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NAVIGATING THE GLOBAL SEMICONDUCTOR INDUSTRY

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Executive Summary

Covid-19 supply chain changes have prompted the global semiconductor industry to confront new challenges. These issues could cost IT, healthcare, and automotive production significantly. Due to a global semiconductor shortage, the semiconductor ecosystem must be improved. The semiconductor shortfall and significant demand surge between 2020 and 2022 destabilised the global economy. Semiconductor shortages could affect many businesses beyond economics. Aerospace, defence, energy, and vital infrastructure are some examples. This policy brief examines semiconductor supply chain difficulties and proposes policy remedies. Effective legislative measures are needed to ensure this crucial endeavor's long-term success. Modern sophisticated economies depend on the semiconductor industry, which fuels smartphones and high-tech transportation systems. Supply chain concerns and the COVID-19 epidemic have made the business increasingly vulnerable in recent years. This document discusses semiconductor supply chain issues and India, China, Vietnam, and the US's remedies. These nations' policies affect global trade, technical leadership, and economic stability.

Context And Importance

The global IT sector relies on semiconductors. The industry is extremely globalised, with considerable international trade. Semiconductor availability is linked to new technology development and economic growth in many nations. From R&D to production to retail, the semiconductor industry has supply chain difficulties. Supply chain disruptions can occur at any of these points, affecting the firm and downstream sectors. Global companies and suppliers often collaborate to overcome these difficulties. COVID-19 has disrupted global supply chains. International trade lockdowns, restrictions, and disturbances have delayed and slowed the semiconductor industry. The outbreak would affect the industry regionally. International relations help overcome these challenges. Countries must cooperate to maintain the semiconductor supply chain. Diplomatic initiatives, trade pacts, and other negotiations can reduce tensions and promote

international cooperation. The semiconductor sector is also heavily influenced by geopolitics[1]. Trade conflicts, export limitations, and technology competition can affect industry dynamics. Geopolitical considerations may affect international diplomacy and relations. The use of semiconductors in several industries, including national defence, makes them a "strategic asset." Thus, the semiconductor sector may threaten national security in some nations. These concerns might motivate diplomatic attempts to protect international interests. Intellectual property and technology transfer are key to semiconductor industry international relations. International trade disputes and diplomatic negotiations are possible. Covid-19, geopolitical upheaval, and increased semiconductor demand have interrupted the company's supply channels. Disruptions have caused delays, shortages, and price hikes in global trade. The semiconductor industry is vulnerable to outside pressures due to its complexity and few market leaders. Electronics consumption has surged due to telecommuting and online education after the COVID-19 pandemic[2]. If one values national security, economic growth, and science, they should not underestimate the semiconductor sector. Thus, fixing these supply chain issues is vital to the global economy and society.

[1] Ishak, S., Shaharudin, M. R., Salim, N. A. M., Zainoddin, A. I., & Deng, Z. (2023). The effect of supply chain adaptive strategies during the COVID-19 pandemic on firm performance in Malaysia's semiconductor industries. *Global Journal of Flexible Systems Management*, 1-20.

[2] Cai, M., & Luo, J. (2020). Influence of COVID-19 on manufacturing industry and corresponding countermeasures from supply chain perspective. *Journal of Shanghai Jiaotong University (Science)*, *25*, 409-416.

Critique Of Policy Option(s)

Geopolitics and technological growth combine in the global semiconductor sector, making its complex supply chain vulnerable to international relations and technology. The COVID-19 epidemic has damaged firms and supply networks worldwide, revealing industry vulnerabilities. Semiconductor manufacturing is a diplomatic concern as states fight for technical dominance. The US and China are investing heavily in semiconductor production to reduce their dependence on foreign suppliers. The global power balance may alter. As the semiconductor sector develops autonomous, trade, intellectual property, and national security issues have complicated international ties[3]. To survive these risks, the global semiconductor supply chain must balance collaboration and national interests. To solve these problems, international cooperation, open regulation, and safe technology diffusion are needed. While fighting COVID-19, governments must unite to prepare for global semiconductor manufacture.

Problems with Semiconductor Supply Chains

A. Global Dependence: Semiconductor supply chains must be global. Conflict and natural disasters can disrupt businesses due to worldwide material and component procurement.

B. COVID-19: The pandemic undermined the supply chain. Chip shortages and delays in numerous industries were caused by lockouts, factory closures, and foreign travel restrictions.

[3] Cai, M., & Luo, J. (2020). Influence of COVID-19 on manufacturing industry and corresponding countermeasures from supply chain perspective. *Journal of Shanghai Jiaotong University (Science)*, *25*, 409-416.

The Indian Semiconductor Industry

A. Rising American Manufacturing India knows semiconductor production's value. Semiconductor manufactures and R&D were targeted by "Make in India".

B. International Cooperation India wants to work with Japan and the US to improve its technology and semiconductor supply.

The Chinese semiconductor industry

A. Financially Risky Bet: China has extensively invested in semiconductors to minimise imports. The "Made in China 2025" plan prioritises Chinese chipmaking.

B. Global Conflict: The US and other governments worry about China's semiconductor ambitions, causing trade disagreements and technology export bans.

Vietnam's Semiconductor Industry

A. Obtaining Foreign Investment: Vietnam dominates chip manufacturing, attracting foreign investment. Location, talent, and government policy make the country a semiconductor leader.

B. : Supply Chain Diversification: Vietnam's supply chain diversification makes it a weatherproof alternative industrial option[4].

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[4] Mohammed, A., & Khan, S. A. (2022, June). Global Disruption of Semiconductor Supply Chains During COVID-19: An Evaluation of Leading Causal Factors. In *International Manufacturing Science*

Policy Alternatives in Context of International Relations

Global semiconductor sector concerns can be addressed by the following policy recommendations:

1. Create an International Semiconductor Forum to address security issues in the semiconductor sector. This group aims to promote best practises and foster collaboration on R&D projects.

2. Assistance Research and Development: Budgetary assistance for R&D activities that boost manufacturing capacity and remove outdated fabrication facilities is essential. Strategic semiconductor manufacturing R&D spending is necessary to achieve this goal[5].

3. Encourage Domestic manufacture: Implement tax incentives and other incentives to boost domestic semiconductor manufacture. To enhance the supply chain and preserve jobs, this plan was created.

4. Encourage Industry Collaboration: To reduce supplier dependence, semiconductor businesses must collaborate on supply chain risk assessments and contingency plans.

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and Engineering Conference (Vol. 85819, p. V002T06A011). American Society of Mechanical Engineers.

[5] Mohammad, W., Elomri, A., & Kerbache, L. (2022). The Global Semiconductor Chip Shortage: Causes, Implications, and Potential Remedies. *IFAC-PapersOnLine*, *55*(10), 476-483.

5. Invest in Education and Workforce Development: The semiconductor business requires a trained workforce through educational programmes and workforce development efforts for long-term success**.**

In order for the industry to keep making substantial contributions to global technical breakthroughs, the proposed policy adjustments are intended to ensure its resilience and continuation. Key actors, such as India, China, Vietnam, and the United States, have taken strategic measures in response to supply chain issues and the effects of Covid-19 in the global semiconductor industry[6]. These policies have far-reaching effects on international relations as a result of their effects on economic dependence, technical leadership, and the dynamics of global trade. Geopolitics and technology are intertwined, as evidenced by the semiconductor industry's demands for collaboration, risk management, and self-sufficiency. In the face of these challenges, the future of the sector and its impact on the global economy will be determined by the ability of nations to achieve a balance between competitiveness and collaboration.

[6] Raudheiding, R. (2023). Comparative Analysis of European Supply Chains Security Regarding East Asia and North American Trade.

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3. Mohammed, A., & Khan, S. A. (2022, June). Global Disruption of Semiconductor Supply Chains During COVID-19: An Evaluation of Leading Causal Factors. In *International Manufacturing Science and Engineering Conference* (Vol. 85819, p. V002T06A011). American Society of Mechanical Engineers.
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