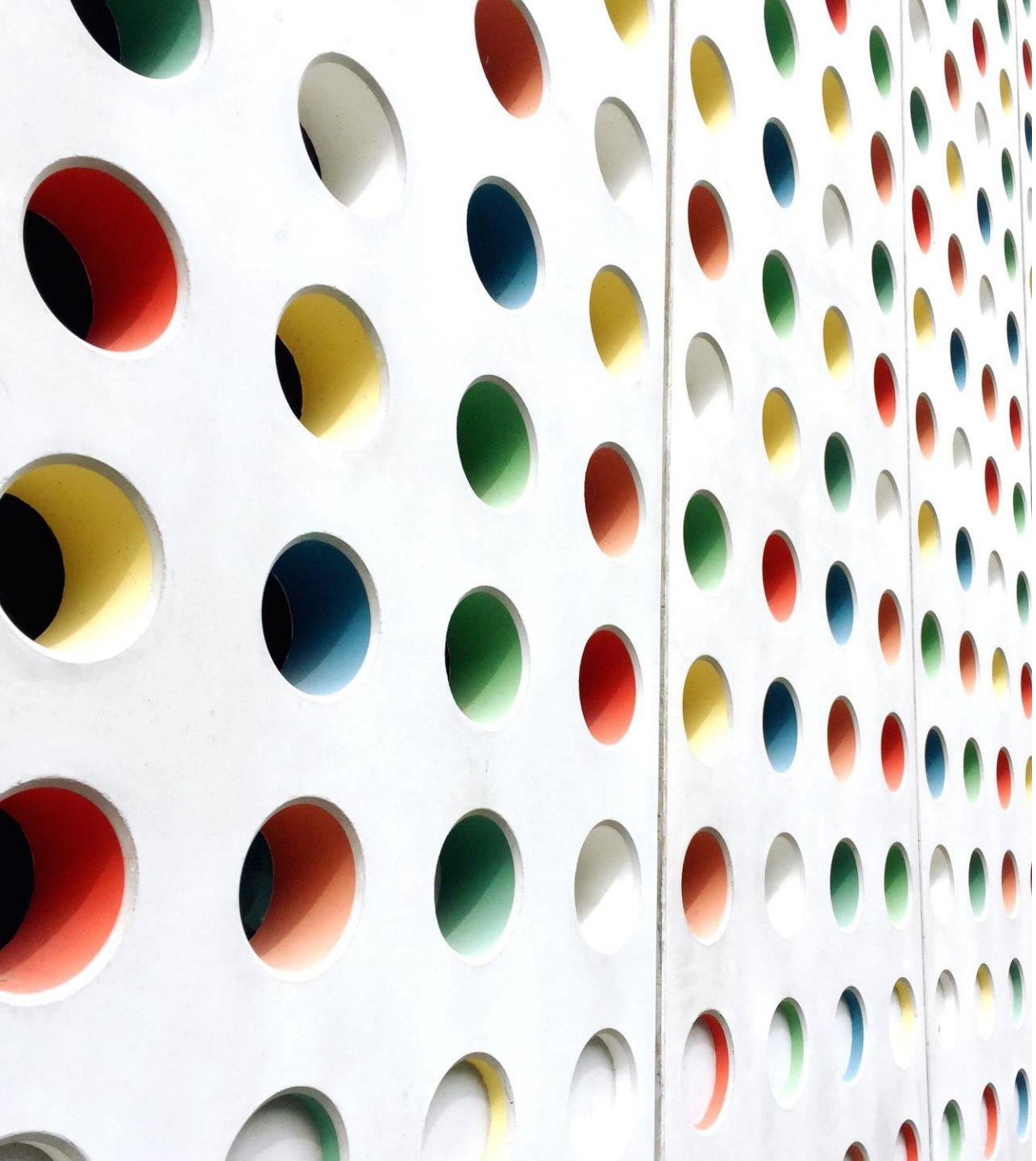


Top Trends and Drivers for Vulnerabilities of Supply Chain Management in Post-Pandemic World

Dr Danny Ho

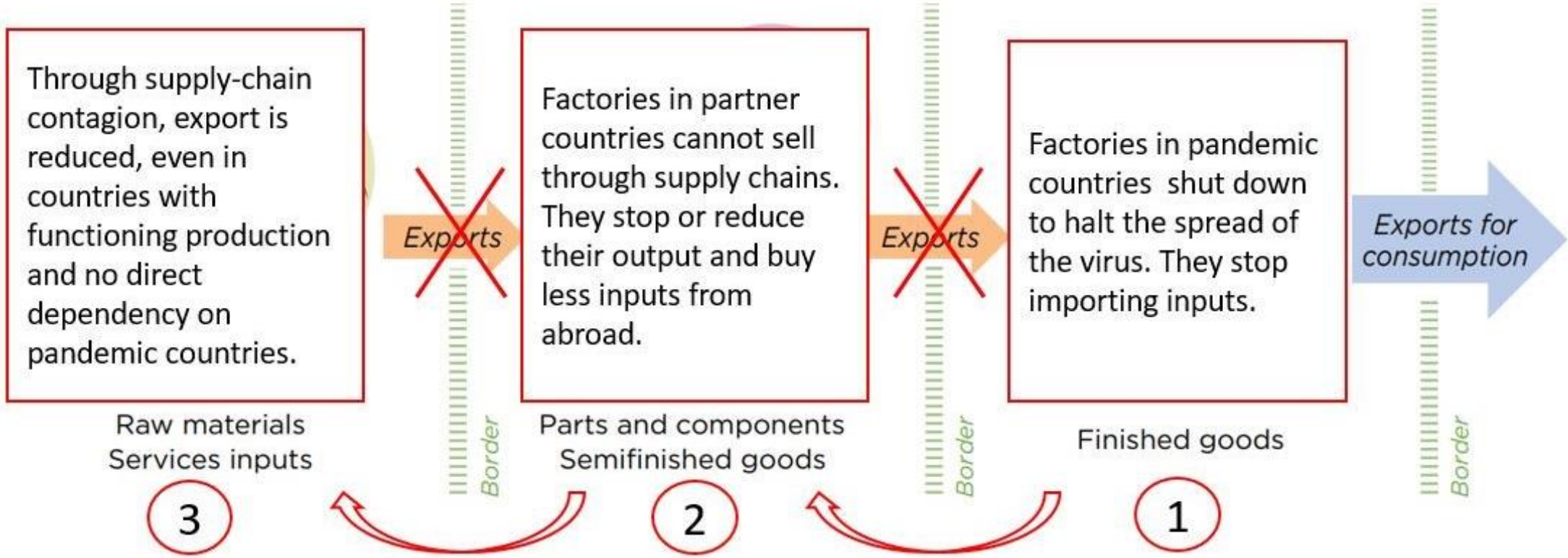
The Hang Seng University of Hong Kong

Contents

Impacts of the Pandemic on Supply Chains

The Great Shutdown

The shutdown of factories creates a chain reaction, affecting the trade of other countries, even if their manufacturing facilities are operational and borders are open to trade.



https://www.intracen.org/covid19/Blog/The-Great-Shutdown-How-COVID19-disrupts-supply-chains/

Major apparel brands delay & cancel orders in response to pandemic, risking livelihoods of millions of garment workers in their supply chain

8 Oct 2020
Article

Covid-19: Trade data reveals drop in apparel order volume & prices following brands' order cancellations & refusals to pay →

8 Oct 2020
Article

Major fashion brands refused to pay for $16bn of goods during COVID-19, leaving overseas suppliers unable to pay garment workers →

US and European fashion companies have refused to pay overseas suppliers for more than $16bn (£12.3bn) of goods since the outbreak of Covid-19, according to CGWR and WRC

10 Aug 2020
Article

Kenya: Over 100 garment factories forced to close from lack of orders during COVID-19, leading to mass job losses →

30 Jun 2020
Article

Thousands of workers in garment supply chains in Asia protest over dismissals →

29 Jun 2020
Article

Bangladesh: 1931 brands have delayed & cancelled $3.7bn worth of orders from garment factories during COVID-19 →

https://www.business-humanrights.org/en/latest-news/major-apparel-brands-delay-cancel-orders-in-response-to-pandemic-risking-livelihoods-of-millions-of-garment-workers-in-their-supply-chains/

Deep Disruptions in Supply Chain

Shortages of critical parts/materials

Delayed shipments and longer lead times

Difficulties in adjusting production capacity in response to fluctuating demand

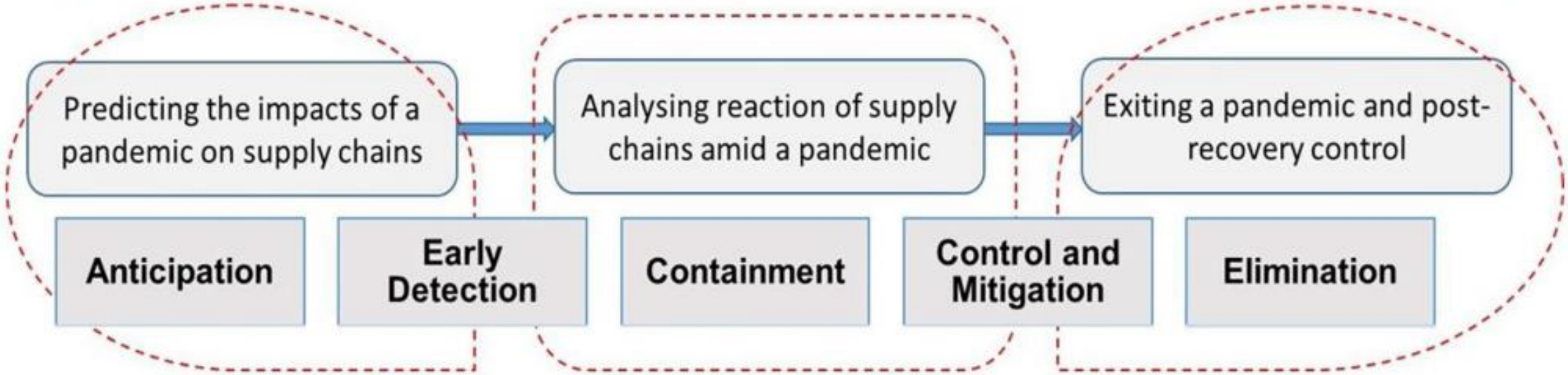
Difficulties in planning amid volatile levels of customer demand

Ripple effect

Disruption propagation through the network

https://www.sourcetoday.com/supply-chain/article/21148985/rethinking-supply-chains-for-a-postcovid-world

The ripple effect has been one of the strongest stressors on SC resilience during the COVID-19 pandemic



From order to chaos

Production stops at suppliers in January 2020 → Closing of ports in February 2020 → Production stops at OEMs in March-April 2020

Deep uncertainty

Silicon production decrease in Fall 2020 → Semiconductor shortage in December 2020 → Production stops at OEMs in January 2021 →

Delayed and inertia effects

Production capacity shutdown during the pandemic in 2020 → Demand increase during pandemic elimination in 2021 → Product deficits and price increases in the markets in 2021-2022

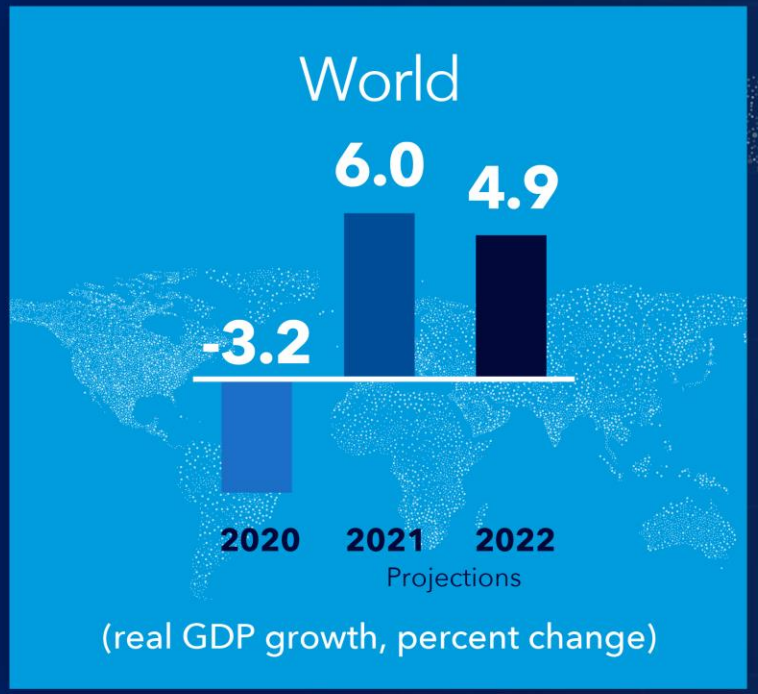
Ivanov and Dolgui (2021)

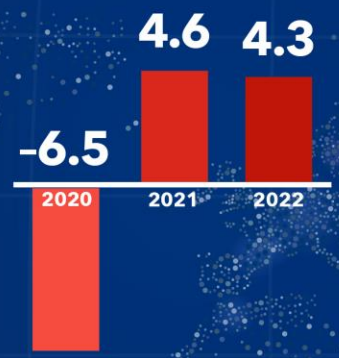
Updates on The Global Recovery

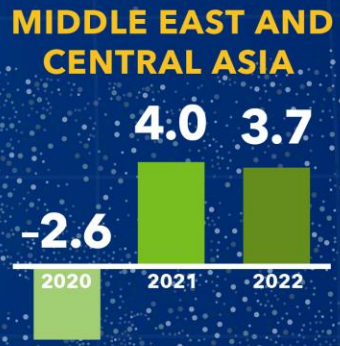
WORLD ECONOMIC OUTLOOK UPDATE JULY 2021

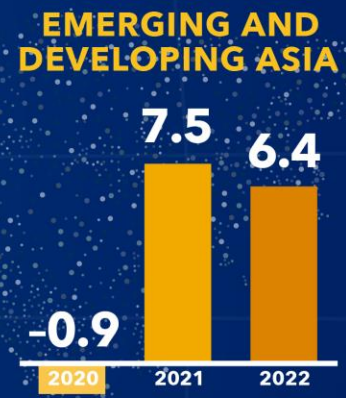
GROWTH PROJECTIONS BY REGION

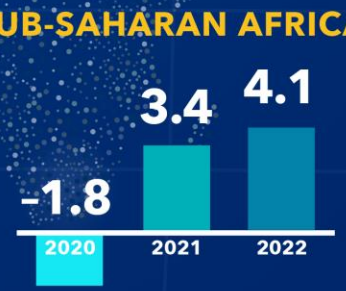
(PERCENT CHANGE)











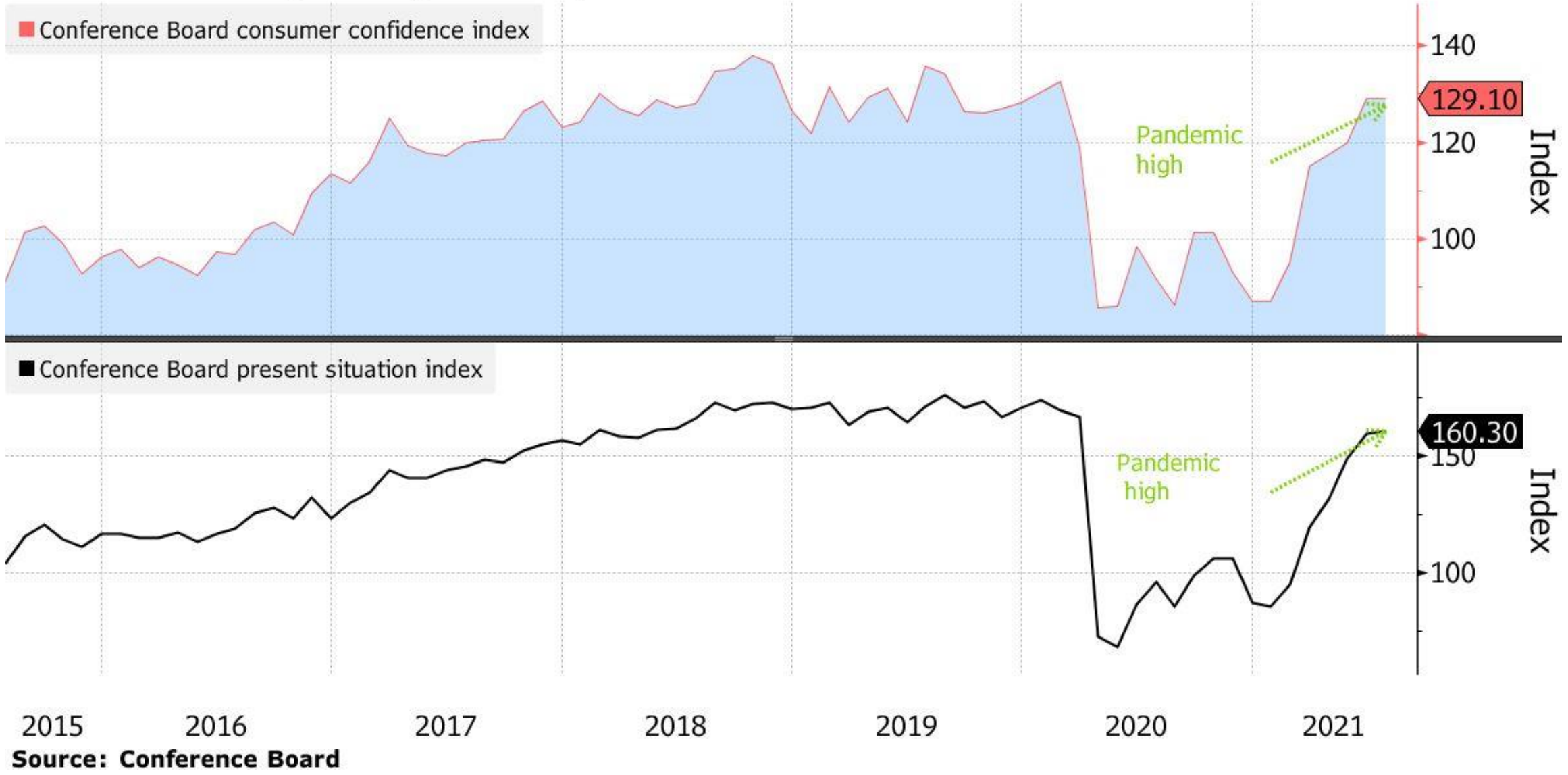
Source: IMF, *World Economic Outlook Update*, July 2021.

Note: Order of bars for each group indicates (left to right): 2020, 2021 projections, and 2022 projections.

IMF.org/social

Rising Optimism (in the United States in July 2021)

Consumers are growing more upbeat about business and labor conditions



Source: Conference Board

https://www.bloomberg.com/news/articles/2021-07-27/consumer-confidence-in-u-s-unexpectedly-rises-for-sixth-month

July 2021 Manufacturing ISM® Report On Business®

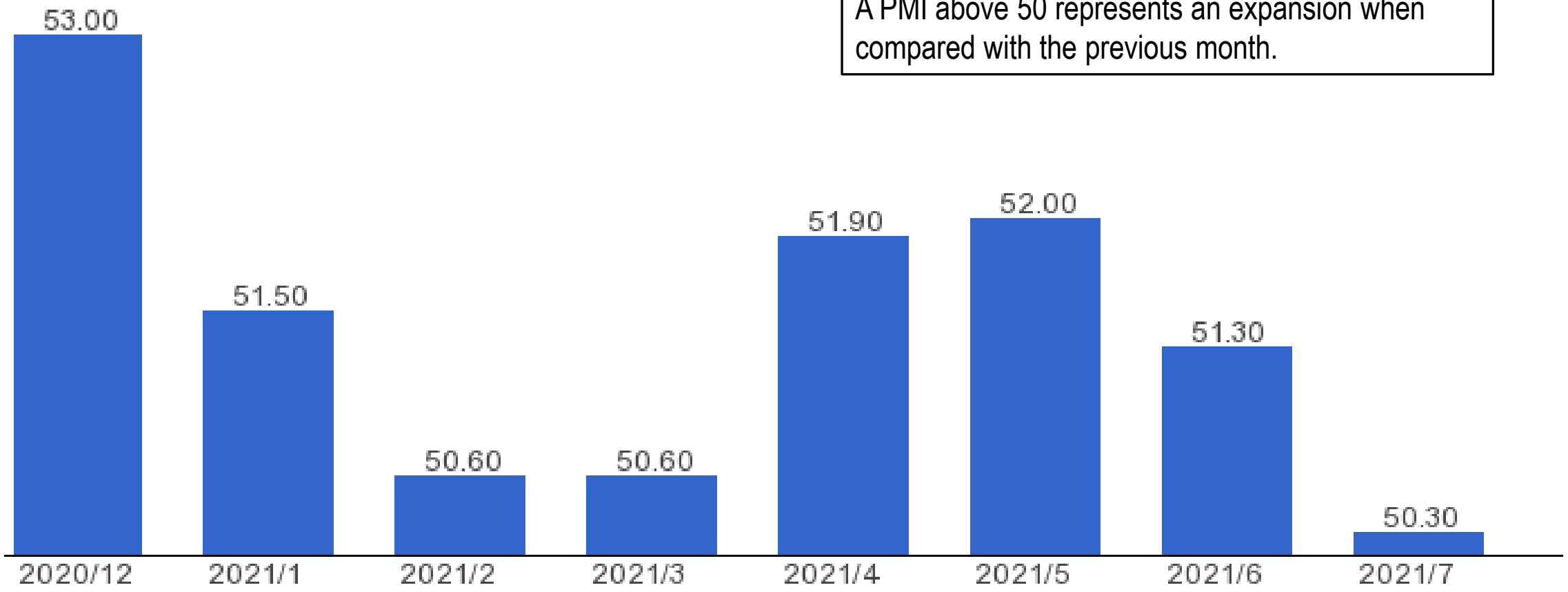
The latest survey from the Institute for Supply Management (ISM) in July 2021 showed in the United States:

1. near record-long raw-material lead times,
2. continued shortages of critical basic materials,
3. rising commodities prices, and
4. difficulties in transporting products across industries.

https://www.prnewswire.com/news-releases/manufacturing-pmi-at-59-5-july-2021-manufacturing-ism-report-on-business-301345349.html

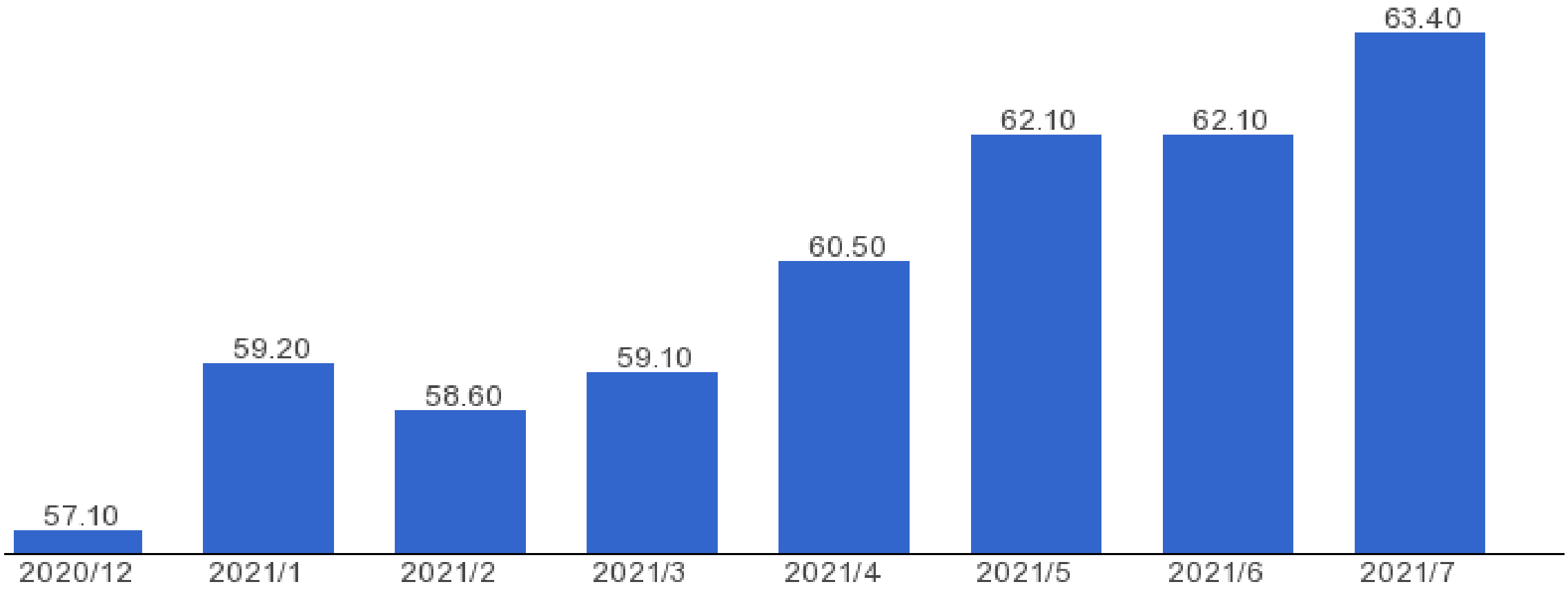
Purchasing Managers Index (PMI), manufacturing in China, Dec 2020 - July 2021

The manufacturing PMI is an indicator of economic health for the manufacturing sector.
A PMI above 50 represents an expansion when compared with the previous month.



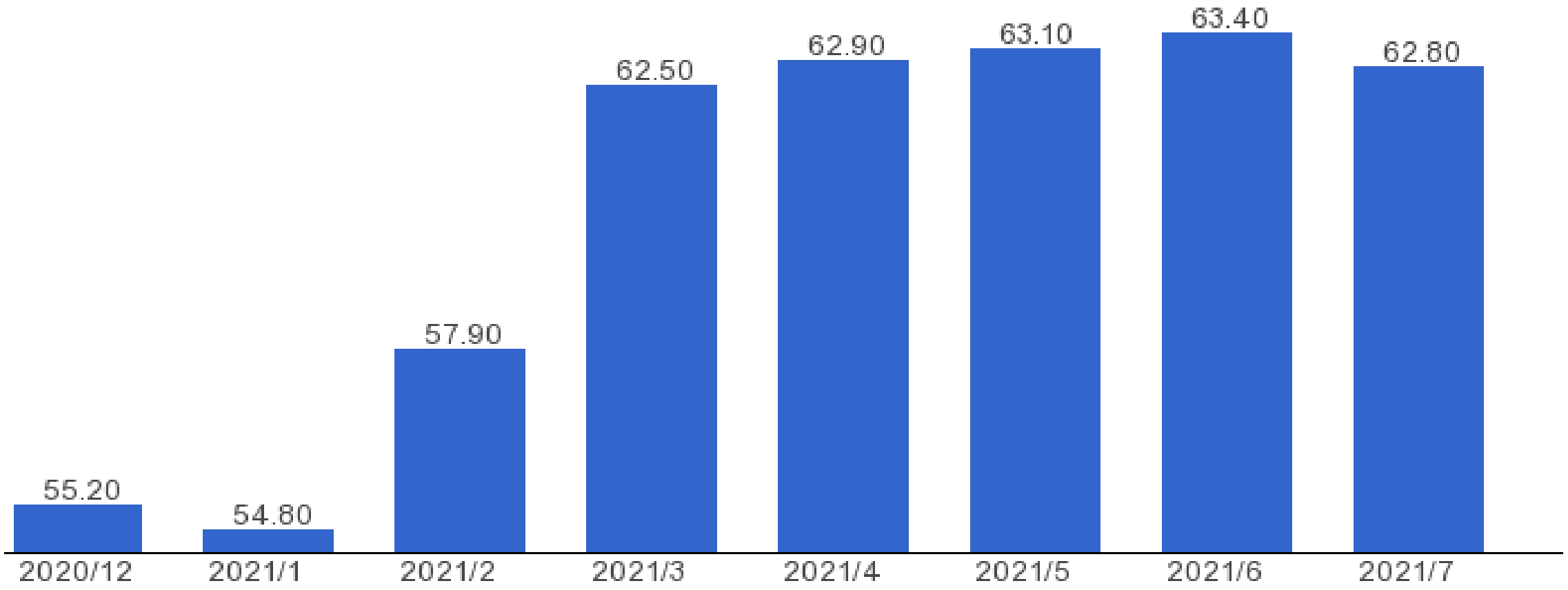
https://www.theglobaleconomy.com/China/pmi_manufacturing/

Purchasing Managers Index (PMI), manufacturing in the US, Dec 2020 - July 2021



https://www.theglobaleconomy.com/USA/pmi_manufacturing/

Purchasing Managers Index (PMI), manufacturing in Euro area, Dec 2020 - July 2021

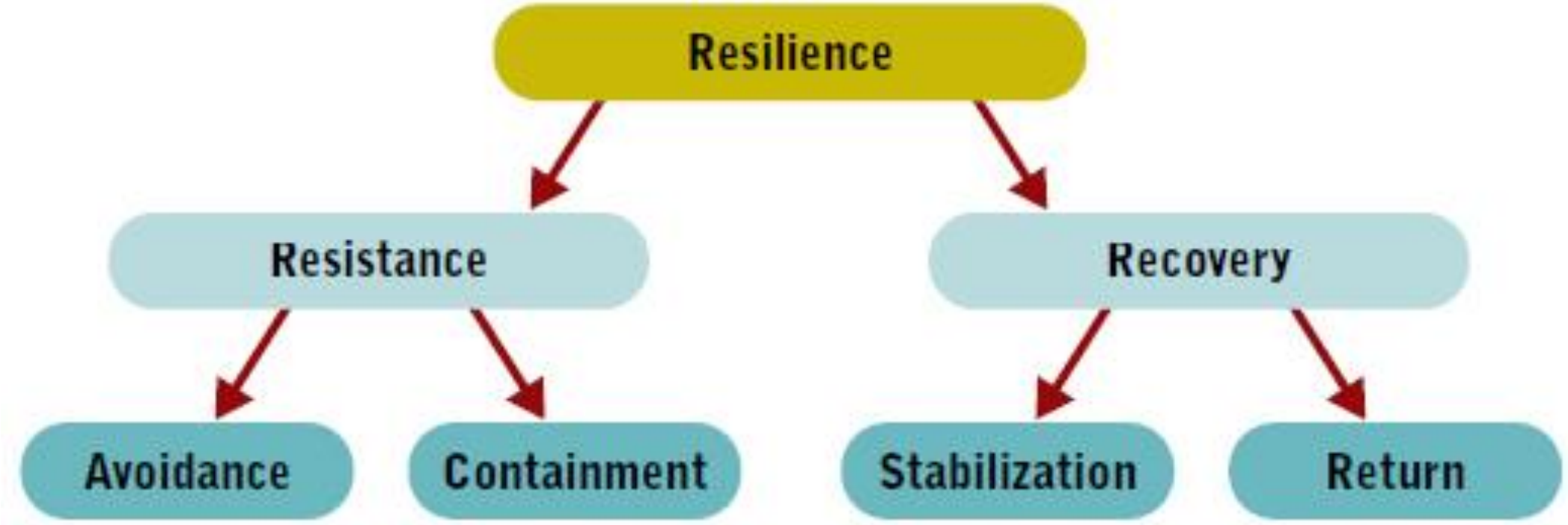


https://www.theglobaleconomy.com/Euro_area/pmi_manufacturing/

Pillars of Supply Chain Resilience

Supply Chain Resilience

"the ability of a supply chain to both resist disruptions and recover operational capability after disruptions occur."



Evade the impact entirely

Minimize time between disruption and the start of recovery

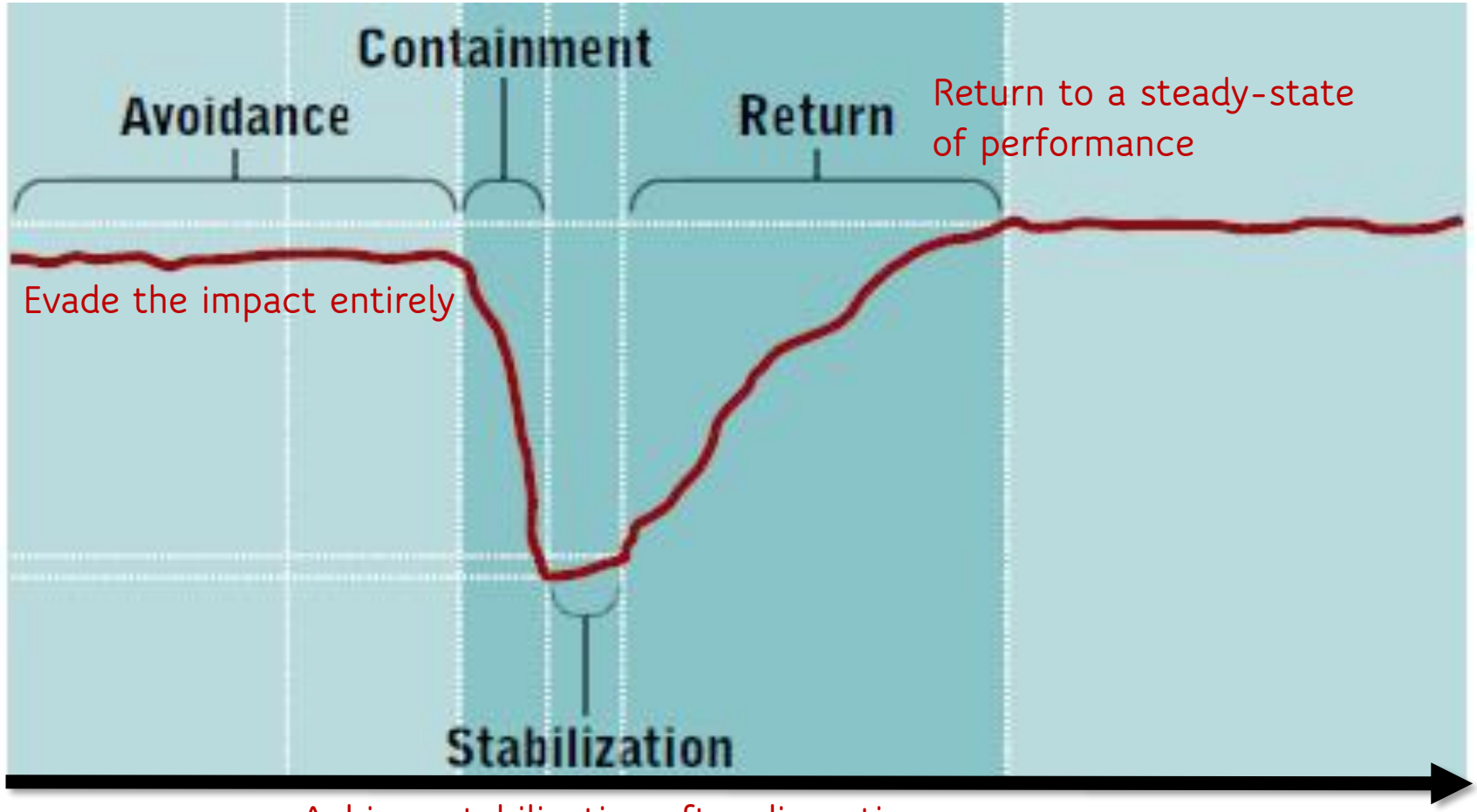
Achieve stabilization after disruption

Return to a steady-state of performance

https://www.supplychain247.com/article/understanding_supply_chain_resilience

The impact of a disruption over time

Minimize time between disruption and the start of recovery



Achieve stabilization after disruption

https://www.supplychain247.com/article/understanding_supply_chain_resilience

Increasing Ability to Absorb Shocks

Redesigning the Global Network

Achieve flexibility through selective applications of redundancy

- dual sourcing
- nearshoring
- vertical integration

Setting New Parameters for Supply Chain Buffers

Set new inventory targets in the supply chain's high-volatility nodes

Evaluate and adjust capacity utilization targets

Align order fulfillment strategies (whether "make to order" or "make to stock") to customer needs

Proactively Managing Suppliers

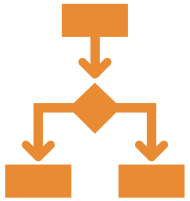
Assess the criticality of suppliers and adjust supplier relationships

Gain transparency into multiple tiers of suppliers

Gain visibility into the reliability of suppliers

https://mkt-bcg-com-public-pdfs.s3.amazonaws.com/prod/building-resilience-strategies-to-improve-supply-chain-resilience.pdf

Increasing Ability to React and Adjust



Managing the Multi-enterprise Supply Chain

Gain end-to-end transparency and enable collaboration

Apply AI systems to support adaptive decision making

Rapidly assess different scenarios

Actively Managing End-to-End Risk

Risk monitoring of suppliers, regions, finances, and cyber security

Gather new data sources and business intelligence to develop business continuity plans

Planning Based on Anticipation, Simulation, and Scenarios

Digital twins simulate the performance of the entire supply chain system

Apply scenario-based planning to understand the impact of multiple potential risks

https://mkt-bcg-com-public-pdfs.s3.amazonaws.com/prod/building-resilience-strategies-to-improve-supply-chain-resilience.pdf

Levers for Improving Resilience Across the Supply Chain

SOURCE: The supplier ecosystem

- Optimize inventory of raw materials and components
- Reallocate sourcing among existing suppliers in various locations
- Convince suppliers to shift production to alternative geographic areas
- Qualify new suppliers to increase diversification
- Procure from new suppliers in alternative geographic areas

MAKE: The manufacturing network

- Increase capacity and capabilities and existing factories to boost flexibility
- Qualify backup contract manufacturers in case of disruption
- Reshore or regionalize own manufacturing footprint
- Reconsider make versus buy strategy
- Explore investing in Industry 4.0 technologies to offset higher labor costs of relocation

DELIVER: Channels and customers

- Optimize inventory of finished goods to increase resilience
- Add new distribution partners
- Rethink transportation modalities mix (e.g., air versus ocean)
- Reconsider distribution strategy (e.g., outsource versus insource)
- Shift warehousing or distribution closer to end markets

https://web-assets.bcg.com/8d/6f/993b0da4424dac2931263f02df1c/bcg-designing-resilience-into-global-supply-chains-july-2020.pdf

Three Emerging Models for Adapting Supply Chains

Revised global supply chain

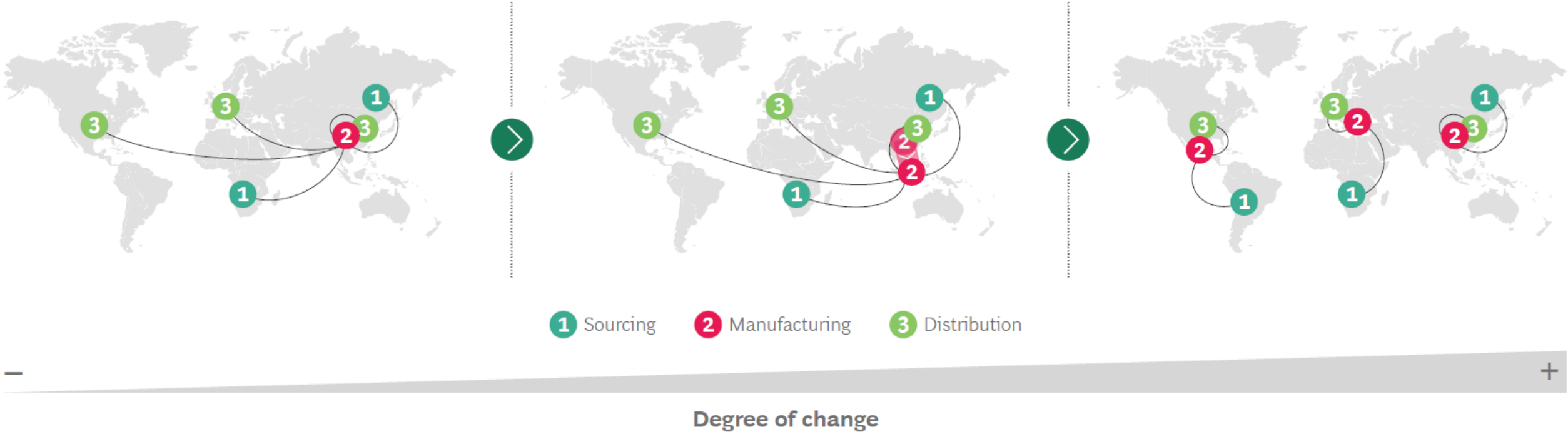
Limited changes are made to manufacturing footprint owing to cost and access constraints

Migrated supply chain

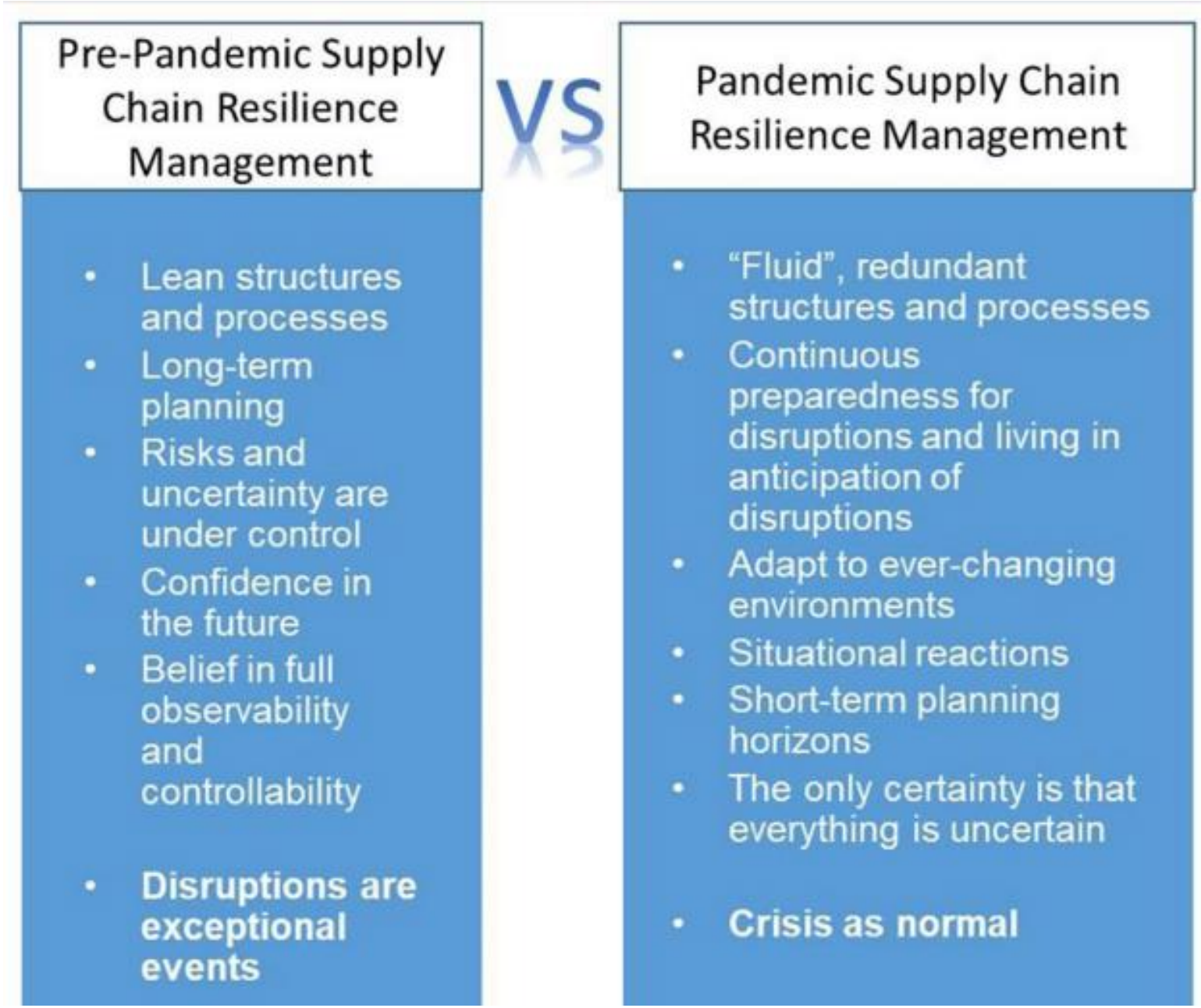
Manufacturing shifts to new locations in order to reduce exposure to geopolitical risk

Regionalized supply chain

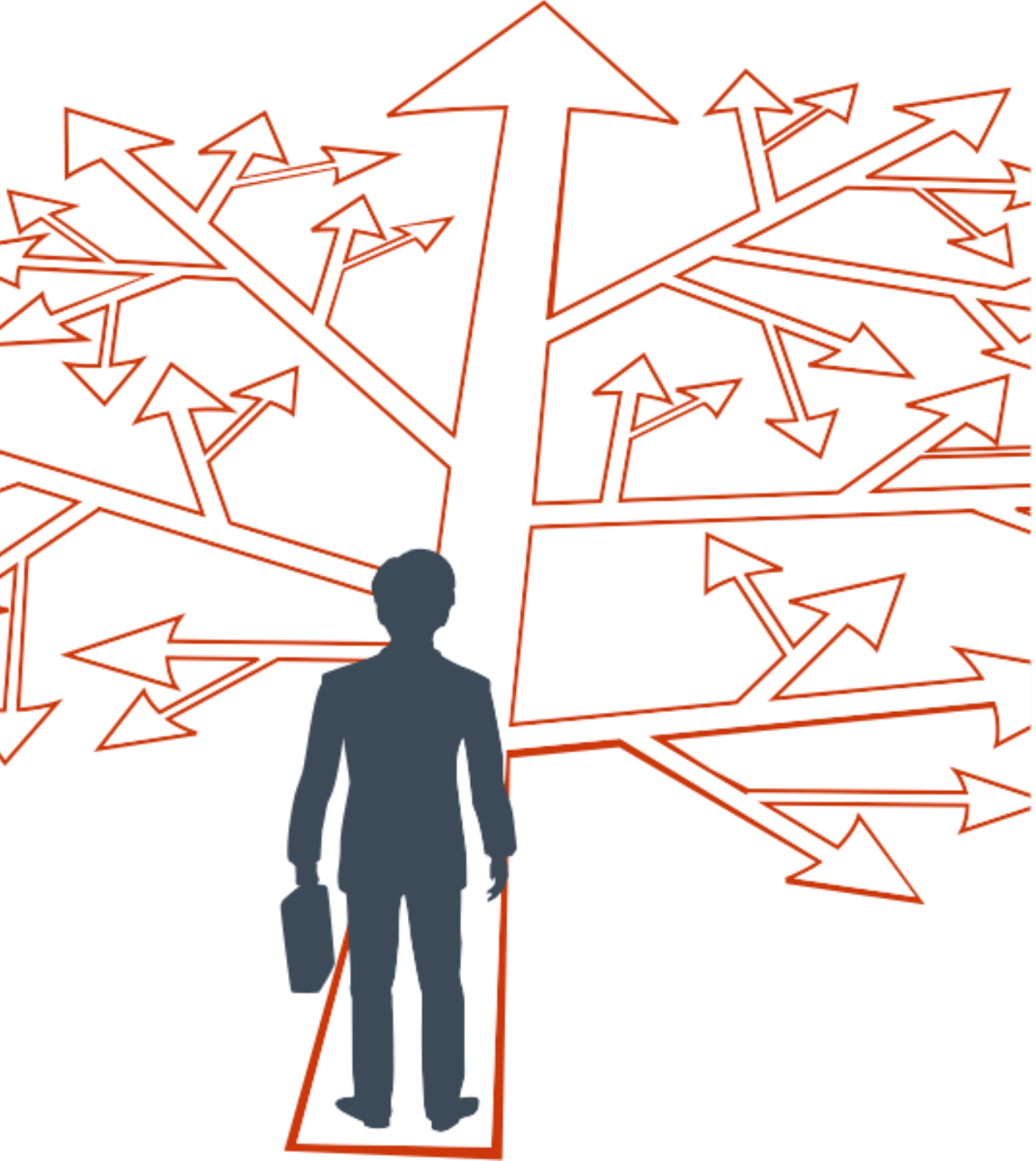
Production and sourcing move closer to end markets because of government policy



https://web-assets.bcg.com/8d/6f/993b0da4424dac2931263f02df1c/bcg-designing-resilience-into-global-supply-chains-july-2020.pdf

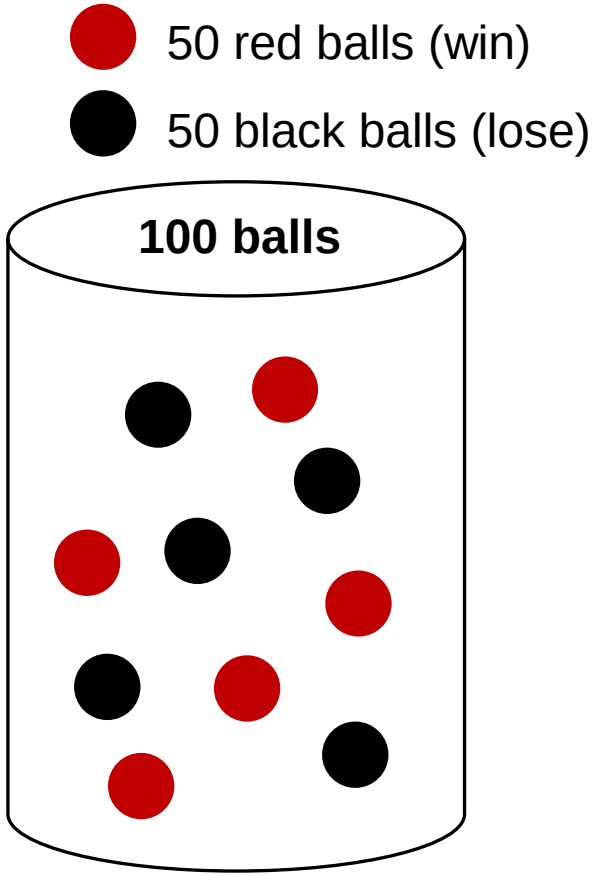


Ivanov and Dolgui (2021)

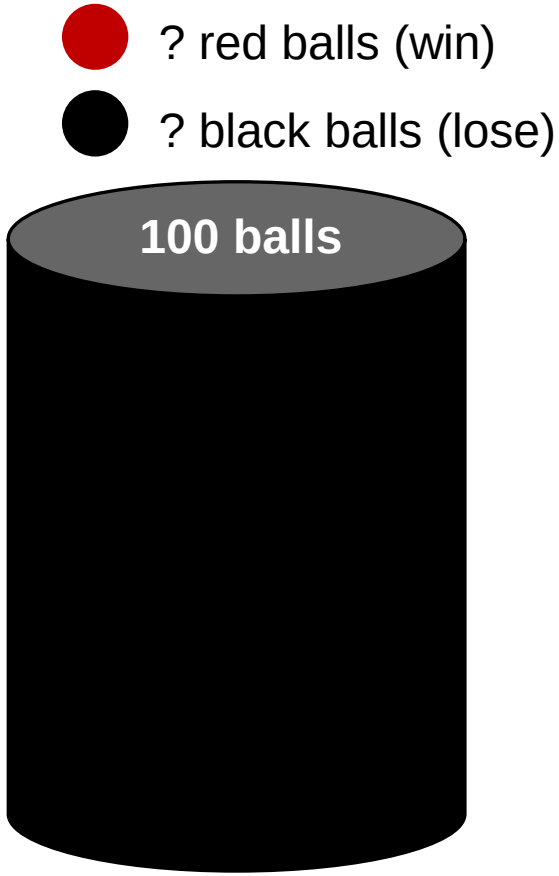


Decision-Making Under Uncertainty Versus Under Risk

Decision-Making Under Uncertainty Versus Under Risk



Container A



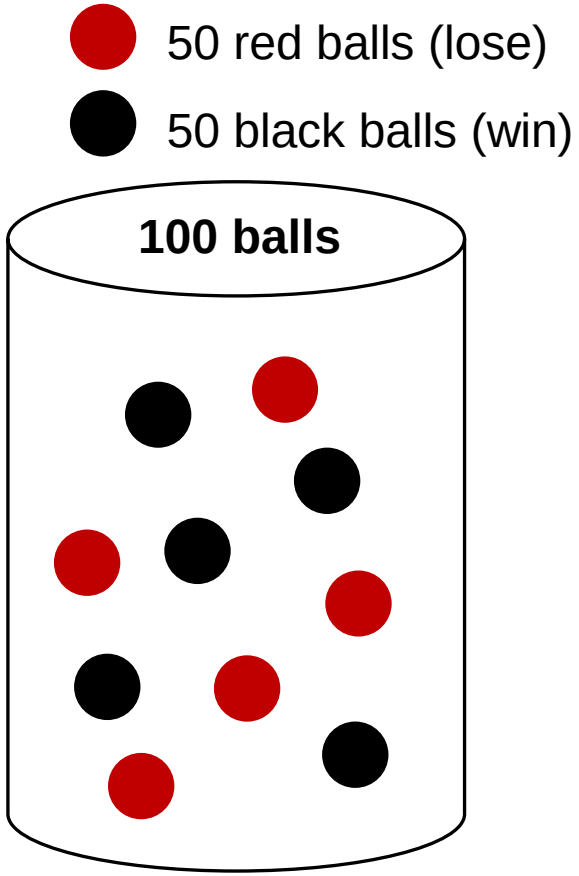
Container B

<u>The 1st decision</u>

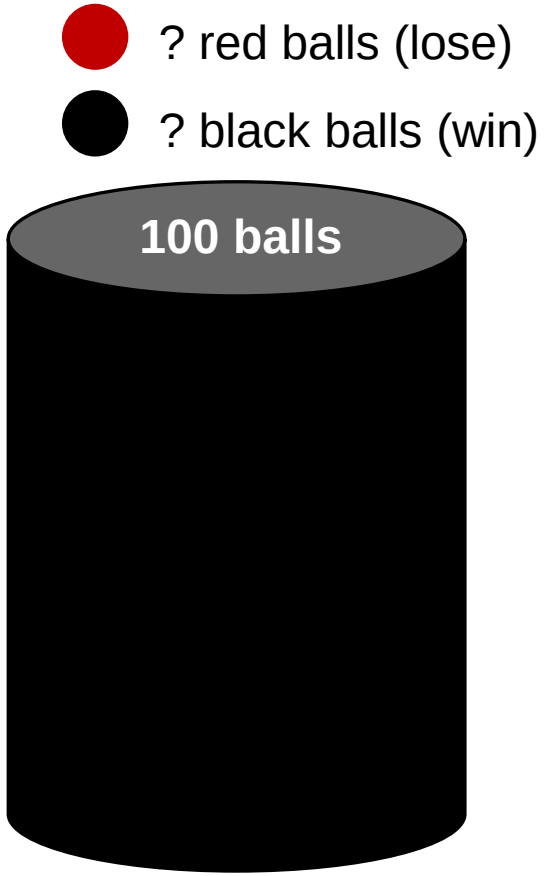
If you have drawn a red ball from the selected container, you win.

Which container will you draw a ball from? A or B

Decision-Making Under Uncertainty Versus Under Risk



Container A



Container B

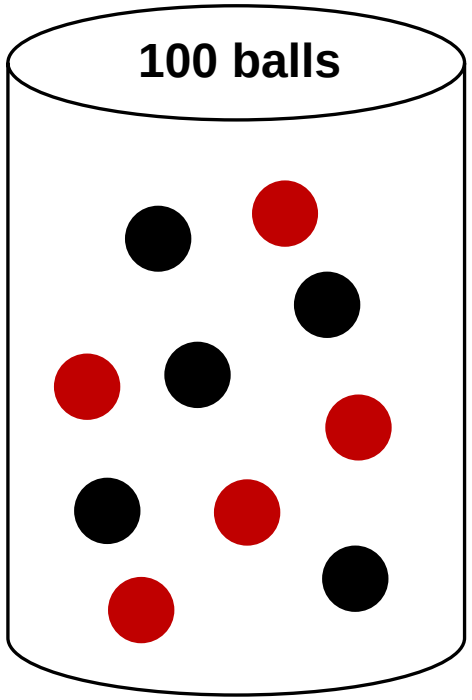
<u>The 2nd decision</u>

Everything remains unchanged, except if you have drawn a black ball from the selected container, you win.

Which container will you draw a ball from? A or B

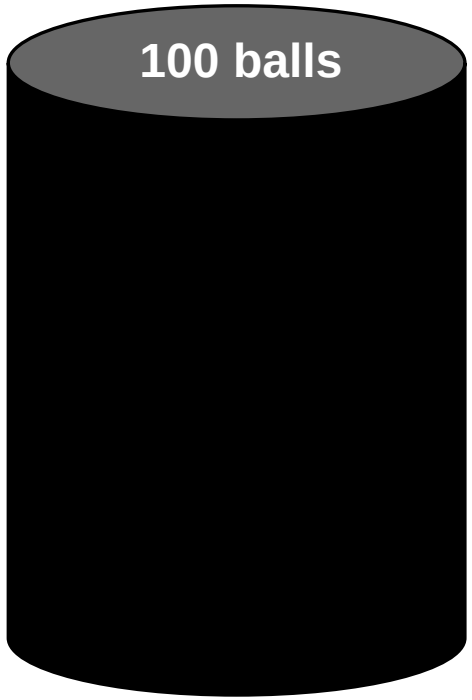
Decision-Making Under Uncertainty Versus Under Risk

Known probabilities



Container A

Unknown probabilities



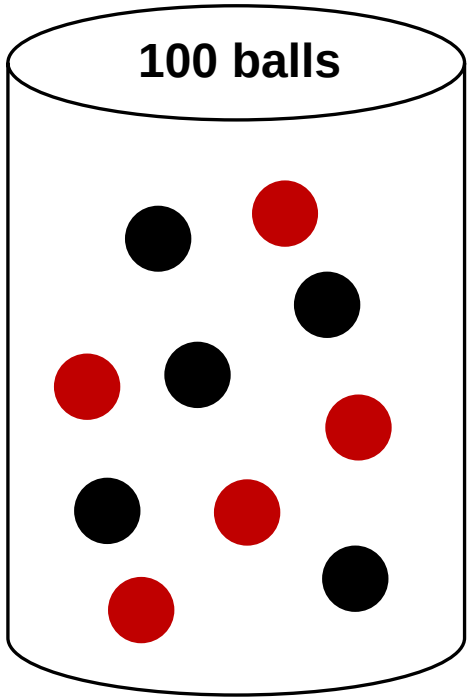
Container B

- For both decisions, most will select Container A because individuals prefer known probabilities over unknown probabilities.
- This experiment illustrates the Ellsberg paradox.

Decision-Making Under Uncertainty Versus Under Risk

50 red balls (win)

50 black balls (lose)

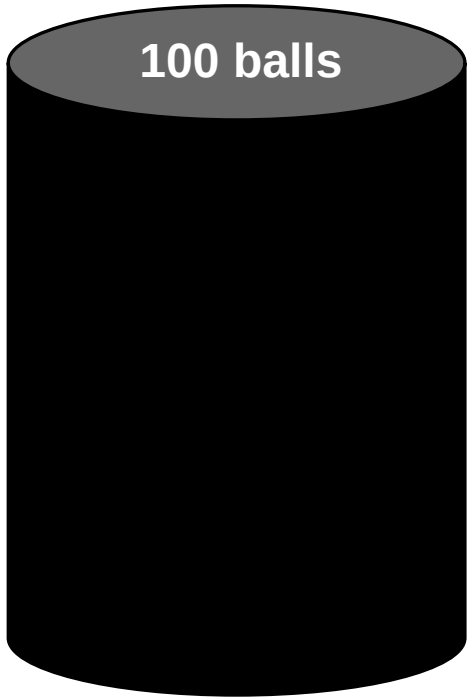


Container A

Assume that:

40 red balls (win)

60 black balls (lose)



Container B

The 1st decision

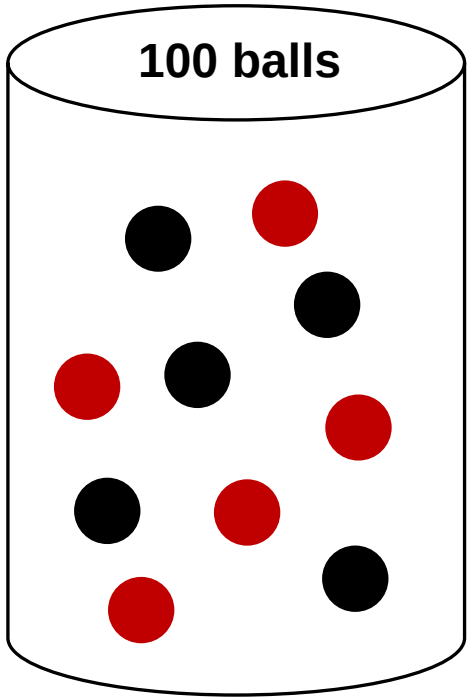
If you select container A, you have assumed that the number of red balls in Container B is smaller than 50.

Your chance of winning is higher.

Decision-Making Under Uncertainty Versus Under Risk

50 red balls (lose)

50 black balls (win)

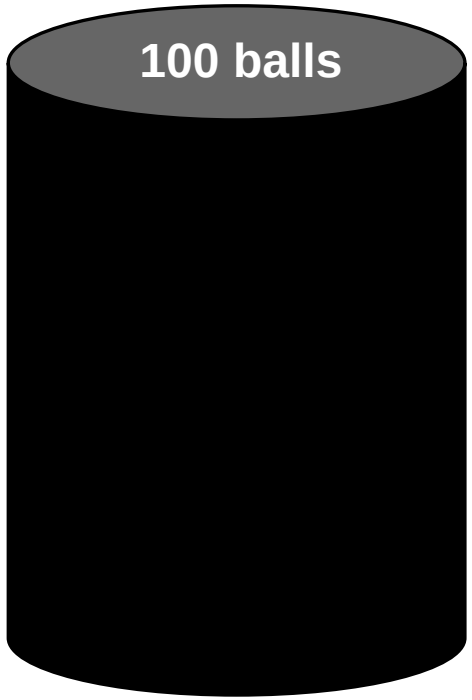


Container A

Assume that:

40 red balls (lose)

60 black balls (win)



Container B

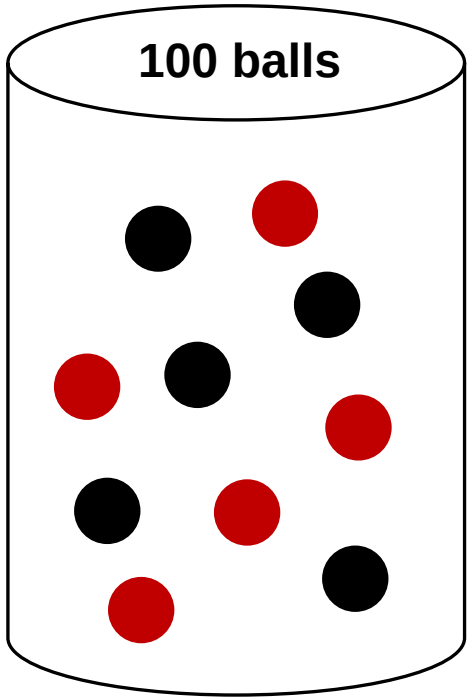
The 2nd decision

Based on the assumption you made, now you should have selected container B to increase the chance of winning.

Yet, you still stick to Container A. That is not rational!

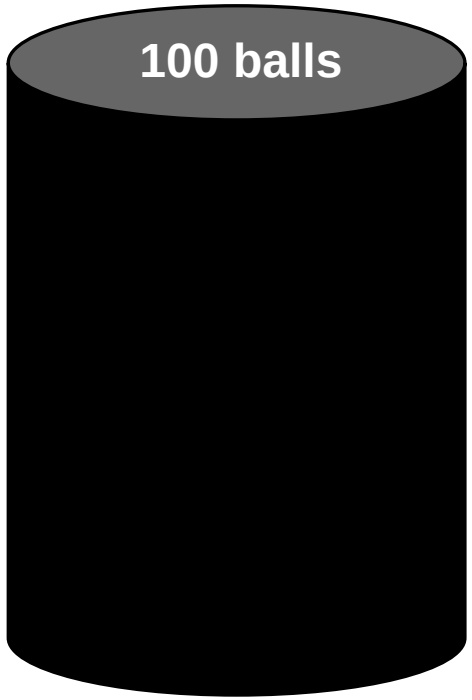
Decision-Making Under Uncertainty Versus Under Risk

Decision-Making Under Risk
The probability distribution governing the outcome is **known**.



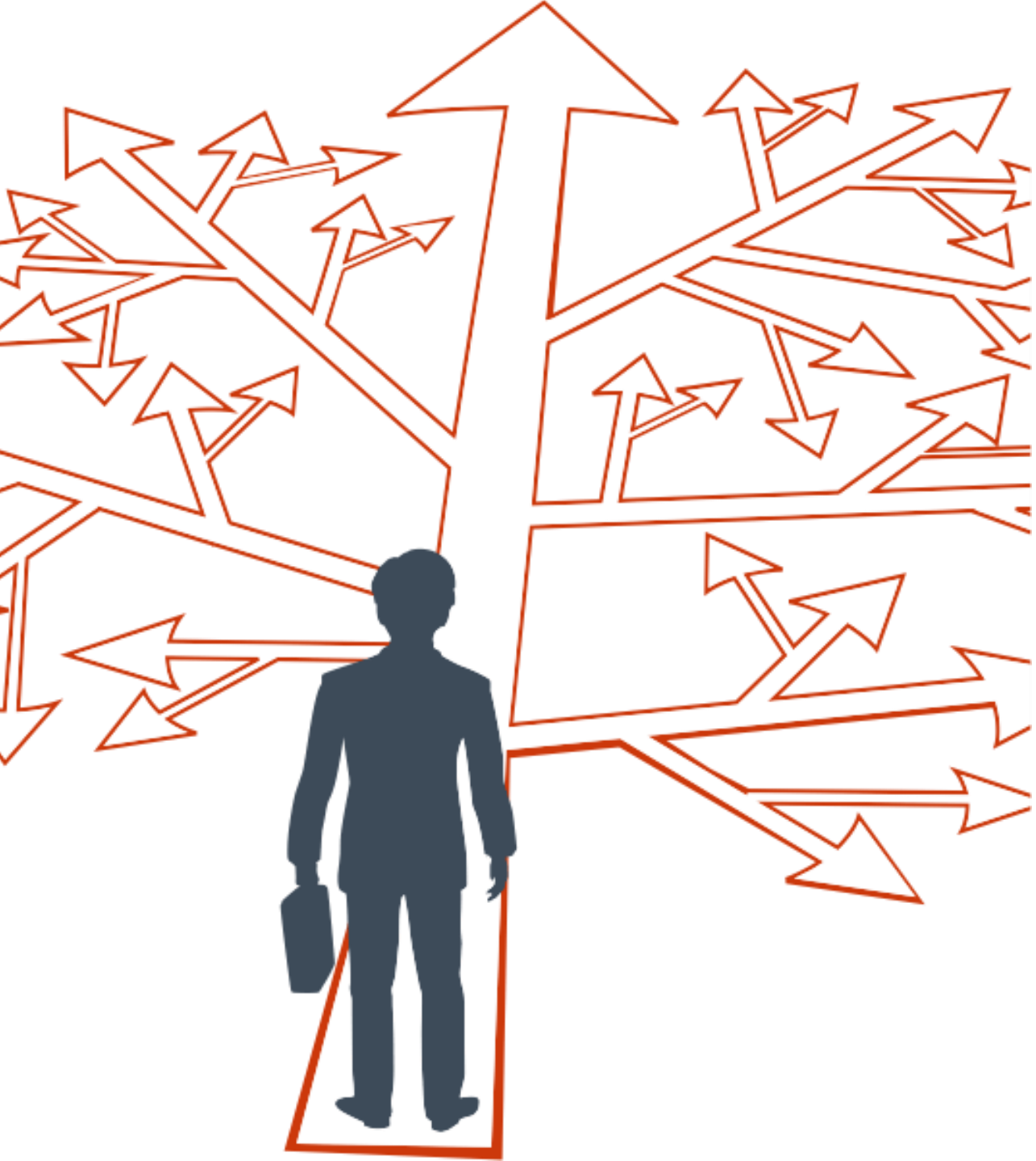
Container A

Decision-Making Under Uncertainty
The probability distribution governing the outcome is **unknown**.



Container B

- When asked to choose, individuals *prefer risk over uncertainty*.
- We often think we are making decisions under risk, but we live in the post-pandemic world full of uncertainty!



How to Make Better Decisions Under Uncertainty for Supply Chain Resilience?

Making Better Decisions Under Uncertainty for Supply Chain Resilience

Considering three potential disruptions and three possible strategies to follow. Their combination results in different payoffs (profit/loss). Which is the best strategy?

Strategy / Disruption	Port shutdown	Restricted business hours	Lockdown
1. Double inventory	220	150	-50
2. Dual sourcing	210	120	-20
3. Online sale	50	200	180

Decision Making Criterion: Maximin

A pessimist model for decision makers who are risk-averse (dislike risk) and seek to achieve the best result if the worst happens. Select the maximum of the minimum payoffs; i.e., the lesser of evils.

Strategy / Disruption	Port shutdown	Restricted business hours	Lockdown
1. Double inventory	220	150	**-50**
2. Dual sourcing	210	120	**-20**
3. Online sale	**50**	200	180

Select Online sale which has the largest payoff (50 > -20 > -50).

Decision Making Criterion: Maximax

An optimist model for decision makers who are risk-seeking and seek to achieve the best result if the best happens. Select the maximum of the maximum payoffs; i.e., the best among the best.

Strategy / Disruption	Port shutdown	Restricted business hours	Lockdown
1. Double inventory	**220**	150	-50
2. Dual sourcing	**210**	120	-20
3. Online sale	50	**200**	180

Select Double inventory which has the largest payoff (220 > 210 > 200).

Decision Making Criterion: Minimax Regret

A model for decision makers who are risk-neutral and seek to minimize the regret (opportunity loss) from making the wrong decision. Select the minimum of the maximum regrets.

Strategy / Disruption	Port shutdown	Restricted business hours	Lockdown
1. Double inventory	220	150	-50
2. Dual sourcing	210	120	-20
3. Online sale	50	200	180
1. Double inventory	220-220 = 0	200-150 = 50	180+50 = 230
2. Dual sourcing **Regrets**	220-210 = 10	200-120 = 80	180+20 = 200
3. Online sale	220-50 = 170	200-200 = 0	180-180 = 0

Decision Making Criterion: Minimax Regret

A model for decision makers who are risk-neutral and seek to minimize the regret (opportunity loss) from making the wrong decision. Select the minimum of the maximum regrets.

Strategy / Disruption	Port shutdown	Restricted business hours	Lockdown
1. Double inventory	220-220 = 0	200-150 = 50	180+50 = **230**
2. Dual sourcing **Regrets**	220-210 = 10	200-120 = **80**	180+20 = 200
3. Online sale	220-50 = **170**	200-200 = 0	180-180 = 0

Select Dual sourcing which has the smallest regret (80 < 170 < 230).

Making Better Decisions Under Uncertainty for Supply Chain Resilience

Which is the best strategy?
Different decision rules could give us different “best” decisions.

Decision Making Criterion	Best strategy
Maximax	1. Double inventory
Minimax Regret	2. Dual sourcing
Maximin	3. Online sale