, container scarcity, global supply chain, maritime supply chain, post COVID scenario, high prices of commodities

Introduction:

Millions of dollars worth of ordered holiday gifts were stuck on massive container ships that were kept waiting to be birthed at ports resulting in epic traffic jams, especially in the port of Los Angeles and long beach which caused the unbalanced global trade equation. Even in the Americans Supply Chain, the deep flaws disrupted the entire chain-wide integration. Every entity is challenged with the repercussions of vulnerability which bullwhipped to the retailer's end with either high prices or empty shelves.

During a COVID-19 pandemic, almost every industry has been affected (Ayaz, Bucak, & Mollaoglu, 2022), and the maritime industry was no exception (Lapena, 2022). The sector's challenges from the epidemic still exist, one of which is the scarcity of empty containers. The logistical choreography of moving empty cargo containers was disrupted during the epidemic. This broken equilibrium caused a

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domino effect across the global supply chain, resulting in either insufficient availability or high-priced goods (Team, 2021). This paper examines the cascading impacts of empty container scarcity and proposes solutions for future unforeseen container shortages. Therefore, the objective of this paper is:

- To realize the scenario that initiated a chain-wide domino effect due to the lack of empty containers during the Covid-19 Outbreak, as well as review the current situation.
- To design measures to reduce the occurrence of a future scarcity of empty containers, as well as to manage any future vulnerabilities

History of Containers and Globalization:

Before the 1950s, most items were carried by break bulk transportation, which involved goods being shipped loose or packaged in boxes, bags, barrels, or other tiny containers that varied depending on the kind of good. Time and manpower spent hauling ships at ports in a manner to reduce damage to the contents was a significant cost in break bulk transportation. Port charges accounted for 60-75 percent of the cost of shipping goods by sea, according to one research from the late 1950s, while cargo handling accounted for roughly 37 percent of overall costs in another assessment of a single ship journey (Levinson, 2016). These expenses included not just labor, but also lost time and damage (including theft) to cargo that was due to be put onto a ship while other materials were being unloaded. The major issue was that the ships were only at sea half of the time and spent the other half of the time in port (Cudahy, 2007), sacrificing potential time for business and huge amounts of money.

In 1956, however, Malcolm McLean altered conventional way goods transport. Due to which almost everything, all over the world, shipped via enclosed boxes. This invention is known as the shipping container, a huge steel box manufactured in a specific number of standard dimensions to allow products to be transported by ship, truck, rail, and, on rare occasions, plane.

Containers have had a significant socio - economic impact. Actors in the maritime sector, particularly port employees, and shipping corporations, were the first to feel the impact. However, the container's impact grew to encompass not solely the shipping sector, but also local development and the global economy. Slack (2004) states "Globalization and container shipping enjoy a reciprocal relationship. There is little doubt that the expansion of international commerce and the expansion of global manufacturing systems would have been impossible without the efficiencies and economies that containerization has brought. Container shipping is a facilitator of globalization."

Moving empty containers has historically been a significant cost factor for shipping lines. It comprises between 5 and 8 percent of the operating expenses. Including the cost of keeping and maintaining empty containers, the proportion of overall operating costs attributable to empty container management will reach 12 percent. (transmetrics 2019). According to Song and Dong (2015), Vacant Container Repositioning has a significant environmental impact as well. To protect the

environment, the movement of these containers must be streamlined by lowering fuel use and emissions, as well as bottlenecks in ports and warehouses. However, trade imbalances were the primary reason for the requirement for empty container management. Far Eastern nations export more than they import from the West. The trade balance is in their favor, requiring shipping companies to return empty containers to Asian countries for use in exports. (transmetrics 2019).

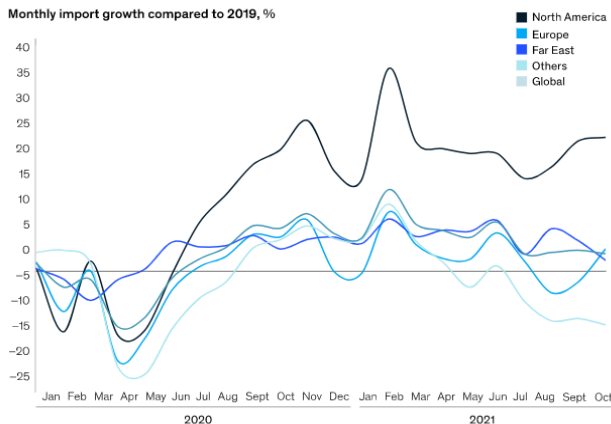
Methodology:

Using purposive sampling, six structured interviews were conducted with the veterans dealing with the supply chain at ports and exporters and importers. They were comprised of three supply chain heads, two heads of the impex department of exporting companies, and two port- manager dealing with the supply chains at ports. The Set of respondents, the heads of supply chains were from the pharma and textile sector, and the manager Karachi Port authority KPT and Port Qasim Authority PQA.

The interviews were transcribed word-for-word and examined qualitatively. Using the online research tool "Consider.ly," initial coding was performed. No respondents were compensated for the interview. For this exploratory investigation, a qualitative approach was chosen. Utilizing a thematic method (Braun and Clarke, 2006), which entails categorizing the data into recurring themes, subthemes, and patterns was realized. This methodology was chosen because it best describes the respondents' experiences. The primary steps include:

- (i) Interview transcription
- (ii) Developing initial coding
- (iii) Generating focused coding
- (iv) Designing selective coding
- (v) Searching for themes
- (vi) Determining and labeling themes
- (vii) Writing a report

Triggering of the domino effect of container scarcity



At the start of the year 2021, many countries set travel restrictions and implemented

national lockdowns causing the production of goods to cease (Youd, 2022), shipping companies decreased the number of cargo ships and stopped sailing (The impact of the COVID-19 pandemic on Freight Transportation, 2020) which not only halted the Impex operations but also caused a stoppage in the collection of empty containers. As China recovered at the earliest, its operations started, and being the largest global exporter (Jahn, 2022). The export surpassed the imports resulting in hikes in China's Exports which again caused container flows from China to importing countries (China exports spike to highest in decades after covid-19 hit, 2021). (Fig. 1: depicts the import growth retrospectively). These exported laden containers were again emptied at the destination ports resulting in piling of emptied containers at the yard and the port proximity even on the streets. However, after releasing the lockdown, developed countries started to import more to restore production levels and to make profits. Although, this again resulted in an increment of empty containers piling up in importing countries and scarcity at the exporting destination such as China (Global shipping snarls, 2021). This initiated disruption at Chinese Ports impacting trade balances and varying trade patterns (Danelia, 2021).

Besides the container sticking at the yard, vessels also got stuck near the port's vicinity as congestion caused delays in port operation. For instance, more than 80 ships stretched the distance from the port of Los Angeles and 500 vessels remain stranded outside Chinese ports (Chaudhary, 2022). This caused a serious threat to the availability of the commodities to the market with a lack of raw material on the Supply-side, and empty shelves at the retailers'-end resulting in the low availability of goods. This increased entire supply chain lead times (Youd, 2022) and decreased service levels.

Impact of empty container scarcity on the global supply chain:

Constrained supply chain challenges caused by container shortages have affected almost every business. On the supply side, shocks were faced by the entities i.e., unexpected abrupt variability in the availability of raw materials, components, manufacturing capacities, and procurement personnel (Global shipping snarls, 2021).

In East Asian electronic industrial hubs such as South Korea, Malaysia, Thailand, Vietnam, Taiwan, Japan, Singapore, and the Philippines, the supply chain has been severely disrupted by the unavailability or delay of imports of essential electronic components and other important raw materials. Due to continual interruptions, the automobile sector and mobile manufacturers are the primary industrial groups afflicted by silicon shortages. Due to dwindling chip supply, Apple's iPhone 13 production has slowed. Besides, the shortage of crucial auto parts, notably semiconductors, several automobile producers has postponed the construction of their vehicles (Chip shortage? now it's a ship (ping container) shortage, 2022). This resulted in supply shortages on the manufacturing side and caused commodity prices to rise above expectations. Oil, chemicals and ferrous/non-ferrous metals have all seen significant price increases. White sugar prices have risen exponentially, while delays in the arrival of food-grade soybeans have pushed up the price of soy milk in Asian countries. Due to a significant scarcity of shipping containers, tonnes of perishables

have been left unshipped in India, producing a serious demand-supply gap in the global food supply chain. On the distribution level, the warehouse lacked enough workers to cater to heavy incomings and to quickly unpack the incoming freight and send it to customers (Notteboom, Pallis, and Rodrigue, 2021) acting as a bottleneck and warehouses near to consumer end had no incoming to refill. American Trucking Associations claimed "*chassis are also scarce, with many stuck under empty containers*" These, capacity constraints on the trucking side led to no replenishment at retail outlets in the low availability of commodities to cater to variable demand patterns. Hence, this resulted in higher lead- times and low high-priced commodities at the retailers' end adding more stress to ports and maritime supply chains.

Impact over high prices of commodities

In the past 18 months, the price of a shipping container has skyrocketed due to the disruption of supply networks and trade routes caused by the coronavirus outbreak (Chengevelyn, 2021). As per UNCTAD's study, if the present boom in container freight costs continues, global import prices will rise by 11% and consumer prices will rise by 1.5 percent between now and 2023 (Chengevelyn, 2021). Spot freight charges for the Asia-North Europe route were 264 percent higher in December compared to the previous year. Rates have increased by 145 percent on the route from Asia to the United States West Coast. The cost of shipping from China to the United States and Europe has increased by 300 percent. Spot rates have escalated to almost \$6,000 for each container, up from \$1,200 retrospectively (Mulhern, 2021).

The Fright charges in Pakistan

Within four month of timespan, sea freight prices from the Far East and China have risen from \$500 to \$2,500 for every 20ft container (Khan, 2020). The shipment to China, which was originally estimated to cost \$400-\$500, is now estimated to cost \$4,000. Cargoes to the United States used to cost \$2,500, but now cost \$4,000-\$5,000."

Is new container injection to the global supply chains a wise decision?

China International Marine Containers (CIMC), Dubai International Financial Centre (FDIC), and Changzhou Xinhua International Containers Co., Ltd. make up over 80% of the world's shipping containers (CXIC). To meet up with the container demand, some firms are ramping up output to new highs. Despite industries scaling up production, supplies of new containers remain extremely low, resulting in a price increase. Furthermore, because the planned boats will be delivered in late 2023 and 2024, constructing extra shipping containers is not an urgent solution to the distorted commerce of the global supply chain. However, pumping more ships would intensify port congestion and exacerbate the waiting time resulting in higher lead times and more incurred costs. Ports should be able to regulate the amount of ships and containers in order to rebalance the distribution of containers around the globe.

To cater to the situation, major multinational corporations are looking to localize their supply chains as freight charges are projected to remain high in 2022. To alleviate inventory shortages, major retailers such as Walmart, Home Depot, and

Ikea are considering acquiring their containers and chartering ships. Cainiao, a subsidiary of Alibaba Group, has developed a container booking service that covers 200 ports in 50 countries, aiming to minimize the backlog of empty containers.

Is the International Container Shortage Attributable to Inadequate Port Infrastructure?

Despite expanding consumer demands throughout the world over the last decade, port infrastructure has remained largely unchanged to meet the massive requirements of shippers. Even before the outbreak, the ports needed to improve their infrastructure so that containers could be utilised to their fullest capacity. Most ports lack the infrastructure to handle large ships containing up to 20,000 containers, which necessitates deeper docks and larger cranes. In May 2021, the average duration spent at anchorage by container ships in North America was much more than 30 hours, up from just 8 hours in pre-pandemic days.

Impact on the national supply chains - The Pakistani Scenario:

Pakistan is heavily reliant on marine transportation, with 98 percent of Pakistanis using sea transit and 88 percent of those vessels being foreign-registered. This suggests that Pakistan should establish its own shipping business, both at the private and government level. The economy will remain steady as a result, and the dollar will continue to circulate in the country.

Moreover, to help Pakistan's maritime business including shippers, investors and to facilitate ship owners to start investing in ship-buildings at all levels, it is highly recommended to either introduce Maritime Merchant Banks and Export-Import (EXIM) banks or windows at existing banks should be introduced.

Due to a drop in demand for imports from Pakistan and other developing countries, the manufacturing sector, and exporters in particular, encountered challenges. Numerous textile shipments were stranded at sea and then returned because, in the aftermath of the pandemic, no nation would allow them to enter the country until everything had returned to normal. Working capital management also posed difficulties for exporters in Pakistan. In addition, small firms, particularly freelance entrepreneurs, have struggled as their supply lines have dried up, leaving them without products or crucial supplies (Impact of covid-19 on socioeconomic situation of Pakistan,2021).

Containers Pile Up at Port as Export Orders Cancelled

April 5, Since March 22, export containers are piling up at Karachi's ports due to a lack of shipping lines and buyer order postponements. The Karachi Port, which handled 76% of all export goods, saw a 31% fall in export container shipments between March 22 and April 3. Cancellation of orders from buyers and decreased availability of ships are identified as the major causes of the reduction. Between March 22 and April 3, 12,690 export containers were exported, while 19,625 export containers arrived at the port, leaving a stock of 6,935 containers at the port.. As Pakistan has already banned shipments to India at the Wagha border, exports from the

eastern border are almost nonexistent. As a result of the coronavirus outbreak, the western borders of Chaman and Torkham were closed to exports to Afghanistan and other Central Asian states. Likewise, Taftan border crossings with Iran were also restricted to trade. According to customs data, just 15 percent of airborne export goods leave the nation. "Exports of air freight units are severely impacted by the closure of air space, and just a few freighters are leaving Pakistan," stated a customs official. The coronavirus outbreak also resulted in the suspension of cargo transit via Pakistan.

KPT Grants 15-Day Free Storage for Cargoes Amid Lockdown

Karachi Port Trust (KPT) allowed importers free access to its storage areas for two weeks on April 22 to alleviate their demurrage burden, which is soaring due to a lack of transportation during the closure. Minister for Maritime Affairs Ali Zaidi stated that the decision was made in light of the difficulties COVID-19 has caused for enterprises. "KPT will also permit terminal operating companies (TOCs) to utilize KPT storage facility to store extra containers, subject to space availability," Zaidi tweeted. TOCs will be permitted to utilize KPT property for containers landing between March 25 and April 30 of 2020 till May 15. The federal cabinet extended the grace period to assist the business community.

Conclusion:

The maritime industry is vital to the global supply chain system, which is strongly dependent on international manufacturing and retailing activities. The current production and the sales structure of the global logistics system is designed primarily to effectively handle on-time delivery, which is seen as a crucial aspect of the supply chain. However, this leads to a lack of flexibility in supply chains during the Covid-19 Pandemic whereby companies are unable to delay or reschedule deliveries due to border closures and other pandemic-related factors. To cater to the post-pandemic supply chains, the suppliers may need to be relocated closer to their customers for them not only to have access but also to be able to predict demand more accurately. This has resulted in an increased focus on the concept of "supply chain agility". However, the container shipping industry is in needs to revamp its modeling equation of container movement specifically targeting the empty shipping container flows as more localized supply chains may be experienced in near future. Moreover, the shipping industry is a capital-intensive sector. The essence of container lines is dependent on costly assets such as ships and containers, which can be owned or rented via time charter contracts (Notteboom et al 2021). Shipping lines are compelled to efficiently manage the relocation of empty containers due to capital restrictions as well.

This paper realized the following five reason for the global supply chain disruption caused by scarcity of empty shipping containers to be the congestion at ports:

- (i) Delayed recovery from Pandemic
- (ii) Changing goods demand at importing sites
- (iii) Reduced number of operating vessels
- (iv) Decreased availability of conatiners

- (v) Congested ports i.e., the land side due to containers pile up and sea-side due to more ships

As we have experienced that national lockdowns have primarily been detrimental to global value networks. As a result, shorter supply chains and an increase in alternative logistic options, such as inter-continental rail services, may be observed to reduce lead times and costs and the introduction of modular warehouses and mobile warehouses near markets may reduce transit time to destinations.

Recommendations:

It is highly recommended that container lines, ports, inland transportation providers, customs, and shippers are among the entities in the maritime supply chain that should engage with each other to exchange data with each other regarding the real-time tracing of their empty shipping containers. This will enable them to share/exchange empty shipping containers resulting in reduced scarcity.

As it has been wisely said, if you cannot measure, you cannot control. Empty containers, a lagged container cycle, unstructured container management, and insufficient information transmission are all problems with existing container management (Ke et al., 2008) which can be overcome by equipping RFIDs in each of the containers. These RFIDs can help to keep track of the number of containers in stock and proactively relocate containers from surplus to deficit ports. Furthermore, the use of RFID leads to more accurate information on container returns, improved forecasting, and greater return rates (Kim & Glock, 2014).

Moreover, it is highly recommended to reshape the container market via collapsible/foldable containers. Global competitiveness has compelled firms to improve logistics during the last decade. The use of collapsible containers opens new possibilities for logistics cost reductions (Ou et al., 2017), usage of these can also alleviate congestion at ports by providing free space onboard ships and at ports for laden containers, helping achieve a higher utilization ratio of available space. According to Konings and Thijs (2001), on shipping routes with persistent trade imbalances, the use of foldable containers can reduce transportation, transshipment, and storage costs because shipping companies are responsible for repositioning their empty container (Konings & Thijs, 2001). The overall savings provided by a collapsible container are difficult to quantify, but they are undeniably significant. Based on established traffic patterns in the Port of Rotterdam, Cargo shell calculated that replacing steel containers with foldable containers would lead to a decrease of 10,000 trips per year (Hanlon, 2010).

To further idealize the container shortage situation and prepare for unforeseen disruptions, modeling-based analysis is necessary, in which meta-models must be realized via partial analysis of regional-based unit models.

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References

- Ayaz, İ. S., Bucak, U., & Mollaoglu, M. Resilience Strategies of Ports Against Covid-19 in Terms of Chaos Theory: An Exploratory Study of Turkish Container Ports. Available at SSRN 4049769.
- Chaudhary, A. (2022, April 13). *500 ships stranded outside Chinese ports due to zero covid policy*. The Maritime Post. Retrieved January 29, 2023, from <https://themaritimepost.com/2022/04/500-ships-stranded-outside-chinese-ports-due-to-zero-covid-policy/>
- Chengevelyn. (2021, November 19). *Surging shipping costs will drive up prices for some consumer products by 10%, new UN report finds*. CNBC. Retrieved January 29, 2023, from https://www.cnbc.com/2021/11/19/surging-shipping-costs-to-drive-consumer-price-inflation-unctad-says.html?utm_term=Autofeed&utm_medium=Social&utm_content=Main&utm_source=Twitter#Echobox=1637295016
- China exports spike to highest in decades after covid-19 hit*. The Economic Times. (n.d.). Retrieved January 29, 2023, from <https://economictimes.indiatimes.com/news/international/business/china-exports-spike-to-highest-in-decades-after-covid-19-hit/articleshow/81374582.cms?from=mdr>
- Chip shortage? now it's a ship(ping container) shortage*. The National Law Review. (n.d.). Retrieved January 29, 2023, from <https://www.natlawreview.com/article/chip-shortage-now-it-s-shipping-container-shortage>
- Cudahy, B. J. (2007). *Box boats: How container ships changed the world*. Fordham Univ Press.
- Danelia, I. (2021). Impact of COVID-19 on global container shipping industry. *European Scientific Journal, ESJ*, 17, 27.
- Global shipping snarls leave Chinese exporters sweating ahead of Christmas*. South China Morning Post. (2021, October 5). Retrieved January 29, 2023, from <https://www.scmp.com/economy/global-economy/article/3151133/china-shipping-container-shortages-leave-exporters>
- Hanlon, M. (2010). The cargoshell: Ingenious collapsible replacement for the standard shipping container. *2010-01-06*[2014-10-15]. <http://www.gizmag.com/the-cargoshell-ingenious-collapsible-replacement-for-the-standard-shipping-container/13736>.
- Impact of covid-19 on socioeconomic situation of Pakistan*. (n.d.). Retrieved January 29, 2023, from https://finance.gov.pk/survey/chapters_21/Annex%20IV%20Covid.pdf
- Jahn, M. (2022, November 10). *Which country is the largest exporter of goods in the world?* Investopedia. Retrieved January 29, 2023, from

<https://www.investopedia.com/ask/answers/011915/what-country-worlds-largest-exporter-goods.asp>

- Ke, X., Zhou, H., Jin, N., Wan, X., & Zhao, J. (2008, December). Establishment of containers management system based on RFID technology. In *2008 International Conference on Computer Science and Software Engineering* (Vol. 6, pp. 329-331). IEEE.
- Khan, A. S. (2020, December 30). *Supply chains choke as container shortage persists*. DAWN.COM. Retrieved January 29, 2023, from <https://www.dawn.com/news/1598612>
- Kim, T., & Glock, C. H. (2014). On the use of RFID in the management of reusable containers in closed-loop supply chains under stochastic container return quantities. *Transportation Research Part E: Logistics and Transportation Review*, *64*, 12-27.
- Konings, R., & Thijs, R. (2001). Foldable containers: a new perspective on reducing container-repositioning costs. *European journal of transport and infrastructure research*, *1*(4).
- Lapena, D. (2022). The Impact of the Covid-19 Pandemic on Distribution Logistics.
- Lapshin, A. (2022, June 7). *Solving empty container repositioning problem with ai*. Transmetrics. Retrieved January 29, 2023, from <https://www.transmetrics.ai/blog/empty-container-repositioning/>
- Levinson, M. (2016). *The Box: How the Shipping Container Made the World Smaller and the World Economy Bigger - Second Edition with a new chapter by the author* (REV-Revised, 2). Princeton University Press. <https://doi.org/10.2307/j.ctvcpsztg>
- Mulhern, B. (2021, March 23). *An 'aggressive' fight over containers is causing shipping costs to rocket by 300%*. Prolink. Retrieved January 29, 2023, from <https://prolink.ie/an-aggressive-fight-over-containers-is-causing-shipping-costs-to-rocket-by-300/>
- Notteboom, T., Pallis, T., & Rodrigue, J. P. (2021). Disruptions and resilience in global container shipping and ports: the COVID-19 pandemic versus the 2008–2009 financial crisis. *Maritime Economics & Logistics*, *23*, 179-210.
- Ou, X., Arinez, J., Chang, Q., & Xiao, G. (2017). Cost analysis and fuzzy control for collapsible container usage based on closed-loop supply chain model. *Journal of Manufacturing Science and Engineering*, *139*(8).
- Slack, B. (2004). Corporate realignment and the global imperatives of container shipping. In *Shipping and ports in the twenty-first century* (pp. 47-61). Routledge.
- Youd, F. (2022, June 22). *Global Shipping Container Shortage: The story so far*. Ship Technology. Retrieved January 29, 2023, from <https://www.ship-technology.com/features/global-shipping-container-shortage-the-story-so-far/>

Song, D. P., & Dong, J. X. (2015). Empty container repositioning. *Handbook of ocean container transport logistics: making global supply chains effective*, 163-208.

Team, M. (2021, March 14). *The 'domino effect' of container shortage distorts the supply chain*. mfame.guru. Retrieved January 29, 2023, from <https://mfame.guru/the-dominoeffect-of-the-container-shortage-distorts-the-supply-chain/>

The impact of the COVID-19 pandemic on Freight Transportation Services and U.S. merchandise imports. The Impact of the COVID-19 Pandemic on Freight Transportation Services and U.S. Merchandise Imports | United States International Trade Commission. (n.d.). Retrieved January 29, 2023, from https://www.usitc.gov/research_and_analysis/tradeshifts/2020/special_topic.html