

## **Global Supply Chain Disruptions**

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### **Introduction**

Throughout the latter half of the 20th century, globalization and international trade have increased rapidly, as nations have embraced free-market economies and more companies have invested in production facilities throughout the world. These innovations increased profitability for many multinational enterprises. But companies grew over-reliant and unprepared for disruptions to international commercial activity. In the following case study, I analyze this issue and discuss opportunities to reduce disruptions and increase local production.

### **Reliance on China at the Expense of Diversification**

The degree to which the world relied on Chinese exports became abundantly clear during the height of the Covid-19 pandemic lockdowns. As lockdowns occurred throughout the world, economic activity fell and companies responded by cutting production. Then demand quickly rebounded, leaving many companies unprepared and causing a cascade of increased production activities. For many companies, this meant ramping up production at factories in China. From June 2020 through June 2021, Chinese exports increased 32% and head haul shipping rates on transpacific trade lanes increased 350% from \$4000 to \$18,000.<sup>1</sup> Carriers even increased the speed of their vessels from an average of 14 knots to 24 knots on the Shanghai to Los Angeles trade lane.<sup>2</sup> Shipping rates on this route illustrate the overreliance on cheap production from factories all located in the same region of the world.

## **Analyzing the Unprecedented Rise in Rates**

Each step of the global supply chain (ships, ports, warehouses, trucking, and rail lines) has witnessed capacity constraints. A mismatch of empty containers located in the wrong parts of the world and labor shortages at each step of the global supply chain has further complicated the issue. Additionally, tens of thousands of TEU (twenty-foot equivalent) shipping containers shipped personal protective equipment to Europe, Africa, and South America in the early part of 2020, as those continents saw a dramatic rise in Covid infection rates. Paired with a slowdown in shipping activity (Maersk idled roughly 10% of its container fleet or about 2.2M TEUs of capacity<sup>3</sup>), many empty containers were left in parts of the world just as locked down consumers began to increase their spending on e-commerce.

### **The Demand Side**

E-commerce activity further fanned the flames on the demand side. Online retail sales increased 30% in 2020 to \$795B. Examining the E-commerce payment processor Stripe illustrates just how quickly demand increased in one year. As everyday activities moved entirely online, Stripe processed payments for over 500,000 merchants. Their 2020 revenue increased 70% to \$7.4B and gave the company a \$95B valuation compared to \$36B the previous year.<sup>4</sup> Locked-down consumers redirected their spending habits almost entirely online.

### **The Supply Side, Relying on China**

The pressure to fulfill e-commerce demand for goods and services has come mainly from Chinese production facilities. China has become the factory to the world. Their

manufacturing dominance has concentrated container capacity within their ports. China is home to 70% of the largest ports in the world as measured by container capacity, with the largest container ship in the world currently holding roughly 24,000 TEU containers. Lori Ann LaRocco, the author of *Trade War: Containers Don't Lie, Navigating the Bluster*, argues that the world is interconnected such that if any port goes down, the domino effect reverberates globally.<sup>5</sup> In 2020, ports went down. The Chinese economy shut down for two months to fight the spread of covid infections. Labor shortages at Chinese ports began a domino effect that reverberated globally, exacerbated by increased e-commerce demand.

### **The Big Picture**

The World Shipping Council estimates that \$4T of goods move by sea annually. If China accounts for 70% of the largest ports in the world, by my estimations, it is plausible to assume that China moves 70% of that \$4T in goods or roughly \$2.8T annually. The latest Chinese export data shows \$2.7T of exports in 2020.<sup>6</sup> That equates to approximately \$233B a month in exports leaving Chinese ports. Therefore, it is plausible to estimate that a two-month lockdown accounted for \$466B worth of disrupted exports during this time. In other words, the shutdown of the Chinese economy disrupted \$466B of exports.<sup>7</sup> As of now, it appears that shippers are willing to pay skyrocketing rates to recuperate that pent-up demand, with reports of some head haul shipments costing as much as \$32,000 on the transpacific trade lane from Shanghai to Los Angeles. As Lori-Ann LoRocco discussed in her book, there is no grace period on the world stage to account for these disruptions. They have reverberated around the world and continue to do so today, causing prolonged global chaos.

The following table calculates the figures discussed in this section:

\$4T	global shipping volume by sea annually
<u>x .7</u>	70%, largest ports in the world located in china
\$2.8T	exports passing through Chinese ports <i>annually</i>
<u>÷ 12</u>	months in year
\$233B	potential exports passing through Chinese ports <i>monthly</i>
<u>x 2</u>	2-month shutdown
<b>\$466B</b>	total Chinese exports disrupted by shutdown

### Ways to Reduce Supply Chain Disruptions

It is highly improbable and inefficient to forecast global disruptions from black swan events in hopes of reducing their impact. It is much more prudent to prepare for disruptions caused by everyday business factors such as weather disruptions, labor disputes, minor bottlenecks, and other day-to-day disruptions. These events are much more probable than extreme one-off global disruptions like we are currently experiencing. Effective strategies should include segmenting supply chains by region, nearshoring production<sup>8</sup> and, stockpiling inventory.<sup>9</sup> Home improvement retailer Home Depot has come up with a third strategy. Home Depot chartered a feeder vessel to avoid disruptions to its import

operations. I discuss this in greater detail in the section below titled “Analyzing Companies Better Prepared and Less Prepared for Future Disruptions.”

### **Segmenting the Supply Chain by Region**

One option to mitigate supply chain risk is to segment the supply chain by region or nearshore production. Segmentation would mitigate any regional disruptions and isolate exports by region, reducing the reliance on select parts of the world. Production facilities would have to get established in countries with access to shipping lanes to facilitate segmenting. Bjorn Vang Jensen, VP of Advisory Services at Sea-Intelligence, argues that world trade is less like a chain and more like a web. Multinational companies rely on primary suppliers, and those suppliers rely on sub-suppliers for their needs.<sup>10</sup> One of the factors from Michael Porter's diamond on National Competitive Advantage states that the spillover effect from a nation with a competitive advantage (such as China has) is that supporting industries (sub-suppliers) cluster near a primary supplier leading to a concentration of exports from one region. We have already seen the weaknesses inherent in such tight concentrations. Regional disruptions should be easier to handle using a segmented, nearshoring approach. However, this approach requires investments in other parts of the world besides China. Since 2009, China has led the world in exporting activities. The country has production activities in electronics, data processing technologies, clothing, textiles, and medical equipment, to name a few industries.<sup>11</sup> In the next section on U.S. manufacturing titled “The Benefit to Local U.S. Manufacturing,” I discuss ways the U.S. is trying to bring data processing manufacturing back to local U.S. factories.

## **Stockpile Inventory**

Another option to mitigate supply chain risk is to stockpile inventory. Although, I believe this strategy is not practical. Stockpiles of inventory are expensive to maintain and carry risks of their own. However, we have seen some stockpiling occur to counteract recent shortages and price increases. The construction sector saw massive raw cost increases as lumber recently doubled in price from \$800 to \$1600 per Board Foot. Many homebuilders reacted by stockpiling as much supply as possible while simultaneously halting sales for new orders to cope with the orders already on their books. The Generally Accepted Accounting Principle (GAAP) of revenue recognition explains the logic behind rejecting new orders. Revenue does not get recognized until the product or service gets delivered to the customer. This past spring, the window of completion and delivery estimates for new home construction was 6-8 months out into the future. In that time frame, many homebuilders believed that raw costs would exceed the original revenue of an order and halted new orders to cope. They stockpiled as much supply as they could in hopes of sidestepping shortages to fulfill their current contracts. Lumber prices fell sharply in July 2021 after reaching \$1600 per Board Foot and demand for new homes slowed throughout the summer months compared to the spring. Homebuilders that stockpiled lumber at higher prices paid a premium on the inventory as prices have fallen and sawmill capacity has slowly recovered. The stockpile strategy is equivalent to insurance against supply constraints and, similar to other types of insurance, is often costly.

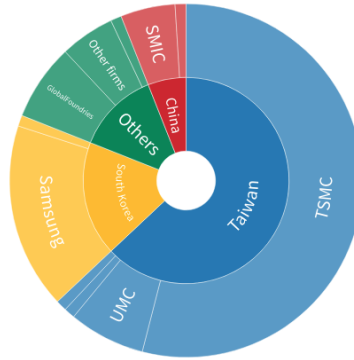
## **The Benefit to Local U.S. Manufacturing**

Asian nations have gained a comparative national advantage in many industries, especially in semiconductor

manufacturing.<sup>12</sup> Taiwan Semiconductor, the largest semiconductor manufacturer in the world, has a monopoly in the industry. Many of its competitors and sub-suppliers are also located in Asia, further concentrating global production. Taiwan Semiconductor accounts for over 50% of global semiconductor production, as illustrated by the accompanying chart.<sup>13</sup> Semiconductors are components in everything from automobiles, airplanes, home appliances, and military equipment. In the 1970s and 1980s, American companies such as Intel, Advanced Micro Devices, and Texas Instruments were the dominant players in semiconductor manufacturing. But, just as the U.S. government was taking a hands-off approach to the industry, barriers to global trade were diminishing. A shift in production occurred, and by 1990 only 37% of semiconductor production took place in the United States. Production has continued to fall to 12% as of 2020. In the 90s, Asian governments began incentivizing chip production in Taiwan, South Korea, and China. Today those nations are home to the companies that hold the largest market share of new contracts awarded for semiconductor manufacturing.

The U.S. Senate recently passed the U.S. Innovation and Competition Act which subsidizes domestic semiconductor manufacturing. The bill provides \$52B of funding for research, development, and production of semiconductors in the United States. Additionally, Intel announced plans to build a \$20B production facility to design and manufacture chips in Arizona. These actions are an attempt to regain some of the early advantages the U.S. once enjoyed. Many New Trade Theorists argue that nations should subsidize their factors of production to gain a competitive advantage as the first entrant in a new industry. In the case of semiconductors the U.S. is not attempting to gain a first-mover advantage but

**Semiconductor contract manufacturers by market share**  
Total foundry revenue stood at \$85.13 billion in 2020



SOURCE: TrendForce (March 2021)



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rather to regain a competitive advantage by subsidizing development and production.

### **Analyzing Companies Better Prepared and Less Prepared for Future Disruptions**

Companies are adjusting to ongoing supply constraints by testing different strategies to alleviate the problem. However, not every company is addressing the situation in the same way. Home Depot and Starbucks are two such companies.

Home Depot has learned valuable lessons from the current crisis and is actively mitigating its future risk. As the third-largest sea importer in the U.S. behind Walmart and Target, Home Depot has witnessed significant disruptions to its operations.<sup>14</sup> Recently, the company chartered a feeder vessel to handle volume for the upcoming holiday season and beyond. Home Depot's immediate response was to procure merchandise on the spot market at rates up to four times higher than they typically pay for similar merchandise. Home

Depot also used air freight as an alternative means of shipping, which is more expensive than ocean freight rates. The situation was so dire that Home Depot was willing to risk its 34% gross profit margins to alleviate supply pressures. The company took a bold step in chartering a feeder vessel. Their strategy could become a model for future risk management. Starbucks has experienced similar disruptions to Home Depot.

Starbucks responded to initial shortages of raw materials by increasing prices rather than proactively addressing ways to mitigate their risk. When ingredients ran out at their locations, the company stopped serving the associated product.<sup>15</sup> The company raised prices on their products while supplies lasted and then stopped offering those products altogether after they ran out of ingredients. Starbucks will eventually have to alter this approach to prepare for future disruptions. But, as of now, the company has not addressed this concern. On the Q2 2021 earnings conference call, the company never directly mentioned supply chain issues. The only mention of supply chain issues occurred when analyst Chris O’Cull from Stifel Financial asked about optimizing the supply chain for raw ingredients of plant-based milk products. Starbucks CFO Patrick Grismer responded that there is enough price premium in their products that the company can absorb rising costs. However, he never addressed how the company plans to optimize its procurement process. And we saw similar comments in Q1 2021. CEO Kevin Johnson mentioned it on the conference call but did not elaborate on the details.<sup>16</sup>

## **Summary**

While supply chains have never been perfectly efficient, they have helped revolutionize modern business and global commerce. However, the current disruptions have magnified

weaknesses inherent to such interconnectedness. Supply backlogs might persist for many months and possibly years to come as the domino effect from original shutdowns continue to reverberate globally from pent-up demand not being met by increased capacity as labor shortages persist. Companies will have to adapt as best they can and learn from the current situation.

### Notes

- <sup>1</sup> <https://www.nytimes.com/2021/07/13/business/china-exports.html>
- <sup>2</sup> <https://www.freightwaves.com/news/full-steam-ahead-why-container-ships-are-racing-across-the-pacific>
- <sup>3</sup> <https://www.youtube.com/watch?app=desktop&v=9-IEcZOa4rg&feature=youtu.be>
- <sup>4</sup> <https://www.wsj.com/articles/how-payment-processor-stripe-became-silicon-valleys-hottest-startup-11618306201>
- <sup>5</sup> <https://www.youtube.com/watch?app=desktop&v=E7t5yj1rScI&feature=youtu.be>
- <sup>6</sup> <https://www.macrotrends.net/countries/CHN/china/exports>
- <sup>7</sup> <https://www.youtube.com/watch?app=desktop&v=E7t5yj1rScI&feature=youtu.be>
- <sup>8</sup> [https://sloanreview-mit.edu/cdn.ampproject.org/v/s/sloanreview.mit.edu/article/reducing-the-risk-of-supply-chain-disruptions/amp?amp\\_js\\_v=a6&amp\\_gsa=1&usqp=mq331AQKKAFQArABIIACAw%3D%3D#aoh=16257842848760&referrer=https%3A%2F%2Fwww.google.com&amp\\_tf=From%20%251%24s&ampshare=https%3A%2F%2Fsloanreview.mit.edu%2Farticle%2Freducing-the-risk-of-supply-chain-disruptions%2F](https://sloanreview-mit.edu/cdn.ampproject.org/v/s/sloanreview.mit.edu/article/reducing-the-risk-of-supply-chain-disruptions/amp?amp_js_v=a6&amp_gsa=1&usqp=mq331AQKKAFQArABIIACAw%3D%3D#aoh=16257842848760&referrer=https%3A%2F%2Fwww.google.com&amp_tf=From%20%251%24s&ampshare=https%3A%2F%2Fsloanreview.mit.edu%2Farticle%2Freducing-the-risk-of-supply-chain-disruptions%2F)

- <sup>9</sup>[https://www.linkedin.com/posts/zelman-%26-associates\\_building-construction-buildingmaterials-activity-6779842773710450688-dVqN/](https://www.linkedin.com/posts/zelman-%26-associates_building-construction-buildingmaterials-activity-6779842773710450688-dVqN/)
- <sup>10</sup><https://www.sea-intelligence.com/market-commentary/12-opinion-pieces/73-chains-vs-webs>
- <sup>11</sup><https://www.investopedia.com/ask/answers/011915/what-country-worlds-largest-exporter-goods.asp>
- <sup>12</sup><https://time.com/6075425/semiconductor-chip-shortage/>
- <sup>13</sup><https://www.cnbc.com/2021/03/16/2-charts-show-how-much-the-world-depends-on-taiwan-for-semiconductors.html>
- <sup>14</sup><https://www.cnbc.com/2021/06/13/home-depot-contracted-its-own-container-ship-to-avoid-shipping-delays.html>
- <sup>15</sup><https://www.nytimes.com/2021/06/10/business/starbucks-shortages.html>
- <sup>16</sup><https://www.fool.com/earnings/call-transcripts/2021/01/27/starbucks-corp-sbux-q1-2021-earnings-call-transcri/>

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***note:*** Citations 5 & 7 are the same source. The source was cited twice in my research and listed here twice to maintain continuity between footnotes and works cited)

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