Reflections on Global Value Chains in the Context of COVID-19 and China

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Agenda

- Global supply chains → disruptions and vulnerabilities are strategic policy now
- U.S. government (Biden administration): building resilient supply chains → a key to revitalizing American manufacturing and securing broad-based growth
- Resilience for Whom? Firms, supply chains and countries
- COVID-19 medical supplies 4 product stories
 - ➤ China vs. U.S. role of the state in scaling up production
- Is industrial policy back?
 - > Reshoring doesn't guarantee national security or resilience
 - ➤ Where does Mexico fit in?



Global Supply Chains and National Security

COVID-19 raised public awareness of supply chain shortages

- Medical Supplies, like face masks, surgical gloves, ventilators & vaccines
- Distribution channels for food, toilet paper and services also affected

Since 2016, economic nationalism on the rise

- Brexit, the Trump administration (U.S.), trade wars, anti-immigration sentiment
- Regional trade agreements and multilateral security pacts at risk

Post 2020, the **U.S. government (Biden administration)** has made America's supply chains and their vulnerabilities a strategic priority



BUILDING RESILIANT SUPPLY CHAINS

4 key U.S. industries facing domestic supply shortages:

- Semiconductors
- Advanced batteries for electric vehicles & utility-scale energy storage
- Active pharmaceutical ingredients for critical medicines
- Critical minerals and rare-earth elements

Policy priority: How can the resilience of critical U.S. supply chains be strengthened?

Source: https://www.whitehouse.gov/wp-content/uploads/2021/06/100-day-supply-chain-review-report.pdf

BUILDING RESILIENT
SUPPLY CHAINS,
REVITALIZING AMERICAN
MANUFACTURING, AND
FOSTERING BROAD-BASED
GROWTH

100-Day Reviews under Executive Order 14017

June 2021

A R*eport by* The White House

U.S. Congressional Briefing on Supply-Chain Resiliency

- Gary Gereffi, founding director of the Duke Global Value Chains Center, testified in Washington, DC on July 15, 2021
- "Recent disruptions associated with the COVID-19 pandemic have resulted in unprecedented supply shortages and demand fluctuations that affected virtually all U.S. industries."



Resiliency for Whom?

After COVID-19, an intense debate \rightarrow whether U.S. supply chains are too rigid and dependent on cost-based global efficiency, or whether they should become more resilient.

Resilience has different meanings at 3 levels:

- For *companies*, resiliency refers to operational efficiency versus risk management options to achieve flexibility.
- For *supply chains*, resilience is defined by appropriate governance structures that organize networks of firms and the diversification options in the geographic configuration of an industry.
- For *countries*, resilience includes national security (e.g., reshoring or national stockpiles) plus economic, social & environmental goals.



Building Blocks of GVC Analysis

GVC framework is holistic, multi-level and actor-oriented

- GVC mapping analyzes entire supply chain (inputs, finished products, services) at the level of products and tasks
- GVC governance structures strategies of industry lead firms set performance requirements (price, quality, standards, logistics) and define linkages between dispersed tiers of suppliers
- Geography (GVC footprint) varies over time
- Value is distributed unevenly across supply chains
- State policies can exert conflicting pressures and unintended consequences on lead firms and suppliers
- GVCs require comparative and longitudinal analysis



PERSONAL PROTECTIVE EQUIPMENT (PPE): ASIA-CENTERED INTERNATIONAL TRADE

Different GVC Dynamics in Medical Supplies

PPE vs. Medical Devices

- PPE concentrated in LDCs; medical devices in DCs
- PPE: Asia's advantage low costs & scale; JIT procurement

Rubber Gloves

Export concentration in Malaysia (67%) and Thailand (18%)

Face Masks

- China's advantages: exports + scale up (non-woven fabric) + catch up
- U.S. policy failures > market failures

Ventilators

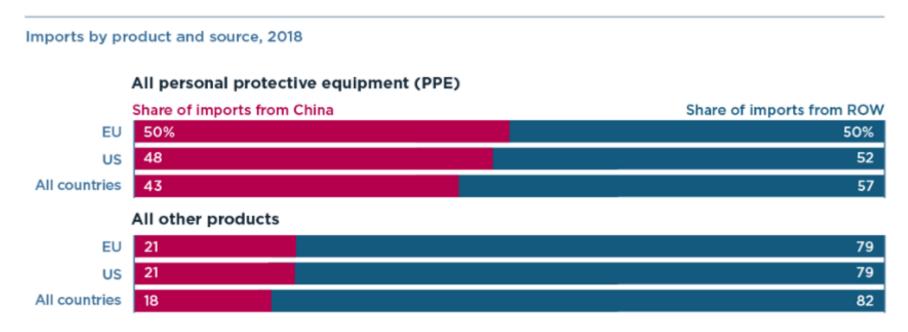
A U.S. shortage becomes a glut

Vaccines

- Big success in R&D; major problems in production and distribution
- Vaccine nationalism (who will supply low-income economies?)

EU and US Imports of PPE from China, 2018

Much of the world's imports of personal protective equipment come from China



Source: Chad Bown, Petersen Institute for International Economics, Washington, DC, March 26, 2020. https://www.piie.com/blogs/trade-and-investment-policy-watch/covid-19-chinas-exports-medical-supplies-provide-ray-hope

Much of the world's PPE comes from China

Share of global personal protective equipment imports by source, 2018





Source:

Constructed by the author from 6-digit Harmonized System import data, available from UN Comtrade accessed via World Integrated Trade Solutions. For product definitions, see appendix table.

Source: Chad Bown, Petersen Institute for International Economics, Washington, DC, May 5, 2020. https://www.piie.com/blogs/trade-and-investment-policy-watch/china-should-export-more-medical-gear-battle-covid-19

Why Does China (& Asia) Dominate PPE Exports?

Before the pandemic, China exported more PPE (face masks, medical goggles & protective garments) than the rest of the world combined.

China has 2 big advantages:

- 1. Low costs
- 2. Unprecedented scale up of production

US manufacturers and hospitals preferred JIT (just-in-time) production & purchasing with low inventories to maximize cash flow.

COVID-19 challenge: By April, 2020, 80 countries had imposed export controls on essential PPE items, such as face masks, medical gloves, and hospital gowns

Resilience Dynamics -> Product-Specific GVCs

Resilience not only has different meanings at the levels of the firm (operational efficiency), GVC (appropriate governance), and the country (national security).

It also varies by **product** and **time period** (crisis versus postpandemic), as illustrated for 4 COVID-19 medical supplies*

*See G. Gereffi, P. Pananond and T. Pedersen, "Resilience Decoded: The Roles of Firms, GVCs and the State in COVID-19 Medical Supplies," California Management Review, forthcoming.



Rubber Gloves

Rubber gloves	Crisis Period	Post-pandemic
Resilience dynamics	Resilience from operational efficiency	
Firm-level resilience	Suppliers' scaling up of production	Focus on higher value-added production (e.g., automation; product quality and variety improvement)
GVC-level resilience	Geographical concentration in Southeast Asia	More emphasis and higher value addition in downstream segments
Country-level resilience	Supportive home-country policy	More specific home-country policies toward higher value addition and export promotion



Face Masks

Face masks	Crisis Period	Post-pandemic
Resilience dynamics	Resilience from value-chain-based scale up	
Firm-level resilience	Scaling up of domestic production	State-supported suppliers resume export growth (China); MNEs balance global and domestic portfolios (US)
GVC-level resilience	Use state-owned enterprises to supply non-woven melt-blown fabric (China); use intra- and extra-MNE networks to handle supply shortages (US)	Continue to support links between midstream & downstream producers (China); compliment MNE-led model with added onshore/offshore links to supply domestic needs
Country-level resilience	Assure midstream inputs for mask producers (China); use DPA to accelerate scale up of domestic supply (US)	Diversify concentrated sourcing patterns; establish regional and strategic partner sourcing options.



Ventilators

Ventilators	Crisis Period	Post-pandemic
Resilience dynamics	Resilience from cross-industry (coordinated) learning	
Firm-level resilience	Ventilator companies partnered with larger to scale up production	Ventilator makers need to retain capabilities added during crisis period
GVC-level resilience	Cross-industry collaboration agreements were forged to tap supply-chain expertise	Production partnerships provide a model for dealing with future crises
Country-level resilience	Government contracts were used in build national strategic reserves of ventilators; shortages became gluts as hospital entries fell	Governments need better planning to avoid strategic reserve gluts; opportunity to build on technological learning and to put strategic reserve surpluses to good use.

COVID-19 Vaccines

Vaccines	Crisis Period	Post-pandemic
Resilience dynamics	Resilience from state-supported (collaborative) innovation	
Firm-level resilience	Competition to develop vaccines	Vaccine production capacity to meet global demands
GVC-level resilience	Combination of subsidiary and contract manufacturers	Global production of vaccines
Country-level resilience	State role in R&D and vaccine production; Commitment to early orders; Financing trials	Global distribution of vaccines

FACE MASKS - CHINA vs. UNITED STATES

Different Roles of the State in Scaling Up Production

N95 and surgical face masks







When it shifted a Southern California factory to making medical masks this year, QYK Brands had to import the fabric-cutting machines from China. Brvan Denton for The New York Times

Source: New York Times, July 5, 2020.

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Face Masks: Low Costs + Scale Up

Surgical masks – loose fitting & designed to trap sprays & droplets from coughing and sneezing

N95 respirators – fit more tightly & protect user from 95% of far smaller airborne particles (associated with a virus)

All masks have at least 3 layers of non-woven & textile fabrics assembled through ultrasonic welding (inner layer absorbs moisture + filter layer + outer layer for splashes)

Before COVID-19 crisis, face masks were cheap

- Box of 100 surgical masks US\$4.00
- Box of 20 N95 respirator masks -- \$17.00 (after pandemic, shortages & price surges)

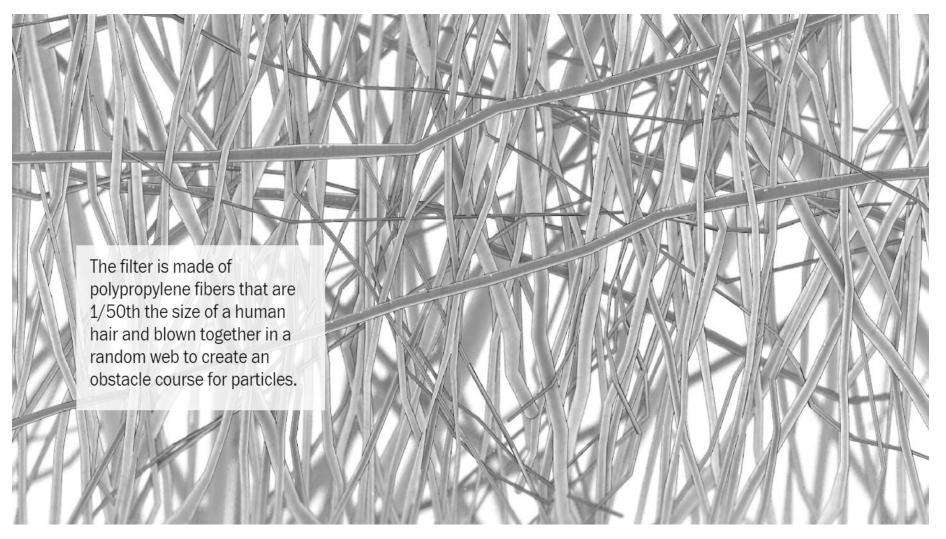
Face Mask Bottleneck: Meltblown Filters

The main input in face mask production is a non-woven polypropylene (PPP) fabric, widely used in baby diapers, feminine hygiene products, and disposable wipes.

- PPP is "meltblown" to obtain fibers of a smaller diameter in a random pattern that can trap small particles
- The meltblown PPP used in filters for face masks is a specialty fabric made by a limited number of companies worldwide
- N95 masks are more complex products (>65 parts) with added protection (e.g., finer filters; splash proof)

Source: K. Bradsher, "China dominates medical supplies, in this outbreak and the next," New York Times, July 5, 2020.

Polypropylene Meltblown Fibers for Filter in N95 Mask



Source: Jessica Contrera, "The N95 Shortage America Can't Seem to Fix," Washington Post, Sept. 21, 2020.

China's Prodigious Scale Up of Meltblown Fabric

China scaled up its production of the meltblown non-woven PPP fabric used for face masks to 150 tons/day

- 5 times what China could make before the pandemic
- 15 times the total output of U.S. companies, even after they ramped up their own production in spring 2020

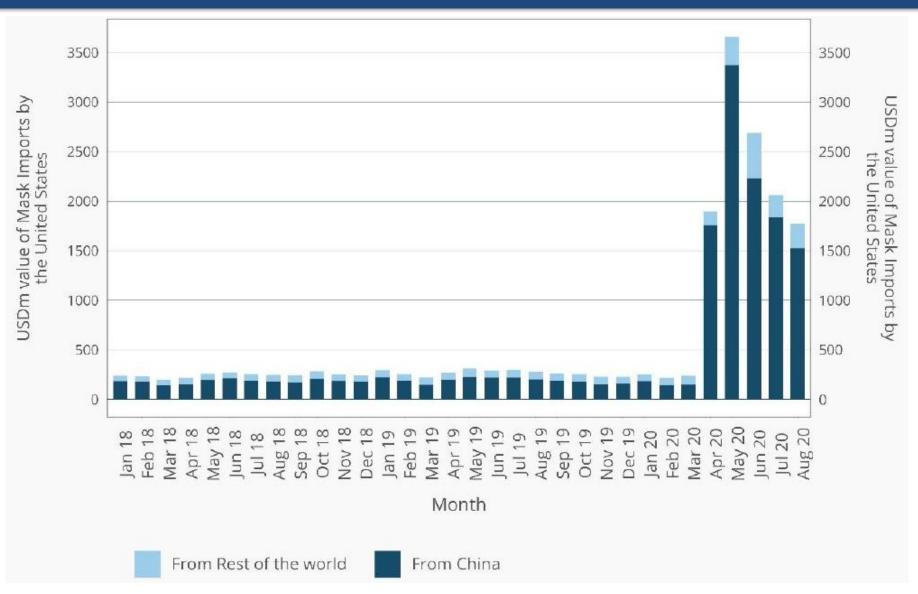
American companies are reluctant to make big investments in fabric manufacturing because they believe U.S. mask demand will be temporary.

Source: K. Bradsher, "China dominates medical supplies in this outbreak and the next," New York Times, July 5, 2020.

Role of the State in China's Scale-up of PPE

- China centralized the coordination of PPE supply in the powerful, inter-ministerial National Development and Reform Commission (NDRC)
- China directed its petroleum SOEs, Sinopec and PetroChina, to ramp up production of key PPE intermediate products – e.g., meltblown PPP
 - E.g., Sinopec added 2 lines for meltblown fabrics in Beijing by early March to produce 4 tons of fabric per day → used for 1.2 million N95s or 6 million surgical masks per day
- China asked 3,000 companies, including 700 tech firms, to add face masks and other PPE items to their production lines
 - E.g., Foxconn added 2 million face masks daily to its production capacity by the end of February, 2020, mainly for its 1 million domestic employees

U.S. Imports of Face Masks from China, 2020



Source: Global Trade Alert.

U.S. Government Response to COVID-19: Denial, Delays and Disruption

- **PPE** Never a top priority; Trump in public denial of COVID-19 (early) & playing catch-up
- Social distancing Late advisories (mid-March); face masks seen as political weakness
- **Defense Production Act** Clumsy tool for fast-moving virus; used to goad large firms (GM and 3M) to action.
- Vaccines Focus of Trump's government incentives; global R&D race; danger of "vaccine nationalism"

Source: Gary Gereffi, "What does the COVID19 pandemic teach us about GVCs: The case of medical supplies," *J. of Internat'l Business Policy*, 3(3), 2020: 287-301.

Overall Assessment: Policy Failures > Market Failures

U.S. private sector response – Despite a late start, domestic producers of face masks increased output 4-fold to 8-fold in March – Aug. 2020.

- Some partnerships slow to develop
- Industry sources claim it is simply not profitable to make N95 masks in U.S. without govt. guarantees

Trump administration response – Denial there was a problem; slow decision-making; no prior planning; misinformation; no lead agency in federal govt.; no distribution strategy for PPE to states and hospitals.

Main cause of PPE shortages – policy failure > market failure.

WILL INDUSTRIAL POLICIES CREATE RESILIENT SUPPLY CHAINS AFTER THE PANDEMIC?

Options for More Resilient Supply Chains

There are several options to reduce rigidity and build greater resilience in global supply chains:

- Make them **more domestic** e.g., reshoring & stockpiles
- Make them shorter e.g., near-shoring (regionalization of production, such as Mexico & Central America for U.S.)
- Make them more diversified e.g., reduce dependence on one or few countries

Currently, policymakers tend to associate resilience with more localized or shorter supply chains.

- However, reshoring does not guarantee resiliency (better to focus of critical inputs rather than complete products)
- Innovation often requires international collaboration (e.g., vaccines)

Resiliency Challenges

- ➤ Supply Chain Transparency Task, product and firm-specific databases are required on the structure of global supply chains, updated frequently
- ➤ Resiliency Stress Tests Requires information of number of vendors, geographical diversification of supply sources, propinquity of supply sources (geographical and political "distance"), and inventory levels.
- ➤ Diversified Sourcing with Trusted Partners Regional and Global
- **▶** Policy Coordination within and between countries



Where does Mexico Fit In?

- Can Mexico's manufacturing supply chains compete with China?
- Is Mexico poised to take advantage of the Biden administration's emphasis on rebuilding U.S. supply chains?
- Is the current policy context in Mexico an advantage or constraint in strengthening international competitiveness?
- What would a GVC strategy to strengthen Mexico's supply chains look like?





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