

Trends in Global Manufacturing and Supply Chains

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Media Coverage

- My research is covered by 400+ media in 20+ countries globally.
 - *Barron's*, "The dirty secret behind companies' carbon-emissions disclosures", July 17, 2023
 - *WSJ*, "Amazon is proof of a major weakness in ESG ratings", Nov 11, 2021
 - *BBC*, "From a rare negative growth in Vietnam to a surge in Chinese orders: the reconstruction of trade in the epidemic era", Oct 22, 2021.
 - *Chicago Booth Review*, "Global supply chains can hurt a company's credit", August 11, 2021
 - *South China Morning Post*, "How to spot and avoid greenwashing in supply chains", June 12, 2021
 - *Sloan Management Review*, "The Right Way to Mix and Match Your Customers", Summer 2021
 - *Economist*, "A wave of supply-chain reshoring around the corner", Dec, 2020
 - *Reuters*, "Decoupling from China does not help companies mitigate risks.", Oct 29, 2020
 - *China Business Knowledge*, "The Chinese Economic Impact of COVID-19 and The Future of Manufacturing Chains", May 7, 2020
 - *Forbes*, "Financial Supply Chain in the COVID-19 Pandemic: Fuel or Wildfire?", Apr 30, 2020
 - *VOA*, "Made in Vietnam' Goods Increasingly Popular in US", March 26, 2020.

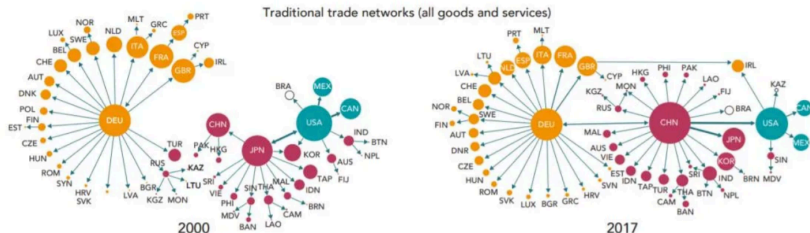
20 Years of Manufacturing Globalization

Rise of China

- China joined WTO in 2003. The open of product and service markets promoted China's strong growth and modernization.
- Global supply chain is transnational arbitrage of production factors. China has comparative advantages in industrial scale and demographic dividend.
- As China accumulates capital, China's innovation potential threatens the United States' position in technology and advanced manufacturing.

Network structure of global value chains in 2000 and 2017

Graph 3

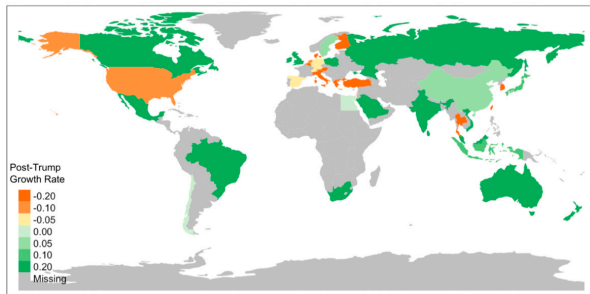
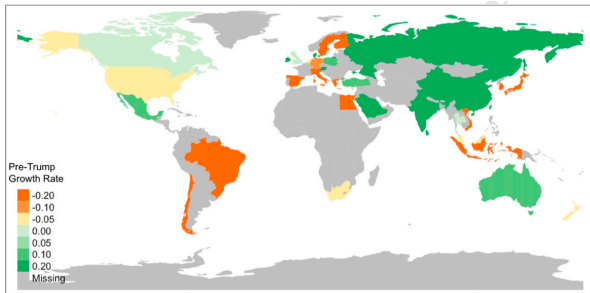


Source: X Li, B Meng and Z Wang, "Recent patterns of global production and GVC participation", in D Dollar (ed), *Global Value Chain Development Report 2019*, World Trade Organization et al (see footnote 3 for full reference).

4 Waves of China Manufacturing Relocation

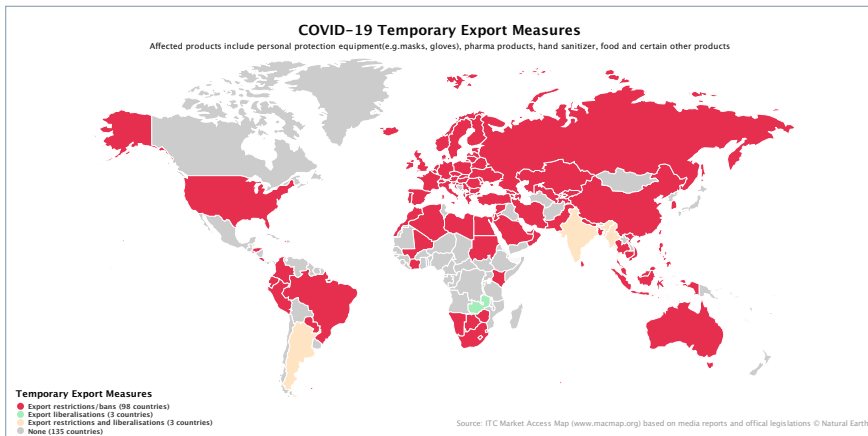
- First round: 2008-2015
 - Production cost squeeze: exchange rate, labor, capital cost, land price
- Second round: 2016-2018
 - Supply-side reform and overcapacity reduction
- Third round: 2018-2021H1
 - China-U.S. trade war, re-shoring, comprehensive decoupling
 - Some supply chains are relatively easy to break (e.g. commodity flows) but finding new suppliers takes time.
 - Some supply chains are simple (e.g. apparel).
 - Some supply chains are complex and can break with prohibitive bans (e.g. tech)
 - There are other forms of interdependence ■ FDI, VC, R&D – all large and cooperative/competitive.
- Fourth round: 2021H2 to present
 - China-U.S. conflict escalation, friend-shoring, targeted decoupling

Trade War: US Sourcing Restructuring



COVID-19: PPE Shortage and Global Export Ban

- The COVID-19 in 2020 has exposed the vulnerability of the global supply chain: governments prioritize domestic needs first so the location of the production base matters.



Indo-Pacific Economic Framework

IPEF (Indo-Pacific Economic Framework)

- US: Return to the Asia-Pacific to restore influence in the Indo-Pacific region
- US: Talking about money is not enough. We need to talk about rules, standards, and regulation
- Japan and South Korea: Look forward to US' return
- India: Benefit from the process of reducing dependence on China by Europe, America, and Japan
- Asean countries: Hope to improve the regional economic and trade rules, not target China (mostly neutral)
- Criticism: talking shopping, a hamburger without the beef
 - China's plan is about the economy (to provide beef).
 - It requires its economic growth (40% of the world's growth) to spillover.

Traditional Tradeoff: Cost Efficiency vs. Concentration Risk

- Multinational companies follow mercantilism (blurry country boundary).¹
 - During trade tension, federal contractors (especially in swing states) increase their imports from China at reduced prices. Similar results on imports from Russia are found during the Ukraine crisis.
 - They are more likely on the tariff list according to Section 301(B) of the Trade Act by United States Trade Representative (USTR).
 - One department is exceptional: DoD.
 - Hedging story: additional cost minimum wage, federal acquisition regulation, business ethics and conduct, disclosure costs, monitoring subcontractors...
- U.S. firms are hurt in the Trade War.²
 - China exporters bear 26% tariff increase, while US importers bear 74%.
 - Chinese firms that are large, export high-quality product, and have relatively high profit margin, choose to stay in the U.S. market.

¹Cen Ling, Jing Wu, & Fan Zhang, "Federal Supply Chains", 2022

²Haichao Fan, Caiyun Wu, & Jing Wu, "The Impact of the Trade War on Export Prices", 2022

New Trends: 4 Pillars of IPEF

- Resilient Economy
 - Improve **supply chain resilience**: Supply chain early warning system to find out the distribution of key supply chains.
- Connected Economy
 - Higher **digital trade standards** for trade facilitation.
- Clean Economy
 - To address **climate change**, strengthen cooperation in areas such as renewable energy and carbon emissions.
- Fair Economy
 - Tax and anti-corruption cooperation, labor condition, corporate responsibility.
- Forces Driven Global Supply Restructuring
 - Economic factors: digital economy, green economy, industrial policy
 - China has certain advantages in the competition of economic factors
 - Non-economic factors: values, friendship/nearshore outsourcing
 - The main pressure on China comes from non-economic factors

Resilient Economy: China Manufacturing is Resilient

- China supply chain is resilient against COVID-19 shock.³
 - We find considerable effects on credit risk propagation during the COVID-19 pandemic by focusing on US-China supply chains link.
 - CDS spreads go down when the economic activity resumed in March 2020.
- Shanghai lockdown proves China's resiliency again.⁴
 - Shanghai port volume is clearly affected by 1 month before re-bouncing back.
 - Local suppliers shift to Ningbo. New suppliers near Shenzhen are quickly engaged.
- Diverse sourcing and local sourcing become popular, especially for PP&E.⁵
 - COVID attacks major manufacturing hubs: Daegu, Bavaria, Milan, Detroit.
 - Tail risk becomes highly weighted. Policies also set parameters (eg. USMCA).

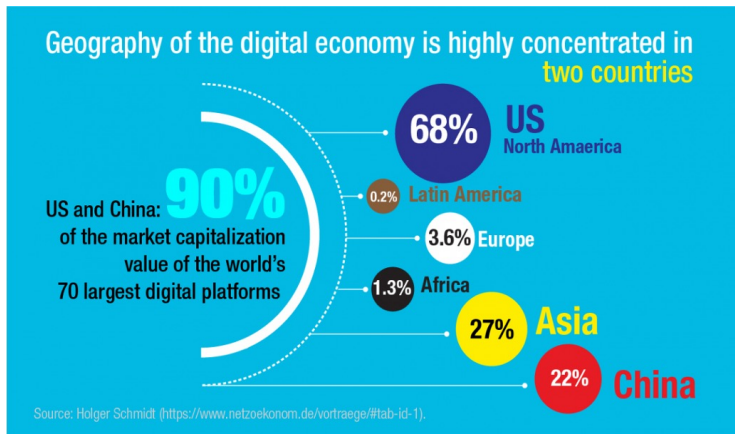
³Senay Agca, John Birge, Ziang Wang, & Jing Wu, "The Impact of COVID-19 on Supply Chain Credit Risk"

⁴Yimeng Niu, Vinod Singhal, & Jing Wu, "Supply Chain Resilience to COVID-19 Lockdowns"

⁵Senay Agca, John Birge, & Jing Wu, "The Impact of the COVID-19 Pandemic on Global Sourcing of Medical Supplies"

Digital Economy: A Tale between Two Countries

- U.S. and China rank top in digital economy.
- The global expansion of digital firms is challenged by digital authoritarianism and other concerns (shared value, political trust, data security).



Green Economy: Who is Producer?

- China has the most manufacturing capacity.⁶
- PV modules - China suppliers more than 75% of the world's shipments.
- EV cars - China has 53% of the global market share.

Today's Green Energy is Red

China dominates key links of the green energy supply chain



EV Sales



Wind Turbine
Manufacturing



Chemical
Lithium



Polysilicon



Battery Component
Manufacturing



Graphite



Rare Earth
Metals



Cobalt
Refining



Solar Panel
Manufacturing



Rare Earths
Refining

⁶Graham Allison, Nathalie Kiersznowski, Charlotte Fitzek, "The Great Economic Rivalry: China vs the U.S., Belfer Center, Harvard Kennedy School, March, 2022."

Non-economic Factors

- Unilateral containment: the trend of “Small yard, high fence” (imposition of stronger lockdowns on specific technology and research areas)
 - Tariffs (likely to be eased)
 - Export controls (likely increase)
 - Rules of origin “USMCA” (likely increase)
 - Delisting of Chinese stocks (in progress)
- Increase investment: active competition
 - R&D investment
 - Industrial policy, distortions through compensation
- Strengthening the alliance: emphasizing values
 - Technology and product standards
 - Economic and trade rules
 - Nearshore and friend-shore
 - Human right and democracy⁷

⁷Ling Cen, Yanru Han, & Jing Wu, “Equal Employment Opportunity in Supply Chains”

Case Study: Why US Targets Huawei?

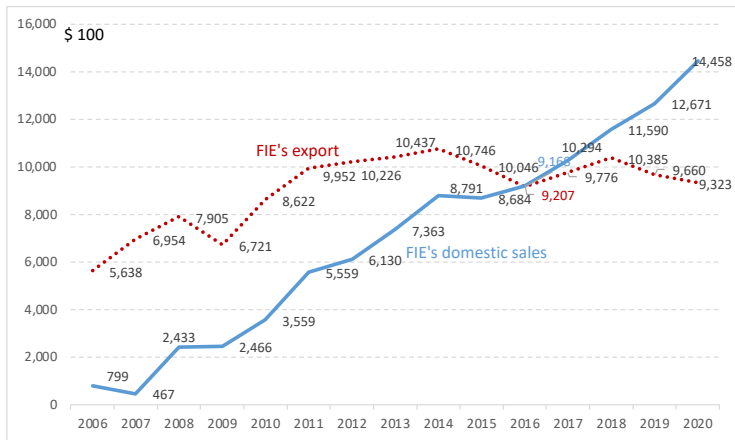
- US core competitive advantage: innovation and technology.
- PCT (Patent Cooperation Treaty): US vs. China

		US	China	China/US			US	China	China/US
1	Data Communication	1,378	1,015	74%	18	Engine, Pump and Turbine	112	9	8%
2	Telecommunications	236	132	56%	19	Environmental Technology	104	8	8%
3	Industrial Control	121	49	40%	20	Polymer Chemistry	264	20	8%
4	Audio-Visual Technologies	95	34	36%	21	Biotechnology	2,163	162	7%
5	Basic Communication Program	32	10	31%	22	Material Handling	134	10	7%
6	Organic Fine Chemical	1,051	296	28%	23	Special Purpose Machines	353	21	6%
7	Transportation	180	43	24%	24	Test and Measurement	696	41	6%
8	Furniture and Game	102	24	24%	25	Civil Engineering	189	11	6%
9	Computer Technologies	798	188	24%	26	Basic Material Chemistry	546	26	5%
10	Thermal Program and Device	54	11	21%	27	Machine Tools	87	4	5%
11	Consumer Goods	173	35	20%	28	Chemistry Engineering	336	15	5%
12	Electric, Electric Motor and Electric Energy	334	67	20%	29	Textiles and Paper Machines	93	4	4%
13	Optics	264	36	14%	30	Surface Machining and Coating	164	5	3%
14	Semi-conductor	252	33	13%	31	Medical Technologies	4,120	118	3%
15	Mechanical Element	46	5	11%	32	Food Chemistry	166	4	2%
16	Metallurgical and Materials	211	22	10%	33	Pharmaceuticals	2,586	63	2%
17	Information Technology Management	230	22	10%	34	Micro and Nano Technologies	23	-	0%

My Predictions on China and Globalization 2.0

1. China Capacity Shift to Domestic and B&R Needs.

- FIE serves mostly domestic demand in China. More Chinese companies will go abroad and become MNCs.
- Due to reshoring and near-shoring, global supply chains will be shortened.



2. China Maintain its Strength in Quality Labor.

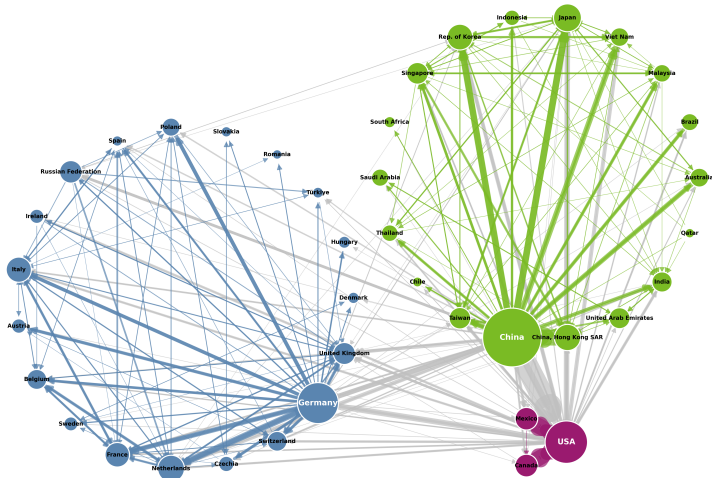
- China has the tradition in raising high skills and uniform labor.⁸
- Chinese families support their children's education at no cost.
- Intellectual returnees contribute greatly to Chinese industrial upgrading.



⁸Ling Cen, Michael Hertz, Ziang Wang, & Jing Wu, "Labor Coordination and Division: Human Capital Investment in Supply Chains"

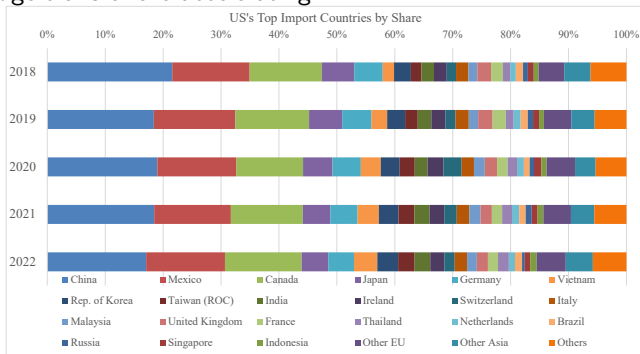
3. China Maintains its High Production Network Centrality.

- China is in a central position among RCEP (ASEAN, China, Japan, S.Korea, India, Australia, NZ) and B&R countries.
- China and ASEAN are complementary and co-opetive.



4. While Trade May Decrease, Globalization 2.0 Picks up.

- The global manufacturing restructuring may be localized and regionalized. There is a trend of diversification (China+N).⁹
- Global trade is at its peak, but cross-border financing, technology and knowledge transfer are accelerating.¹⁰



⁹Miaozhe Han, Ben Charoenwong, & Jing Wu, “Trade and Foreign Economic Policy Uncertainty in Supply Chain Networks: Who Comes Home?”

¹⁰Michael Hertzel, Jie Peng, Jing Wu, & Yu Zhang, “Global Supply Chains & Cross-border Financing”

5. Geoeconomic Buffer Zone (GBZ) Faces Opportunity.

- Great powers compete for control and influence over geoeconomic buffer zones to gain economic and geopolitical benefits.
 - Examples: “B&R” (China), USMCA (US).
- Geoeconomic buffer zones can also serve as bridges and platforms to carry out economic cooperation, promote cross-border trade and investment, and strengthen the regional economic integration.
- China companies are important players in such GBZ due to their experience dealing with emerging economies and “weak” institutions.

Summary

- China's rise in globalization has relied on its comparative advantage in labor and industrial scale. However, its push in the high-end manufacturing sector and technology innovation challenges the United States.
- The impact of Natural disasters and geopolitical risks has led to frequent disruptions in global supply chain, leading to a trend towards re-shoring, near-shoring, friend-shoring.
- The geoeconomic buffer zones between regions will become the focus of competition among major powers, ushering in new growth opportunities.
- India, Mexico, Southeast Asia, Africa etc. have the opportunity to become the new “world factory” in next decades.
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