



What's Wrong With Our Supply Chains?

JUST THE FACTS

Although the COVID-19 pandemic exacerbated supply chain inadequacies and inefficiencies, the problematic situation has loomed for years.

Lean philosophy and principles have been criticized as a contributing factor in today's supply chain management failings, but there are stronger contributing factors—including how lean was adopted in supply chains in the United States and around the world.

The decoupling of supply chain networks will help make supply chains competitive and resilient.

The proper use of lean can help find the right balance by Nick Vyas

For many, scenes of frenzied buying¹ of toilet paper, hand sanitizer, masks, bottled water and lifesaving drugs during the early days of the pandemic will stay in our collective memory for a long time—perhaps forever. Most of us witnessed the horrors of seeing regular folks turn on one another and abandon the sense of altruism even as we clamored to shove items into our respective carts. It's even worse when such behavior happens in the quest for essentials such as food and medicine.

These images, to me, are emblematic of all that has gone wrong with supply chains during the past four decades—so bad that even after more than two years of the coronavirus showing up on our shores, our supply chains remain affected.

Container ships unloading goods stayed longer at U.S. ports in the past three months than they did even at the pandemic's start.² Prominent U.S. companies, including Apple, General Electric and Mondelēz,³⁻⁵ have warned that their supply chains will stay constrained for the foreseeable future. More than one-third of U.S. C-suite executives responding to a recent survey⁶ expected supply chain disruptions to continue. News and images of food shortages continue to emerge worldwide, including in the United States. The problem of semiconductor shortages persists.⁷

Two years is a long time for any intelligent system to learn from its errors and correct its course. That does not seem to have been the case with our supply chains. Naturally, questions abound:

What's wrong with our supply chains? How did the pandemic catch our supply chain managers napping? And as significantly, what can be shored up to address the situation?

These are some big existential questions about a mammoth system as old as civilization itself. There are no simple answers. But considering the crisis we face, questions must be asked and solutions sought.

Finger pointing at lean

Many observers have, for example, questioned whether a big problem with our supply chains is that they are too lean. “We went way too far,” a recent *New York Times* article quoted a McKinsey partner about the lean mentality adopted by industry strategists.⁸ A 2021 *Wall Street Journal* article squarely blamed the shortage of essentials on lean manufacturing.⁹

It appears that a good number of industry professionals also share the sentiment. The Council of Supply Chain Management Professionals’ “2021 Third-Party Logistics Report” found that 42% of respondents felt, based on their pandemic experience, that supply chains were “too lean.”¹⁰

There is no doubt that the charge of supply chains having gone far too lean carries some weight. However, making them less lean—with warehouses better stocked—is an easy answer. After all, by definition, a catastrophe defies our best estimation and preparations. That being said, this article evaluates the claim of supply chains going too lean.

Also, remember that no amount of resilience can ward off panic buying that triggers a low loop and a resultant supply outage.¹¹ A more significant cause for concern is the sustained disruption of supply chains when the initial blow has kept the supply chain struggling.

Clearly, besides being “too lean,” there are other issues at play. The elephant in the room is the single-strand supply chain that serves the United States, with demand centers concentrated at one end and supply centers at another. To understand the severity of this issue, consider the chip shortage problem and how it has affected the auto industry.

Chip shortage: A symptom of a deeper issue

In February 2021, a global chip shortage halted car production in three states. Governors of Michigan, Indiana, Ohio, Kentucky, Kansas, South Carolina, Alabama and Missouri wrote to President Biden to urge global

The global supply chain network was built for the cheaper cost to serve high-yield markets as it began in the 1980s. The corporate strategists adopted lean practices for competitiveness, but not for resilience.

FIGURE 1

Semiconductor demand by country



semiconductor and wafer companies to expand production and “temporarily reallocate a modest portion of their current production to auto-grade wafer production,” *Reuters* reported.¹²

The world was in the grip of a chip famine, which has since abated, but not before creating a situation costing the auto sector globally an estimated \$210 billion in lost revenue in 2021.¹³

The shortage of semiconductors can be traced to the peak of the first pandemic wave in July 2020: When spooked by lockdown restrictions, carmakers in the United States and elsewhere scaled back their procurement of semiconductors. This prompted the chip manufacturers—the vast majority are based outside the United States—to redirect their production lines to the electronics industry, which faced a demand surge due to the pandemic-induced trend of remote working.

From a larger perspective, it doesn’t help that the U.S. share of global semiconductor fabrication has dipped from

37% in 1990 to a meager 12% today.¹⁴ Notably, more than 75% of semiconductor fabrication is now localized in East Asia.¹⁵ Equally as noteworthy, China’s share of chip manufacturing trajectory presents a sharp contrast, going from zero to nearly 30% in the same period.¹⁶ Demand-wise, however, the United States remains unbeatable (Figure 1).

The important example of the semiconductor shortage shows us that even the most sophisticated best practices, demand forecasting tools and advanced data analytics—practiced in two of the most technologically advanced industries, automotive and electronics—cannot help if supply chains suffer from structural deficiencies.

How we got here

Blame it on a supply chain made for the good times and of the good times. Or, in other words, a global supply chain that began shaping up during the shopped-’til-we-dropped decade, to use a *Los Angeles Times* moniker.¹⁷

From all accounts, the meeting of two distinct trends during this era began to create the structure of the global supply chain strand that serves the United States today. These two trends were a booming consumer demand at home and lowering trade barriers that ushered in globalization.

President Ronald Reagan and U.K. Prime Minister Margaret Thatcher—the champions of the free market economy—echoed the voice of a brave new world that wanted to trade. This was the first time in U.S. economic history that the average family spent more on buying a car than it did on total food at home.¹⁸ Wages also grew, but inflation had to be kept in check. The fall of the iron curtain in 1989–1990 and the end of the Cold War of 1991 heralded an era when the biggest economies embraced the idea of a truly global supply chain.

In 1989, exports rose to 14% of global gross domestic product—its highest level since the pre-World War years. The next few years saw significant economies drop trade tariffs to unprecedented lows, where they have stayed since (see Figure 2).

The present crisis has exposed the structural flaw of our supply chains that are built more for cost and speed, and less for resilience.

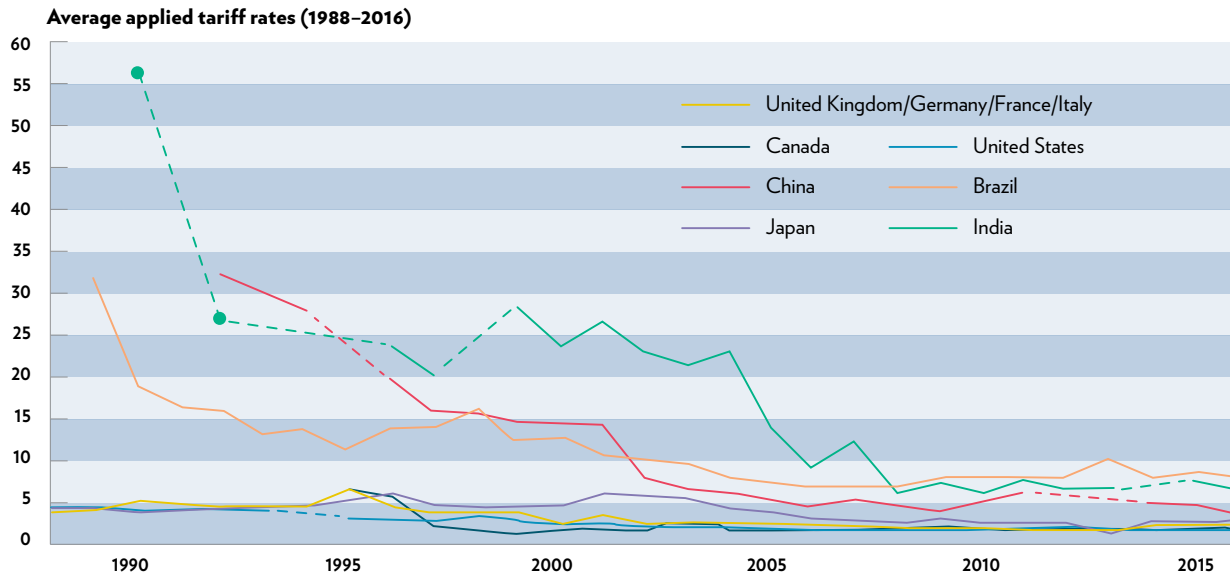
The lowering of trade barriers gave producers around the world a great opportunity to fulfill the demand of consumers in high-income countries, including the United States. As a result, imports to the United States rose substantially since the 1980s. The share of exports, however, stayed at the same level and even began to fall by the 2010s (see Figure 3, p. 20).

The meeting of these two trends—rising consumption and globalization—worked well for U.S. consumers. Manufacturers, however, were hit by the rude realization that globalization is a two-way street. They met their worthy contenders when Japan—the only Asian country among the world’s top five manufacturers until the 1970s—leapfrogged

FIGURE 2

Lowered trade barriers ushered in globalization

Major economies dropped tariff rates and kept them low



Note: Shows world's 10 largest economies, 2016. Rates are weighted by trade value. Dotted lines indicate years when data are not available.

Source: World Bank DataBank.

every other country in the 1980s to go head-to-head with the United States. This was a time when each produced close to one-fifth of the world factory output.¹⁹

As observers of recent history will recall, Japan's roaring success made quite a few headlines back then. Researchers, columnists and consultants rushed to Japan to learn its secret sauce, the reason the former foe was able to leverage globalization and indulge in a "one-sided trading," *The Atlantic* noted in one article.²⁰

Reasons proffered ranged from Japan's protectionist policies²¹ that sought to keep its home consumption low and corporate profits high, to charges of undercutting competition²² from local and foreign sellers in the United States.

Enter lean

During the mid to late 1970s, some scholars and industry associations were documenting a little-noticed practice they felt was responsible for the spectacular performance of Japan's automotive companies, led by Toyota. The academic article "Toyota Production System and Kanban System Materialization of Just-in-Time and Respect-for-Human System,"²³ considered the earliest source on Toyota's just-in-time (JIT)

system,²⁴ was the first to appear on the subject in English in 1977.

Another important work that same year appeared in *American Machinist*. Anderson Ashburn, the magazine's editor, wrote about this unique management system in "Toyota's 'Famous Ohno System.'" He wrote the piece after visiting Honda's motorcycle plant in Japan, where he noticed there was almost no work-in-progress inventory.²⁵

It took several years, however, before U.S. companies recognized the brilliance of this unique system. By the mid-1980s, it had become relatively well known among the manufacturers. Mentions of JIT and Toyota Production System appeared in many case studies published around the mid-1980s.

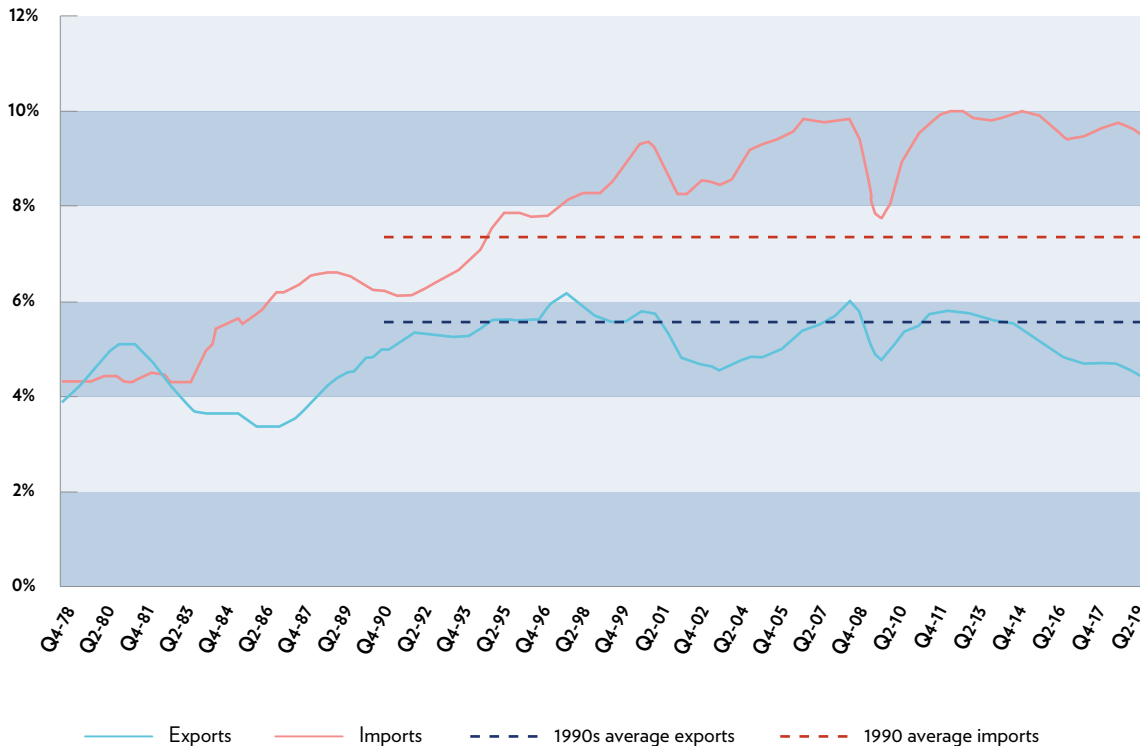
A particular 1986 case study book devoted a chapter to a system called zero inventory production system that Omark Industries (later Oregon Tool), an equipment manufacturer, formed based on JIT. The book had two other chapters on JIT at several Hewlett-Packard plants, Harley-Davidson, John Deere, IBM in Raleigh, NC, and Apple.²⁶

Subsequent research and scholarly work, notably "Triumph of the Lean Production System"²⁷ and *The Machine*

FIGURE 3

Imports soared, but exports as a share of GDP kept falling

Manufacturing trade (SITC data) as a share of U.S. GDP



Source: U.S. Census Bureau/BEA/Haver Analytics

GDP = gross domestic product

SITC = standard international trade classification

That Changed the World,²⁸ made lean production or lean thinking integral to manufacturing.

This also was a time when supply chain and logistics as distinct disciplines were taking shape in academia and the industry. The supply chain management concept, for example, was coined in the early 1980s by consultants R.K. Oliver and M.D. Webber.²⁹ They posited that supply chains must be viewed as a single entity.³⁰ In addition, strategic decision-making at the top level of the chain was needed to manage it effectively.³¹

The lean philosophy and its principles were extended to supply chain and logistics operations in the following years. Today, lean is regarded as among the most influential movements to have shaped the way things are manufactured and distributed, and rightly so. During the past 30 years, globalization has changed the nature of competition from being between businesses to being between supply chains.

How lean was adopted

The afforested genealogy of lean—focusing on the events that led to its adoption in the United States and subsequently the world—provides an informed view into one of the questions posed at the beginning of this article: Should the present, fragile state of supply chains be blamed on lean?

Here's where I stand: The problem lies not with lean philosophy, but *how* it was adopted in supply chains in the United States and the world.

In the United States, lean was adopted—or readopted, if you consider Henry Ford's flow production system as the origin of lean—to cater to a booming economy. In Japan, however, it was developed as an antidote to disruption; therein lies the critical difference.

A closer study of Toyota's formative years reveals a troubled start. Within a few years of inception, the automaker found itself grappling with wartime curtailment of the use of raw

material during World War II.³² This was soon followed by an air raid that nearly destroyed its facilities, which faced a mass resignation of employees no longer bound by wartime conscription rules.

Again, within a few years of resuming production, the automaker was hit by labor strikes—bringing it to the brink of bankruptcy and forcing the founder Kichiro Toyoda out in 1950.

During the same year, Eiji Toyoda, the founder's cousin and Toyota's managing director, visited Ford Motor Co. in Michigan and came back taken in by Ford's scale, though unimpressed by its inefficiencies.³³ His experience there led him to team up with a veteran loom machinist, Taiichi Ohno, to finetune their company's operations. The duo developed concepts such as *kanban* and *kaizen*, which formed the core principles of the Toyota Way. In simpler words, Toyota's lean system was a philosophy forged by fire.

Therefore, it emerges that the global supply chain network was built for the cheaper cost to serve high-yield markets as it began in the 1980s. The corporate strategists adopted lean practices for competitiveness, but not for resilience.

The flaw becomes apparent

Herein lies the design flaw that the pandemic has laid bare. As examples of how Toyota's (and those of other Japanese automakers') supply chains are built for resilience, consider two often-overlooked factors: *keiretsu*, Japan's traditional supply system, and the geographical spread of its suppliers.

The hierarchal structure of a *keiretsu* incentivizes suppliers to work together for the common good and ensure their survival.^{34,35} Building such a network requires companies to nurture relationships that survive and step up during disruption. As the *Harvard Business Review* noted, once a darling of business schools and manufacturers, *keiretsu* fell off the radar as cost became the more significant concern in the United States. Japanese automakers, however, revived the practice in recent decades.³⁶

The new, reinvented *keiretsu* is about forming supplier relationships that are not only richer and deeper but are also more global and cost-conscious. This is a lesson for strategists when designing supply chain networks.

The practice of *keiretsu* also entails companies locating their suppliers as geographically close as possible. This has helped Japanese automakers through the disruptions. As the *New York Times* pointed out,³⁷ Toyota has been among the automakers least affected by the semiconductor shortage because the company, from the days of JIT inception, relies on suppliers located close to its base in Japan, "making the company less susceptible to events far away."

Sure enough, a comparison of the geographical spread of General Motors³⁸ with that of Toyota³⁹ provides a study in contrast. Plain near-shoring of suppliers is presently more

of a reactionary and counterproductive approach—one more instance of the proverbial all-eggs-in-one-basket solution—and not a balanced, long-term approach to finding a solution.

A better way would be an approach that I've long been advocating: decoupling of supply chain networks.⁴⁰ A decoupling point is a concept in inventory management in which a specific inventory-holding point is established close to the operational zone. The decoupling point acts as a strategic distribution hub and safety buffer that protects that regional supply chain network from demand shocks.

Decoupling of the supply chain means instead of having a single-strand global supply chain, which is susceptible to a shock anywhere along its length, a more resilient form would comprise a network of regional supplier clusters, each situated close to demand centers, each network connected to the other through decoupling points. I expect supply chains of the future to be formed along these lines because it will help make our supply chains competitive and resilient.

The pandemic has ensured that the next phase of evolution in adopting lean in healthcare and other services will be to build an enterprise system to provide a customer-centric solution. Even the original lean transformation process was not about working with reduced inventory. It was meant to drive enterprise excellence and not at the expense of agility and resilience. Our single-strand supply chain in which we became overly dependent on one or more supply chain clusters was not shaped by lean—the very practice of lean preaches building redundancy, agility and resiliency.

Experts in academia and industry have long implored supply chain organizations to integrate risk management practices, such as failure mode and effects analysis, and prevention, preparedness, response and recovery, into their strategy and operations. The present crisis has exposed the structural flaw of our supply chains that are built more for cost and speed, and less for resilience. **QP**

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EDITOR'S NOTE

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Nick Vyas is the founding executive director of the University of Southern California (USC) Marshall's Kendrick Global Supply Chain Institute and academic director of the M.S. Global Supply Chain program. He holds a doctorate in global executive education from USC. He is an ASQ fellow and the chair of the ASQ Lean Enterprise Division.