

Supply Chain Disruption



Source: NASA photo of ship congestion at the Ports of Los Angeles and Long Beach in California [i]

The basic course of the pandemic's economic impacts on U.S. consumers and businesses can be described in a few sentences, but the path to recovery is more complex and reflects uncertainty about how businesses view future risks to their supply chains. As the pandemic unfolded demand declined and inventories increased, many Asian factories slowed or suspended production, and operations at ports and inland transport systems were slowed by labor constraints and mitigation efforts.

When the U.S. economy slowed, imported goods remained in shipping containers for extended periods which slowed the return of containers in the shipping system. The lack of containers further slowed shipments by exporters and limited manufacturers' abilities to fulfill buyers' needs as the effects of the pandemic eased. Even as manufacturers desired to increase production, the pre-pandemic flows of inputs, labor and transport services remained constrained. Adding to the challenges, import recovery was further disrupted by Asian port shutdowns and increasing congestion at ports, especially at major West Coast ports. Given that the OCED estimates almost 90% of the world's goods are transported by sea and 60% of those

Contents

1

Supply Chain Disruption

4

Lessons from U.S. Mask
Manufacturing

7

Anneal Initiative Company
Highlight

9

Texas A&M University –
Galveston Researching Best
Practices and Principles for
Resiliency in Maritime Supply
Chains

Where to reach us:
<https://cbts.tamu.edu/>
Email: cbts@ag.tamu.edu



CROSS-BORDER THREAT SCREENING
AND SUPPLY CHAIN DEFENSE
A Department of Homeland Security Center of Excellence

TEXAS A&M
AGRI LIFE

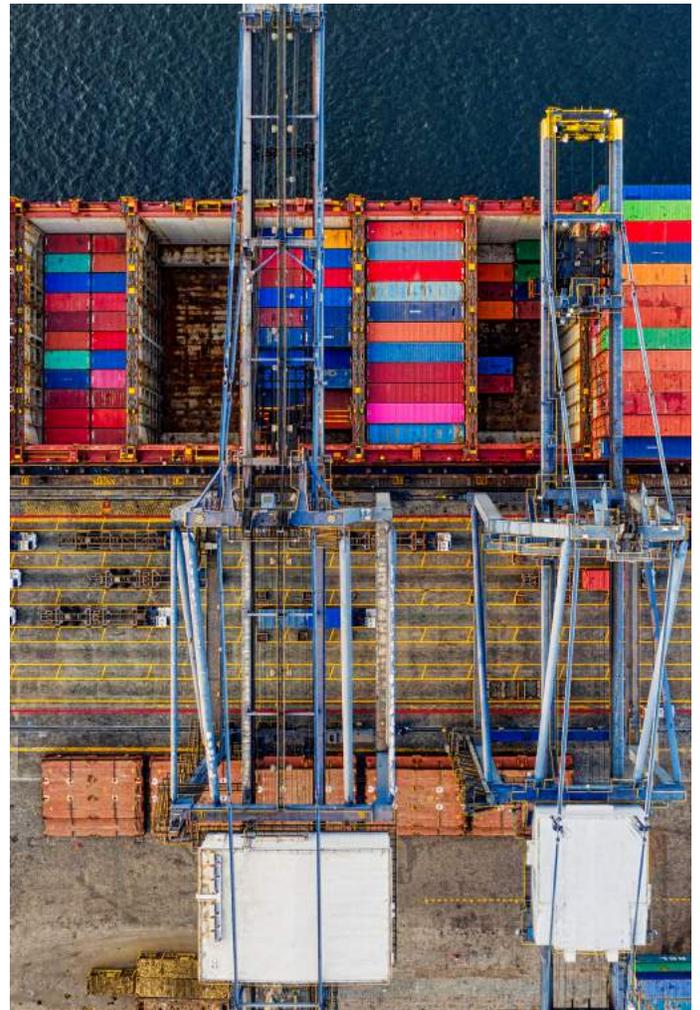
shipments are moved in shipping containers, it is no wonder almost everyone has felt the impact of supply chain disruptions. [ii]

Throughout the pandemic analysts have used many individual measures to calculate the impacts of these disruptions including slower transit times, increases shipping charges, and higher prices for producers and consumers. In December, there were nearly 100 ships waiting to off load their cargo at the Los Angeles and Long Beach terminals with an average delay of 18 days. [iii] Over the course of the pandemic total transit times doubled, inland transportation constraints continued to bind, and staffing issues at ports remained constant concerns. Freightos notes that the rates for 40-foot containers moving across the Pacific declined from a high of \$19,700 in September 2021 to just under \$14,500 in January 2022. Two years earlier the cost was about \$1,500 per container.

In January 2022, the Federal Reserve Bank of New York (FEDNY) introduced a new indicator that reflects the many pressures arising from disruptions and constraints experienced by global supply chains. In developing their Global Supply Chain Pressure Index, the FEDNY sought to combine existing shipping and logistics metrics into a summary of potential disruptions affecting global supply chains. The index is normalized around zero so that positive values represent increased pressure and negative values represent decreased pressure on supply chains. This index reflects the fact that while pressures on global supply chains are common, the pressures facing supply chains since the pandemic have been incredible.

However, pressures on supply chains only provide a partial explanation for the impact the pandemic has had consumers and businesses. [iv] Despite congestion and rising shipping costs, U.S. imports in 2021 set a record with an

annual increase of over 18% compared to the prior record year in 2020. [v] Increased demand for goods has played a significant role. The most recent 12-month Consumer Price Index estimate reached 7.5%. This was the biggest year over year increase since the early 1980's. A recent Forbes article highlighted the combined impact of increased demand and congested supply chains by noting some consumer prices have increased by 19 to 51 percent.[vi] As highlighted by the Bureau of Labor Statistics data, the impacts of supply disruptions and increased demand have been especially dramatic for major durable (e.g., cars, furniture, and appliances) purchases.



What can we expect moving forward? Reduced pressures on global supply chains should ease pressures on prices, but it does not mean markets or prices will return to pre-pandemic operations or levels.

The pandemic highlighted fragility in our global supply chains, and in the process, it has forced manufacturers, shippers, and others to consider how they will compete going forward. We are already seeing efforts by shippers to consolidate and extend their operations inland through acquisitions. In the face of increased awareness of logistical risks and concerns about their competitiveness, we know manufacturers and suppliers are revisiting decisions about the geographic footprints of their operations and the sources of their input suppliers. However, as a recent Wall Street Journal article noted, the U.S. manufacturing base has been shrinking for decades as firms consolidated, sold out or moved production to places with lower costs.[vii] It is not clear whether those long-term trends will reverse or slow as firms reconsider the risks associated with extended supply chains.



We know consumers, workers, governments, and businesses are trying to adjust new market conditions. However, it is difficult to determine what information will be used to guide actions or the timing for recovery paths. For example, the need for more truck drivers has been a top ten concern within the American trucking industry for the past decade, and their number one concern for the past five years. [viii] Awareness of risk and issues alone is not sufficient.

Businesses that consider near-shoring production and diversifying the sources of their inputs will need base their decisions on expected reductions in supply chain disruption risks, access to labor and inputs, changes in regulatory oversight, exposure to new risks, and the potential impact of all these changes will have on their costs.[ix] Given recent political and consumer outcries about inflation, businesses will need to consider their ability to pass through possible increased costs. As global supply chains recover, the domestic businesses' desires to change will be tested. While government intervention is a possibility and disruptions and rising prices remain concerns, that does not necessarily mean that intervention will lead to better or quicker outcomes compared to those that will unfold as markets adjust to new conditions. As we are currently witnessing, the recovery is following a path marked by many uncertainties.

[i] <https://www.nasa.gov/feature/amazing-earth-satellite-images-from-2021>

[ii] How many products are transported by sea? | World Economic Forum (weforum.org)

[iii] <https://theloadstar.com/new-york-nudges-biggest-us-container-port-title-as-west-coast-imports-flatline/>

[iv] <https://fbx.freightos.com/>

[v] https://www.logisticsmgmt.com/article/port_tracker_has_2021_import_volumes_on_a_record_setting_pace

[vi] <https://www.forbes.com/sites/alexkonrad/2022/02/07/flexport-is-silicon-valleys-solution-to-the-supply-chain-mess-why-do-insiders-hope-it-sinks/?sh=27be0492753d>

[vii] <https://www.wsj.com/articles/u-s-manufacturing-why-2020-was-the-bottom-of-a-long-decline-11608037200>

[viii] <https://www.fleetowner.com/operations/media-gallery/21179300/driver-shortage-tops-atris-2021-trucking-issues-list>

[ix] How do natural disasters affect supply chains long term? | World Economic Forum (weforum.org)

Lessons from U.S. Mask Manufacturing



Late January 2022, the federal government began distributing free N95s masks from the United States Strategic National Stockpile (SNS). The shipment of an estimated 400 million masks, represented about half the 750 million that were stored in the SNS. This action highlights the difference a year can make in fulfilling the nation's need for N95 masks.

Around the same time, the “Domestic Security Using Production Partnerships and Lessons from Yesterday Act of 2022” or Domestic SUPPLY Act was introduced to Congress. If passed, this legislation would require the Secretary of Homeland Security

along with other Agency heads “... to establish a program of entering into partnerships with eligible domestic manufacturers to ensure the availability of qualified personal protective equipment to prepare for and respond to national health or other emergencies, and for other purposes.”

The reason this legislation was brought before Congress amid a mask give-away to support domestic personal protection equipment (PPE) manufacturers is due to the painful lessons learned in the early days of the pandemic. Dramatic increases in global demand led to severe mask shortages in the U.S. and higher prices as buyers exhausted import and domestic supplies.

These lessons were emphasized by the realization the U.S. depended heavily on foreign manufacturing and domestic mask production responses by established and new manufacturers. The stress of demand took time to accomplish, and business models changed due to higher prices. Domestic manufacturers needed time to find and acquire equipment, materials and labor needed to make masks that met the standards to allow sale in the U.S.

Ultimately, the Domestic SUPPLY Act represents a public/private approach to address the pandemic's lessons learned about the fragility of some supply chains, and the competitive, though not always fair, global mask market that is now seeing lower prices return as demand falls.

During the pandemic, the market for PPE was booming. Prior to the pandemic, the market for PPE, including N95 masks, was mature and complacent. Manufacturers located in China accounted for more than 50% of the masks used worldwide, and over 70% of the masks used in the U.S. prior to the pandemic. China also controlled a growing share of the fabrics required to make masks.[i] Given suppliers with the lowest prices often gain market share, cost minimization is critical to their business models. Similar to other industries, cost cutting led to a dependence on extended, international supply chains. As long as mask demand was stable, and suppliers were trustworthy, concerns about possible disruptions or supply chain resilience were insignificant. Prior to the pandemic, firms had little incentive to invest in U.S. capacity that could buffer domestic markets in the event of supply chain disruptions.

As the supplies dwindled, the real and imagined demand by governments, the healthcare sector, businesses, and individuals grew. The introduction of new market participants meant traditional business relationships and supply chains were altered as desperate buyers sought to outbid each other for any products that found their way to market. This led to additional disruptions and increased criminal activity as counterfeit products became prevalent and criminals defrauded buyers with bogus transactions. The disrupted and corrupted markets increased distrust among buyers and sellers, obstructed efforts to resolve shortages, and led to increased political noise and misinformation. During this time of uncertainty and mistrust, entrepreneurs across the country stepped forward to address the nation's need for PPE.



In mid-May 2021, CBTS hosted Experiences in the U.S. PPE Market, Lessons and Challenges, a seminar discussing the issues in the U.S. PPE market. Participants of the seminar heard from a range of speakers including entrepreneurs who launched businesses, United States Mask and Wisconsin Medical Supplies, devoted to helping fill the country's mask shortage while struggling with limited access to inputs needed to manufacture and distribute N95 and surgical masks. The seminar speakers described the difficulties they encountered trying to acquire machines and materials needed to start manufacturing. Also, due to the newness of the companies, in some cases hospital suppliers and distributors excluded new firms as preferred sources in bidding processes and were unable to compete for hospital sales.

Domestic mask manufacturers faced price competition from foreign suppliers who are, in some cases, subsidized by their governments. In an odd twist, as supply concerns eased, the U.S. government continued to prohibit U.S. companies from exporting their products. Today, we are witnessing the results of U.S. firms' struggles with the boom-and-bust nature of the mask market. Firms like Premium-PPE, that once produced up to a 1 million masks, has since laid off most of its employees.[ii] Another firm, DemeTech, a surgical mask manufacturer laid off 1,500 workers last year as the market for American masks faded. Suppliers, such as Cummins Filtration, who ramped-up production to meet the needs of U.S. mask manufacturers are also responding to the effects of reduced demand and competition from foreign suppliers by shutting down their production lines.[iii]

The effects of competitive pressures are ongoing. In June 2021, Honeywell, one of the nation's largest N95 mask manufacturers with facilities in the U.S. and China, announced they were selling off mask-manufacturing equipment and laying off about 700 employees in Arizona—barely a year after the company expanded production in response to the incredible need for masks. Honeywell, which helps supply the U.S. Strategic National Stockpile, cited a significant reduction in demand for N95 masks in the U.S. as the main reason for adjusting its operations.

By September 2021, smaller, often new, U.S. mask manufacturers stopped production and laid-off workers. At the beginning of 2022, the number of firms shutting down doubled.[iv] Shutdowns, the sale of equipment, and related job losses illustrate the pressures domestic manufacturers face as the pandemic abates and foreign suppliers return to U.S. markets with prices that appear to be lower than the cost of production.

The reactions of domestic manufacturers and suppliers evoke questions about what will happen in the event of another pandemic. The public can expect another generation of entrepreneurs to respond, but there is uncertainty as to if similar delays accessing inputs, machinery, labor and regulatory oversight required to produce will be experienced. The Domestic SUPPLY Act offers one approach to combating those issues in a cost-effective and preventative manner. Other approaches include a continued heavy reliance on foreign suppliers, managed stockpiles, and purely private actions alternatives.

Stockpiles offer a cushion against supply shocks, but the cost of maintaining stocks can be prohibitive. The SNS of PPE were intended to serve as safety nets, but due to limited attention to inventory levels and a lack of urgency led to lower funding and reduced reserves. The combination of limited stockpiles and extended supply chain disruptions magnified the impact of reduced domestic capacity as the surge in global demand attracted new buyers and sellers, but it didn't result in an immediate offsetting surge in domestic production.

Private approaches may take many forms which will allow firms to take advantage of market opportunities they observe, however market risks will remain a challenge for these firms and their investors. An example of this approach is the 2020 partnership between Prestige Ameritech, a large domestic manufacturer of masks, and a collection of hospitals that wanted to ensure access to masks. Under this arrangement the hospitals pledged to buy a portion of Prestige Ameritech for up to six years.^[v] While offering some stability in demand this type of arrangement involves risks as other mask buyers appear willing to rely on foreign suppliers to once again to reduce mask costs.



Each approach provides potentially important signals to firms that will inform their future production decisions, and none precludes the application of any other approach. As in many other industries, the credible application of approaches will help domestic firms and distributors assess their longer-term interest in retaining a capacity to deliver critical products in the future. Moving forward, firms' and government stakeholders' actions will provide insights into the approaches that will ultimately determine our capacity to build domestic resilience in the face of future public health, extreme events or willingness to rely on other nations to supply needed goods or inputs.

[i] <https://www.cnn.com/2021/09/15/success/us-mask-makers-china-competition/index.html>

[ii] <https://thehill.com/business-a-lobbying/business-a-lobbying/565997-us-mask-makers-say-theyre-in-danger-of-going-broke>

[iii] <https://www.ammaunited.org/post/the-majority-of-u-s-mask-manufacturing-will-go-offline-in-60-days-2-647-jobs-already-lost>

[iv] <https://www.axios.com/free-n95-masks-biden-omicron-covid-2d814749-72de-48be-9ea8-2f32bdc226ad.html>

[v] <https://www.reuters.com/world/us/burned-by-covid-supply-crunch-hospitals-invest-us-mask-making-2022-01-14/>

Anneal Initiative Company Highlight



The Anneal Initiative Team (left to right) Jennie Jackson, Jeremy Jackson, and Amy Billinger.

Cross-Border Threat Screening and Supply Chain Defense works with various organizations in the pursuit of detecting, assessing, and responding to known and unknown biological threats to the nation's supply chain. During the initial stages of the COVID-19 pandemic, CBTS launched a study with Anneal Initiative, Inc. to assess global supply chain risk analysis capabilities for inputs related to pre-harvest livestock and crop production.

Founded in 2017, the Anneal Initiative team is dedicated to developing innovative analytical methods in order to prevent threats and

manage risks to the United States. The three-partner team consisting of Amy Billinger and husband and wife Jennie and Jeremy Jackson, work to identify and analyze threats and risks, develop risk management strategies, and build regulatory compliance programs.

The partners bring varying educational backgrounds and experiences to the table at Anneal Initiative which help them when consulting with clients.

Jeremy Jackson graduated with a Bachelor of Science in Mechanical Engineering and a Master of Arts in Intelligence Studies. Jackson was a member of the Military Reserves or National Guard since 1993 and recently retired from military service. During his service, Jackson worked in intelligence analysis and worked toward developing the Kansas Intelligence Fusion Center (KIFC) where he served as founder and director.

Jennie Jackson graduated with a Bachelor of Architecture and worked at various architectural firms as an architectural designer and school districts as a substitute teacher before the formation of Anneal Initiative. With her experience in project management in different industries, she is able to work on the business side of Anneal where she manages the company's accounting, finances, staffing and other business functions.

Amy Billinger graduated with a Bachelor of Art in History and Military Studies. She also studied Russian and following college studied at the Smolny Institute in St. Petersburg, Russia. She then worked for the Department of Defense as a language intelligence analyst. She joined the Air National Guard as an intelligence analyst before working with Jeremy at the Kansas Intelligence Fusion Center as the lead cyber intelligence analyst.

While working at KIFC, Jackson and Billinger wanted to find ways to develop and conduct innovative analytical capabilities on a broader scale that allowed for more flexibility and adaptability to various threats which led to the development of Anneal Initiative, Inc., Jackson said.

At the beginning of the COVID-19 pandemic, CBTS was working with several other teams to assess the impacts of the pandemic on food and agricultural sectors, but the pandemic exposed other potential risks to supply chains that needed attention. Anneal Initiative was brought in to develop information requirements and assessments of potential risks including disinformation campaigns disrupting supply chains, concerns of scientific publication processes being manipulated to mislead government COVID-19 responses, and risks of nation-states using the pandemic to consolidate power by restricting access to goods and inputs.

“The goal of the project was to effectively fill in the components of an overall risk equation for a food supply chain. We wanted to look more deeply at what was vulnerable about pre-harvest agriculture and food, the resources, the production, and then the overall supply chain,” Jeremy Jackson said. “We also looked at the consequences of those disruptions which oftentimes presented threats to other parts of other supply chains due to interdependency. The third component of our project was to look at the threats posed by the pandemic and our responses to the pandemic.”

Their methods of research for the project were built off of a previous framework Anneal Initiative developed for emerging infectious disease, foreign animal disease and the potential threats they pose to food and agricultural sectors, Jackson said. The project’s data collection design was made to ensure analysts did not miss key pieces of information and help them develop research questions for predictive analysis.

“We produced analysis that identified threats and risks to pre-harvest food and agriculture production and our analysis should allow industry and government organizations to try and prevent or mitigate risks to protect

production in the US,” Jackson said. “That’s what we’re trying to do to make a difference to hopefully get the attention of those who can take action for prevention and mitigation.”

ANNEAL
INITIATIVE, INC.

FORGING STRENGTH
THROUGH INNOVATION

<https://annealinitiative.com/>

Email: info@annealinitiative.com



Texas A&M University – Galveston Researching Best Practices and Principles for Resiliency in Maritime Supply Chains

In 2021, CBTS and the National Bureau of Economic Research (NBER) initiated a research project designed to examine existing and emerging supply chain risk. At a virtual conference in December 2021, the project brought together researchers in various fields to study issues of current importance and to frame the future research agenda.

Texas A&M University – Galveston’s “Incorporating Cyber Resiliency in Maritime Supply Chains: Best Practices and Principles” project was one of the projects launched in 2021 and presented at the December conference.

The team, co-led by Dr. Paula S. deWitte, and Dr. Joan Mileski, are investigating how maritime technology (OT) and information technology (IT) assets and systems risks potentially affect the flow and movement of goods and cargo using vessels and ports. The research of this project will provide a guide to principles and best practices for resiliency in the maritime supply chain regardless of the cause of the disrupting event.

The objective the team is trying to accomplish through this project is to give managers at businesses or ports the best practices to take-into-account in order to be prepared amongst various risks and disruptions. The main questions trying to be answered are “What makes a supply chain resilient?” and “How quickly can it recover?”

As witnessed over the course of the pandemic, fragility in our supply chains highlights the need to develop resiliency concepts that are generally applicable to the maritime supply chain regardless of the cause of the disruption. The research being done by the team is designed to leverage resiliency work from other industries



and scenarios to develop concepts specific to the unique maritime environment. Some possible events or disruptions being studied are physical or natural (weather, fires, global pandemics), port system disruptions or destructions, supply chain control, cyber attacks and security, and unintentional damages due to human errors or mistakes.

The team’s hope for the project is to help industries to adopt best practices which will ultimately make government jobs easier by making the industry more secure. In order to ensure project success, feedback will be necessary from industry professionals in order to improve implementation and best practices. The feedback will also help make training for individuals within the supply chain easier and assist in workforce development which is vital to industry success.

The project is expected to conclude during the summer of 2022. After completion, the team will develop a source library of applicable industry and government standards, academic papers, and other relevant material, and form a preliminary list of relevant standards. This in turn will be vital to helping address and prevent supply chain issues and disruptions.



**CROSS-BORDER THREAT SCREENING
AND SUPPLY CHAIN DEFENSE**

A Department of Homeland Security Center of Excellence