NAVIGATING TARIFF TURBULENCE IN THE TECHNOLOGY SECTOR

21 Expert Insights on Supply Chain Disruption, Cost Pressures, and Strategic Realignment

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Navigating Tariff Turbulence in the Technology Sector

One of the most headline-making developments of the early Trump administration has been the introduction of sweeping new tariffs on historical long-standing trade partners and geopolitical rivals alike. Companies importing manufactured goods now face a baseline 10% tariff, with certain countries—notably China—seeing rates as high as 145%.

While the tariffs themselves are significant, the on-again, off-again nature of tariff policy discussions has also injected significant uncertainty into global technology markets. This unpredictability has prompted industry leaders to reassess their supply chain strategies and operational costs in the face of shifting trade dynamics.

This volatility underscores the challenges faced by tech firms navigating geopolitical tensions, while striving for stability and growth. This whitepaper aims to bring clarity amid the uncertainty. ABI Research's expert analysts have been closely tracking the tariff developments and their impact on technology suppliers and end users worldwide.

Through 21 in-depth articles, we examine how the evolving tariff landscape is reshaping the technology sector—from increasing costs in Internet of Things (IoT) hardware to potential lifelines for domestic supply chain software vendors. Whether you're a supplier navigating shifting costs or an end user rethinking procurement, our analysis highlights the key implications—and opportunities—driven by this turbulent new trade environment.

Stuart Carlaw, Chief Research Officer

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1 President Trump's New Tariffs Will Push More Central Banks Toward Domestic Payment Schemes

Ash Robinson, Research Analyst

Effects of the Tariffs on the Payment Landscape

President Trump's new tariffs, which were due to go into effect on April 9, but have since been given a 90-day freeze, have already influenced the stock price of companies active in the transaction side of the payments market. With Visa, Mastercard, and the potential new owners of Discover, Capital One, seeing a 6%, 6.1%, and 13% respective drop in value within the first week of the announcement, until the tariffs were frozen on April 9.

Two weeks later, these companies have yet to see their stock prices return to pre-tariff levels, with the added uncertainty of whether or not the tariffs will go into effect, the current market environment presents the ideal scenario for more domestic payment schemes to develop.

How Tariffs Lead to a More Diverse Payment Landscape IMPACT

These tariffs have already had a real-world effect when it comes to the development of payment networks. When speaking on The Pat Kenny Show on the April 5, the head of the European Central Bank (ECB), President Christine Lagarde, asked for a "payments revolution." She further said "Visa, MasterCard, PayPal and Alipay are all controlled by American or Chinese companies," arguing that "we should make sure there is a European offer."

In the European Union (EU), there are already several countries that have diversified payment network landscapes that are not dominated by Visa or Mastercard. Two prominent examples include France's Le Groupement des Cartes Bancaires (GIE CB) and Belgium's Bancontact.

Although organizations like GIE have a heavy market share with a 95% penetration rate in France, they are still not wholly independent with the scheme being a joint enterprise between the main French banks and Mastercard. What the EU central bank is now looking for is the creation of an EU Europay, Mastercard, Visa (EMV) license to be used by the likes of GIE CB and Bancontact to replace the American-dominated EMV license market.

A Simplified Four-Point Plan for Domestic Card Success

As outlined in an ABI Research report, *How the Local Payment Systems Market Is Becoming More Diversified* (AN-6336), there are four key points that are considered critical for a domestic payment scheme to succeed. For any potential EU card scheme to work, it would need to follow along these lines:

- The card scheme must receive clear support from local governments; for the EU, this is certainly possible with the EU central bank making soft suggestions for an EU payment scheme over the last few months, and the latest statement from ECB President Lagarde showing its clear support for a Europe-wide scheme.
- The scheme must have a strong regional card manufacturing industry inside the EU. This is achievable with market-leading card manufacturing companies like Giesecke+Devrient (G+D), Thales, and IDEMIA providing a strong backbone for a potential EU scheme. The biggest issue for the EU to overcome is procuring an alternative EMV license to the one with Visa, Mastercard, and Discover. An EMV license will have to be developed in-house either by the EU central bank or by another EU banking institution.
- To be able to compete successfully, the scheme must have the support of European banks. While this was already a possibility before the U.S. tariffs announcement, its implementation will incentivize local banks to move away from the increasingly economically isolationist United States.
- Lastly the scheme must have the support of the European public. While this might have been a hard sell before President Trump, today's anti-EU sentiment expressed by the U.S. administration is driving the response of an anti-American stance and, in turn, more support for pan-Europeanism. This flip of public perception provides an opportunity to develop and deploy an EU payment scheme.

2 Private Cellular Adoption Will Slow Down Amid U.S. Tariff Uncertainty

Shadine Taufik, Research Analyst

The Trump Administration's Tariffs Are Causing Macroeconomic Uncertainty

Throughout the past few months, the Trump administration has brought about economic uncertainty through different measures aimed at cementing the United States' global dominance. Among them is the implementation of tariffs on products coming into the United States from other countries. Starting in February, the current U.S. government has imposed a variety of tariffs on different countries, ranging from 10% on amicable partner countries to 145% on China to promote U.S. products and reduce external reliance. This is incredibly important given the nature of the global manufacturing supply chain—raw materials are mined across various centers, then processed, formed, combined, and finished across multiple locations, only to be resold in different markets. With these tariffs, production costs will become higher, costs will be shifted to consumers, and this will lead to recessionary headwinds.

For a market like that of private cellular, which largely relies on customer willingness to invest in new infrastructure to innovate, this could significantly impact sales for Mobile Network Operators (MNOs), System Integrators (SIs), and, most notably, infrastructure vendors. Although it has gained major ground and enterprise recognition recently with the rise of use case-centered offerings from market leaders such as Verizon, higher prices may be enough to dissuade customers from engaging in private cellular implementation—especially in the short term.

The United States has since paused its tariffs, but this is one among the many destabilizing activities the Trump administration has put into place over the beginning of the president's term. For one, he threatened to fire the chair of the Federal Reserve. He has also cut off U.S. funding to the World Trade Organization. In any case, this marks a series of events that have caused global, macroeconomic uncertainty.

Private Cellular: An Unnecessary Investment or Future-Proofing Tool?

Indeed, the leading infrastructure vendors are based, and often manufacture outside of the United States, and partner with local telcos based within the countries of deployment—creating a buffer from reliance on North American entities. However, this by no means suggests that these firms will come out unscathed.

Private cellular deployments are composed of several hardware, software, and services components, most often sourced from different global vendors, giving rise to a complex supply chain. In the United States, intangible assets such as software and services are exempt from these tariffs; however, potential markups of up to 25% on hardware (including Radio Access Networks (RANs) and private cellular core hardware) may be prominent as suppliers look to shift costs onto their customers and create a higher Total Cost of Ownership (TCO), blocking out Small and Medium Enterprises (SMEs) from adoption. Pricing of direct hardware is not the only concern—especially in use case-centered propositions, wherein the full stack of hardware and software is procured. Pricing of components such as edge devices, Internet of Things (IoT) sensors, cameras, tablets, and communications devices would also increase. This will also affect maintenance and expansion efforts for existing private cellular networks, as well as ongoing Proofs of Concept (PoCs) and rollouts as enterprises' spending power plummets. Simultaneously, this distress and uncertainty may also give rise to a greater reliance on private cellular—especially in the United States. As wages rise due to inflation, and the pool of skilled workers continues to age out—the country's job vacancies reached 7.6 million, and 12.8% of citizens are age 65 years and older in 2025—automation becomes a more critical facet of operations. More heavily adopting automation efforts for U.S. companies will mean it will be able to free up more of its human capital budget and repurpose this for measures that will affect their bottom line.

Outside of the United States, the immediate effect of these tariffs would be the abundance of cheaper components, as non-U.S. infrastructure vendors (such as Nokia, Ericsson, and Samsung) will have to offload their supply as their market considerably shrinks when U.S.-based customers are priced out. Long term, this will reduce the profitability of these firms, as demand equalizes—these players have lost one of the most mature private cellular markets in the world. Additionally,

reciprocal tariffs could be implemented by other countries upon the United States, further fragmenting the supply chain, especially with critical automation components such as chipsets. Amid this, enterprises will feel economic turbulence as their additional operational costs build up due to the tariff-imposed price hikes, limiting their ability to expend capital. This will not only require firms to deal with their current problems, such as addressing skills gaps and innovation, but also force them to rethink their cost structures and further increase efficiency to stay afloat. General economic uncertainty is sure to put a halt to investment, inclusive of private cellular networks. To reduce spending, enterprises will look to maintain existing, legacy connectivity systems, shifting focus from greenfield to brownfield deployments, and leveraging existing infrastructure. This may mean a decrease in non-core functions such as Augmented Reality (AR) or Virtual Reality (VR), massive IoT, and drone inspections, among others. This means that firms will prioritize their short-term profitability over long-term digitalization goals. Of all players, firms offering as-a-Service propositions will be the most likely to see activity as costs are shifted across longer-term payment plans.

Looking to Mitigate the Tariffs' Ill Effects

Although there is no silver bullet, infrastructure vendors must consider several factors to minimize the impact of tariffs on their portfolio:

- **Audit Supply Chain and Source Alternative Components Manufacturers to Reduce Deployment Delays:** In the long term, it makes sense to build up reshoring plans for U.S.-based firms, especially if sourcing, manufacturing, or assembly occurs in China. In the short term, although the Trump administration excluded tariffs for specific electronics such as smartphones, computers, semiconductors, and screens, among others, U.S.-based firms should still take this as a cue to source small electronics from other price-comparable manufacturing hubs, such as India. To remain risk averse, firms may also utilize consumer-grade technology in their offerings, to mitigate the tariffs, as Amazon Web Services (AWS) has done. Outside of the United States, firms will benefit from short-term discounts on infrastructure. Although there may be an effect on general spending habits and generally more costs along the supply chain, these firms have the strategic advantage to partner with hubs across Latin America and Southeast Asia to create manufacturing opportunities outside of the United States.

- **U.S. Vendors May Have an Opportunity Abroad, but the Opposite Is Less Likely to Pan Out:** As the United States looks to promote its supply chain independence, its infrastructure vendors stand a chance to target emerging markets if these firms ensure that their solutions target specific use cases, are flexible in payment plans, and are relatively affordable. However, none of these will matter if reciprocal tariffs come into play, which will only drive firms to source from China. On the other hand, the tariffs have made it difficult for non-U.S. players to enter the U.S. market, as their prices are effectively multiplied. The only way this may be mitigated is through an emphasis on virtualization.

- **Private Cellular Offerings Must Highlight TCO and Clear Return on Investment (ROI):** Customization and non-core functions are no longer attractive. Enterprises need to invest in solutions that with clear returns and validated business cases. End-to-end use case-based offerings, especially when paid in an as-a-Service scheme, are the most potent ways to position solutions given the flexibility, clear benefits, and speed of deployment these options provide. It is important that offerings remain minimal, but impactful. Automation and communication suites will be front and center, and if coupled with plug-and-play hardware, it will likely attract more willing enterprises. At this point, immediate, high ROI use cases among large enterprises with minimal hardware components will be the only ones able to justify the costs of deployment.

- **Software, Cloud-Native, and Virtualization Products Must Become Top of Mind:** Amid the uncertainty, intangible goods have become the safest bets for vendors across borders, as it reduces physical footprints and allows for more agile scaling. Vendors must accelerate product roadmaps in this domain, and potentially partner with existing hyperscalers, such as AWS and Azure, to host their virtualized RAN and core solutions. Enterprises already use cloud services in their operations, and gradual hardware decoupling will not only benefit them from a price perspective, but vendors as well.

3 IoT Hardware Is Global and Software and Services Are Local—How Trump's Tariffs Impact the IoT Market and How It Can Respond

Dan Shey, Vice President, Enabling Platforms

Trump's Tariffs—Affecting IoT Hardware, Software, or Both?

In the Internet of Things (IoT) world, it is fair to say that IoT hardware is global, and software and services are local. Devices and connectivity are built from components all over the world. Once a product is connected, connectivity services are typically delivered locally via local networks or cellular networks. The services to build the applications, analyze and store data, and support IoT solutions are also typically available in the country they are connected within.

Trump's tariffs apply to goods, not services. This is not a hard and fast rule in the Trump tariff fine print, but there are practicalities that drive the focus of tariffs on goods. First, custom enforcement agencies are not equipped to tax services. Second, U.S. and international communities have agreed through the World Trade Organization (WTO) and the United States-Mexico-Canada Agreement (USMCA) that software and services are exempt from tariffs. Effectively, services and subscription-based software have less chance of being taxed using tariffs—at least for now.

The Obvious Observation—IoT Devices Become More Expensive

The ramifications for devices and communication components are that they will become more expensive for the U.S. market. This applies to both standalone IoT devices and machines with built-in sensorization and connectivity.

Looking at this on a deeper level, IoT systems using high-turnover standalone devices will be harder hit by tariffs. An example is an asset tracking solution. If the device is replaced every 2 years, and the device comes from China, your device costs will more than double (assuming the 145% tariff rate). Devices that experience higher turnover in the IoT domain are in categories covering people/pet tracking, wellbeing wearables, home monitoring and patient monitoring segments, and the broad enterprise asset tracking segment that covers pallets, smart labels, etc. It can also affect condition-based monitoring categories such as tank monitoring. These categories represent 22% of the U.S. installed base today and will grow to 28% by 2030.

IoT solutions for devices and machines with embedded sensorization and connectivity will be far less affected by tariffs on these components because the sensor and connectivity components will be a smaller share of the total machine cost. It is more likely that IoT solution demand will decrease because tariffs will increase the price of these new digitized machines and, thus, lower overall demand for the machine itself. For instance, tariffs that decrease demand for cars are far more likely to decrease demand for IoT services than will be the added costs of IoT components in the car. Already, Telemetry, a Detroit-based automotive advisory firm, is projecting that auto sales across the United States and Canada will decline in 2025 by 1.8 million units if the current tariff environment remains in place.

Tariff Implications Will Result in More Than Higher Device Costs

The challenge with projecting the ramifications of tariffs on the IoT market is that ecosystem choices are highly dependent on the magnitude of the tariffs—how much additional cost will tariffs add to my product? If the tariffs were to stay in the 10% range, suppliers could react more slowly and possibly just wait them out, hoping that Trump will give up on his tariff strategy, or wait until Trump is out of office altogether. Regardless, as long as Trump is the president, IoT suppliers need to understand the possible tariff implications on their IoT business, and the choices they can make to limit the tariff impact.

- **China May Be Least Affected:** The trade war will have less impact on the Chinese IoT market. There are a lot of "it depends" in this assertion, depending on the connectivity technology because Qualcomm owns such a large share of the cellular chip market. However Microcontrollers Units (MCUs) are not exclusively U.S. products—many Western European companies offer processors. The rest of the IoT value chain can be served by Chinese firms such as Huawei and ZTE for device-to-cloud services, and Alibaba for hyperscaler services. Even the hardware in data centers that support

applications and data storage are increasingly using Chinese and Asia-Pacific suppliers. However, the issue for China with the tariffs is that IoT hardware vendors want and sometimes need to expand outside of China to drive profitability. In China, device and component competition is stiff, driving down profitability. Yes, Chinese firms can sell into Western Europe, Japan, South Korea, and a few others, but the U.S. market is a tough one to give up. As an example, one major cellular module vendor had 54% of its sales in 2022 and 2023 outside of China. Its average profit margin was 2.5%!

- **Subscription Fees:** Back in the United States, tariffs may cause IoT solution providers to reassess their business models. For instance, vendors that offer a disposable device model may want to switch to a reusable device model. Disposable device models have advocates for improved sustainability, but tariffs make sustainability more expensive. Already, suppliers like Tive and Controlant are measuring themselves on their "reused device" percentage. Other models may also include more devices bundled into the solution with longer service contracts. Hiding the higher device cost is easier by spreading the higher device fees across monthly subscription fees paid over a longer contract period.

- **Supply Chains:** As the components in IoT devices and gateways are many, the only reason for the component Original Equipment Manufacturers (OEMs) to move manufacturing to the United States is if they have many or their largest device OEM customers in the United States. The biggest IoT markets that could see this change are the automotive and smart home segments. These two segments constitute about 40% of the U.S. IoT market measured by installed base. Another possible change to supply chains could be that electronic component, with distributors stepping in to help soften the cost impact and taking on the brunt of supply chain realignment for U.S. device OEMs. This group is used extensively by the IoT device community, particularly smaller OEMs that are not buying directly from component suppliers. They would be better equipped to more cost-effectively resource products and even support supply chain realignment to lower tariff countries—or to support more onshore U.S. production.

- **Transfer Pricing Schemes:** One way that device OEMs are looking at lowering the costs of tariffs is by separating the software from the hardware. Many IoT device OEMs bundle the firmware/software on the device and ship to the United States. If they can disentangle the device software from the hardware, tariffs would apply to a less expensive device. But how this is done can be a challenge. One option is to show that the software comes from the United States, so the tariffs would only apply to the hardware. But this may not be legal per Internal Revenue Service (IRS) guidelines. The second option is shipping the "dumb" device to the United States and flashing software onto the hardware when in the United States.

- **Chinese Supplier U.S. Reshoring:** There are Chinese IoT suppliers actively building businesses in the United States to allow selling their products under the label of "Made in the United States." So far, there has been no backlash to this activity. Could this mean more Chinese IoT device and component OEMs building manufacturing facilities in the United States? The answer is maybe. First, the political environment in both the United States and China would need to allow it. Second, would the sales in the United States for Chinese OEMs be large enough to support the move, knowing that wages in the United States would be higher than in Asia-Pacific? Robotics could alleviate higher human labor costs. However, building a new factory or retrofitting an existing building in the United States would be costly compared to the costs in China that are low to non-existent for Chinese manufacturers. The Chinese government often pays for all or part of new factory construction in China. Third, components sourced outside the United States will still see tariffs, but would there be U.S. exemptions if a product is assembled in the United States?

- **IoT Software and Services Impact:** It is unlikely that tariffs will apply to overseas software and services consumed in the United States. As a result, tariffs will have much less impact on IoT value chain software and service costs, including application development, device-to-cloud services, data storage, etc. However, tariffs could affect IoT software and services in two ways. First, if fewer devices are deployed, there will simply be less need for software and services. However, tariffs could also accelerate the use of software in certain business processes. An example is in supply chain logistics. Many companies have used data from Enterprise Resource Planning (ERP), warehousing, and transportation software systems to enable greater visibility in the movement of goods across the supply chain. And now asset visibility suppliers are augmenting their software-only approach with IoT devices for not only the location and condition detail, but also for real-time alerts, enabling better control over cargo in transit. However, the Return on Investment (ROI) of visibility solutions that use IoT devices are very sensitive to device costs. The result is that the added costs of tariffs will likely slow down greater use of IoT devices for supply chain visibility, either delaying device investment or driving customers to invest more in software-based solutions.

- **5G Acceleration—or Deceleration:** Many in the device and Mobile Network Operator (MNO) community are seeking growth in 5G, both for its revenue from replacing 4G devices, but also for monetizing 5G network investments. The challenge right now is that 5G devices are more expensive than 4G devices. One tariff scenario an acceleration of 5G device deployments in the U.S. market because higher volumes will bring down device costs, and operators want to start monetizing their 5G networks. The problem with this hypothesis is that U.S. operators are still upgrading their 5G networks to Standalone (SA) and 5G network equipment for U.S. operations is primarily coming from Ericsson and Nokia, companies that mostly manufacture their 5G products in the tariffed regions of Europe and Asia-Pacific. The second is that the United States is still 5 years away from starting the 4G network shutdown, so there is no need to take on the extra costs to accelerate 5G device uptake. The more likely scenario in the U.S. market is that 5G adoption in the IoT market will be delayed slightly or see more hockey stick growth late in the decade.

4 Bad, the Worse, and the Ugly of Automotive Tariffs

James Hodgson, Research Director

What New Costs Do OEMs Face?

April 2025 has been a tumultuous month for global trade, with the U.S. administration announcing a series of tariffs on imported goods, which rapidly shifted in scope, time frame, and rate over the course of 2 weeks, leaving many manufacturers scrambling to plan and optimize based on the new costs that a globalized supply chain will inevitably incur.

At the time of writing, the new tariff structures facing the automotive industry are summarized below:

- A 25% tariff on imported vehicles from all countries, going into effect April 3
- A 25% tariff on a wide range of imported vehicle components, going into effect May 3
- United States-Mexico-Canada Agreement (USMCA)-compliant vehicles will only be subject to tariffs on the non-U.S. component value of the vehicle
- Certain materials already subject to Section 232 tariffs will not be compounded by these 25% tariff rates

According to the U.S. administration's own analysis, some 50% of vehicles sold in the United States each year are imported, with only 40% to 50% of the value of each domestically produced vehicle derived from domestically manufactured components. Therefore, from May 3 onward, around 75% of the U.S. automotive market value will be subjected to a 25% increase in supply-side costs. In reality, the impact will be even greater, as those domestic component manufacturers will no longer be subjected to the same foreign competitive pressure to reduce costs. Furthermore, the tendency for a component to cross borders multiple times during construction can see these components, in effect, tariffed on multiple occasions. In addition, the 10% base tariff that has emerged as the settled state for most U.S. trading partners for a period of 90 days from April 9 can be expected to have a generally inflationary effect, also impacting supply chain costs.

Alongside the greater supply side costs, the automotive industry must also anticipate a demand-side shock resulting from the effect of increased tariffs on inflation, interest rates (and therefore, financing), consumer confidence, economic growth, and employment.

For Original Equipment Manufacturers (OEMs), while there will clearly be no outright winners in this context, there will certainly be automakers set to lose less than the competition, potentially setting themselves up for an increased share of an albeit smaller market.

Automaker Responses—Both Foreign and Domestic

Domestic OEMs: Both Ford and Stellantis have announced the expansion of employee pricing to general consumers on most models, representing thousands of dollars of savings per vehicle. This will help these automakers get ahead of the likely demand disruption caused by the new tariff framework, and also help them gain market share at the expense of competitors that are unable to match these discounts, or that are even being forced to withdraw incentives in the face of new cost pressures. The driving factor enabling these OEMs to offer such discounts is, no doubt, their U.S.-dominated vehicle manufacturing, with 60% of Stellantis vehicles sold in the United States, and 80% of Ford vehicles sold in the United States being manufactured domestically.

Ford also operates a higher level of inventory than the industry average (4 months compared to 3 months), and this push to sell down the higher stock level at lower prices likely reflects fears of a looming demand-side impact later this year.

Foreign OEMs: The response from foreign OEMs has been equally mixed, with some general trends still observable. Audi and Mitsubishi are both holding U.S. imports at port, before the point at which the new tariffs would be applied. Audi manufacturers all of the vehicles sold in the United States either in Europe or Mexico, with the Mexican manufactured Q5 (Audi's best-selling model in the United States) not featuring enough U.S./Canadian/Mexican content to benefit from USMCA exemptions, subjecting it to the full 25% tariff. Mitsubishi, meanwhile, manufactures every vehicle sold in the United States outside of North America, and has also taken steps to reduce consumer incentives and raise financing rates.

Audi has endured successive quarters of shrinking vehicle sales in the United States, while Mitsubishi has found its profit margin coming under pressure. For foreign automakers already under pressure in the U.S. market, the 25% tariff will push a "wait and see" approach, pausing imports, while the economics of onshoring are considered, or in hopes of a reduction in tariffs. Meanwhile, Mercedes-Benz has committed to maintain 2025 pricing, benefiting from a manufacturing presence in Vance, Alabama, responsible for the production of models such as the GLE, GLS, EQE, and EQS. These models are high margin, allowing Mercedes-Benz to better absorb the impact of the tariffs insofar as it applies to the non-U.S. content of these models.

Overall, the automakers, both foreign and domestic, that are best positioned to weather the storm are those with significant U.S. manufacturing presence, with U.S. production capacity devoted to the manufacture of high margin models such as Sport Utility Vehicles (SUVs) and luxury sedans. Holding a renewed competitive advantage, these automakers may even double down and pursue increased incentives to increase their market share before the demand-side impact starts to bite.

Meanwhile, OEMs without any USMCA-based manufacturing, or that feature too high a proportion of non-U.S. content in their vehicles for exemptions in their USMCA-based manufacturing, are most heavily exposed, particularly with respect to narrow margin models.

What Happens Next?

Scenario 1: Uncertainty Plagues the New Sales Market (Bad): U.S. policy on tariffs has fluctuated considerably since April 2. What was first announced as a series of reciprocal trade tariff rates apparently calculated in accordance with the U.S. balance of trade deficit for each country has given to way to a blanket 10% tariff on all trading partners, with the exception of China, with goods currently subject to a tariff of 145%. While the policy on automotive tariffs has remained consistent, the recent decision to exempt certain devices and components such as smartphones, semiconductors, and other components for a period of 90 days has given rise to speculation that a more general return to the pre-April status quo, or something like it could be in the cards. However, it is important to be realistic about the prospect of such a shift. In the first case, the rhetoric of the U.S. administration tends toward re-imposition of protectionist measures against smartphones and their components after the pause. More generally, automotive protectionism is long standing, with the recent 25% levies an expansion of an existing practice, rather than a novelty.

However, even if the scope and rate of automotive and automotive component tariffs were to be reduced, this would only serve to amplify the confusion and uncertainty with which automakers are grappling. Onshoring is a complex process, with the timeline for the planning, construction, and optimization of new manufacturing processes measured in years, meaning automakers are reluctant to commit to such a strategically important decision in the context of a policy environment that is changing by the day.

Scenario 2: The Tariffs Remain and Other Major Markets DO NOT Retaliate (Worse): Some of the United States' trading partners have pursued a cautious policy in their response to increased U.S. tariffs, preferring a measured approach that maximizes the probability of a compromised trade deal as close as possible to the status quo. In this context, the biggest shake-up will be in the composition of the new vehicle sales market, with domestic brands or brands with a healthy U.S.-based manufacturing base gaining market share at the expense of OEMs skewed or entirely dependent on non-U.S. manufacturing, even while all of the U.S. market deals with the demand impact of higher prices. If the automotive tariff framework is generally accepted by the market to remain consistent for the long term, then a protracted period of onshoring, combined with a preference for U.S.-based components will prove the least worst way to optimize in this context.

At the same time, it will make sense for vehicles manufactured within the United States for export to have their production shifted outside of the United States in order to avoid the tariffs placed on the import of non-U.S. components and construction materials more generally. Of the 4.9 million vehicles manufactured in the United States by international OEMs, 0.76 million were exported, with European OEMs, in particular, exporting over half of the vehicles manufactured in the United States.

Scenario 3: The Tariffs Remain and Other Major Markets DO Retaliate (Ugly): While the United States does import many of the vehicles that American consumers buy, it also exports many vehicles for sale in other countries. According to the European Automobile Manufacturers' Association (ACEA), in 2022, the United States exported 3.9 million vehicles, with 13% of these vehicles sold within the European Union (EU). While increasing protectionism in the United States can make U.S. OEMs more competitive in their home market, retaliatory measures can make them uncompetitive everywhere else. China has adopted a more "tit-for-tat" policy in response to U.S. tariffs, with the impact on the automotive market already visible in the fact that Tesla is no longer accepting orders for U.S.-manufactured Model S and X vehicles in China. At the high water market in 2017, U.S. manufacturers exported 4 million vehicles into China alone, in comparison to the roughly 6 million vehicles that the United States will typically import. Having ceded leadership in Autonomous Vehicles (AVs), Software-Defined Vehicles (SDVs), and Electric Vehicles (EVs) to Chinese OEMs, U.S. automakers were already struggling with being competitive in China on capability, halving their share of new car sales in China reach just over 2 million in 2023. Retaliatory tariffs will likely to lead to American vehicles being uncompetitive on cost and capability in the world's largest automotive market.

5 Exemption of Networking Equipment from Trump's China Tariffs Offers Temporary Reprieve, but Industry Is Already Readjusting to the New Trading Reality

Andrew Spivey, Principal Analyst

The United States and China Engage in a Tit-for-Tat Tariff Spiral

Early April saw the rapid escalation of tariffs on trade between the United States and China. President Trump's April 2 "Liberation Day" suite of tariffs introduced a further 34% levy on all goods deemed to originate from China and Hong Kong, on top of the 20% tariff enforced by his March 3 executive order, bringing the total up to 54%. In retaliation, China implemented its own 34% tariff on all U.S. goods, which triggered Trump to impose an additional 50% on Chinese goods, raising the total tariff up to 104%. Not to be outdone, China also hiked its tariff 50% up to 84%, to which the U.S. response was to raise their rate to 125% on top of the 20% from March 3, for a total of 145%. China subsequently increased their total tariff up to 125%, at the same time signaling that they would refrain from any further moves because the existing high rates already meant that U.S. goods in China were essentially unmarketable. It was then revealed on April 12 that networking equipment, including Wi-Fi routers and network modems, would be exempt from the additional 125% tariff (see exempted products under tariff classification 8517.62.00), although they are still subject to the 20% blanket tariff from early March, and are expected to be slapped with another set of separate tariffs in the near future. While the style and speed with which tariffs were enacted and then withdrawn on Chinese networking equipment may be shocking to the outside observer, both Chinese networking Original Design Manufacturers (ODMs) and their U.S. customers were not caught completely off-guard, as they have invested significant resources over the past half decade in preparing for any potential breakdown in trading relations between the two countries. This ABI Insight reveals the ways in which Chinese networking ODMs have prepared for further U.S. restrictions on their products, explores how the U.S. networking equipment industry will be impacted by retaliatory measures from the Chinese government, and provides foresight on the potential ramifications of this recent trade spat on the global networking equipment market.

U.S.-China Decoupling Is the Only Certainty in Uncertain Times

It should be recognized that this new suite of tariffs is only the latest chapter in a multi-year decoupling between the world's two largest economies, and they follow on from successive rounds of targeted export controls from the U.S. Commerce Department's Bureau of Industry and Security (in October 2022, October 2023, and December 2024) on the export of advanced chipsets for Artificial Intelligence (AI) applications and semiconductor manufacturing equipment to China. Whereas higher Liberation Day tariffs on all other nations were delayed for 90 days (aside from the 10% blanket rate), China's tariffs

were escalated up to 145% for most items, with the exempted items given only a temporary reprieve at 20%. This reflects a deep-rooted belief from many in the U.S. government that a severing of trade ties between the United States and China is a desirable outcome, and that while there is potential for a mutually beneficial deal to be made with other nations, there is no acceptable compromise to be made with China. Compounding tensions is the fact that neither side is willing to signal weakness and both believe they have the upper hand. Confident that he possesses the advantage, Trump calculates that a strategy of relentless and unyielding pressure will eventually result in China's capitulation, whereas China's Foreign Ministry believes that it has sufficient tools and resources to counter the U.S. threat, and vows that it will "fight to the end." Ultimately, given that the U.S.-China trade conflict is systemic in nature and, unlike other nations, cannot be resolved simply by rebalancing trade, companies should consider sustained political friction and trade restrictions between the two sides as the base case scenario, and prepare accordingly. This extends to the networking equipment industry, whose exemption from the additional 125% tariff does not shield it from being targeted again in the future.

None of the events of the last several weeks would have come as much of a surprise for Chinese networking ODMs, for they have been facing an unpredictable economic climate and ever-increasing U.S. pressure for over half a decade at this point. While scrutiny on Chinese networking vendors was gradually ramping up in the late 2010s, the sudden shock of the COVID-19 pandemic was the real watershed moment, after which the market saw irrevocable change. In the wake of the supply disruptions caused by the strict COVID-19 lockdowns in Mainland China across 2020 to 2022, virtually all major U.S. Internet Service Providers (ISPs) and networking equipment brands sourcing from Chinese networking ODMs have worked to diversify their supply chain away from China. Moreover, heightened security concerns have resulted in Chinese suppliers facing ever-increasing scrutiny. TP-Link for example, the world's largest vendor of Wi-Fi routers for the retail market, has been the subject of a long-running U.S. government investigation into whether its equipment poses a cybersecurity risk to U.S. consumers, with many calling for an outright ban of TP-Link sales in the United States. These factors, alongside the general deterioration of the U.S.-China relationship, have already compelled many Chinese vendors to abandon the U.S. market altogether. For the rest, they long-ago came to the realization that substantial adjustments to their business model were necessary if they were to continue operating in the U.S. market.

As previously reported on by ABI Research, in recent years Chinese networking ODMs have drastically increased their investments in foreign production sites in order to circumvent existing restrictions on Made-in-China products and prepare for future ones, as well as to benefit from lower local labor costs. Vietnam has proven to be the most popular choice for overseas manufacturing sites, with Malaysia also emerging as a key destination. With manufacturing sites and logistics infrastructure now firmly established in these nations, they are well-equipped for Chinese networking ODMs to take advantage of them to sidestep tariffs on their equipment from the United States or any other nation. Indicative of Southeast Asia's newfound role within China's overseas trading network, Chinese exports to the region surged to their second highest on record in March 2024, with a large portion of this trade presumably consisting of supplies sent in anticipation of further U.S. trade restrictions on China. It was with this in mind that Vietnam was assigned a 46% tariff by the United States on the April 2 Liberation Day, a figure even higher than China's initial 34%. The implication was that Vietnam, and countries in a similar position, must choose between China or the United States (not coincidentally, Chinese leader Xi Jinping's first foreign trip this year, which began on April 14, is to Vietnam and Malaysia, alongside Cambodia). The potential imposition of sizable tariffs on Southeast Asia poses a major challenge to Chinese networking ODMs relying on business from the U.S. market, because although they no doubt expected restrictions on goods from the Chinese Mainland, they likely did not foresee the scale of the tariffs that are being proposed for Southeast Asia. Thus, for many Chinese networking ODMs it will be the final tariff that is placed on the home of their overseas facilities, rather than on China itself, which will have the biggest impact on their operations.

How Trade Tensions Will Impact the U.S. Networking Equipment Ecosystem

Just as Chinese ODMs failed to anticipate the size of the proposed tariffs on Southeast Asian nations, U.S. networking equipment brands and ISPs procuring networking Customer Premises Equipment (CPE) also placed their bets on this fast-growing region, believing that de-risking away from China and reorientating to Southeast Asia would afford them supply chain resiliency (in many cases, the suppliers of these U.S. firms are still Chinese ODMs operating in Southeast Asia). Unfortunately, this has now left them equally as vulnerable to the disruption that tariffs on Southeast Asian nations would cause, and they will exist in a state of limbo until they gain more clarity on the exact nature of the tariffs. In the meantime, businesses will be incentivized to refrain from making large investments and delay decision-making until there is more certainty on the exact tariff rate imposed on their supplier's country of origin.

U.S. firms are also burdened by the reality that, at least in the near term, reshoring the production of networking equipment to the United States would be unlikely to prove profitable for them. The hyper-competitive race to the bottom nature of the networking equipment market, where successful ODMs are forced to produce equipment at scale with very low margins, mean that the manufacture and assembly of the equipment itself offers negligible value-add. Large capital investments would also be necessary in order to build the requisite capacity or capabilities. At the same time, the little upside that U.S. vendors will gain from these developments, such as supplanting low-cost Chinese CPE in the U.S. residential market (U.S. vendors are already overwhelmingly dominant in the U.S. enterprise market), is unlikely to outweigh the drawbacks. There is also no escaping that fact that removal from the market of cost-effective Chinese networking equipment—either because it is no longer low-cost due to tariffs or because it becomes subject to an outright ban—will end up being highly inflationary in the near term.

Another underappreciated threat to the U.S. networking industry is China's retaliatory measures. Over the past several years, China's retaliatory toolkit in the face of U.S. export restrictions has become progressively more targeted and creative, leveraging the country's dominant position in the global production of critical minerals, particularly Rare Earth Elements (REEs), of which China controls around 70% of worldwide production. The first wave of Chinese export restrictions on critical minerals began in August 2023, when the country's Ministry of Commerce (MOFCOM) implemented export controls on Gallium and Germanium. This was then followed by the expansion of export controls to Graphite in December 2023 and Antimony in September 2024, and then in direct response to the Biden administration's third round of semiconductor export controls to China in December 2024, a complete ban on shipments of Gallium, Germanium, and Antimony to the United States was enforced. Now, alongside hiking tariffs on U.S. imports into China to 84%, China has mandated the approval of export licenses for the export of seven Heavy REEs—Dysprosium, Gadolinium, Lutetium, Samarium, Scandium, Terbium, and Yttrium.

Each of the critical minerals and REEs were strategically selected on account of their centrality to the production of advanced technologies, such as semiconductors and lithium-ion batteries. Several of them are integral to the manufacture of components used throughout the Wi-Fi industry. Gallium, for example, is a vital element used for Gallium Arsenide (GaAs) wafers, the dominant substrate currently used for Wi-Fi Front End Modules (FEMs) due to its high performance and efficiency levels compared to alternatives. The Heavy REE Scandium is also relied upon for the Radio Frequency (RF) FEMs found in Wi-Fi modules. While the immediate impacts of the export restrictions/bans on the global production of Wi-Fi FEMs will be slight due to the relatively minor role the United States plays in their manufacture, they will hamper U.S. efforts to ramp up the manufacture of these products domestically.

6 U.S. Tariffs and Telco Cybersecurity: Accelerating Independence

Georgia Cooke, Research Analyst

Reversing Globalized Supply

The recent slew of tariffs from the United States have thrown global markets into disarray, with the dollar weakening and geopolitical tensions increasing as a trade war develops. This period of uncertainty comes against a standing backdrop of an increased drive toward sovereignty and supply chain visibility in the telco security market, particularly in the European Union (EU), where sentiment already went against the processing of customer data on U.S. servers, as the 2018 CLOUD Act allows the U.S. Government to subpoena data from any U.S.-based provider. These latest moves from the United States will only strengthen the cautious attitude toward its vendors, creating a challenging position for them in the global market.

Avoidance Tactics: Softwarization and the Infrastructure for Regional Trade

The tariffs themselves only apply to the import of physical goods, with the resulting complexity intensifying the existing move toward service-based delivery of telco security. The standing pressure for providers to enable multi-cloud, vendor-agnostic tools will be intensified by an environment that is likely to fragment the cloud market, with data centers likely to feature more heterogenous hardware as a result of the disruptions and long-term changes to supply chains.

Currency fluctuations will also contribute to complex supply relationships, with international confidence in the dollar falling following the introduction of the tariffs and the resulting crashes in the U.S. stock market. This is particularly impactful for key enterprise network end markets such as oil, because the U.S. dollar is the currency of international oil trade and most Gulf Arab currencies are pegged to the dollar. Solutions for de-dollarization of the international economy are likely to involve accelerated rollout of Central Bank Digital Currencies (CBDCs) to enable sufficiently digitized trade, requiring infrastructure support and changing requirements for billing.

Riding Out the Storm

This is a period marked by uncertainty, with large-scale changes possible at a moment's notice and conflicting information, with rumors of pauses on the tariffs being cited as "fake news" by the U.S. administration before being actioned. Focus should not be on the exact details of the tariff plan at this stage, given the capacity for wholesale change at the drop of a dime, but on the macroeconomic trends; most importantly for Mobile Network Operators (MNOs):

- Sovereignty, and a preference for domestic suppliers, with the likelihood of an increasing drive toward autonomy throughout the supply chain
- Market fragmentation, with more complex regional dynamics and pragmatics such as currency fluctuations
- Increased challenges to hardware, likely driving increased softwarization in order to deploy networks on domestic clouds without the need to import network equipment

In terms of strategy, there are opportunities in hand for non-U.S. MNOs and vendors, as well as challenges. These vendors should:

- Reshape hardware supply relationships with the new market. Certain regions such as the Middle East & Africa already have strong relationships with Chinese Network Equipment Providers (NEPs), bolstered by the tear-out demands of Huawei and ZTE equipment in high security governmental cellular networks in the United States and Europe in recent years, which forced China to target alternative markets. Once again, Chinese NEPs will be losing a portion of their customers, and may offer an attractive prospect to new and growing markets in order to replace them. The risk will have to be considered, and security requirements rigorous—tear-out schemes have been disastrous, with numerous delays and extreme expense, and growing markets cannot afford to be in the same position of needing to remove Chinese network equipment should they later identify a risk. European vendors such as Nokia and Ericsson pose an alternative, and offer numerous manufacturing options, though each has U.S. manufacturing locations that must be avoided to avoid the impact of reciprocal tariffs.
- Accommodate and capitalize on sovereignty sentiment, offering flexibility in deployment models and prioritizing interoperability.
- Focus on software and service models, building trust with the holdout customers that maintain mistrust in software security. Detailed educational materials targeting Chief Information Security Officers (CISOs) and risk compliance officers will help limit the need to provide hardware solutions.

U.S. vendors should take the following steps:

- Ericsson and Nokia each has U.S. manufacturing plants, and will benefit from the transfer of low-risk network customers who were still using Chinese NEPs before the tariffs. This will further drive intense competition between the two, and U.S. customers and dependent vendors will need to negotiate the changed landscape. Creative strategies will be needed to avoid excessive dependency, with multi-vendor supply models being important to mitigate unchallenged commercial leverage.
- Security vendors will need to tackle a challenged international perception, deploying in a productized and modular model approach in order to allow global customers to use the elements of their solution that comply with their sovereignty posture.
- U.S. network security vendors such as Cisco will need to adjust their targets for private networks—they will still be able to target end markets like oil in the Gulf States, as trade relations are expected to remain largely unchanged in the region. Mining hotspots like South Africa are also not expected to implement retaliatory tariffs. For other addressable markets like seaports and manufacturing hubs, the situation will be more complex, and vendors will need to assess their role in the supply chain.

7 Tariff Uncertainty Could Stall RAN Upgrades—but May Speed Up Disaggregation Strategies

Larbi Belkhit, Industry Analyst

The United States Announces Pause on Global Tariffs—Except for China

In early April 2025, President Trump's administration implemented a sweeping new round of tariffs. This consisted of 10% baseline tariffs, followed by country-specific rates from April 9. For now, these reciprocal tariffs have been paused for 90 days for all countries except China, which now will see a 145% levy, having responded with its own tariffs against U.S. imports. While the headlines have been dominated by the impact these tariffs will have on the automotive and manufacturing industries, there will also be a significant impact on the telecommunications sector. Some of the relevant countries and regions that will be hit include Vietnam (46%), the European Union (EU) (20%), Japan (24%), and South Korea (25%).

Price Hikes and Network Virtualization

The impact of these tariffs is likely to be much more significant for smaller vendors such as Airspan and Mavenir than incumbent vendors such as Nokia and Ericsson. Adding to their cost of business creates even more strain than they were already experiencing, with Airspan having just emerged out of bankruptcy protection and Mavenir facing rumors of financial uncertainty and looking for a significant investment. While Nokia and Ericsson have a manufacturing presence in the United States, importing necessary components is unavoidable. However, due to their stronger financial positions, they will have prepared in advance for the implementation of these tariffs and have significant stock of the portfolio for the U.S. market.

Smaller players will not have been able to make such adjustments on a significant scale as they typically manufacture their solutions once an order has been placed and payment has been received to help with their cash flow positions. This will mean that when competing for future contracts in the United States, it becomes even harder for smaller players to compete from a price perspective, and the cost of developing new solutions will increase. In the table below, ABI Research breaks down how these tariffs may impact some of the different RAN components.

Impact of U.S. Tariffs on RAN Components

RAN Component	Key U.S. Suppliers	Supplier Locations	Tariff Impact	Estimated Price Impact
Passive Antennas	Amphenol Prose, Ericsson	United States, Sweden, Germany	High (many components sourced from China and Asia)	Higher than 20% component cost increase
Baseband Processor	Intel, Marvell, Nokia, Ericsson	United States, Finland, Sweden	High (many components sourced from China and Asia)	10% to 25% component cost increase
Radio (Active Antenna Unit (AAU) and Remote Radio Unit (RRU)	Ericsson, Nokia, Samsung, Fujitsu	Sweden, Finland, South Korea, Japan	High (many components sourced from China and Asia)	Higher than 20% component cost increase
Amplifiers	Qorvo, Skyworks, Broadcom	United States, Singapore, Malaysia	High (many components sourced from China and Asia)	Higher than 20% component cost increase

Furthermore, Fujitsu is likely to be more affected by these tariffs than other incumbent players. The vendor supplies radios to Boost Mobile and AT&T and will immediately see a 24% increase to product costs once they kick in again. Especially as the 5G radios being supplied to these customers are Open RAN-compliant, there is a risk that to avoid these costs, their customers

may decide to select another vendor that is already part of the respective Open RAN deployments. However, this will still necessitate an integration process with the automation layer, especially in AT&T's network where Ericsson integrates the third-party radios onto the Ericsson Intelligent Automation Platform (EIAP), so an immediate vendor swap is unlikely.

From a network deployment perspective, operators are unlikely to change their Capital Expenditure (CAPEX) plans, but rather slow down infrastructure upgrades/deployments. Nokia and Ericsson are more likely to increase the price of their solutions, rather than absorb the increase in component cost due to the competitive pricing they already offer their customers, keeping their margins in this market low, so operators will now have slightly less purchasing power for the duration of these tariffs. Any announcements set to be made in 2Q 2025 by the leading U.S. operators will be pushed back as they wait to see if they are able to wait out these tariffs.

From a strategy perspective, operators may reassess their network virtualization/cloudification strategies and look to see if they are able to accelerate their roadmap for these technologies in the midst of geopolitical uncertainties. Making their RAN more software-defined would impact operators less, especially if running the network over Commercial Off-the-Shelf (COTS) servers. Notably, NVIDIA's DGX and HGX systems are exempt from U.S.-Mexico tariffs, sorted under the United States' HTS codes 8471.50 and 8471.80, thanks to the United States–Mexico–Canada Agreement (USMCA) trade agreement. U.S. import data for these server-related categories show that 60% of the US$73 billion in imports in 2024 came through Mexico. This could entice U.S. operators to take a closer look at the feasibility of deploying an Artificial Intelligence (AI)-RAN architecture, especially as it offers the potential of monetizing their edge assets via Graphics Processing Unit-as-a-Service (GPUaaS) for third-party AI workloads. Should this occur, Fujitsu will again be a strong candidate for selection, having already integrated its technology with NVIDIA's Aerial RAN for SoftBank.

Market Uncertainty Creates an Opportunity

The increased uncertainty surrounding the size and length of these tariffs necessitates adjustments from operators and vendors, but also presents these vendors with a unique opportunity to capitalize on this uncertainty and grow their presence. There are several measures that U.S. operators and RAN vendors can take:

- **Operators can accelerate the roadmap for RAN virtualization or cloudification.** The necessity for many proprietary components for their radio network leaves operators vulnerable to continued geopolitical instability in the future. Working closely with their existing RAN suppliers to help accelerate their roadmap by conducting more trials and setting out a strategy to prioritize their infrastructure upgrades toward virtualizing their network, specifically with COTS servers, will help operators avoid these same tariffs in the future and limit the effects of cost instability.
- **RAN suppliers must review their Bill of Materials (BoM) and sourcing strategies for their RAN solutions.** Identifying areas of exposure to tariffs, both current and in the future, can allow vendors to diversify their supply chain where possible and keep the costs of components for the U.S. market as low as possible, ensuring they are capable of offering competitive pricing. Furthermore, RAN vendors must assess the possibility of moving more of their production to the United States, Mexico, and/or Canada. Nokia and Ericsson already have manufacturing capacity in the United States; however, it is unclear whether these are more for assembling pre-manufactured components imported from their other facilities.
- **RAN vendors must also work quickly to integrate their RAN software into more platforms that allow for network virtualization, such as NVIDIA's Aerial RAN or Intel Xeon 6.** Integrating their solutions into these platforms will allow vendors to assist operators in their network virtualization strategies and compete for future contracts, especially as the increased uncertainty is likely to make vendor diversification become less of a priority for operators as they take a more conservative approach. Being among the first to be able to offer this to operators will help them capture new opportunities first.

8 Trade Wars and Chinese Competition Are Fracturing the Automotive Market: How Can Automakers and Their Suppliers Respond?

Abu Miah, Research Analyst

Chinese OEMs and Vendors Continue Expanding Outside Asia, While U.S. Tariffs Isolate North American OEMs

The United States escalated its trade war action again in March, announcing a 25% tariff on vehicle imports from April 2, and on vehicle part imports from May 3. There is no 100% "American-made" vehicle, so even Original Equipment Manufacturers (OEMs) like Tesla and Rivian, which assemble their vehicles in the United States, will see costs increase eventually. Vehicle models will see price increases of at least US$3,000, with EVs, in particular, expected to become up to US$12,000 more expensive. This tariff action is seen as a protectionist response by the Trump administration to the increasing status of Chinese vehicle offerings across the U.S. and global markets, but the reliance of many OEMs on foreign, and especially Chinese, vehicle components is creating a difficult environment for American consumers, suppliers, and automakers.

Chinese automakers have been expanding their presence in Western markets significantly over the last year, despite tariffs from markets like the United States and European Union (EU). This presence will continue to grow in the future as these OEMs bolster their positions with local manufacturing facilities, such as BYD's planned EV manufacturing plants in Hungary and Turkey, which are expected to start production in the next 3 years. This expansion is also the case with Chinese suppliers, as well as automakers—most recently, ECARX, a Chinese Tier One supplier, which announced a partnership with Volkswagen for digital cockpit systems in Brazilian and Indian vehicles, and is actively exploring ways to extend this to Škoda vehicles in Europe. There are also some markets, like EV batteries, where stakeholders are reliant on Chinese companies for their operations. However, the opposite (Western companies with strong positions in China) is not the case.

A Global Automotive Market Split in Two: China (and China-Accessible) Versus the Rest of the World

The Chinese market opportunity, the largest automotive market in the world, for foreign automakers and suppliers has been eroded as domestic players like BYD and Geely grow more competitive with their EV and Software-Defined Vehicle (SDV) offerings and adaptation to Chinese consumer preferences. Additionally, a complex regulatory environment, intense competition from local players, and cultural nuances have pushed Western players out from their previously meaningful shares of the market. The growing Chinese foreign presence has built on their domestic dominance, but other markets have enacted protectionist policies that have created a fragmented automotive industry. One part is accessible by Chinese automakers and suppliers, and the other is not (to varying degrees). The United States, for example, has taken a very strong protectionist stance against the Chinese, while the EU has adopted a more "lukewarm" approach, making Europe a market that is still somewhat accessible to Chinese companies, but the opposite is certainly not true.

The U.S. approach will have a direct consequence on automotive production and consumers, lowering industry outlooks for new vehicle sales in the coming years. The eroding profit margins of North American OEMs will further hamper their transitions to new technologies and architectures, including electrification and software-defined vehicle technologies like zone controllers. As electrification targets are delayed and scrapped in various regions across the world, OEMs are scaling back their platform timelines, but these platforms have often been the grounds for their innovations in digital cockpits or SDV features, too.

The divergence of the market into a Chinese-accessible and non-accessible market has an important impact on the trajectory of technology innovation across the world. On one hand, reduced competition and lack of free exchange of ideas will limit innovation as a whole across both halves of the market, but on the other, a domestic market that is shielded from the competitive pressures of Chinese players is intended to allow North American stakeholders to protect their domestic shares and innovation timelines. The significant advantages of Chinese OEMs and suppliers in cost competition and government support have played a large part in their ascent, but other markets aren't able to replicate these circumstances for their own.

Historically, different technologies grow significantly in localized regions, which then spread this knowledge across their global operations, allowing foreign players to adapt quicker. For connected cars, the United States was an early leader; for active

safety, Western Europe; and for EVs and autonomous vehicles, China has been the market leader for innovation. If the U.S. attitude of strong separation to Chinese threats continues, American stakeholders must consider how to stay competitive and ensure access to crucial technologies, such as batteries. A departure from net-zero targets does somewhat delay this need, but the competitiveness of EVs for long-term Total Cost of Ownership makes a transition to electric cars economically advantageous, even with the lack of regulatory support. More importantly, if Western automakers ever want to regain the volumes they once enjoyed in China, they must be EV and AV competitive. The measures that are protecting their domestic markets against Chinese imports have significant consequences for global competitiveness. For Europe, the pursuit of decarbonization has played a part in its softer tariff action against Chinese entrants. In the longer term, Chinese companies will be able to circumvent any new tariff actions as new factories are opened in Europe, and even in North America in the future.

A Safe Domestic Innovation Ground or Stunted Development?

The creation of these two parallel automotive markets with unique consumer preferences and innovation profiles will require adjustments from automakers and their suppliers to remain competitive. To protect against Chinese entrants and regain market share from Chinese companies in the Chinese market, there are several measures that Western stakeholders can take.

Tier One suppliers can:

- **Build and strengthen relationships with both Western and Chinese automakers.** Understanding their current priorities in technology and end consumer feature offering is critical to tailor a platform and component offering to these two markets, as the end consumer preferences can vary significantly. Early and often engagement to demonstrate market-personalized technology offerings across the domains of digital cockpits, infotainment, or connectivity, among others, are valuable for automakers, i.e., seeing their problems and opportunities coming before they materialize.
    - This requires engagement with government and regulatory bodies to ensure a thorough understanding of quickly changing trade policies, and enables them to advocate for measures that will promote open and stable automotive competition.
- **Review the Bill of Materials (BOM) and sourcing strategies for their solutions.** Identification of areas of tariff exposure and geopolitical risk exposure, for both current and potential future threats, can allow Tier Ones to build diverse supply chains/sourcing routes that are resilient to changes in the above. This reduces dependencies on specific regions and allows them to support OEMs across all the regions they operate in, or want to operate in.

Automakers can:

- **Make investments in EV platforms, next-generation digital cockpits, and sophisticated highway autonomous driving to compete with Chinese companies, both domestically and in China.** Especially in the Chinese market, consumers have strong preferences for advanced digital cockpit and infotainment technologies, like gaming (e.g., Volkswagen's AirConsole partnership) and video-on-demand. By focusing on improving vehicle architectures in the long-term, OEMs better enable themselves and their partners to customize their vehicles over time with new features to meet changing consumer tastes.
    - Doing this in China will require OEMs to forge partnerships with local Chinese domestic suppliers, to navigate geopolitical hurdles and cost pressures, as well as provide expertise on the market that foreign entrants otherwise do not have access to. Joint ventures and strategic alliances for specific technologies or architectures can allow some OEMs to catch up to their Chinese competitors and learn from their technology practices.
- **Disentangle their SDV and AV offerings from the EV platforms.** As EV targets and government support is scaled back/removed in markets like the United States, it becomes necessary to disentangle technological progress in electrification from progress in SDV architectures and AV features to remain competitive in these other domains. This applies only to markets where this removal of regulatory support is occurring—at the time of writing, this refers to the United States.
- **Leverage their strengths in Western and Chinese markets and capitalize on them as differentiators to Chinese OEMs.** Building on existing strengths, such as brand reputation or loyalty, build quality, or expertise in a particular infotainment domain, and leveraging already established sales/service networks can bolster an OEM's domestic operations in the face of Chinese competition. This can also apply to operating in Chinese markets—for example, some OEMs are still popular as luxury choices for more wealthy Chinese consumers, despite the growth in luxury Chinese OEM offerings. Capitalizing on this brand status can allow them to retain a foothold in the market as they rebuild a comprehensive technology offering that keeps up with Chinese competitors.

9 U.S. Government Tariffs: Technology Will Not Be Enough to Save U.S. Manufacturing from Increasing Costs

James Prestwood, Industry Analyst

Few Spared from U.S. Government Tariffs

Manufacturing was a key element of Donald Trump's election campaign, with the now President promising to bring a "manufacturing renaissance" to the United States, an industry that represents 10% of the U.S. Gross Domestic Product (GDP). Many U.S. manufacturing workers lived in key swing states, increasing the relative value of manufacturing as a topic affecting the outcome of the presidential race. The reciprocal tariffs that were promised on the campaign trail are now coming into full effect, in a far more impactful fashion than was imagined half a year ago. Core manufacturing nations around the world have been hit hard, above the universal 10% tariffs, such as China (34%), Vietnam (46%), Japan (24%), Thailand (36%), and Taiwan (32%). In total, over 180 countries and territories have seen "reciprocal" or universal tariffs imposed on their exports to the United States. These tariffs threaten to upend the modern global supply chains that have supported the manufacturing industry for decades, dragging industrial markets into significant uncertainty and threatening widespread manufacturing challenges.

What Is the Likely Impact on U.S. Manufacturing?

The challenges of inflationary pressure faced by the Biden administration, the specter of which is still very real in the U.S. economy, is highly likely to rear its head again. The presence of the tariffs on key suppliers of inputs for U.S. manufacturing will drive up costs, as many U.S. companies source materials, feedstock, and components from foreign markets, especially China. Despite the goal being to relocate production of these inputs back into the United States, this is not exactly an overnight process, and in many cases, requires years of plant construction, alongside process design and optimization, even if the investment in the new production does come. The higher costs of manufacturing will not be swallowed by manufacturers, but instead passed onto consumers, driving inflation and thereby curtailing consumer spending, hurting U.S. manufacturers even further. This will inevitably be compounded by retaliatory tariffs from affected nations, dampening foreign demand for U.S. exports, beyond the already political-driven boycotts of U.S. manufactured products from close allies, as seen in Canada. The U.S. domestic market will be highly unlikely to make up for this shortfall in demand.

A primary goal of the tariffs was also to bring back manufacturing jobs to the U.S. market; however, it is unlikely that the U.S. labor market will be able to absorb the increased jobs in its current state and, in fact, compounds an existing challenge already faced by U.S. manufacturers—a lack of skilled manufacturing labor and unfilled manufacturing jobs, with the United States having 482,000 manufacturing job openings in February 2025. The industry faces a low manufacturing unemployment rate, currently at 3.1% (March 2025), and while this an improvement on the low point of 1.8% back in December 2022, a sharp jump in production output will likely push the manufacturing labor market back down toward unsustainably low unemployment rates, resulting in increasing wage costs for manufacturers and further inflation for consumers.

Can Technology Save the Day?

One way out of the input and labor cost hole for U.S. manufacturers would be to double down on investment in technology, with a core focus on automation and robotics solutions to improve production efficiency, and thereby reduce unit costs. In a way, this would represent a highly positive outcome for the U.S. manufacturing industry, improving the country's digital maturity and Industry 4.0 positioning. Impactful and modular software solutions that can be rapidly deployed will likely see an increase in demand as production scales up, such as Manufacturing Execution System (MES) software. Digital work instructions and supporting Generative Artificial Intelligence (Gen AI) copilots will be highly valuable features as manufacturers look to onboard increasing numbers of workers who will need training and support. However, the situation is unlikely to be as rosy as described, and industrial technology vendors should not expect a buying spree from U.S. manufacturers. Cost-cutting will be the name of the game, and large investments in new technologies might well be the last thing on the minds of many companies. Interestingly, this could be the time to shine for Software-as-a-Service (SaaS) providers, with the Operational Expenditure (OPEX) cost being easier to accept than large Capital Expenditure (CAPEX)-based deployments.

While the United States could see a long-term increase in manufacturing output across the board and growth in the number of available manufacturing jobs as the relative costs of domestic manufacturing falls, in reality, even if manufacturing returns significantly to the United States, assuming the tariffs hold long enough to drive this effect, the cost of production will simply be higher than what current supply chains can offer. Even with the implementation of Industry 4.0 manufacturing technologies, it is unrealistic to expect U.S. manufacturers to achieve even a semi-competitive standing against the majority of production processes in cheaper labor markets such as Mexico, Thailand, and Vietnam. The only manufacturing vertical that these tariffs are likely to positively impact is semiconductor manufacturing, assuming U.S. production can still ensure a cost-effective supply of specialty chemicals, gases, and raw materials required for production, with the high value-added production processes aligning more effectively with U.S. labor costs and skillsets. This is the industry that, so far, has seen the most notable commitment to reshored production, actually started during the Biden administration with the CHIPS and Science Act.

In sum, the U.S. Government tariffs represent more of a political statement by the current administration, rather than an effective policy to drive comprehensive and valuable growth in the U.S. manufacturing market. It remains unclear whether the tariffs are intended to be utilized as a long-term structural policy or as a bargaining tool to win concessions from foreign governments, a tactic that the Trump administration has attempted to use before.

10 Tariffs Present U.S. Manufacturers Opportunities to Reshore—Solution Providers Will Need to Address This Directly

Adhish Luitel, Principal Analyst

United States Announces Tariffs Globally

Last week, the current U.S. administration levied tariffs on all imports. The 10% baseline tariffs imposed by the administration came into effect this past weekend, whereas the country-specific rates, which are higher, go live on April 9. Additionally, higher reciprocal tariffs were introduced for specific trading partners, calculated based on the trade deficits with each country to reduce trade imbalances – although these reciprocal tariffs have been paused for all countries except China. In response to the U.S. tariffs, China announced a 35% tariff on all U.S. imports, effective April 10. This escalation intensified trade relations between the two largest economies, with potential implications for global trade dynamics and manufacturers' outlook on their supply chains.

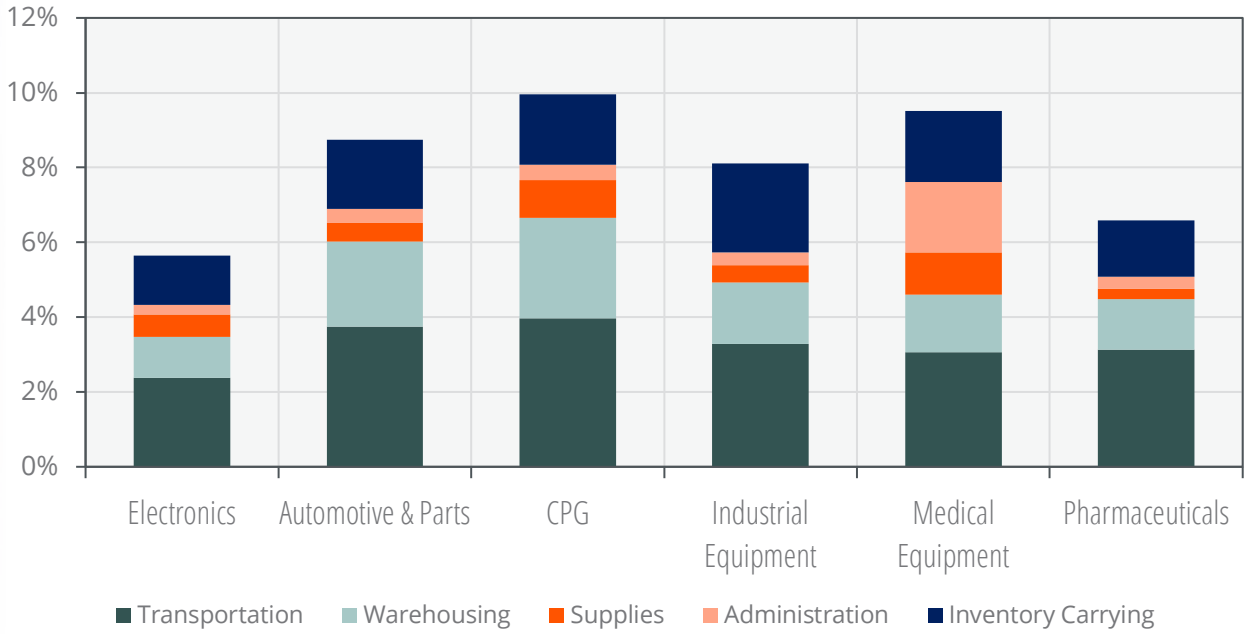
Potential Acceleration of Reshoring and Its Benefits

In the long term, the decision to impose tariffs worldwide can lead to large pay-offs in the form of a manufacturing boom. Apart from reducing trade imbalances, the current administration also wants to narrow the cost gap between foreign and domestic production, and create jobs domestically. For enterprises previously offshoring to benefit from lower labor or material costs, tariffs can tip the scales back in favor of U.S.-based manufacturing, especially when factoring in shipping lead times and inventory carrying costs. There is an opportunity to double down on reshoring efforts and look into U.S.-based suppliers and carriers. Manufacturers looking to maintain or grow their hold in the U.S. consumer market will have to look into how reshoring could potentially lower their Total Cost of Ownership (TCO). As mentioned in ABI Insight "As More Manufacturers Look into Reshoring, Efficient Supply Chains to Lower Overall Costs Will Be Important," lowering the TCO and using TCO estimators will be crucial to make the call on reshoring decisions. Inputs such as suppliers, transportation modalities used, etc., are accounted for in TCO estimators and are being assessed by manufacturers before investment.

One of the clear advantages of reliance on U.S.-based suppliers would be the benefits it can gain from reduced days to market, which is 45 days for U.S.-based versus 120+ days for China-based production, on average. Beyond shorter lead times and reduced days to markets, localized supply chains can also present opportunities for greater resilience and agility. Local production can allow for faster adjustments to design changes or market shifts—this is crucial in fast-moving industries like apparel or consumer electronics. The chart below shows logistics costs (as a percentage of sales) by industry, signifying high logistics costs for non-localized supply chains.

Logistics Costs (as a Percentage of Sales) of Supply Chains by Industries, 2024

(Sources: ABI Research, Establish Inc.)



Companies looking to reshore should also assess the blueprint laid out by manufacturers that have been successful with their reshoring efforts in the past. Even this month, Fast-Moving Consumer Goods (FMCG) giant Johnson & Johnson (J&J) announced that it will be investing US$55 billion in new U.S. manufacturing facilities over the next 4 years, in response to the tariffs. J&J's reshoring strategy is based on building four new facilities. A notable one that shows the benefits of reshoring is in Wilson, North Carolina, a city with 21% unemployment at present. Undoubtedly, there are socioeconomic upsides to such reshoring if strategic opportunities for job creation are factored in.

Opportunities for Procurement Management and Supply Chain Optimization Platforms

As manufacturers looking to reshore will be reconfiguring their operations, identifying new partners, and reworking their sourcing strategies, there are opportunities for solution providers to make the most of it. Since digitalization can be a great enabler to streamlined reshoring, network redesign and optimization tools could start to address a lot of pain points and desires of manufacturers. Coupa's Supply Chain Design & Planning platform, for example, can run multiple reshoring simulations using optimization algorithms and help manufacturers redesign their networks post-tariff change. Kinaxis' platform Maestro, has end-to-end supply chain orchestration capabilities that can help manufacturers concurrently plan, monitor, and respond to changing conditions. Similarly, Siemens' SupplyFrame, which is a sourcing and procurement intelligence platform, also has very targeted capabilities like scenario analysis, alternate selection, and risk assessment capabilities that help manufacturers with their sourcing and procurement decisions. What makes SupplyFrame stand out is the fact that it can also digitalize and automate Bill of Materials (BOM) and unlock capabilities like automated quoting and sourcing updates directly to various business units within the organization.

There are other providers like E2open, Blue Yonder, and Sophus Technology that also have supply chain optimization solutions. Their go-to-market framework should consider a use case-driven segmented focus where they seek to provide network restructuring, risk mitigation, and resilience planning capabilities. Reshoring opportunities can prove to be a needle mover for these solution providers, and there is a need to lead with this as a business case. Emphasizing time-to-value will be a crucial part of market messaging, as well as reshoring having changed from a long-term consideration to a mission-critical step for some manufacturers. In addition, there is also a large chunk of the middle market that is relatively untapped. As these medium-sized manufacturers make up a large portion of the country's manufacturing economy, addressing their needs by offering low-risk pilot projects and "Design-as-a-Service" by partnering with consultants and integrators can be a game changer as well. There are numerous ways to approach manufacturers looking to bring manufacturing back home—solution providers in this space must act sooner, rather than later.

11 The U.S. New Tariff Regime: What Are the Potential Repercussions for the Hardware Security Module Market?

Michela Menting, Senior Research Director

U.S. President Announces Worldwide Good Tariffs—and HSMs Are Not Exempt

Accompanying the United States' new tariff announcement on April 2, 2025 was a 40-page annex (Annex II) of exempted products, which included various semiconductor and electronic Integrated Circuit (IC) types. It did not, however, include Hardware Security Modules (HSMs) specifically, and it is unlikely that the Peripheral Component Interconnect Express (PCIe) form factor fits the exempted categories. Therefore, HSM imports to the United States will be subject to the new tariffs. The announcement will have repercussions for HSM sales by foreign Original Equipment Manufacturers (OEMs) in the United States. This will affect Average Selling Prices (ASPs), market shares, and demand for HSM services. This ABI Insight explores the possible repercussions to the HSM market in the United States and more globally.

Costs Will Go Up and Services Will Be Impacted

The first impact will be the cost—HSM OEMs, especially non-U.S.-based ones, will bear the brunt of it, and will have to decide if, when, and how much of that impact to pass on to the customer. Either way, it will be financially painful. The second impact will come if the U.S. administration doesn't back down or if negotiations on these tariffs don't make headway, and other countries set retaliatory tariffs on goods. This will bode badly for all HSM vendors, U.S.-based or not. The third impact will likely be on HSM services, a dynamic market that is growing much faster than the HSM hardware space. HSM users will likely be looking at migrating to cloud or managed HSM offerings if the Total Cost of Ownership (TCO) for HSM appliances becomes too high. This could be the big catalyst for HSM service adoption, and could quicken the pace at which U.S. cloud service providers (Azure, Amazon Web Services (AWS), and Google Cloud Platform (GCP)) are rolling out service offerings for HSM and Key Management Service (KMS).

However, there is a significant risk factor that could just as well cut that U.S. service expansion down: the European Union's (EU) Anti-Coercion Instrument (ACI). The ACI is a regulation that allows the EU to take action against economic coercion—essentially, allowing it to adopt "measures that affect the access of foreign direct investment to the Union or trade in services and that apply to services supplied, or direct investments made, within the Union by one or more legal persons established in the Union and owned or controlled by persons of the third country," i.e., the coercing country. Should the EU decide that the United States is, in fact, trying to economically coerce it with its tariffs, it could well decide to retaliate against the U.S. service sector, against which it runs a €109 billion trade deficit. This includes trade in digital services, thus impacting HSM and KMS solutions. This would be a complex endeavor for the EU, as digital trade can be difficult to quantify appropriately because many U.S. companies set up subsidiaries in the EU where a lot of internal revenue trading happens, making export quantification of digital trade services difficult. Further, the ACI is an instrument of last resort. The regulation states that the EU must work all other alternative routes before leveraging the ACI, but in these uncertain times, even the EU's careful and risk-averse nature may push it to take a more determined stance. With the EU's Digital Services Act (DSA) and Digital Markets Act (DMA), as well as the resurgence of digital service taxes in a number of European countries, the EU is already exerting tools to curb what it deems to be the abusive influence of U.S. digital service companies.

For the HSM services market, and certainly for non-U.S. providers, this could be a boon, giving companies like Thales, Utimaco, Eviden and Wordline a break to compete more effectively against the aggressive push in cloud HSM by the big cloud providers, which are also likely to face rising costs as it pertains to data centers (with tariffs on imported aluminum, steel, and electronic components driving up costs related to servers, storage, and networking equipment). This could also be an opportunity for firms like Entrust and Crypto4A in Canada, as well as smaller outfits such as Securosys in Switzerland, Kryptus in Brazil, and Procenne in Turkey, giving them more room to expand into the HSM service business, especially in Europe.

HSM Vendors Still Have Time, but Will Need to Make Hard Calls for the U.S. Market

This first, immediate issue is in the United States for foreign HSM OEMs. The top three are all headquartered abroad: Thales in France, Utimaco in Germany, and Entrust in Canada. This means that selling into the U.S. market now will mean these OEMs, among others, will face import duties on their products. There are three major considerations for foreign HSM vendors going forward in the United States.

The first is that HSMs are not a luxury, nice-to-have item. They are a critical asset for those using it, meaning those users will continue to buy HSMs, so the market is unlikely to shrink. In theory, even if OEMs pass on the cost of the tariffs to the consumer now, users will absorb these costs because they don't have a choice; it will mean slimmer margins if OEMs want to push up ASPs, as the duties will have already eaten into buyers' willingness to pay more. In the short term, the market is unlikely to fluctuate much, but as refresh cycles come up, U.S. clients will be looking long and hard at pricing and TCO, especially if the likelihood of a recession looms large.

Second, for those OEMs already selling to the U.S. Government, the likelihood is that they have set up manufacturing facilities in the United States to comply with U.S. supply chain requirements (as Thales does already). They could expand those facilities to also meet enterprise demands, thereby avoiding the tariffs. This would mean bigger investments into U.S.-based manufacturing and there are other issues at stake—HSM supply chains are complex, and not all parts can be made in the United States. Some will have to be imported, and those will also be subject to tariffs.

Third is that there are two strong U.S. HSM OEMs, Futurex and Marvell. Futurex manufactures all of its HSMs in the United States, so the new tariffs might be beneficial for its U.S.-based sales, positioning it better against competition from others outside of the country. However, if there are retaliatory tariffs abroad, this may impact its international expansion. There may also be other costs if its supply chain includes overseas parties. Marvell, on the other hand, offers only PCIe form factors, and it outsources manufacturing in Asia. This will mean that it will face duties when it brings the goods back into the United States. However, PCIe HSMs are still cheaper than network-attached HSMs, so Marvell could capitalize on this opportunity. However, with a focus primarily on cloud service providers, rather than enterprise, it might be easier to pass on those costs. IBM is also a U.S. HSM OEM, though it only offers its CryptoExpress as part of its Z mainframes, but with a market under stress, it could position itself as a viable alternative, especially on its service offerings.

As it stands today, the main difficulty will be in the U.S. market. It is not easy to predict how things will pan out with a U.S. administration that doesn't seem to play by the standard rules, whether that is in trade or policy. HSM vendors still have time to assess the situation and watch the outcome of negotiations with the United States. But they should start looking at all options, and prepare for worst-case scenarios.

12 Building Under Pressure: How Tariffs are Shaping the Future of Data Center Growth

Sebastian Wilke, Principal Analyst

Tariffs Shift with Ripping Effect on Data Center Operations and Strategy

On April 2, the Trump administration announced a tariff regime aimed at strengthening U.S. manufacturing and countering foreign competition, while reflecting U.S. federal deficit concerns. Despite being paused shortly after, the reprieve is only partial and likely temporary. The updated tariff regime directly affects the data center sector, as it impacts essential equipment such as servers, storage devices, and various critical components to data center infrastructure and data center construction materials. This move is part of a broader economic strategy that intends to strengthen domestic production, but introduces complexities for industries heavily relying on global supply and value chains. Although the final shape of this expansive use of tariffs, potential exemptions, and its economic impacts remain unknown, ABI Research expects these tariffs to accelerate the shift in global data center infrastructure planning, construction, and management, reshaping cost structures, supply chains, partnerships, and location decisions across the industry.

Increasing Costs and Operational Complexities

The tariffs' impact on data center components and construction materials is expected to elevate operational costs and complexities, particularly for smaller players with limited resources. Meanwhile, larger companies with operating leverage

might even double down on their Capital Expenditure (CAPEX) commitments, particularly those focused on Artificial Intelligence (AI), as they are seen as efficiency drivers and disruption presents an opportunity to gain competitive ground. The current tit-for-tat retaliation dynamics of tariffs are also likely to create new paint points, like the tariffs on digital services.

The most immediate impact will be on hardware supply chains, which rely heavily on international sourcing for critical components, affecting both new builds and expansions of existing facilities. Hardware suppliers face elevated costs for essential components like servers, networks, and storage devices, thereby increasing the overall cost of equipment acquisition for data center operators. This could either lead to deferred investments or force companies to absorb or pass on higher costs, affecting their profit margins and potentially the demand picture for both data center hardware and services. Building new facilities will become more expensive due to the increasing costs of construction materials—like steel, aluminum, copper, and electrical components. As construction costs increase, data center operators may face longer timelines to meet growing demand, further exacerbating operational delays. This will create additional challenges in site selection, particularly for data centers looking to balance cost-effectiveness with proximity to strategic factors like energy resources, regulatory jurisdictions, skilled labor force, or local tax incentives.

In the broader context, the tariffs are prompting a shift in supply chain dynamics, leading operators to further diversify their component sourcing strategies and possibly invest in more local manufacturing options to mitigate increasing costs, subsequently leading to a new wave of governments and enterprises rethinking their digital sovereignty strategies. While this may foster a sense of national self-reliance in the United States, it could result in more fragmented and less cost-efficient global supply chains and loss of comparative advantages. These combined factors put pressure on data center operators to reevaluate both short-term and long-term strategies, affecting pricing models, investment decisions, and demand forecasts.

Navigating New Realities to Ensure Resilience and Growth

While many data center operators have relied heavily on overseas hardware suppliers, particularly from Asia, the tariffs will make it more expensive and uncertain to maintain these relationships. Hardware vendors must seek alternate suppliers, where feasible, within the United States or other regions that may be less impacted by tariffs. While vendors that manufacture domestically in the United States may offer a more stable pricing structure and lower tariff exposure, there are few and they often face challenges in scalability and cost efficiency. Balancing these with the vendors that manufacture abroad but are headquartered and still have significant operations in the United States can provide a buffer against increasing tariffs and provide a balance between cost efficiency and risk mitigation. When sourcing from the largest of vendor tiers, foreign vendors that manufacture outside the United States, the additional cost of tariffs and potential supply chain disruptions are the base case. Considering a mix of the limited U.S.-manufactured products from domestic vendors and U.S. vendors with some level of domestic production may ensure continuity of supply, while hedging against cost increases associated with international sourcing. Forming strategic partnerships with domestic manufacturers or encouraging localized or in-house production for critical components could offer some relief in terms of costs. Negotiating long-term contracts with price adjustment clauses tied to tariff changes will be crucial for managing cost uncertainties across all vendor groups, while building up stockpiles of essential components in anticipation of price hikes and delays may provide a buffer against unforeseen disruptions.

From an operational perspective, companies should consider adjusting their pricing models to reflect increased costs, adjusting pricing structures for both existing customers and new contracts. On the data center construction side, exploring modular designs and prefabricated construction techniques could help mitigate or offset increasing costs or delays. Higher costs for materials and construction may push operators to delay or even focus on secondary markets or regions with lower construction and energy costs, which will have to be carefully evaluated regarding their regulatory environment, growth potential, and long-term viability. This could involve revisiting energy access and sustainability considerations. Governments may also offer incentives for domestic infrastructure development, but the associated costs must be weighed carefully as these opportunities need to be balanced with the higher costs of construction and operations in certain regions. In this environment of heightened market uncertainty and volatility, data center providers and hardware suppliers will need to remain flexible in their long-range strategic planning, nimble in balancing cost, and geographic considerations in their operations and expansion plans by focusing on both short-term agility and long-term resilience with the ultimate impact determined by how higher costs are absorbed. At this point, scenario planning for tariff impacts across multiple, differentiated, and plausible future outcomes of tariff regimes should be the strategic tool of choice for organizations to strategize about the potential future impact of tariffs on digital services and their operations by closely monitoring the evolving regulatory environment, while reassessing expansion strategies accordingly.

13 Tariffs and Tech: New Challenges for Apple's Manufacturing Operations in Vietnam

Victor Xu, Industry Analyst

Trade Tensions: U.S. Tariffs on Vietnam

In early April 2025, the United States announced a 46% tariff on Vietnamese exports as part of a broader trade policy shift aimed at addressing trade imbalances and foreign market practices. The announcement raised immediate concerns for Vietnam's export-driven economy and companies like Apple, which rely heavily on the country as a manufacturing base. However, shortly after the announcement, the United States government issued a 90-day delay on the implementation of the 46% tariff, reducing it temporarily to a flat 10% across all affected imports from Vietnam. With a substantial tariff now potentially targeting Vietnamese exports to the United States, Apple will face challenging decisions to reassess its production allocation, pricing strategy, and long-term manufacturing investments in the country.

In recent years, Apple has deliberately expanded its manufacturing footprint beyond China to reduce supply chain risks. This diversification strategy gained momentum following the initial Trump-era tariffs, COVID-19 disruptions, and chip shortages that exposed vulnerabilities in Apple's China-centric production model. Vietnam has since emerged as a key alternative manufacturing hub for several Apple products, including iPads (20% of production), AirPods and Apple Watches (90% of Apple's wearable product assembly), and some Mac computers.

The United States remains Apple's largest and most profitable market, accounting for over 30% of its global revenue. A substantial portion of the products manufactured and assembled in Vietnam—particularly high-demand items like AirPods, iPads, and Apple Watches—are destined for consumers in the United States. As a result, the proposed 46% tariff on Vietnamese exports poses a significant threat to Apple's cost structure, pricing strategy, and supply chain logistics for the United States market. While the tariff has been temporarily delayed for 90 days, allowing for further negotiations, its potential implementation could disrupt Apple's operations and profitability in one of its most critical markets.

The Strain on Apple's Manufacturing Operations in Vietnam

The introduction of import tariffs on Vietnamese exports has introduced significant friction into Apple's manufacturing ecosystem. Vietnam, once viewed as a strategic hub for the cost-effective assembly of key Apple products, could now possibly face fresh headwinds that would challenge its role in Apple's global supply chain.

- **Planned Capacity Expansion in Vietnam at Risk:** Apple's ambitious production expansion in Vietnam will face renewed uncertainty due to the shifting tariff landscape. In recent years, Apple has significantly scaled up manufacturing in the country, with key suppliers investing heavily to meet its global demand. For example, Foxconn (Hon Hai) committed US$270 million to build a facility in Bac Giang province dedicated to MacBook and iPad production, with a projected capacity of 8 million units annually. Similarly, the assembly of AirPods and Apple Watch has ramped up through partners like Luxshare and Goertek. These investments were made on the assumption that Vietnam would remain a cost-efficient, strategically favorable hub for serving both global and U.S. markets. While the recently announced 46% U.S. tariff on Vietnamese exports has been delayed for 90 days, the underlying risk remains. If the full tariff is implemented after the grace period, capacity intended for U.S.-bound shipments may need to be reevaluated, repurposed, or scaled back, and this will be a challenge to the long-term viability of Vietnam as a key production node for Apple's U.S. supply chain.

- **Cost Pressures and Erosion of Vietnam's Cost Advantage:** The proposed 46% U.S. import tariff on Vietnam-origin Apple products will introduce a substantial cost burden that would significantly undermine Vietnam's role as a cost-efficient manufacturing hub. Devices such as AirPods, iPads, Apple Watches, and some Mac computers—manufactured or assembled in Vietnam and largely destined for U.S. consumers—would face nearly half their value added as tax when entering Apple's most profitable market. And this would, in turn, effectively nullify the production cost advantages that Vietnam has through lower wages and operating costs. Although the United States has delayed the implementation of the tariff for 90 days—replacing it with a temporary flat 10% rate—the threat of the full levy still casts uncertainty over the long-term viability of Vietnam-based manufacturing for U.S.-bound Apple products. Should the tariff take full effect, Apple may be forced to increase retail prices by hundreds of dollars on select products to preserve margins, or to even reconsider Vietnam as a core assembly location for the U.S. market. In either case, the looming tariff places financial strain and strategic ambiguity on Apple's operations in Vietnam, prompting a possible reassessment of production allocation across more favorable trade environments.

Strategic Considerations for Vietnam in Light of the U.S. Tariff Risks

In light of the announced 46% U.S. tariff on Vietnamese exports—currently delayed for 90 days and replaced with a temporary flat 10% duty—Apple's Vietnam-based manufacturing operations face renewed uncertainty. Vietnam has played a pivotal role in Apple's supply chain diversification, particularly for products such as AirPods, iPads, and Apple Watches. However, with the full tariff still looming, Vietnamese stakeholders may need to reassess the associated risks and perhaps even consider strategic responses to safeguard Vietnam's position in the global electronics manufacturing landscape.

Key recommendations include:

- **Diversify Market Exposure Beyond the United States:** Manufacturers in Vietnam, especially those dependent on U.S.-bound Apple production, could explore rebalancing their customer base and strengthening exports to markets less exposed to U.S. tariffs—such as Europe, Southeast Asia, and emerging economies. By leveraging Vietnam's extensive Free Trade Agreements (FTAs), the Vietnam-based exporters could possibly consider shifting production toward regions that offer tariff stability and sustained demand.
- **Build Multi-Market Production Flexibility:** To stay competitive as global production hubs, Vietnamese manufacturers and their regional peers could consider investing in manufacturing capabilities that would allow production switching and parallel assembly across multiple countries. Apple's expanding operations in India—where U.S. import tariffs are comparatively lower at 26%—highlights the need for regional suppliers to develop geographically-flexible capacity. Regional governments could further facilitate this by streamlining cross-border component flows and improving investment frameworks to attract co-located or spillover manufacturing activity.
- **Leverage Strategic U.S. Investments for Policy Leeway:** Apple's US$500 billion investment commitment in the United States—while not directly tied to Vietnam—could provide political capital that may be used to push for tariff carve-outs or grace periods. Vietnam, along with Apple and its key suppliers (e.g., Foxconn, Luxshare, Goertek) could work jointly to frame continued investment in Vietnam as complementary to U.S. economic and supply chain goals, and this could potentially open avenues for negotiated trade concessions.

14 Even with Semiconductor Exemptions, Tariffs Are Creating Cost Pressures That Will Ripple Through the AI Supply Chain, Impacting Every Stakeholder

Reece Hayden, Principal Analyst

Semiconductor Exemptions Limit "Pain" but Supply Chain Will Still Be Hit

While semiconductors have fortunately been exempted from the latest round of tariffs, the broader Artificial Intelligence (AI) ecosystem is still poised to face considerable headwinds due to the newly announced 10% baseline global tariff on U.S. imports (excluding China). The most immediate pressure will fall on AI infrastructure. Original Equipment Manufacturers (OEMs) operate interconnected global supply chains, with most U.S.-based firms primarily focusing on domestic assembly. Take Hewlett Packard Enterprise (HPE), a leading U.S. AI server OEM—it sources components and materials from Mexico, China, Taiwan, India, Singapore, Malaysia, and beyond, while also relying on commercial operations in the Czech Republic. Imposing tariffs on these foreign-sourced components and raw materials will substantially increase the cost of manufacturing AI servers. Even companies like SuperMicro, which emphasizes its "Made in the USA" branding, will not be immune. Despite a stronger domestic manufacturing presence, companies still depend heavily on overseas-sourced components.

This increase in production costs creates a difficult choice for server OEMs: absorb the costs and see profit margins shrink or pass them on to customers through server price hikes. In the United States, customers may have limited negotiating power and little choice other than to accept higher prices, but internationally, buyers will have greater flexibility and may be able to pivot to non-U.S. alternatives with more cost-competitive offerings (e.g., Lenovo, Huawei). This buying power will likely force OEMs to absorb some of the tariff costs into their bottom-line. But some costs will be passed on and added to the likely increases in labor and raw material cost, with the end result being large increases in data center Capital Expenditure (CAPEX)

(and Operational Expenditure (OPEX) for hyperscalers, neo-cloud providers, and stakeholders (e.g., telco operators). The net impact will be a slowdown in data center expansion, and a subsequent reduction in demand for key components, especially high-performance semiconductors. There will also be a downstream effect on AI software and services. Infrastructure led by CAPEX expansion will result in increased prices cascading down to end users, increasing the cost of software, platforms, and services.

Beyond AI supply-related costs, AI-focused manufacturing projects face risks. Over the last several years, companies like TSMC and Intel have committed significant investment in reshoring semiconductor manufacturing and building capacity within the United States. Yet, these tariffs now threaten these projects by increasing the cost of construction—labor, imported raw materials, and foreign equipment (such as ASML's lithography systems). The likely outcomes are grim: projects could be paused in hopes of riding out policy changes or canceled altogether due to diminishing Return on Investment (ROI). While a theoretical solution could involve reinvesting tariff revenue to support domestic manufacturing, that scenario appears politically unlikely. The most probable outcome is a long-term pullback in AI-related infrastructure investment. That means slower growth in server manufacturing, reduced expansion of data center capacity, and a broader decline in the U.S. position in the global AI market.

Increasing Trade Tensions Between the United States & China Will Significantly Impact Infrastructure Vendors

The temporary relief granted to many of the United States' global trading partners has not extended to China. In response to the United States' aggressive tariff stance, China's decision to retaliate has triggered a sharp escalation—potentially setting the stage for an epoch-defining trade war. As of now (though conditions are rapidly evolving), the United States has implemented a 145% tariff on Chinese imports, while China has countered with tariffs of up to 84% on U.S. goods.

Semiconductors remain exempt for the time being, but the uncertainty around their future inclusion presents real risk—particularly given the heavy reliance many U.S. chipmakers have on the Chinese market. Based on 2024 revenue estimates, roughly 30% of Intel's (US$15.5 billion), 25% of AMD's (US$6.25 billion), 43% of Marvell's (US$2.5 billion), 13% of NVIDIA's (US$17.1 billion), and 46% of Qualcomm's (US$18 billion) revenue is tied to China. If semiconductors are drawn into the trade war, the financial consequences across the sector will be significant.

Even without direct tariffs on chips, the semiconductor players will already be impacted. Vendors with exposure to consumer devices, especially smartphones and AI Personal Computers (PCs), will see immediate disruption. As demand in China contracts, companies like Intel, AMD, and Qualcomm will feel the ripple effect through key OEM partners such as Dell and HP. Apple, too, faces serious headwinds, with 17% of its revenue (US$66.8 billion) coming from Greater China—most of which could be jeopardized under current tariff conditions. Meanwhile, Chinese OEMs that have made strong inroads into the U.S. market are equally exposed. Lenovo, now holding approximately 15% of the U.S. PC market, and IEIT SYSTEMS, a rising server player in Western markets, both risk seeing their recent gains wiped out as the trade war intensifies.

Structural Friction & Uncertainty Creates Long-Term Strategic Headaches

The escalating U.S.-China trade war—and broader imposition of global tariffs—poses major strategic challenges for the AI industry, even as semiconductors remain temporarily exempt. Three main challenges impact stakeholder decision-making:

- **Strategic Uncertainty:** With tariffs shifting unpredictably, long-term planning becomes a high-risk endeavor. AI ecosystem stakeholders—from OEMs to cloud providers— will struggle to build resilient strategies when core component and import costs are in flux. Uncertainty will also impact semiconductor vendors as demand for leading chips will be impacted by tariffs directly impacting the cost basis of their technology and commercial partners.
- **Structural Friction:** Domestic manufacturing may offer a path to stability, but the reality is more complex. Building or scaling manufacturing capacity, particularly for high-tech infrastructure, requires years of lead time. Around a 5-year lag between investment and meaningful output presents a major friction point for players seeking short-term cost control or supply chain realignment.

- **U.S.-Centric AI Supply Chain:** U.S.-assembled AI infrastructure is set to face cost increases of around 10% due to higher tariffs on imported components, with fully imported servers facing similar hikes. This margin compression poses serious challenges for U.S. vendors looking to compete internationally, particularly in cost-sensitive regions like Europe where domestic and Asian alternatives may hold pricing advantages. These challenges are amplified by the current U.S. dominance of the AI value chain. While China continues to advance and Europe gains traction through players like Mistral.ai and Aleph Alpha, the lion's share of AI chip vendors, server OEMs, hyperscalers, and model developers remain rooted in the United States—making the entire ecosystem more vulnerable to increasing costs.

In response, ABI Research expects to see several strategic shifts across the AI supply chain, which, if implemented, could significantly reshape AI power distribution globally:

- **U.S. AI server OEMs** (e.g., HPE, Dell) will aim to expand production capacity in offshore facilities—particularly in Southeast Asia and Eastern Europe—to serve international markets and lessen the impact of U.S. tariffs on cost basis.
- **Hyperscalers and cloud service providers** will ramp up investment outside the United States, as they look to expand AI data center infrastructure, while retaining greater control over costs and ROI.
- **Chipmakers will deepen partnerships** with non-U.S. OEMs and Original Device Manufacturers (ODMs) to circumvent U.S.-centric price increases and remain competitive globally.
- **International cloud service providers** will diversify suppliers, turning to vendors like IEIT SYSTEMS that are less exposed to U.S. tariffs.
- **Software and service vendors** will look to move workloads to adjacent regions outside of the United States to avoid higher inference costs that will likely be passed down to them from infrastructure vendors.

But the challenge isn't limited to the AI supply chain. U.S. enterprises are also being forced into difficult decisions. Increasing input costs will put pressure on Information Technology (IT) budgets, and Chief Information Officers (CIOs)—already under scrutiny—will need to reassess their AI roadmaps. For some, AI will be seen as an expensive "nice to have," especially for early-stage deployments that haven't delivered ROI. These projects are likely to be paused or scrapped. Others may double down on AI to drive operational efficiency in response to tighter budgets. ABI Research expects that the net effect will be a near-term slowdown of AI adoption as financial constraints push organizations to prioritize ROI-positive initiatives.

15 Tariffs Impact XR on More Than Price: Uncertainty, Confusion, and Supply Chain Disruption Are Unavoidable

Eric Abbruzzese, Research Director

Day by Day Tariff Changes

In the tumult surrounding the global economic uncertainty and ongoing tariff war, no market is spared. As of early April 2025, the United States has paused tariffs over 10% for (nearly) all countries—China is an exception, with over 100% tariffs maintained. This is changing rapidly, so discussion around specific percentages, countries, and timelines is unhelpful, but analysis around broad tariff impacts and how companies will be approaching this tumultuous market is still viable and indeed incredibly valuable currently. For the Extended Reality (XR) market, this impact is certainly significant and will have a few key areas of impact: cost, delayed planning thanks to uncertainty, and ongoing disruption of supply chains and manufacturing.

The Tariffs Impact Is Both Broad and Specific

The most obvious impact comes down to cost. Component costs can vary dramatically based on source and current tariff rates—China being a major component and device source, with tariffs as of writing reaching over 100% in relation to the United States, having the potential to entirely kill the feasibility of some XR devices. With XR devices already expensive, technologically complex, and low in volume, these impacts from tariffs are exacerbated even further. Higher margins and economies of scale can help alleviate some impact, but the majority of XR operators do not have these options.

Though cost is obvious, the uncertainty around markets could be worse than the tariffs themselves. A 5% or 10% tariff can be planned around, but a 150% tariff is a non-starter, and at the same time, not a guarantee. It is impossible to plan with these constant changes, especially with the overall severity of the tariffs being pitched. This will pause active investment and development until a semblance of consistency occurs—then, once a known tariff is established, companies can at least plan around that. Few companies will take on significant product and supply chain redesign without a clear timeline or established quantity and impacted location list.

The guaranteed disruption to supply chains will also be hard felt. It is almost impossible to find a purely single-country product currently: Meta, Apple, and Google are U.S.-based companies with hardware components coming through Taiwan, Japan, South Korea, China, and more. Google is relying on Samsung as a key hardware partner for driving the novel Android XR ecosystem as well. Chinese vendors are not much different, with vendors like Pico and DPVR at least using non-domestic chipsets that Qualcomm currently fills. Established supply chains have been a boon for XR manufacturers thanks to the cost and complexity of the devices—not having to build up manufacturing capability, secure parts suppliers, and streamline a supply chain allow a company to more quickly hit the market and react to shifts. With these chains in flux, this incumbency advantage lessens, while the path for new ventures becomes more expensive and convoluted.

One of the actual goals of the tariff back-and-forth is encouraging domestic products and relationships, which will also be true for XR. Using domestic components when possible will be a focus, though it will prove difficult, if not impossible, for the current class of XR products. Some of this is perhaps already being seen, with China-based XREAL's recent announcement of targeting a US$100+ billion XR ecosystem in Shanghai alone. XREAL is also one of the first Original Equipment Manufacturers (OEMs) with a proprietary chipset in the market, though this came before the recent tariff situation.

Take Steps to Prepare, for Both Uncertainty and a New Normal

With the rate of change surrounding tariffs and the broader economy, it is difficult to look ahead and plan out even months ahead, let alone years as companies prefer to do. There are a few key considerations to make today, however, that are independent of tariff specifics and timing.

- **Diversifying Manufacturing and Supply Chain:** The most immediate and effective response, though also quite difficult and time consuming, is diversifying manufacturing and sourcing. Most XR products rely on global components—displays, sensors, optics, and chipsets are most notable. Companies should explore alternative manufacturing hubs in countries with lower tariff risk, such as Vietnam, India, Mexico, or Eastern European nations. Although relocating production can be capital-intensive and logistically complex, starting this transition now helps mitigate long-term tariff exposure and builds greater geopolitical resilience. Where alternatives are not available, clear messaging becomes paramount; in the interim, investing in building up alternatives can prove worthwhile, if not necessary, over time. Even if tariffs unexpectedly return to pre-2025 levels, relationships and disrupted supply chains take time to recover, so these investments are not wasted, but instead bolster standing.
- **Cost Management and Product Redesign:** XR companies must reevaluate their Bill of Materials (BOM) and look for opportunities to redesign products with alternative, domestic, or lower-tariff area components. Engineering teams can also focus on modular designs that separate high-tariff and low-tariff parts, allowing for easier customization and manufacturing flexibility. Simultaneously, firms should audit their pricing strategies and consider staggered releases or tiered product lines that cater to both cost-sensitive and premium markets, helping offset price increases.
- **Policy Engagement and Messaging:** The XR industry must collectively advocate for fair trade policies by engaging with trade associations and policymakers. Working through organizations like the Consumer Technology Association (CTA), VR/AR Association (VRARA), and Augmented Reality Enterprise Alliance (AREA) can provide data-driven arguments about how tariffs harm innovation, consumer access, and technological leadership. Public communication is equally important: transparency with consumers about pricing changes and supply chain shifts helps maintain brand trust and some additional clarity among the uncertainty.

16 Supply Chain Software Should Benefit from the Tariff Roller Coaster; Material Handling Solutions Might Not Fare as Well

Ryan Wiggin, Senior Analyst

Volatility Is the Only Guarantee

Tariffs are taking companies on a roller-coaster ride. One minute they're in, the next they're paused, so it's impossible to predict and seemingly impossible for organizations to build a state of resilience. Whatever level of tariffs becomes the new norm, the impacts on supply chains and the solution providers that serve them are becoming more apparent.

For software providers, volatility is more often than not great for business. As uncertainty goes up, organizations need more visibility, more analytical capabilities, and platforms that can bring in more data inputs to provide the most holistic picture of the potential effects. While the same can't be said for hardware providers (devices, automation, etc.) that are facing potentially significant cost pressures and shaky consumer confidence, underlying industry fundamentals are hard to ignore.

Bracing for a Mixed Impact

Software providers are focusing on the positives of the disruption:

- As soon as the tariffs were announced, big data analytics provider Palantir started promoting its Palantir Foundry and Artificial Intelligence Platform (AIP) that can bring together disparate data sources for unified insights. The Ontology System brings together areas across a business, including logistics, inventory, finance, and compliance, to assess the full impact of a new tariff on operations and then allows the user to action changes that automatically update across business functions.

- Startup freight broker Nuvocargo has seen a stark increase in demand for services since tariffs were announced, as companies have turned to the company's AI-powered digital platform to help with cross-border freight forwarding between Mexico and the United States. The additional administrative tasks required as tariffs change is arguably a greater cost to businesses than the actual tariffs themselves, so establishing strategic partnerships with experts like Nuvocargo is the only way that businesses can react in time.

While supply chain software and Information Technology (IT) services may be able to see the benefits of the current situation, the same can't be said for warehouse hardware and automation providers. Already, System Integrators (SIs) for warehouse automation, in particular, have reported slowing deal cycles and delays to existing projects. Most are now scrambling to get deals done as fast as they can due to uncertainty around continued demand and shocks to pricing of key equipment.

In the short term, fixed automation is likely to see a bigger impact than mobile automation solutions, due to the higher amount of infrastructure such as steel racking that is required for installation. For more price-sensitive customers that are just dipping their toe into the world of automated picking solutions, simple, scalable Autonomous Mobile Robot (AMR)-based solutions from Brightpick and Locus Robotics will be a more attractive option.

Should tariffs have a significant impact on consumer confidence as well, it's likely that productivity and workflow solution providers will see a similar impact on their sales as they did in 2023. As is outlined in ABI Insight "A Drop in the Sales of Handheld Devices in Warehousing Will Require Both Product and Software Differentiation to Spur New Business," Zebra, Honeywell, and DataLogic all saw double-digit percentage drops in revenue, attributed to a "soft goods economy" and delayed Capital Expenditure (CAPEX) investments due to macroeconomic uncertainty.

Opportunities Remain If Positioned Correctly

As highlighted in recent ABI Research reports, supply chain solution providers have been turning their attention away from groundbreaking innovations, and more toward supporting implementation through flexible, scalable approaches. Such an approach will have to be leaned on when making deals in an environment where cost pressures increase, and discretionary spending is pressed.

System Integrators (SIs) also have the ability to benefit from the current environment through who they select to partner with to deliver material handling systems. If one system provider is more impacted by tariffs due to the nature of their inbound supply chain, SIs need to be reactive and identify alternative providers that are better shielded from tariffs. Piecing together the right providers for each project will enable SIs to limit price pressures and remain competitive.

It's also imperative to identify the industries that will hold more buying power through this type of disruption. Companies are likely to shift more of their logistics and warehousing to Third-Party Logistics (3PL) providers to tap into inbound expertise and processing capabilities. Many automation providers have already tapped 3PL providers as the next big growth industry for warehouse automation, and if such companies see a surge in new business, this may accelerate the trend.

End users should also see the benefits of shifting their sights to more homegrown or regional technology providers. While North America has typically played host to a lot of innovation on both the software and mobile automation side, and Europe has led in terms of SIs and fixed automation solutions, the industry is relatively well balanced, and there is no shortage of providers to choose from closer to home. And this is an important factor to consider in the long term. Data sovereignty is a growing regulatory focus and something that regional providers will have specific expertise on, shielding companies from any incoming regulation. And on the hardware side, there is both a greater degree of predictability when working with regional providers and unique implementation expertise that can help smooth deployments.

17 Lessons Learned in a Turbulent Global Trade Climate: Southeast Asia

Benjamin Chan, Research Analyst

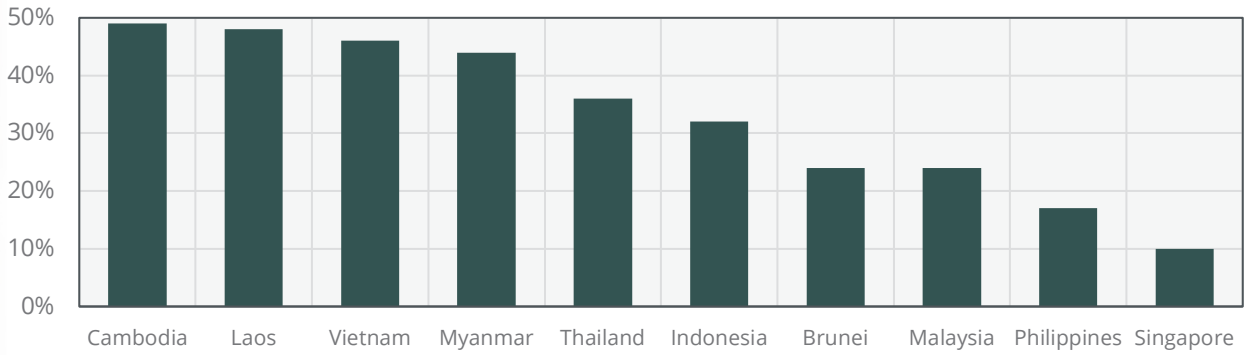
Tumultuous Global Trade Winds Leave Southeast Asia Bracing for Impact

In April 2025, the United States' first order of sweeping global tariffs sent shockwaves through Southeast Asian economies, triggering market volatility and forcing rapid strategic reassessments by their governments across multiple industries. The "Liberation Day" tariffs hit Southeast Asian countries with varying severity, with Indochina nations bearing the heaviest burden. Cambodia faced a staggering 49% tariff, followed by Laos (48%), Vietnam (46%), Myanmar (44%), Thailand (36%), Indonesia (32%), Malaysia (24%), Brunei (24%), the Philippines (17%), and Singapore (10%) bearing the baseline tariff.

This disproportionate impact on the Indochina countries is likely a retaliatory tax stemming from their perceived close ties to China, as seen in Cambodia and Vietnam, along with their growing role as alternative manufacturing hubs in Vietnam and Malaysia to circumvent previous U.S. tariffs aimed at Chinese manufacturers.

United States' Reciprocal Tariffs as of April 2, 2025

(Source: ABI Research)



While Some Countries Are Reeling from Tariffs, Opportunities Present Themselves to Others

Even as global markets prepared for the effects of tariffs, the sweeping tariffs on nearly all of the U.S. trade partners surprised many globally, including some of its closest allies. For instance, Vietnam's 46% tariff greatly affected its semiconductor

industry, as these broad tariffs directly threatened its component manufacturing and the production of rare earth materials essential for chip production. Semiconductor manufacturing was also affected in Taiwan, one of the United States' closest trade partners, where the 32% tariffs did not directly target finished semiconductor chips, but had repercussions for the wider supply chain of servers and related equipment. This looming supply chain impact could accelerate the regional capacity building as Foreign Direct Investments (FDI) in technology production and manufacturing could shift to Southeast Asian countries with lower tariffs exposure, such as Singapore, the Philippines, and Malaysia. These countries are all significant players in the global semiconductor industry, with Malaysia ranking as the 6th largest, the Philippines as the 9th largest, and Singapore contributing approximately 10% to global chip production and 20% to global semiconductor manufacturing equipment production. ABI Research foresees that global semiconductor supply chains may evolve, with foreign investments favoring the three major Southeast Asian semiconductor players over Vietnam and Taiwan.

Although the sweeping "Liberation Day" tariffs have not been fully implemented, as the United States announced a 90-day reevaluation and pause of its reciprocal tariff strategy, the lingering effects of the panic they caused in the market will persist. President Trump's abrupt implementation of a global tariff strategy has already sent shockwaves, signaling to international trade partners that prioritizing the reduction of the U.S. trade deficit at the expense of established trade norms is becoming increasingly normalized. Southeast Asian countries are directly impacted by this turbulent trade climate, as many of the region's largest trading partners are the United States and China amid the escalating trade tensions between the world's two largest economies. The region is currently in a precarious position, as it risks losing the backing of FDI from American and Chinese multinational enterprises due to the impending high reciprocal tariffs.

Regional Restructuring Necessary for Long-Term Strategic Growth

Even as the tariffs were in effect for a mere 13 hours, one of the key lessons presented to the Southeast Asian region was its need for internal realignment and investment diversification. This largely stems from two main challenges that impact the region's most vital stakeholders:

- **Strategic Uncertainty:** Unpredictable tariff shifts make long-term planning strategies increasingly speculative and risky. Regional technology development and investment stakeholders will struggle to build resilient strategies when core materials and export costs fluctuate. If left unaddressed, this uncertainty will continue to permeate the technological ecosystem, hindering its growth potential.
- **Overreliance on International Influence:** Much of the region's investment comes from international FDI, rather than regional FDI. Many major companies from the United States and China, including Microsoft, Micron, Amazon Web Services (AWS), Alibaba, and Midea, have made significant investments in technology infrastructure and manufacturing hubs across the region. While the flow of FDI stimulated strong growth across the region, the sudden shifts in trade climate will breed further uncertainty in the region, which may, in turn, lead to less appetite for infrastructure investment from the United States and China due to turbulent trade policies.

Southeast Asian countries should adjust their strategic alignment to address these emerging challenges to ensure future growth potential. These strategic shifts will revolve around these two principles:

- **Internal Realignment:** As the international trade climate becomes increasingly tumultuous, it is likely that a more viable strategy to divert investment that seeks to nurture technological innovation intra-regionally will be implemented. Focusing on building a strong regional startup ecosystem that builds confidence in technological growth will be a viable strategy for Southeast Asian countries to continually develop their growth potential, while reducing the reliance on U.S.-based Venture Capital (VC) investments to drive innovation. On a local level, governments should also spearhead locally led infrastructure development and improvement, focusing on improving their domestic tech capacity and workforce.
- **Investment Diversification in Industry:** Diversifying investments in multiple high-potential sectors reduces overexposure to tariff-vulnerable industries like electronics or textiles. Governments should develop a multi-sectoral approach that prioritizes investment in key markets central to capturing further growth potential, such as semiconductors, Electric Vehicle (EV) batteries, and renewable manufacturing. Investments in these key industries will not only enhance high-potential sector development, but will also build supply chain resilience centered around the Southeast Asian region.

18 Can Manufacturing Software Providers Keep the Ship from Sinking Under U.S. Tariffs?

James Iversen, Industry Analyst

No Country or Industry Is Immune

Starting on April 2 and promptly promoted as "Liberation Day," President Trump announced a baseline tariff for all countries (besides Russia) of 10%, with specific countries that conduct large quantities of trade with the United States such as China, Vietnam, Taiwan, Japan, and India having significantly higher tariffs due to unbalanced trade deficits. Unlike previous tariffs that specifically target subsections of industry to promote internal growth, the reciprocal tariffs were applied to all physical goods being imported into the United States. Due to significant internal (U.S.) and global upheaval, as of April 10, Trump reversed course and rescinded the reciprocal tariffs to a blanket 10% for all countries besides China, which at time of writing, sits at 145%. With the changing nature of U.S. politics, it is unlikely that the blanket and 145% tariff on China will remain. The trillion-dollar questions now are how long will the tariffs stay in place and will they increase again before stabilization.

U.S. Tariffs Hurt All, but Volatility Is Just as Potent

Since the initiation of the reciprocal tariffs, countries around the world have been responding with different strategies. Notably, China, Canada, and the European Union (EU) have opted to impose likewise tariffs, while countries such as the United Kingdom are looking to broker a deal and negotiate through diplomatic channels to decrease the sweeping tariffs or become exempt. Regardless of which strategy a country takes, the end goal is a resumption of the status quo pre-tariffs. The backtrack to a 10% global tariff rate has marginally improved economic optimism; however, it has not quelled all the concerns around a global recession with the VIX Index sitting at the highest rate in 30 years (excluding the financial crisis of 2008 and the COVID-19 pandemic).

Examining the tariffs through the lens of global manufacturing, volatility is the true motivator (or non-motivator). With a relapse on tariffs in just 1 week, certainty about what will happen in a month, a year, or 4 years from now is unknown. Manufacturers rely on certainty as an indicator for future expansion and growth. With the fluctuating nature of U.S. tariffs, manufacturers are unlikely to open greenfield factories or retrofit brownfield sites with significant Operational Expenditure (OPEX) spending as both processes take significant time and are likely to change based on volatile pricing. The most likely result in the short term will be manufacturers actively reducing spending across the board, while looking to source raw materials and parts/components outside of the United States, and increasing the goods sold to more local and favorable markets.

How Can Manufacturing Software Providers Stop the Bleeding?

It is important to highlight that the global trade network established over the last 35 years that supports all manufacturing operations cannot be salvaged by software providers alone. However, they may be able to ease the burden on manufacturers through reduced OPEX, streamlined operations with automated technology, and new supplier recommendations.

- **Software-as-a-Service (SaaS)-based Computer-Aided Design (CAD):** CAD providers such as Autodesk, Dassault Systèmes, PTC, and Siemens need to continue the momentum of promoting SaaS-based CAD. SaaS-based CAD has a revenue Compound Annual Growth Rate (CAGR) of 14.4% over the next decade, outpacing traditional on-premises solutions, which sit at 6.12%. Growth in the CAD SaaS market was strong prior to the U.S. tariffs, but will grow faster based on manufacturers trying to reduce costs across the entire organization. SaaS-based solutions are, on average, 31% cheaper than on-premises counterparts, and with the manufacturing market already making significant strides in transitioning, U.S. tariffs and volatility will act as an accelerator.

- **Lightweight and Flexible CAD Software:** On top of the benefits of switching to SaaS-based CAD, manufacturers may look further to reduce costs. CAD software that can be scaled up or down (number of user seats and core functionality) will likely see an increase in use among manufacturers that operate in industries with long product development cycles and reduced Bill of Materials (BOM). Although necessary for advanced manufacturing industries such as Architecture and Design (A&D), automotive, and heavy machinery, manufacturers in industries such as pharmaceuticals and Consumer Packaged Goods (CPG) are likely to switch to lightweight CAD models with less functionality, but a cheaper price tag.

- **Product Lifecycle Management (PLM) and Generative Artificial Intelligence (Gen AI):** PLM software will also play a role in aiding relative price stability. This will materialize through the use of Gen AI and the extensive buildout of supplier and contract manufacturers in PLM databases. To circumvent tariffs in the short term, manufacturers must look for alternative means of sourcing, preferably in-country when possible. Although the price of manufactured goods will remain higher than the pre-tariff rates, using Gen AI in conjunction with PLM databases will mitigate the short-term effects as the second-best supplier option can be assessed for new parts and components. New deployments of Gen AI in PLM are being used to locate the best raw material suppliers based on price, lead time, quality, and now, expected tariff rate.

It is unlikely that manufacturing software providers will be the answer to the sweeping U.S. tariffs as replacing the global manufacturing supply chain with incremental increases in cost savings and efficiencies; however, vendors that position and market solutions in the correct manner may carry some of the heavy burden.

19 Smart, Sustainable, and Self-Reliant: Tariffs Are Creating Localized and Modular Smart Building Product Lines to Navigate the Uncertainty Ahead

Rithika Thomas, Senior Analyst

The smart building ecosystem is implementing proactive measures such as multi-nodal supply chains, product and material innovation, and scaled implementation of Artificial Intelligence (AI) to accelerate energy efficiency, weather the uncertainty ahead, and stay competitive.

Weathering the Tariff Storm

The smart building industry is no stranger to fluctuating material prices and supply chain disruption, thriving on an interconnected global network of resource flows to minimize cost. U.S. tariffs of up to 25% on imports are having a cascading effect on the global economy, increasing raw material costs and creating short-term challenges. On the hardware side, for instance, steel and aluminum are on the tariff hit list, a critical structural material for prefabricated structures, doors & windows, sheet piling, and hollow sections. Connected device components and software companies are bracing for costs increases of up to 40%, due to international dependency, in addition to inflation and hardware improvements due to integrating AI. In the long term, solution designers must not only design for the product, but strategically navigate a diversified supply chain and material sourcing strategy.

Realities of Trade Barriers

The tariffs are leveling the playing field, encouraging localized sourcing and driving demand for domestic products. The smart building ecosystem is a competitive marketplace with the United States being the largest installed base of innovative smart building technology and market share. The current implications of tariffs on the local and global supply chain are listed below:

- **Global Relevance:** The United States currently lacks scale and manufacturing infrastructure to meet the demand for device components at a competitive price. Countries without tariffs will become more attractive for innovation and investment, drawing investment and talent away from the United States. Uncertainty regarding the U.S. political landscape is creating opportunities for Europe and Asia to invest in Research and Development (R&D), secure long-term partnerships, and scale manufacturing.
- **Stalled Innovation:** Innovation is the foundation of the smart building industry, with solutions disrupting the marketplace with cutting-edge technology. Financial constraints to meet current business commitments will override R&D investment and new product launches, and directly impact advances in energy efficiency, sustainability, and global decarbonization goals.
- **Panic Purchases:** Domestic manufacturers are ramping up production to fill the gap, pushing back on large orders and reverting to engaging long-term sustainable partnerships and pricing. Unlike during COVID-19, there is no shortage of material, but an additional cost on imports. Over the long term, it's an opportunity for the domestic ecosystem to create a resilient partner ecosystem to compete globally.
- **Price Rise:** Contractors are facing the dilemma of reducing profit margins or powering through and passing the costs further down the supply chain to the developers and building occupants. As a price increase is inevitable in the short term, stockpiling inventory softens the blow, buying time to avoid delays and maintaining brand reputation.

Proactive Measures in Uncertain Times

The construction and smart building industry often operates on long-term contracts, so sudden shifts create financial strain on all stakeholders involved. Despite current headwinds, the demand drivers for the smart building industry are powering on, namely digitalizing built portfolios, labor shortages, increasing energy costs, and pressing environmental regulations. Listed below are recommendations for proactive measures to stay ahead of the curve:

- The biggest opportunity presented by the tariffs is localizing the supply chain. They are often more reliable and reduce a business' carbon footprint along the value chain. Implementing product take-back and repair schemes reduces embodied carbon, recovering highly tariffed raw materials and extending product lifecycle.
- Technology providers will need to streamline product portfolios to stay relevant and cost-effective, ensuring seamless and open integration, and they need to support third-party building automation.
- Energy efficiency will be a key driver of innovation and will accelerate the adoption of AI to drive controls to optimize operation schedules, predict maintenance, and support remote monitoring.
- On a product level, advancements in wireless and battery-free solutions and material substitution should be explored to reduce international dependency. Additionally, on the design front, modular design enables flexibility, and optimizes cost, assembly, compliance, and service to keep up in an evolving landscape.
- As solution providers negotiate their supply chains with new local suppliers or tariff-free countries, companies need to refocus on long-term partnerships to secure stable pricing as a cost-effective measure.

Forward-looking companies are laying the foundation for self-reliant, digitized, and resilient supply chains with a risk-based agile strategy to weather unpredictable times.

20 The Implications of U.S. Tariffs on the Competitive Landscape for Cellular Modules, and IoT Components

Jamie Moss, Research Director

The United States is one of the world's biggest markets for the consumption of Internet of Things (IoT) hardware and services. And wherever tariffing gamesmanship ultimately takes the United States, it is undeniable that China is its principal target. Chinese vendors hold the greatest share of the module market in the United States and will not give up without a fight, with defensive tactics already underway.

Target for Retribution

The United States is one of the world's biggest markets for the consumption of Internet of Things (IoT) hardware and services. According to ABI Research's IoT Market Tracker, 18% of all cellular IoT connections are situated in the United States; and according to ABI Research's M2M Embedded Cellular Modems market data (MD-M2MM-176), 16% of all cellular modules shipped each year are destined for use in the United States. The IoT is all about predictability, and the assurance of business outcomes through performance guarantees, especially when it comes to Operational Expenditure (OPEX). Uncertainty in, or increases in the cost of, essential components will be an active concern for IoT device Original Equipment Manufacturers (OEMs), and their downstream enterprise and municipal customers.

The majority of cellular modules shipped are manufactured by Chinese vendors—80%, in fact. There are 35 Chinese module vendors currently known to be competing in a market of some 60+ vendors worldwide. Not all Chinese module vendors serve the international market, but the handful that do are considered power players. Quectel is the dominant cellular module supplier in many countries, and is the global market leader with a massive 42% share. More Chinese vendors are seeking to follow its lead, and break out of their domestic market. But wherever tariffing gamesmanship ultimately takes the United States, it is undeniable that China is its principal target for retribution.

Problematic for All Participants

As a result of the need to diversify sourcing to reinforce supply chains, following the global disruption to business caused by the COVID-19 pandemic, and the following "chipset crisis," module vendors have already started spreading their manufacturing between factories in different countries. Not every cellular module sold by Chinese vendors is made in China. And due to the increased attempts to restrict the use of Chinese modules, by the United States' Secure and Trusted

Communications Networks Act, and the U.S. Department of Defense, large vendors are already employing tactics that would also prove useful in circumventing tariffs; namely, licensed, U.S.-based manufacturing of their original module designs.

Any IoT device OEMs that already have concerns about the security of Chinese modules, or of Chinese vendors' longevity in the United States, already deliberately buy from other vendors. But many OEMs' only concerns are cost, quality, and customer service. Cost is not the most important factor per se, but as Chinese vendors have actively sought to excel in both quality and customer service, cost often ends up being the deciding factor between vendors. Of further concern for all Chinese module vendors with a market presence in the United States is extra potential expense from a tit-for-tat response by the Chinese government. Chinese vendors build modules based upon all baseband modem chipset platforms, but it is the products with Qualcomm chips that sell best for them in Western markets, especially in the United States.

If China imposes retaliatory tariffs on U.S. products, Chinese vendors risk paying more to import the components they need. As well as having to pay again when their U.S.-registered entities, or customers, import the finished products to the United States. Chinese modules risk costing 2.5X as much, creating a greater still incentive to accelerate U.S.-based manufacturing plans. An unfortunate necessity for the supply-side of the IoT is that products and services need to be highly commoditized to be affordable enough for purchase en masse. The IoT market has grown organically for decades, and is the biggest it has ever been, even with the stagnation of the last few years, with global shipment revenue of around US$5.6 million since 2022. Ergo, all new costs are problematic for all participants when profitability has been static for years.

Local Knowledge, and the Funding Necessary

All other cellular module vendors stand to benefit from the exclusion of their Chinese competitors from the U.S. market. Even if other vendors' products also face increased tariffs, it will be less so than for Chinese vendors, and the opportunity to take such a significant market opportunity away from them will be too great to resist; such that international vendors may be willing to absorb any extra tariff costs, and not pass it on to their customers. U.S.-based vendors, however, should theoretically gain the most, with no new costs to contend with related to their U.S. sales. But should U.S. vendors also manufacture products based on imported chips, for export and sale in other regions of the world, then they will incur extra expense. But this, too, should be palatable considering the potential increase in overall turnover from their domestic business.

Conversely, even modest tariffs could affect some imminent new entrants to the U.S. market. India is becoming a breakout region for low-cost manufacturing outside of China. There are module vendors relying 100% on Indian manufacturing, with products currently waiting for certification by the Federal Communications Commission (FCC). Their fortunes will be especially sensitive to sudden price volatility, and may even cancel any U.S. product launches. But Chinese module vendors will not give up and retreat to their domestic market without a fight, as there is too much value at stake. The companies already employ a wealth of Western talent corralled from the cream of the crop of their competition. They have the local knowledge, and the necessary funding, to understand how to weather a tariff storm; as well as still having the rest of the world outside the United States to serve.

Chinese manufacturers have a longstanding ability to undercut their international competition on pricing. And they have often been blamed for tanking the value of hardware markets, placing international competitors in an impossible position. All the while, Chinese companies have still made greater margins on those products sold abroad than they do domestically. If Chinese module vendors' products were excluded from specific geographic markets, or should be forced to increase in price, it would please the parties looking to reestablish the intrinsic value of cellular modules. But waiting for Chinese vendors to be forced out remains a hope, rather than a certainty, and hope is not a reliable business strategy.

21 U.S.-Borne Economic Uncertainty Will Test OEMs and Hamper AI-Augmented Robot Development

George Chowdhury Industry Analyst

Uncertainty Will Curtail Innovation

The robotics world is divided between East and West. Chinese progress within Artificial Intelligence (AI) and robotics automation is buoyed by government backing, a receptive public, and a permissive regulatory environment. Contrastingly, automation growth across the rest of Asia, in the United States, and in Europe depends on the largesse of Venture Capital (VC), which is predicated on tangible, near-term Return on Investment (ROI) and, ultimately, the ability to deliver a viable product.

Uncertainty surrounding tariffs and trade will begin to squeeze VC, which, in turn, will start to look for surer bets. A balance must be struck between long-term investment in real innovation and the baseless hype that the robotics industry is currently inundated with (consider the Figure AI US$40 billion valuation). On a normal day, Blue Sky Robotics research, which is currently riding on the wave's crest of the "AI revolution," has no place within the profit-driven private sector. Furthermore, large companies will consider pausing Research and Development (R&D) efforts into robotics products out of a need to shore up resources around primary revenue generators.

Established industrial robot Original Equipment Manufacturers (OEMs) represent the other, and considerably larger, side of the automation economy. For OEMs, the current unrest, trade war, and geopolitical tension will either create another hostile market in the United States or reshoring initiatives will take hold, creating new and bountiful opportunities. This is opportune timing as China's domestic industrial robot OEMs increasingly present stiff competition for foreign robot OEMs.

Without Field Testing, the Robotics Industry Will Stall; OEMs Find Themselves Between a Rock and America

For the large established OEMs—KUKA, FANUC, ABB, YASKAWA—tariffs and economic uncertainty are a further addition to their litany of woes. These companies are already facing stiff competition from domestic Chinese industrial robot OEMs and suffering the consequences of manufacturers over-ordering robots during the pandemic. An important observation is that none of the large robotics OEMs manufacture products within the United States, making them subject to any further import tariffs enacted by the current U.S. administration. The OEMs listed above now all manufacture robots within China to adhere to the unwritten "Buy Chinese" policy, which encourages manufacturers to buy homegrown robotics—robots that use Chinese software, hardware components, or are completely manufactured in China are preferrable over imported products. It would be a very daunting prospect for OEMs if they were obliged to entirely manufacture hardware within the United States.

As it stands, potential customers are uncertain of the value proposition posed by AI-augmented robotics. Repeatability and long-term support remain major challenges that inhibit the uptake of innovation. Manufacturers and supply chain managers have adopted innovative solutions such as humanoid robots—primarily at lighthouse facilities—because they can spare the resources and want to be considered forward looking, rather than these solutions offering greater efficiency or economic advantage in the near term. Decision makers may well decide to turn away from aiding experimentation, perhaps soon to be considered a frivolous and unnecessary expense. This would damage the funding prospects for innovators and deprive them of real-world deployments. This is especially true of the automotive sector, which has worked closely with several humanoid developers—seemingly due to their structured environments and the need to perform dexterous tasks.

For the innovators—Agility Robotics, Apptronik, and Figure AI—this is a major lifeline. VC keeps these startups afloat, allowing them to field-test their robots, working through edge cases and harvesting crucial real-world data.

Reshoring Manufacturing via Robotics Automation Will Be a Challenge in the Near Term

The Trump administration wishes to reshore manufacturing. Implicitly, automation must be a large part of this initiative. But robots themselves are not generally manufactured in the United States; high tariffs will raise operational costs for budding manufacturers. Although protectionism might be a boon to domestic robot manufacturing, the time and capital investments required to build manufacturing plants will dampen competitiveness until at least the end of the decade. Furthermore, AI-driven robots are far from mature. Large, specialist engineering staffs will be required to build up manufacturing to a fraction of the capacity of Chinese manufacturers.

Ultimately, both tariffs and political uncertainty will be wholly damaging to the entire robotics industry. The embryonic overlap between AI and robotics requires delicacy, patience, willing industry partners, and patient VC funding. As these begin to evaporate, and investors get cold feet, innovation will begin to dissipate. For OEMs that already do assembly in the United States, extending production to full-blown robot manufacturing is likely to be near untenable due to cost considerations. Feasibly, the U.S. administration may adopt a "Made in the USA" strategy comparable to China, allowing assembly and software components to qualify. Such action may appease officials in the near term, while OEMs scope out the viability of domestic manufacturing.

One facet of the current tumult could be beneficial: eliminating the funding for hype-based funding that results in the overvaluation of certain robotics startups. Startups must push to demonstrate value now as investors review their portfolios. Robotics OEMs should expand U.S. operations to curry favor with the U.S. government. All should be aware that, ultimately, tariffs and uncertainty are internecine.

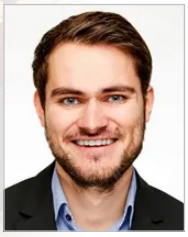
Meet The Analysts

Stuart Carlaw
Chief Research Officer
As Chief Research Officer, Stuart Carlaw leads ABI Research's analyst teams covering global technology markets. Stuart's primary responsibility includes managing industry research content, technology and market focus, subject matter guidance, product portfolio mix, and custom research and consulting, as well as client engagements and strategic advisory provisioning.

Dan Shey
Vice President
Dan Shey, Vice President, Enabling Platforms at ABI Research, manages the Machine-to-Machine (M2M)/ Internet of Things (IoT), digital security, and wearables research services, which cover the telco, industrial, Information Technology (IT) and Operational Technology (OT) ecosystems with a focus on devices, connectivity, platforms, applications, big data/analytics, convergence, and strategic analysis of the entire IoT value chain extending from devices through value-added services. He plays an essential role in helping clients decipher the complex relationships and opportunities across the "digital first" and "physical first" domains.

Michela Menting
Senior Research Director
Michela Menting, Senior Research Director at ABI Research, delivers analyses and forecasts focusing on digital security. Through this service, she studies the latest solutions in cybersecurity technologies, from trusted silicon and hardware to secure applications and infrastructures. She then delivers end-to-end security research, closely analyzing technology trends, growth opportunities, and industry-specific implementations in end markets, including enterprise, government, financial, telecommunications, industrial, and IoT.

Eric Abbruzzese
Research Director
Eric Abbruzzese, a Research Director at ABI Research, primarily leads research efforts in Augmented Reality (AR), Mixed Reality (MR), and Virtual Reality (VR). Coverage includes devices, content, platforms, and use cases across consumer and enterprise applications. Additional coverage areas include gaming, video, metaverse, and emerging technologies.



James Hodgson
Research Director
James Hodgson, Research Director at ABI Research, conducts research related to the field of autonomous driving and smart mobility, with a focus primarily on quantitative forecasting and analysis in the areas of Advanced Driver-Assistance Systems (ADAS), autonomous driving, and connected infotainment. James also writes reports on the transformative effect of automotive technologies on personal mobility and ecosystem dynamics.

Jamie Moss
Research Director
Jamie Moss, ABI Research's Research Director for Enabling Platforms, covers Machine-to-Machine (M2M), Internet of Things (IoT), and Internet of Everything (IoE) technologies. Jamie conducts competitive analysis, data modeling, and develops front-end analytical tools for products and services in the machine-type connectivity market.

Meet The Analysts

Reece Hayden
Principal Analyst
As part of ABI Research's strategic technologies team, Principal Analyst Reece Hayden leads the Artificial Intelligence (AI) and Machine Learning (ML) research service. His primary focus is uncovering the technical, commercial, and economic opportunities in AI software and AI markets. Reece explores AI software across the complete value chain, with a cross-vertical and global viewpoint, to provide strategic guidance for, among others, enterprises, hardware and software vendors, hyper scalers, system integrators, and communication service providers. Reece previously worked in the distributed & edge compute team, where he supported clients across various areas, including enterprise connectivity (including network-as-a-service), edge AI platforms, and the semiconductor market.

Adhish Luitel
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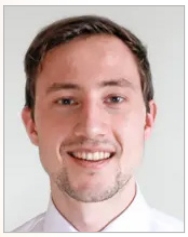
Adhish Luitel, Principal Analyst at ABI Research, provides global supply chain management research coverage, including on fleet management, warehousing and fulfillment, retail technologies, and connected assets. He leads research on emerging areas such as telematics technologies, AI Video, aftermarket ADAS, autonomous trucks, material handling automation, and digital solutions implementation.



Andrew Spivey
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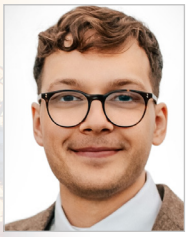
Andrew Spivey is a Principal Analyst on the Strategic Technologies team focused on wireless connectivity at ABI Research. He is responsible for producing qualitative analysis and market forecasts in consumer and enterprise Wi-Fi and wireless infrastructure, Fixed Wireless Access (FWA), and other trends impacting wireless networking technologies.



Sebastian Wilke
Principal Analyst
Sebastian Wilke is a Principal Analyst within ABI Research's Strategic Technologies team, with a focus on network and cloud markets. With expertise in the data center and Artificial Intelligence (AI) ecosystem, his research covers specialized neocloud and sovereign cloud dynamics and deployments. Prior to joining ABI Research, Sebastian was a Market Intelligence Analyst at Intel, working in the Data Center and Artificial Intelligence Group. Before that, he worked as a Senior Research Associate at RR Donnelley.

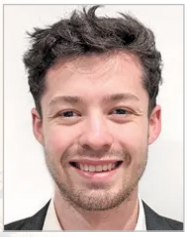
Rithika Thomas
Senior Analyst
Rithika Thomas, Senior Analyst at ABI Research, is part of the company's End Markets team, tracking the development and adoption of emerging technologies within the context of smart commercial building, sustainability, and circularity across industries. Rithika's research focuses on industry-specific digital technologies such as lifecycle and carbon management, digital twins, and supply chain optimization, and the application of Artificial Intelligence (AI), the Internet of Things (IoT), and connectivity technologies to decarbonize and achieve global net-zero goals.

Meet The Analysts

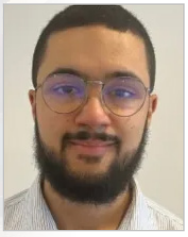
Ryan Wiggin
Senior Analyst
Ryan Wiggin is a Senior Analyst on the ABI Research End Markets team. His focus is on supply chain management and logistics. Prior to joining ABI Research, Ryan served as a National Supply Chain Management Assistant for Aldi U.K.

George Chowdhury
Industry Analyst
George Chowdhury is an Industry Analyst on the Strategic Technologies team at ABI Research. George provides research, analysis, and insight into industrial, collaborative, and commercial robotics, focusing on robotic technologies that interact with and augment the human workforce in line with industrial transformation.

James Iversen
Industry Analyst
James Iversen is an Industry Analyst on the Verticals and End Markets team at ABI Research. James provides research, analysis, and insight into the Industrial and Manufacturing sector, with core specialization in Cloud Manufacturing, Product Lifecycle Management, Simulation, and Generative Design.



James Prestwood
Industry Analyst
As part of the Industrial & Manufacturing team, James Prestwood leads research on high-impact digital technologies in manufacturing production, operations, and service. His research focuses on the most transformative innovations within and across these core domains, including Manufacturing Execution Systems (MES), industrial automation (hardware and software), and quality.



Larbi Belkhit
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Industry Analyst Larbi Belkhit is part of ABI Research's Strategic Technologies research group focused on 5G, 6G, and Open RAN research. He is responsible for producing qualitative analysis and market forecasts on indoor and outdoor network infrastructure, Fixed Wireless Access (FWA), Massive MIMO, and other trends impacting network technologies.

Victor Xu
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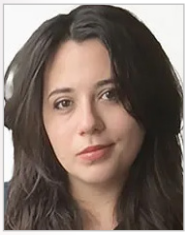
Industry Analyst Victor Xu is a member of the Asia-Pacific Advisory team and contributes to a diverse range of research projects, exploring technological domains such as mobile network infrastructure, 5G technologies, wireless networks, the Internet of Things (IoT), satellite communications (SatCom), and key technological developments across the Southeast Asian region. Before joining ABI Research, Victor worked as an Enterprise Risk Management Analyst for Nikko Asset Management. In that role, he developed risk assessment frameworks and conducted firmwide risk assessment exercises.

Meet The Analysts

Ben Chan
Research Analyst
Research Analyst Benjamin Chan is a member of the Asia-Pacific Advisory team focused on issues related to Artificial Intelligence (AI) and Machine Learning (ML) implementation and digital transformation. Benjamin also focuses on key technological developments within the Southeast Asian region.



Georgia Cooke
Research Analyst
Georgia Cooke is a Research Analyst within ABI Research's Digital Security team, conducting research on topics such as 5G security and RISC-V. Georgia works closely with security providers to understand the state of these markets and deliver actionable analysis.

Abu Miah
Research Analyst
Abu Miah, Research Analyst at ABI Research, is a member of the End Markets team. Abu is responsible for research within the Smart Mobility and Automotive service, focusing on connected cars and software-defined vehicles. Before joining ABI Research, Abu was a Research Assistant at the Saïd Business School, University of Oxford, focusing on corporate Environmental, Social, and Governance (ESG) strategy and governance, ESG assurance, and activist investing.

Ash Robinson
Research Analyst
Ash Robinson is a Research Analyst within ABI Research's Cyber & Digital Security team, using his past experience in the payments industry to help develop the digital payment technologies sector. Before joining ABI Research, Ash was a POS Acceptance Payments Specialist for Small and Medium Enterprises (SMEs) in Barclays' Barclaycard Payments division. While at Barclays, Ash gained experience in the credit card issuance market.

Shadine Taufik
Research Analyst
Shadine Taufik is a Research Analyst within ABI Research's Strategic Technologies team, with a focus on hybrid cloud and 5G markets research. She covers the commercial aspects of these key technologies and maps out the role of ecosystem players, such as hyperscalers, system integrators, infrastructure vendors, and mobile network operators, in facilitating enterprise connectivity.

NAVIGATING THE NEW REALITY OF INTERNATIONAL TRADE

When the COVID-19 pandemic hit, ABI Research was there to provide the market intelligence needed for organizations to survive in uncertain times. We are committed to replicating that success with our clients amid the new economic headwinds. To learn how a partnership with us can help your organization stay afloat or even identify emerging opportunities, contact us today. We will walk you through the existing and upcoming reports, market data, and competitive analyses pertaining to your areas of interest.

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