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Fragmenting Supply Chains & the Rise of the Robots

WHITE PAPER

Fragmenting Supply Chains & the Rise of the Robots

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Key Takeaways

- Global supply chains are fracturing and critical industries like electronics and health-care will be centered in the future around two distinct US and China centric supply systems.
- Capital deployment will revert to the west as production moves closer to end consumption.
- Reshoring of production to the west will drive a large demand for automation technologies and digitization of manufacturing.
- We have investments in several of the likely key beneficiaries of this long-term trend.

Disruption of Supply Chains and the Rise of the Robots

The period from China's entry into the World Trade Organization (WTO) in 2001 until the Global Financial Crisis (GFC) in 2008 will be remembered as the period of peak globalization. The driver was the outsourcing of low value-added manufacturing to China and other emerging economies and optimization of supply chains and business processes. China's share of global manufacturing value-added went from less than 10% to 25% while that of Europe, US and Japan declined significantly. It was the period of the great moderation and symbiotic growth between East and West. No other company than Apple better captures the zeitgeist of the era of globalization, outsourcing everything associated with low value- added and high capital requirement manufacturing to China and other low cost countries. In 2018, for instance, some 600 facilities were involved in one way or another in the production of Apple products, only 9% of Apple suppliers were based in the US and 70% located in Asia.

The GFC brought the beginning of the rise of the Nation State and the early innings of the decline of globalization (driven by rising inequality, political center fragmenting and rising populism). The change in the US-China relationship from constructive dialog to strategic rivalry and now the COVID-19 pandemic, has accelerated the winds of change to gale speed and political pressure is building both in the US and EU to reshore production of critical supplies.

Looking into a changed World Economy

Production networks of the last decade and today often have complex interrelationships that go back and forth across borders. Business processes have been optimized to perfection and because of ever longer and more complex supply chains the world economy has become a lot more fragile over the last 20-30 years. This fragility becomes highly visible as trade wars and a pandemic hit the world economy. This will lead to diversification of supply chains and the accelerated adoption of technology in manufacturing, what has been termed the fourth industrial revolution or Industry 4.0 (see the infobox at page 7). Critical sectors

will realize that the "just in time" production principles have been taken too far and that companies will have to develop a "just in case" mentality. In this process the value of long-distance logistics will diminish and the strategic value of storage rise. The wartime mindset of having inventory in times of crisis has been reignited. It will be a more robust but potentially also less efficient world as supply chains are brought home, moved closer to consumers, or redirected to strategic allies over the next many years.

The factors driving this reversal are both financial as well as non-financial and likely to be quite persistent:

- Growing awareness of the uneven benefits of globalization has triggered populistic pressures to bring home previously lost jobs and to reverse global linkages. Tariffs and other protectionist measures are the most dramatic manifestation of this.

- National security concerns are growing along with the rise of China as a rival to the US, most recently exemplified by the ban on sales of advanced US technology to Huawei and other leading Chinese tech firms.

- Continuous falling costs of automation technologies and rising labor costs in China and other recipients of outsourced functions are reducing production-cost differentials between developed and emerging economies.

- High tax countries — most importantly, the US — have cut corporate tax rates reducing the incentive for tax arbitrage.

- There is a feeling the west has reached "peak physical stuff", and in general the trend of ageing societies is to see increased demand for services, that are inherently local in nature, and a reduced demand for traded goods.

- Concerns about climate change are creating a push to reduce the carbon footprint and produce things closer to customers. Some countries have an under-appreciated competitive advantage — non-fossil fuel. Over 80% of Canadian and French electricity is non-fossil fuel in contrast to China, India and Thailand where fossil fuels account for 70-90% of power generation. Most companies have set emission reduction targets. In some cases, these require sizable cuts, which are not easily achievable through energy efficiency alone. Relocating supply chains can help meet these targets. 7% of global emissions are from international freight transport (air, land and sea).

This will lead to three trends: 1) Increased geographical diversification of supply chains away from China and closer to end consumption, 2) increased digitalization and automation of manufacturing processes (Industry 4.0) while at the same time, 3) China's industrial upgrading as described in Made in China 2025 will pose greater competitive challenges vis-à-vis other industrialized manufacturers and drive China towards more self-sufficiency in key technologies, as previously discussed in our White Papers Made in China 2025 & The New Tech War and the Geopolitics of 5G.

> **Because of ever longer and more complex supply chains the world economy has become a lot more fragile over the last 20-30 years.**

A survey conducted by analysts from Bank of America Merrill Lynch prior to COVID-19, covering 3000 companies found that more than 80 % of companies in 12 global sectors (USD 22tn market cap) in North America, Europe and Asia-Pacific (ex-China) have implemented or announced plans to shift at least a portion of their supply chains from current locations suggesting that the trend of globalization to localization is real. While the breadth of this shift is striking, the depth is moderate at present. Many firms are experimenting with a "China Plus" strategy whereby they keep existing supply chains largely in place, while running 'pilot' programs in alternative locations

and over time develop dual-supply chains. South East Asia and India were the planned destinations for half of North American and Asian supply chains, but many companies in North America also declared an intent to "reshore". This was particularly true for high-tech sectors and industries for which energy is a key input.

A coming automated and digitized manufacturing Renaissance in the West?

Given the above mentioned trends resulting in the shifting of production back closer to where end-consumption is, it is likely the US – as the world's largest consumer economy – will be the biggest "reshoring" market. However, supply chains are moving back to higher cost countries, necessitating an increase in factory automation and will accelerate the idea of Industry 4.0. Automation technologies cover many different products and technologies, both hardware and software, and besides robots include IoT systems for data gathering, machine learning to analyze data, CNCs, PLC and vision and laser technology, etc. Automation technologies are more cost-competitive than ever, and are immune to the coronavirus and thus less vulnerable to public health related and supply disruptions. The pandemic has already now led to a wider deployment of robots beyond factory production lines, including for tasks such as disinfection, assisting healthcare workers in routine tasks, pharmaceuticals production and unmanned vehicles for goods deliveries, amongst others. The pandemic will furthermore speed up the transition to a digital economy, and manufacturing is no exception. Digitalization can help manufacturers improve the resilience of supply chains. Technological advancements in big data will allow information on materials, logistics, and demand them to be collected, shared, analyzed and predicted more quickly, which alongside automation can help minimize supply disruptions and optimize inventory management.

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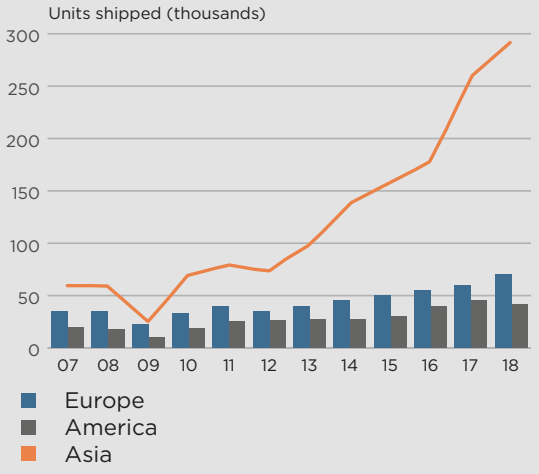
The automotive and electronics sectors are by far the two most important sectors in terms of end-market demand for factory automation technologies. Therefore, whether the supply chains of these two sectors decouple or not will have a profound impact on whether factory automation will benefit from this trend. The share of electronic-related imports into the US from China is by far the largest at 45% and from South East Asia a further 40%. On the other hand, transportation equipment makes up a relatively small part of US imports from China and South East Asia (less than 4%). Therefore, on top of the geopolitical reasons for expecting a decupling, we think the electronics industry is most exposed to the decoupling of supply chains from "East" to "West" because North America/Europe collectively drive around 40% of global electronics-related consumption but only 10% of production today.

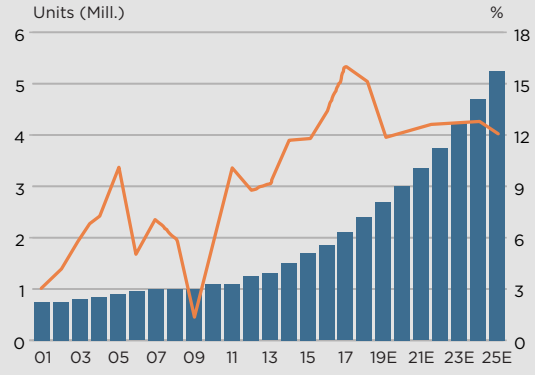
Figure 1: Robot Sales Driven by Asia



Source: Henrik I. Christensen as of May 2020

The globalization of manufacturing and the shift to Asia in general and more specifically to China has over the last couple of decades benefited factory automation and machinery manufacturers. As the chart in figure 1 above shows, most of the growth in automation technology exemplified by robots has been registered in Asia, and China's share of global robots has increased to 25% from close to 0% in the early 2000s. We think reshoring and dual-supply chains may lead to another medium- to long-term investment boom for factory automation and machinery companies as we saw in earlier decades when supply chains were shifting to Asia. In fact, we think "declining globalization" could prove to be an even larger driver for factory automation demand. Automation technologies will be a market with strong secular growth throughout the 2020's as the graph in figure 2 from Bank of America depicts.

Figure 2: Robot Secular Growth Market



Source: BofA Global robotics as of Mar. 2020

The gradual Formation of two separate Supply Systems

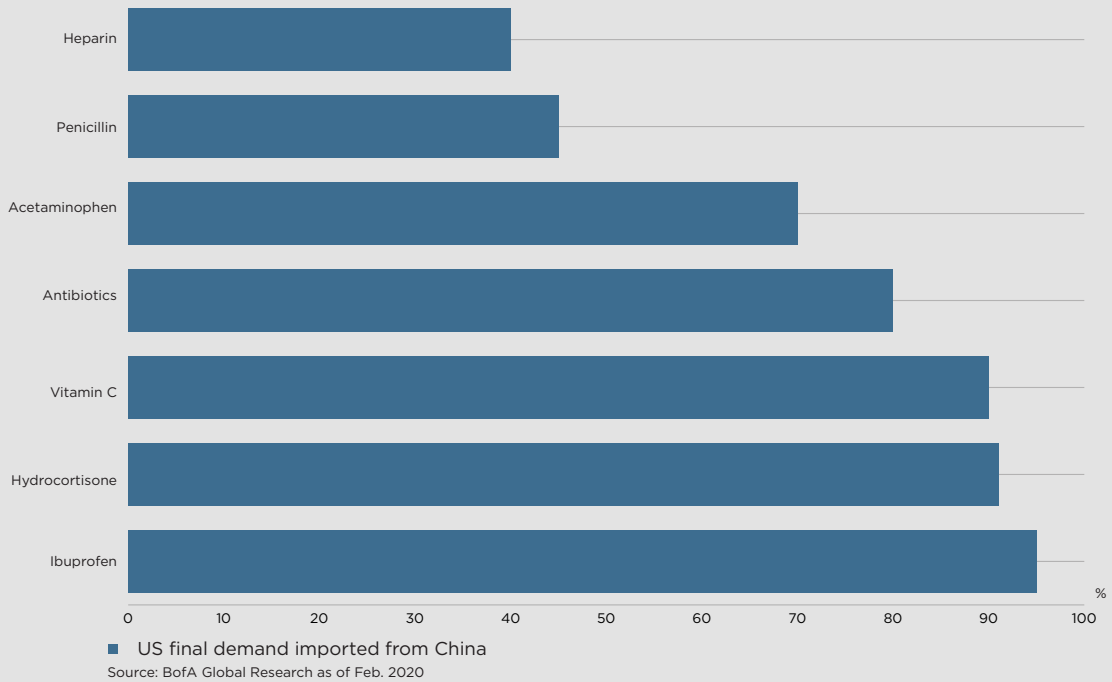
The combination of US-Sino trade frictions, the Huawei ban imposed by US authorities and latest the US Department of Commerce rule on the banning of exports of products for potential military use has heightened the urgency for the Chinese government to develop its own semiconductor supply chain. China's self-sufficiency ratio for semiconductor products currently stands at around 15%. However, as part of the "Made in China 2025" policy, China back in 2015 set

itself a target of reaching a 40%/70% self-sufficiency ratio in integrated circuits (IC) in 2020/25. Although these targets today seem highly unrealistic, they nonetheless represent an opportunity for factory automation companies as China ramps up its investments.

In general, China will remain a global manufacturing powerhouse. For most industries it will be close to impossible to fully diversify away from China because of the huge number of supply chain clusters of excellence being present in China today. However, going forward the focus of global companies will increasingly be on China's large domestic market and higher value-added sectors, aided by a leading position in artificial intelligence and Industry 4.0 readiness. Tech sanctions against China could incentivize companies to shift technology sensitive production out of China, while Chinese tech companies may also be incentivized to source components from Asian and European suppliers. Such cutting-edge products may require new, rather than existing production lines, thereby driving new investments in automation technologies.

In pharmaceutical products like generics, active pharmaceutical ingredients (API) and Personal Protective Equipment (PPE) national supply security will trump economics. Supply chains were severely disrupted during the COVID-19 pandemic, leading to severe product shortages across the world. China has a near monopoly position in the raw materials going into API and PPE and very high market shares in many pharmaceutical categories, as the chart in figure 3 below shows. China's dominant position will be reduced as both Europe and the US seek to avoid future supply disruptions by building their own production capacity and rebuilding strategic inventory.

Figure 3: COVID-19, Overdependent & Underprepared



Source: BofA Global Research as of Feb. 2020

Industry 4.0

The fourth industrial revolution, encompasses combination of traditional manufacturing and industrial platforms and practices with the latest smart technology. This primarily focuses won the use of large-scale machine to machine communication (M2M) and Internet of Things (IoT) deployments to provide increased automation, improved communication and self-monitoring, as well as smart machines that can analyse and diagnose issues without the need for human intervention.

Source: Wikipedia

Conclusion

We envision a gradual formation of two separate supply chains in strategic sectors like technology and in lower value-added parts of healthcare. Dual-supply chains mean more capital stock for the same output, as companies and industries that choose to have dual-supply chains will have to invest and maintain a larger production base relative to output. Therefore, all else being equal, the demand for factory automation per unit of output is likely to structurally increase in the future. TSMC's recently announced US fab is one example of a "neutral" company that has to commit capital to both China, where TSMC has produced for some years now, and the US, in order to stay in the game as a strategic supplier to both sides. China has already been going down the self-sufficiency path for some time and we think that will accelerate. Companies of vital importance, with technologies that both the US and China find critical, can conceivably benefit from duplicated investments into the supply chains.

Active Investments

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