



Supply chain resilience

**Deconstructing fragility in supply tiers
using big data: Episode 1**

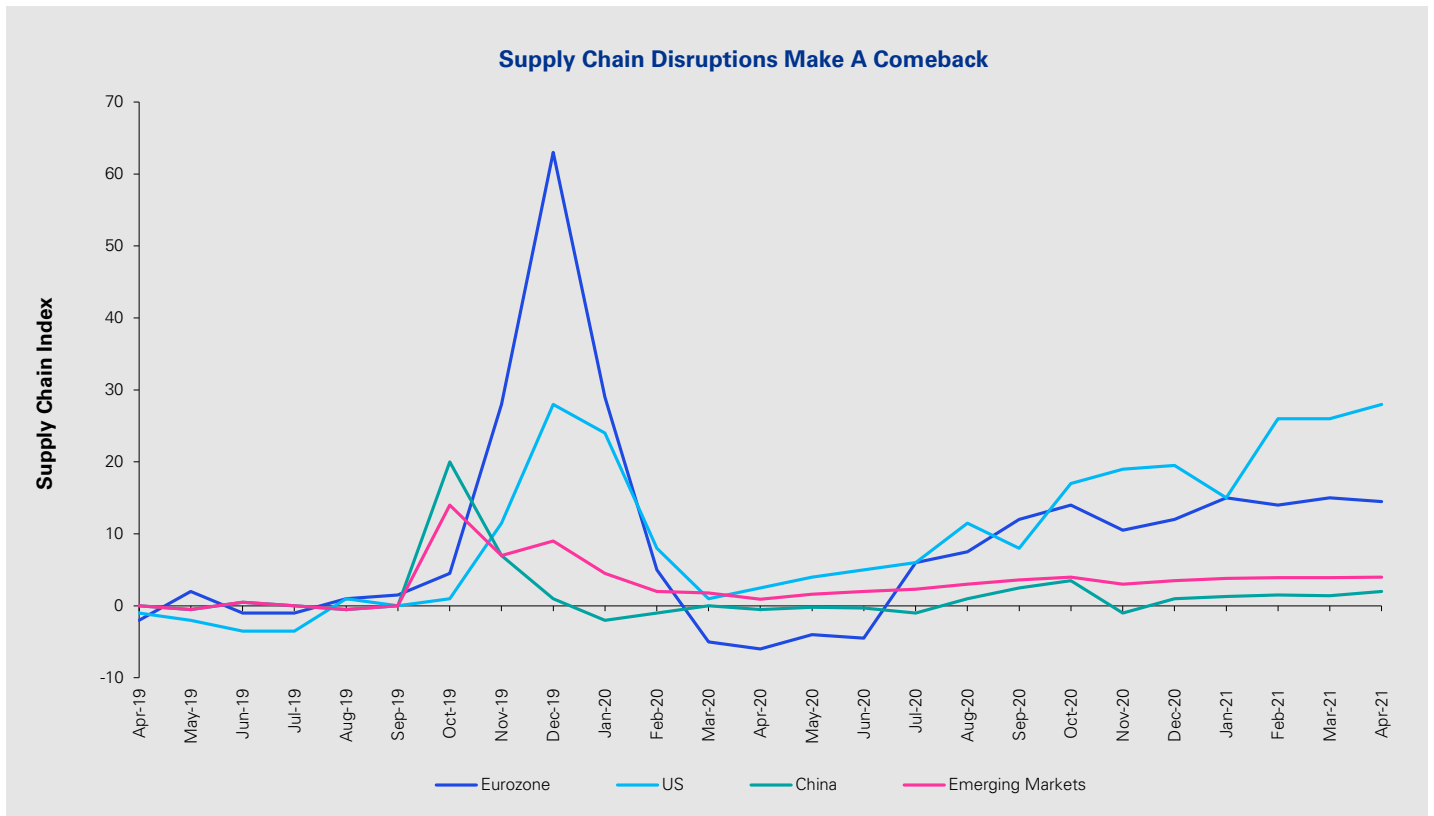


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The Institute of Supply Management (ISM), in a survey in 2020, found that nearly 75 per cent of the companies surveyed reported supply chain disruption due to the

pandemic. One of the findings in the survey pointed that over 44 per cent of the companies did not have a plan to handle the disruption from China¹.



Source: Macrobond, Markit, ISM, SILF/ Swedbank, Harper Petersen and Handelsbanken
Note: Supply chain disruption index inspired by IMF analysis (WEO Oct 2021), calculated from PMIs

Disruptions are getting longer in their temporal memory especially post Covid and costing CPOs, SCOs and CEOs a lot more sleepless nights and hurting financial performance. A survey conducted in 2021 by Statista, found that, on average, the cost of disruption for an organisation is a staggering USD184mn per year—the highest financial burden estimated in U.S.- based companies at nearly USD228mn².

And looks like we are just getting warmed up; the recent port shutdown in Shanghai, the Ukraine-Russia war, palm oil supply disruptions from Indonesia, poultry supply disruptions to Singapore, neon gas supply hits from Ukraine, deforestation levels increasing, truck driver availability in the UK, the list goes on...

¹ "75% of Companies in ISM Virus Survey Report Supply Chain Disruptions," Industry Week, March 11, 2020
² Cost of supply chain disruptions in selected countries 2021, Statista Published by Martin Placek, Apr 12, 2022

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If you think about it, these disruptions affect multiple levels and components in your product's Bill of Material (BOM) — some at the commodity level vs some at the component vs some directly affecting your Finished Goods (FG). For example, come Monday morning, your CPO/COO ask you; 'How will the shortage of palm oil affect us: you need to assess:

- Where, when, and what proportion of palm oil gets used in which and how many of your products?
- Who supplies it and how much of it?
- Where does it come from e.g., manufacturing location?
- How much Raw Material (RM), Work in Progress (WIP), FG inventory you have left—both palm oil and its affected BOM components?
- What is the unfulfilled demand—value and volume impact?

You would think these are reasonable, simple questions to answer. Our experience says the opposite. In fact, it's a lot like the tip of an iceberg; you see 20 per cent visible while the remaining 80 per cent is under the water. It's this '20 per cent visible and 80 per cent invisible' part that we will dig into, in this first episode of our series: 'Deconstructing fragility in supply chains'.

In KPMG International's Global Manufacturing Prospects 2022³ survey, when asked about the impact of the pandemic on their organisations in 3 years' time, more than 68 per cent of CEOs say they aim to ensure their supply chain is resilient in the event of a global lock-down. Now, we could build "resilience" into our supply chain by getting better in tracking where we lie in the face of disruption. We can calculate critical survival metrics like Time to Survive and Time to Recover and devise mitigation plans. But what if we can go beyond Resilience? What if we could try and uncover what's at

the bottom of the iceberg and see 50-60 per cent of it? That's where we believe that organisations could build Antifragility into the supply chain.

In his book, "*Antifragile*" (November 2012), Nassim Nicholas Taleb, stresses the difference between resilience and antifragility. In his words...



Some things benefit from shocks; they thrive and grow when exposed to volatility, randomness, disorder, and stressors and love adventure, risk, and uncertainty. Yet, in spite of the ubiquity of the phenomenon, there is no word for the exact opposite of fragile. Let us call it antifragile. Antifragility is beyond resilience or robustness, The resilient resists shocks and stays the same; the antifragile gets better...



Antifragility, in other words, for a supply chain, is the ability to increase its capacity to thrive and adapt in the face of stress and shocks. And one of the key levers to driving antifragility is data and analytical insights from this data. As we go through this series, we will delve deeper into the five tenets to moving towards antifragility:

1. Connect the dots and build an intelligent foundation
2. Build a multi-dimensional view of risk
3. Go beyond forecasts, sense
4. Horses for courses, empathizing with end-users, matters
5. Platformise: leverage technology to scale disproportionately

In today's episode, we talk about connecting the dots and building an intelligent foundation.



³ Global manufacturing prospects 2022, KPMG International

Connect the Dots - The interconnected and Interdependent Multilayer Network

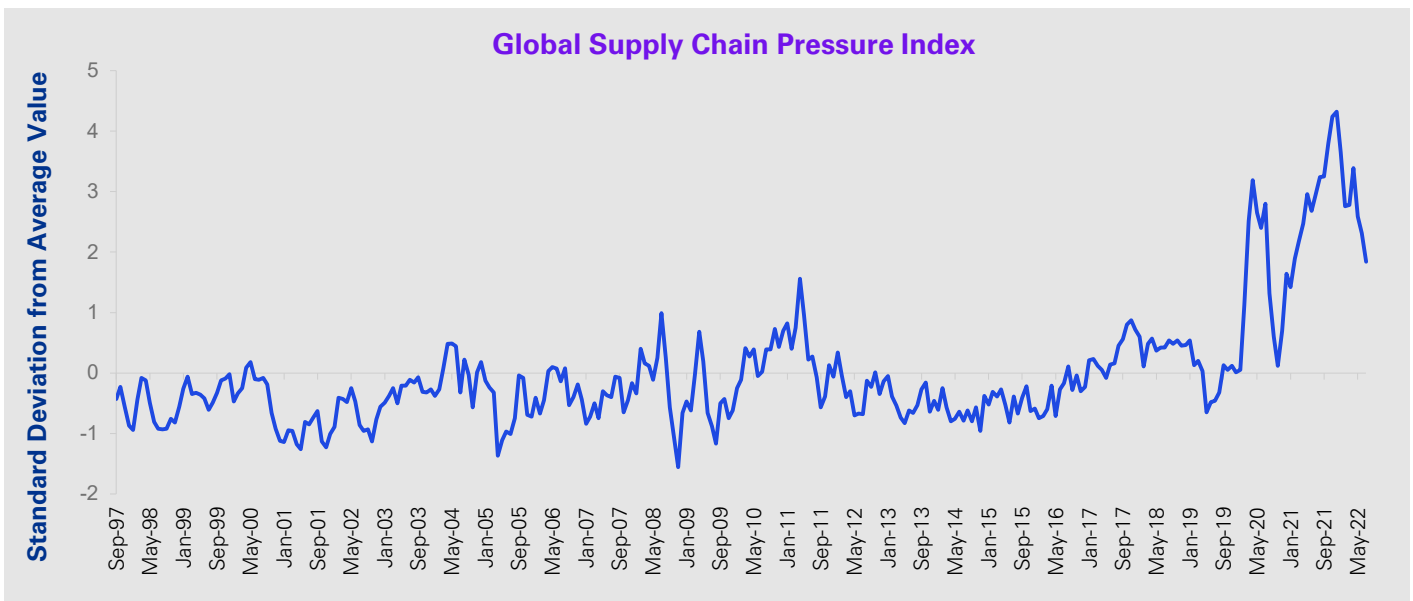
With global supply chains, it is critical that organisations consider the entire gamut of possibilities that arise from interconnected and interdependent phenomena. A key principle is to **Connect the Dots** by making information (about disruption risk of primary, secondary, tertiary suppliers) accessible, so that organisations can anticipate disruptions and make better strategic decisions. Organisations may consider two potential remedies:

1. Contracting with secondary backup suppliers; and
2. Monitoring disruption risks with primary key suppliers.

Research however has shown that investing in secondary sources of supply is harmful if the current information about risk of primary suppliers is not accurate⁴. In the paper “The value of flexible backup suppliers and disruption risk information: newsvendor analysis with recourse”, Dr. Soroush Saghafian, develops a model for examining effective remedies to increase supply chain resilience and makes some interesting observations.

Here are a few notable ones:

- Firms that do not have an accurate vector of reliability belief (at least for key suppliers) can achieve larger savings in their true costs through obtaining risk information. Hence, monitoring suppliers should be more attractive for such firms
- When reliability belief of primary suppliers is good enough, investing in an expensive backup supplier is not advantageous. Obtaining disruption risk information is a relatively better risk mitigation mechanism because it helps the firm to make better ordering decisions
- Disruption risk information is more attractive when the profit margins are low.
- There is a trade-off between the cost of obtaining disruption risk information and the savings due to better contracting and ordering decisions.



Sources: Bureau of Labor Statistics; Harper Petersen Holding GmbH; Baltic Exchange; IHS Markit; Institute for Supply Management; Haver Analytics; Bloomberg L.P.; authors’ calculations.

Note: Each index is scaled by its standard deviation

As per the Bureau of Labor Statistics, while global supply chain pressures show a downward trend, they continue to remain significantly high. It is therefore vital that organisations coalesce information from all the indicators to describe the interactions, dependencies, and behaviors between different nodes in the complex

supply chain network.

As a result, the visibility to seemingly uncontrollable or invisible links in the supply chain start to emerge. Which empowers the organisation to establish a system that learns from stress situations and serves for collaborative and resilient relationships with critical suppliers.

⁴ Soroush Saghafian & Mark P. Van Oyen (2012) The value of flexible backup suppliers and disruption risk information: newsvendor analysis with recourse, IIE Transactions, 44:10, 834-867, DOI: 10.1080/0740817X.2012.654846

Therefore, assessing the exposure between Manufacturing locations, Distribution Centers, Upstream Supplier Tiers, Supply variability, Capacity constraints, Quality issues, Unfilled Orders/Revenue Exposure, Product variety and Product lifecycles, among others, is crucial to have a holistic view on vulnerability and exposure.

And this is where connecting the dots from a data perspective holds the promise of building that first layer of antifragility in the chain and flipping our iceberg's view to 60% at the top from the current 20%. Let's look at these elements.

Elements of Disruption risk information⁵

Supplier Tiers:	Suppliers Tiers for each Manufacturing locations and specific to items in the BOM. Related information about location risks, clustered/ concentrated in one region / country or diversified? Dependencies of the Alternate suppliers – Are they dependent on my Tier 3 & Tier 4, Availability of Key components, raw materials
Supply Variability:	Shipment Routes & Delays (crowded ports), Labor shortages, Supply chokes, Transportation Costs
Customer Behavior / Demand Pattern:	Suppressed demand, Surges, Panic buying, shifting buying behaviors, Consumer preferences etc. Changes in Customer's Perceptions of Company's Product Lawsuits or other legal actions
Facilities:	Shared Infrastructure, Distribution centers,
Inventory parameters:	Volume of Distribution, stock levels, Delivery/ lead times, Quality, Scheduling
Location Attributes:	Logistics – Airports, Runways, Transoceanic Flights, Power Stations
Logistics Breakdowns	Damage en-route; Shipping Mishaps; Accidents (Oil Spill, Sunken Ship)
Supplier Behavior	Key Supplier's Financial stability; Significant Increase in Prices; Contract Limitations
Externalities (Uncontrollable)	
Political events	Trade Barriers, Lack of Political Stability
Climate change/Environment	Deforestation, weather patterns, rising temperatures/sea levels, ESG responsibility
Competitors Behavior	Competitive Pricing, Supplier relationship
Financial and Economic factors	Forex Risk, Interest Rate risk, economic indicators
Other Unanticipated Events	Extreme weather events, War & Terrorism, Communication failure, Cyber Risks, Facility Shutdowns

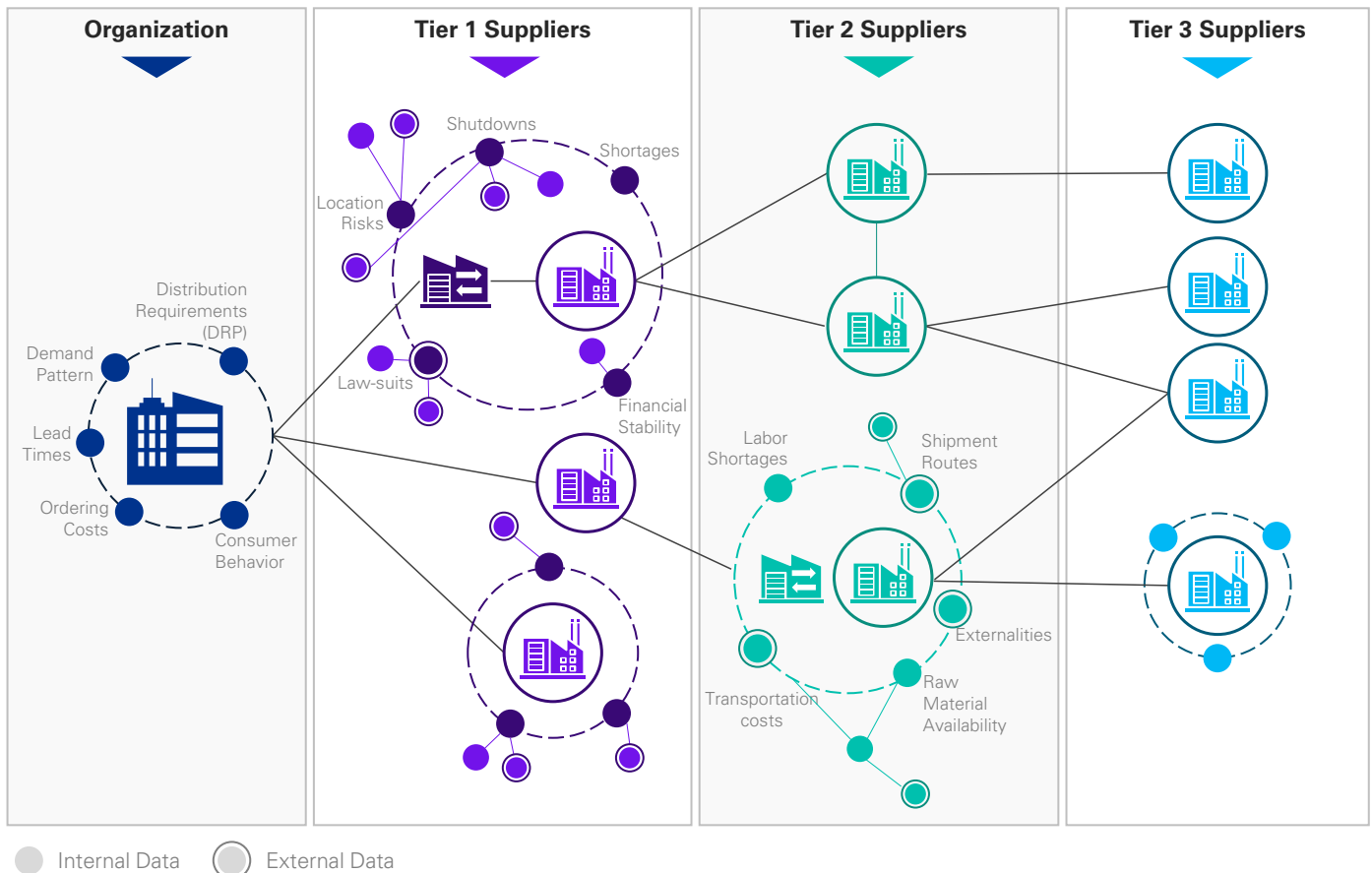
⁵ Peter W. Stonebraker, Ph.D., Joel Goldhar, Ph.D. and George Nassos (2007) Toward a framework of Supply Chain Sustainability: The Fragility Index, and additional contributions from KPMG India Lighthouse

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Connecting internal and external sources of data and overlaying that information with risk signals provides us the first intelligent foundation to slingshot our other tenets on driving antifragile supply chains and even enabling the **Plus one** business strategy. This forms the

bedrock for generating signals at each node of a complex network that enables activation of contingency levels in the likelihood of a disruption or during the course of an ongoing crisis, as is the case with a pandemic.



Watch this space for Episode 2 and beyond of this series...

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