CRITICAL ANALYSIS OF SEMICONDUCTOR SUPPLY CHAIN MANAGEMENT IN THE U.S. POST PANDEMIC

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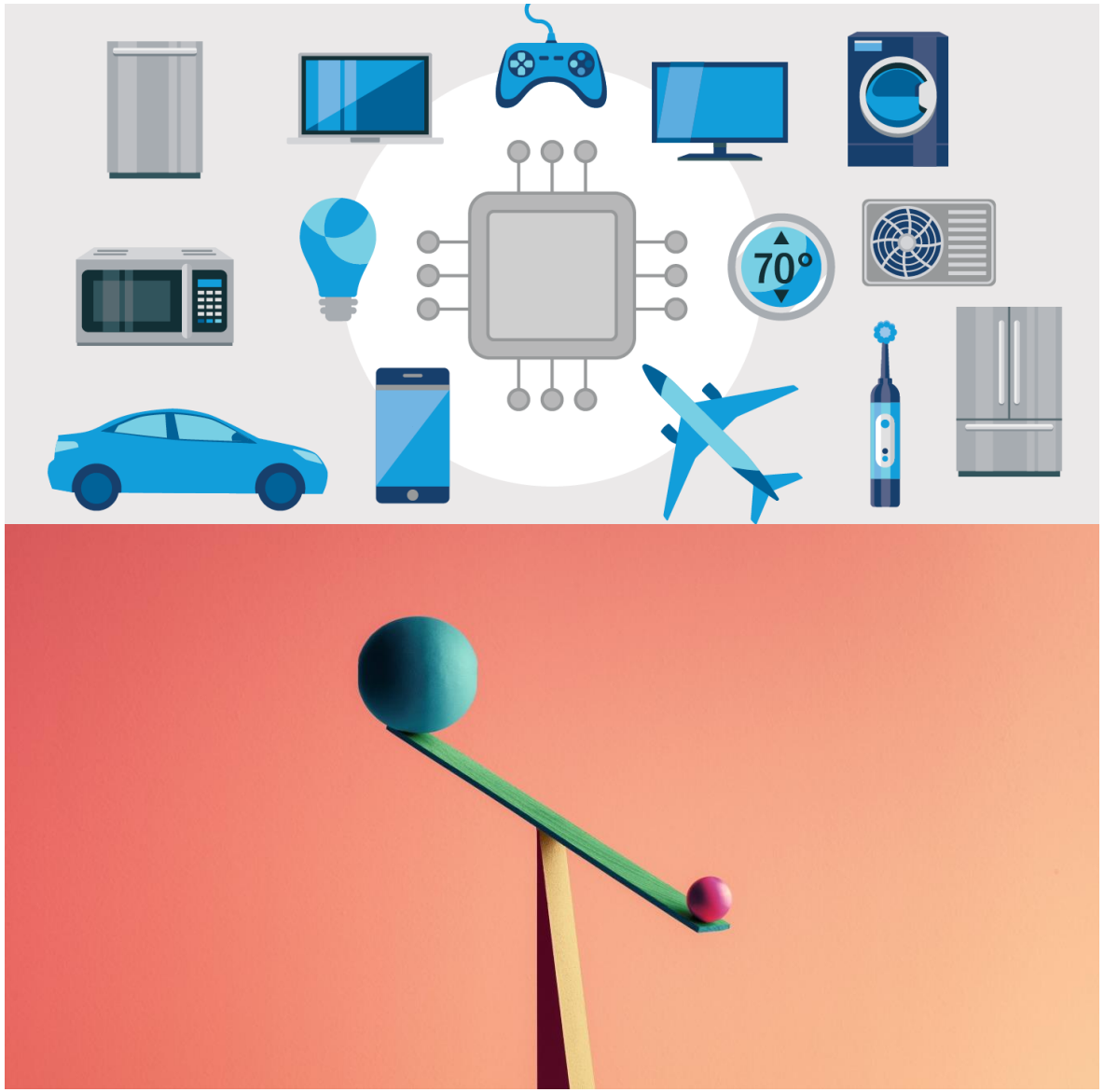
Contents



Introduction

- Semiconductors are the foundation of modern life and plays a vital role in enabling the world's technological shift.
- Since the stay-at-home legislatives, there has been an unanticipated rise in semiconductor demand,
- The U.S. holds flagship in technology sector but is currently facing turmoil due to the disruptions in the supply chain.

SOURCE: SEMICONDUCTOR INDUSTRY ASSOCIATION, SIA, 2021, ACCESSED ON 12/01/2022 AT 15:00.

REVIEW OF THE EFFECT OF COVID-19 ON THE AMERICAN SEMICONDUCTOR INDUSTRY SUPPLY CHAIN, 2020, ACCESSED ON 12/01/222 AT 15:10. HTTPS://WWW.COLUMBIATHREADNEEDLEUS.COM/BLOG/A-DEEP-DIVE-INTO-THE-GLOBAL-CHIP-SHORTAGE ACCESSED ON 12/01/2022 AT 18:25

Semiconductor Supply Chain

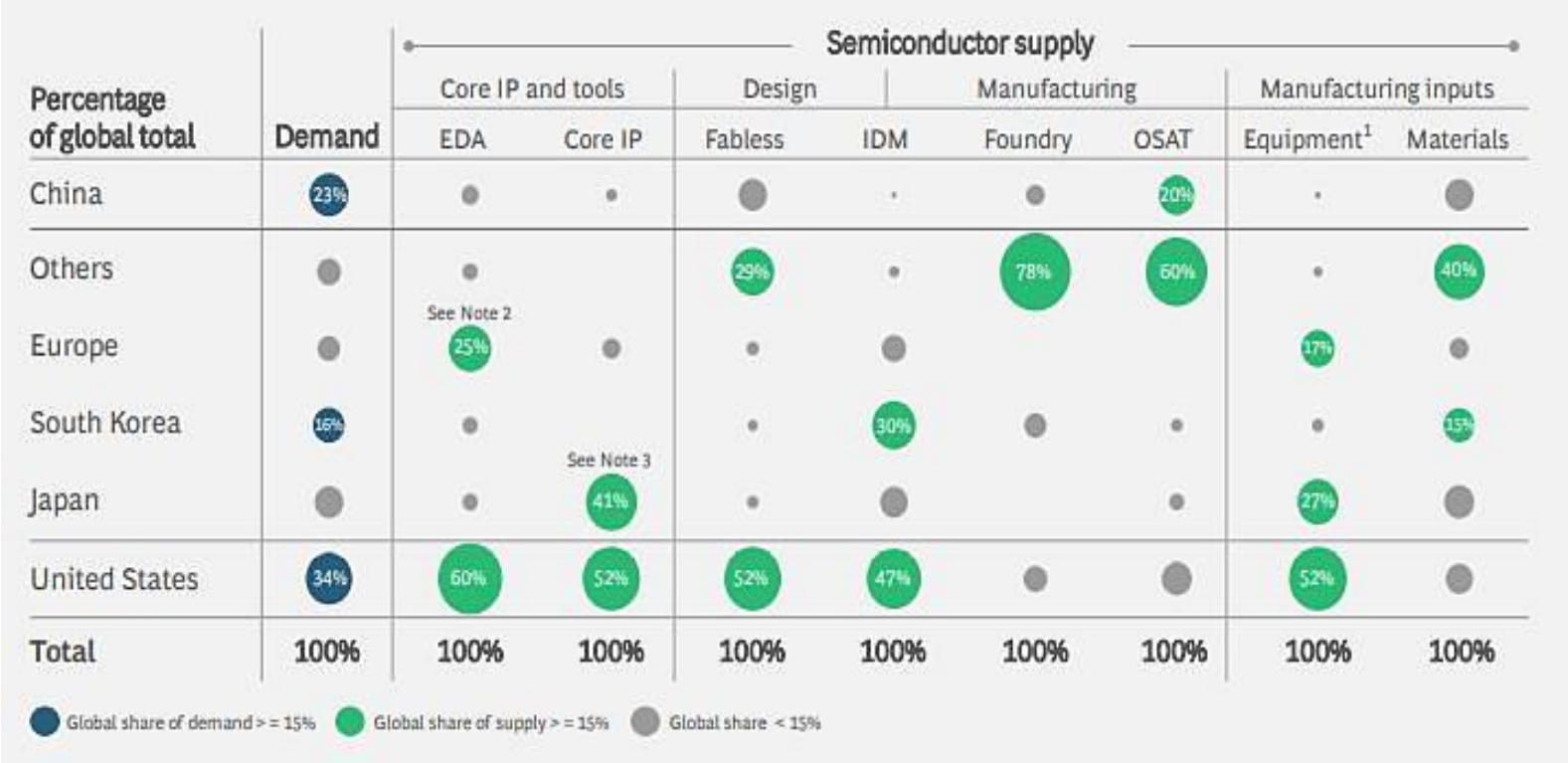
- 1000 production steps
- crosses borders 70 times
- 3 full trips
- 100 days

The transportation costs of the semiconductors are very less as compared to the value provided by them.

Source: An Allied Approach to Semiconductor Leadership, 2020, https://itif.org/publications/2020/09/17/allied-approach-semiconductor-leadership Accessed on 12/01/2022 at 15:12.

U.S. Positioning in Semiconductor Supply Chain

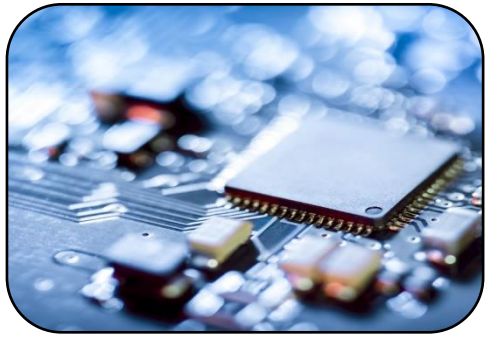
- Design
- Fabrication
- Assembly, Test & Packaging
- Materials
- Tools & Equipment



- The U.S. is world leader in semiconductor design and equipment, but relies on foreign countries for certain materials, manufacturing, assembling, and testing.
- The semiconductor manufacturing has dropped from 37% of the global total in 1990 to 12% in 2021.

Source: 100-Day Reviews under Executive Order 14017, Building Resilient Supply Chain, Revitalizing American Manufacturing, and Fostering Broad-Based Growth, June 2021, accessed on 12/01/2022 at 16:02.
Boston Consultancy Group, How Restrictions To Trade With China Could End US Leadership In Semiconductors, accessed on 12/01/2021 at 16:05.

Impact of COVID-19



Shortage of Chips due to the imbalance

PC & consumer electronics: nearly $442 billion in retail sales revenue

Inflation of goods: Automobiles

U.S. National Security at **Risk**

Source: https://www.barrettdistribution.com/consumer-electronics-fulfillment Accessed on 12/01/2022 at 16:12.

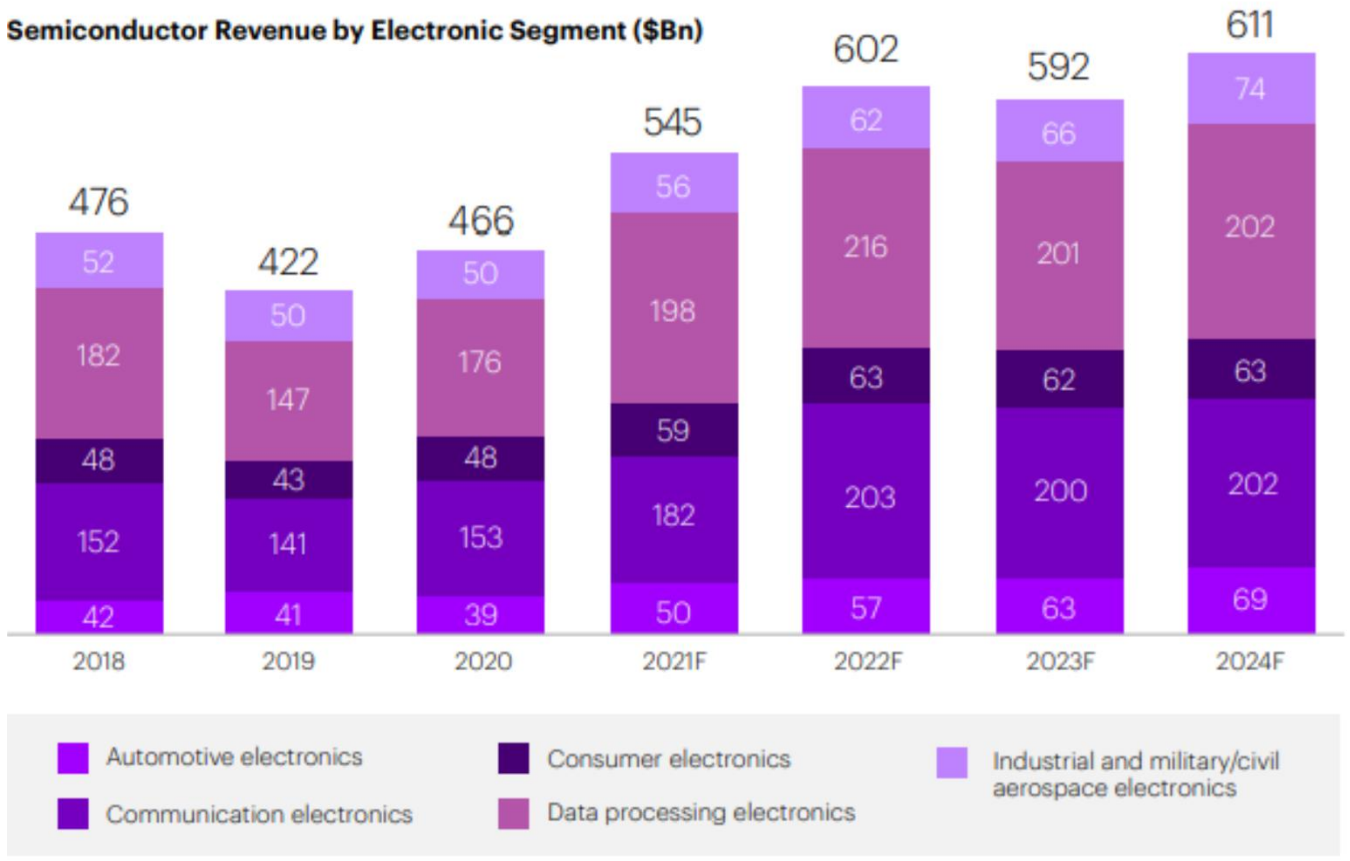
Semiconductor Demand Drivers

End Use Category	Computer	Communication	Consumer	Industrial	Automotive	Government
Annual Growth	21.2	1.2	-3.0	8.2	-0.3	-11.8
Total Value ($B)	142.2	137.6	53.0	52.9	50.1	4.6

- End-use demand 2020.
- The end-use sale of semiconductors experienced significant unexpected shifts across all the categories throughout 2020.
- In the first half of 2021, strong growth has been observed in end market sales across all the categories.

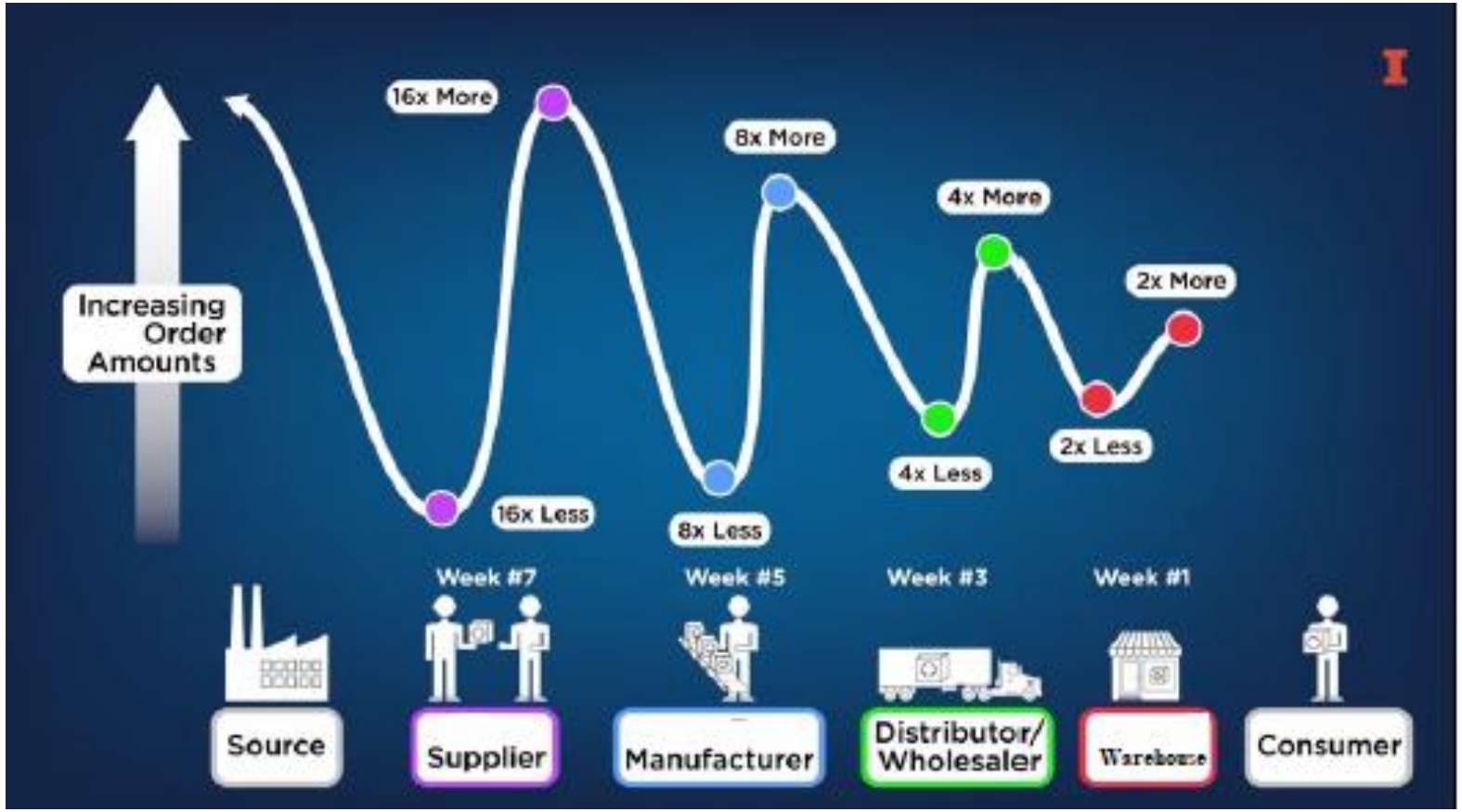
Source: Semiconductor Industry Association, SIA, 2021, accessed on 12/01/2022 at 18:45

Semiconductor Revenue



Source: Gartner (Semiconductor Forecast Database, Worldwide, 1Q20 Update and 1Q21 Update), accessed on 10/01/2022 at 14:54

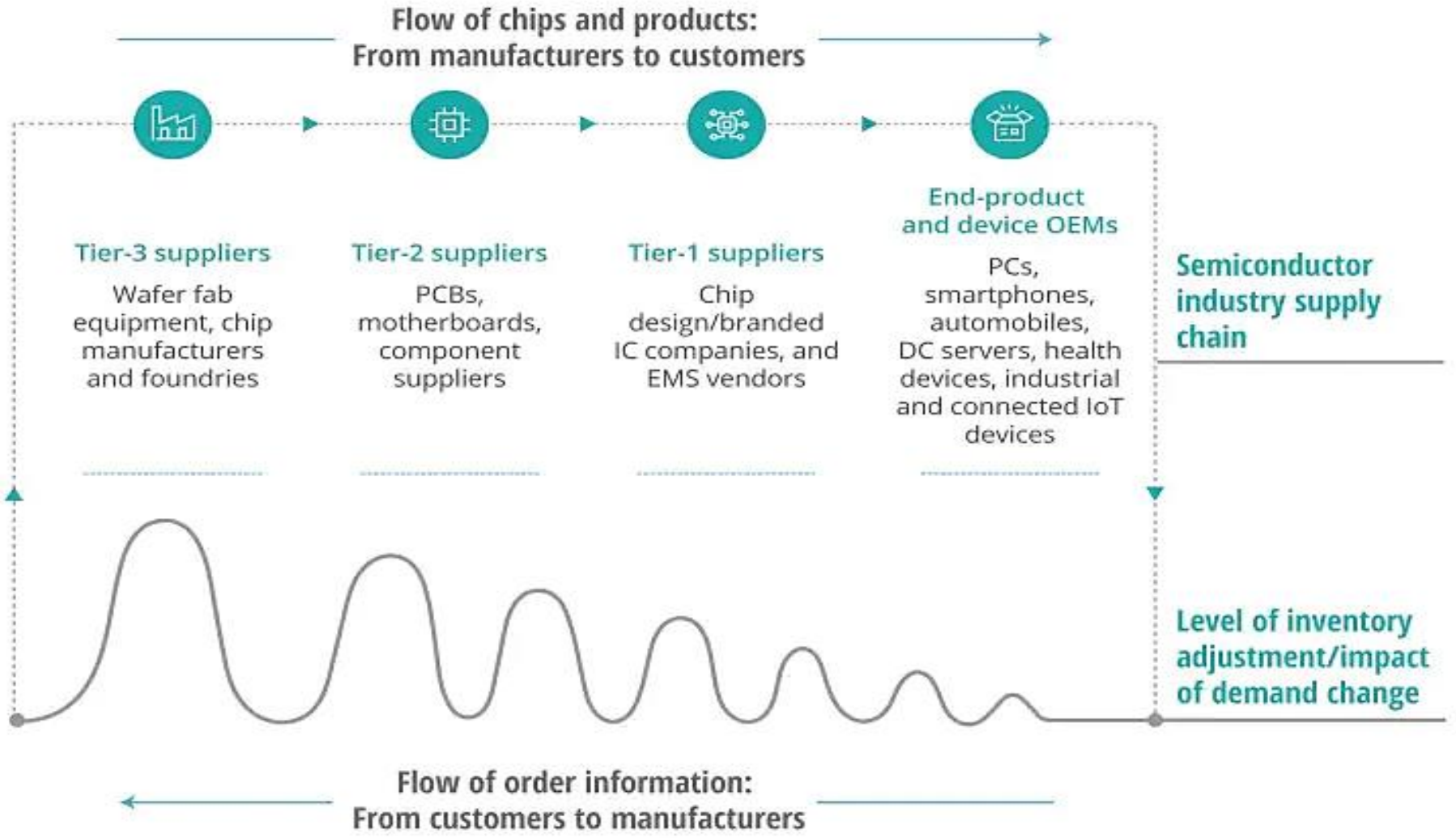
BullWhip Effect: Semiconductor Supply Chain



- Global Production Network
- Unstable demand & supply

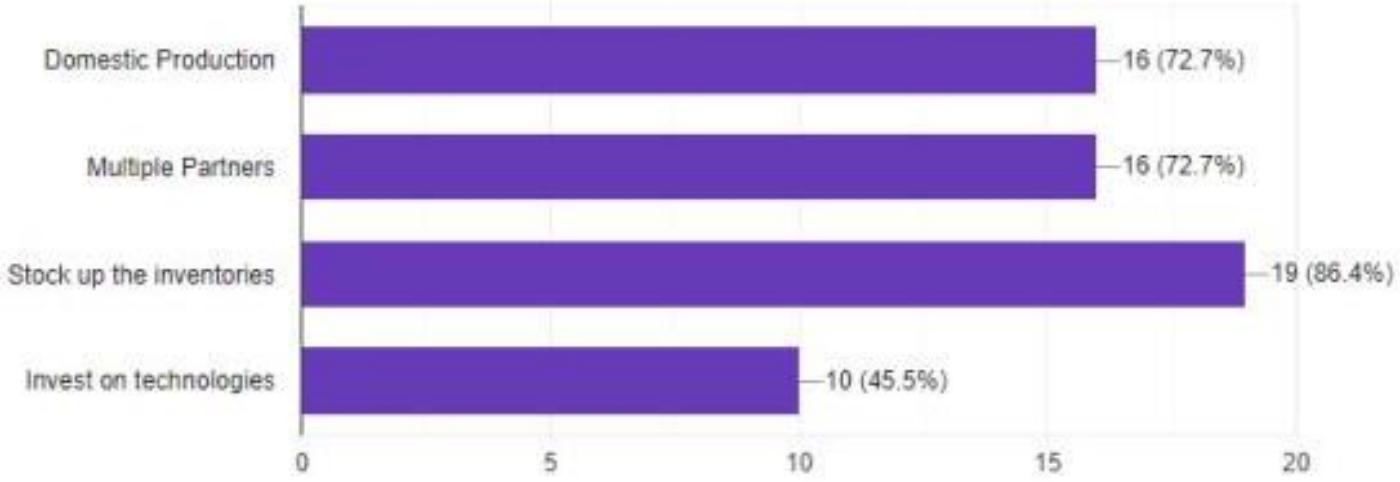
Source: Scott, Nehemiah: Managing Supply Chain Disruption During COVID-19 2021 accessed on 12/01/2022 at 19:20.

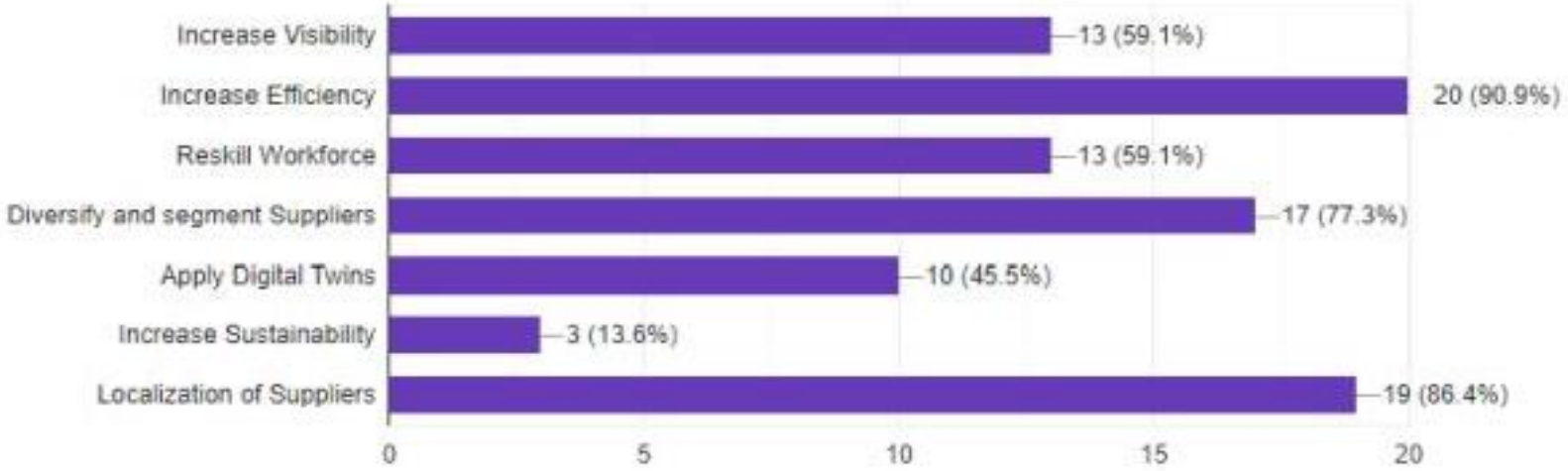
BullWhip Effect: Semiconductor Supply Chain



Source: Dan Hamling Chris Richard Duncan Stewart Karthik Ramachandran, Five fixes for the semiconductor chip shortage, Deloitte Insights, 6 Dec 2021, accessed on 13.01.2022 at 15:24, source: https://www2.deloitte.com/xe/en/insights/industry/technology/semiconductor-supply-chain-solutions.html accessed on 13/01/2022 at 14:15.

Survey Results





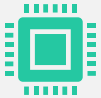
22 — Number of respondents in the U.S. were surveyed

86% — Respondents feel the need to stock up the inventories

90% — Increased efficiency

Survey link, https://forms.gle/vg9119p8cEKnpF679

Building Resilient Supply Chain



Bain & Co. has put forward some strategies to cope up with ongoing Semiconductor shortage: Adaptability, Redundancy & Real-time feedback.

In Adaptability, focus is to make product flexible in terms of components.

Redundancy, where company need to maintain inventory and purchase from multiple vendors.

Real-time feedback helps to monitor possible failure points in a supply chain via heat maps.

Source: peter hanbury and anne hoecker, "two lessons the chip shortage taught us about supply chains", bain & company, 20 september 2021, accessed on 09/01/2022 at 17:10

Building Resilient Supply Chain

Digital Twin, Digital twins will help assess risks associated with Operations & Finances with respect to disruptions in the market.

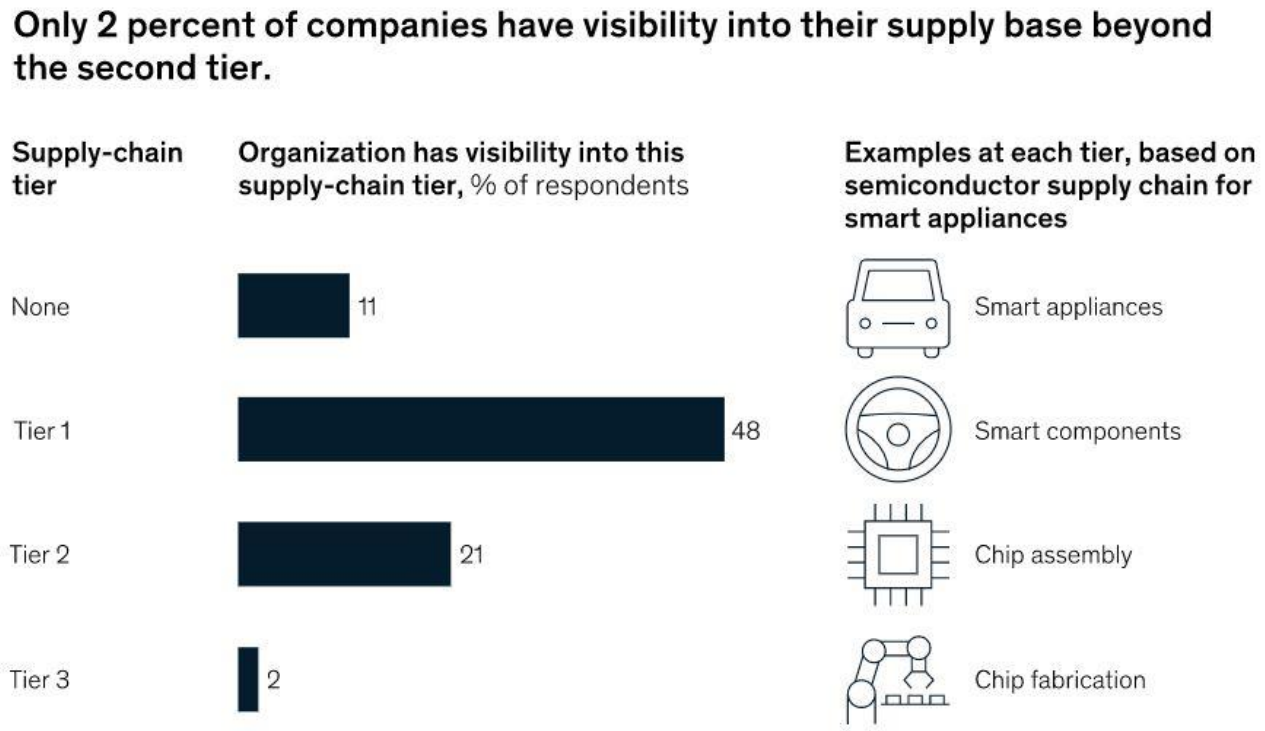
Time ’s up for just-in-time

Digital Supply Chain, can help us redesign the traditional supply chains into an integrated & connected supply chain by focusing on all tiers of suppliers.

Source: Syed F. Alam, Steve Craen, Jolie LeBlanc, vanessa naik ,"building resiliency in Semiconductor supply chains", Accenture report 2021, accessed on 11/01/2022 at 16:40

Risk Management

- Mckinsy states that actions taken for risk management of supply chain for any company is directly proportional to the maturity of their supply-chain risk-management capabilities.



Source: Knut Alicke, Ed Barriball, and Vera Trautwein, How COVID-19 is reshaping supply chains, Mckinsey & Company, Nov 2021, accessed on 10.01.2022 at 01:57

Key Considerations for Major Players

Action	Chipmakers	Distributors	Customers	Governments
Build overall capacity	✓			✓
Build local capacity	✓			✓
Become strategically lean		✓	✓	
Break the bullwhip	✓	✓	✓	✓
Digital transformation	✓	✓	✓	

All the steps are not needed to be completed by all the players involved.

Source: Dan Hamling Chris Richard Duncan Stewart Karthik Ramachandran, Five fixes for the semiconductor chip shortage, Deloitte, 6 dec 2021, accessed on 10.01.2022 at 19:30

U.S. Semiconductor Innovation Policy Landscape

Invest in U.S. Semiconductor Leadership

Strengthen America's Technology Workforce

Promote Free Trade and Protect IP

Cooperate Closely with Like-Minded Economies

Source: Semiconductor Industry Association, SIA, 2021, accessed on 12/01/2022 at 21:00

Conclusion

- The pandemic has disrupted the semiconductor supply chain globally.
- The chip shortage has highlighted how susceptible the supply chain is, and it has forced the companies in this sector to reconsider and transform its global supply chain model.
- To break the Bullwhip effect, all the players involved in the sector need to coordinate and work in close cooperation to come out of this semiconductor's shortage circle.
- The U.S. government has produced number of innovation policies to remain leaders in the Semiconductor sector.