
THE GEOPOLITICS OF THE GLOBAL CHIP WAR: SANCTIONS, RARE EARTH MINERALS, AND INDIA'S SEMICONDUCTOR MISSION

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ABSTRACT

Technological sovereignty has transformed the core paradigms of global statecraft, shifting classical conflicts over physical geography into highly contested digital and material supply vulnerabilities. This article explores the systemic intersection of international trade law, national security sanctions, and resource nationalism within the global semiconductor ecosystem. Focusing primarily on the structural rivalry between the United States and the People's Republic of China, it examines how the weaponization of advanced microchip exports and semiconductor lithography restrictions is met with corresponding resource blockades on critical rare earth minerals, specifically Gallium and Germanium. In response to this bilateral decoupling, India has positioned its strategic landscape through the India Semiconductor Mission (ISM) to transition from an downstream assembling outpost to an independent commercial chip design and manufacturing hub. This paper outlines the cross-border legal challenges, structural interdependence, and a modular framework designed to introduce academic curricula to modern techno-nationalism.

KEYWORDS: Semiconductor Geopolitics, US Export Restrictions, Rare Earth Minerals, India Semiconductor Mission, Weaponized Interdependence, Technology Law.

1. INTRODUCTION

Technological advancement has significantly reshaped the way states assert geopolitical authority and protect their sovereign jurisdictions. In the contemporary global order,

advanced microchips—or semiconductors—have emerged as the definitive resource underlying both absolute military dominance and advanced commercial enterprise. Ranging from foundational consumer computing units to hyper-complex artificial intelligence arrays and modern guiding systems, semiconductors represent the structural neurons of global civilization. Consequently, control over their supply vectors has shifted from a matter of commercial trade logic to a core imperative of national security statecraft.

Historically, classical geopolitics focused heavily on fixed territorial control, maritime shipping pathways, and hydrocarbon reserves. However, the contemporary landscape demonstrates a clear paradigm shift toward 'techno-nationalism'—a framework where a country's sovereignty and competitive advantage are directly derived from its domestic innovation indices and technological monopolies. This article analyzes the intense legal and resource friction generated by the United States' targeted tech sanction architectures against China, the subsequent retaliation via rare earth mineral resource blocks, and India's comprehensive mission to carve out strategic autonomy within this highly weaponized value network.

2. The Weaponization of Export Regulations and Sanctions

The primary mechanism of modern hegemonic containment relies on international trade enforcement and export control protocols. In October 2022, the United States Bureau of Industry and Security (BIS) enacted historic updates to the Export Administration Regulations (EAR), placing structural embargoes on advanced computing microchips, semiconductor manufacturing equipment, and transactional technology links to specific foreign entities, principally within the People's Republic of China. Rather than deploying military force, these legal tools effectively cut off access to global fabricators that rely on American intellectual property or design components.

This targeted action exemplifies the strategic concept of 'weaponized interdependence.' In highly centralized networks, states that command core structural physical hubs can exploit asymmetric dependencies to impose severe operational costs on global rivals. By restricting access to extreme ultraviolet (EUV) lithography equipment and banning high-end graphics processing units (GPUs), the United States has constructed a comprehensive regulatory perimeter to freeze its competitor's domestic technological capabilities below critical advanced nodes.

3. Resource Nationalism: Rare Earth Mineral Retaliation

A major limitation of high-technology containment strategies is the intense material dependence on upstream mineral elements. Fabricating high-frequency microchips, optoelectronic systems, and defense electronics requires specialized chemical inputs that are highly concentrated geographically. Recognizing this critical leverage point, China has systematically weaponized its domestic dominance over upstream elements. In mid-2023, China's Ministry of Commerce instituted strict licensing mandates over Gallium and Germanium—two vital structural elements used globally in next-generation high-power semiconductors and radar arrays.

This shift marks a significant return to resource nationalism. By restricting foundational chemical compounds, nations with supply monopolies can impose real costs downstream, effectively bypassing finished-product sanctions. As a result, the semiconductor supply chain is split into fragmented territorial spheres, introducing major resource insecurity across global commercial tech sectors.

4. Strategic Positioning of Major Actors

To clarify the current friction points, the matrix below details the structural advantages, primary legal vulnerabilities, and overarching strategic goals defining the foreign policy profiles of the United States, China, and India:

Nation	Strategic Capability	Core Primary Vulnerability	Supply Geopolitical Objective
United States	Monopoly over advanced software tools (EDA), chip architecture IP, and key equipment design.	Dependence on East Asian physical fabrication facilities (TSMC, Taiwan) and mineral suppliers.	Isolate adversaries from computing hardware, secure supply lines, and onshore manufacturing.
China	Dominance over upstream processing of rare earth elements (Gallium, Germanium) and packaging operations.	Lack of native extreme ultraviolet (EUV) manufacturing tooling and advanced lithography software.	Achieve complete structural decoupling, scale trailing nodes, and break technology blockades.
India	Massive technical workforce, world-class chip design hubs, and strong state capital incentives.	Absence of operational domestic manufacturing fabs and heavy reliance on imported raw components.	Establish indigenous chip fabs, achieve commercial tech autonomy, and secure a place in global supply chains.

5. India's Semiconductor Mission (ISM) and Indigenous Wafer Fabrication

Recognizing the strategic vulnerabilities of high import dependence, India has systematically initiated its own comprehensive technological sovereignty path. Launched under an

institutional capital outlay of

■ 76,000 crore, the India Semiconductor Mission (ISM) serves as the core policy framework guiding the establishment of sustainable domestic fab ecosystems. While India has traditionally excelled in the upstream phases of silicon architecture—boasting a massive global engineering workforce handling complex chip design—it lacked the physical fabrication architecture to independently build commercial silicon chips.

This landscape is undergoing direct evolution via massive state co-investments and collaborative joint ventures. Under updated policy guidelines, key commercial developments in regions such as Dholera and Sanand in Gujarat, along with new projects in Morigaon, Assam, are creating concrete manufacturing foundations. By partnering with leading international electronics firms, India is intentionally bypassing standard downstream packaging (ATMP/OSAT) pipelines to establish full commercial wafer fabrication capabilities. The goal is to build long-term defense autonomy, protect vital electronics networks, and shield its growing digital economy from external geopolitical supply shocks.

6. Instructional Syllabus Module

To translate these modern supply chain conflicts into clear academic curricula for syllabus students, the following three-module structure outlines the instructional path, analytical focus areas, and core learning milestones:

Module 1: The Regulatory Architecture of Techno-Nationalism: Focuses on export controls, EAR regulations, and the entity list as strategic legal tools. Students will analyze the mechanics of the 2022 BIS mandates and the legal boundaries of extraterritorial jurisdiction.

Module 2: The Geography of Resource Monopolies: Examines mineral choke points, rare earth logistics, and the material limits of high-tech industries. Topics include mapping global Gallium and Germanium extractions, and the environmental and spatial realities of chemical processing plants.

Module 3: India's Path to Technological Sovereignty: Investigates the India Semiconductor Mission, joint-venture corporate law, and the transition toward domestic wafer fabrication. Focus centers on policy incentives, technology transfers, and the legal hurdles of cross-border IP licensing.

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7. CONCLUSION

The ongoing global chip war demonstrates that while software operates across borderless digital systems, its foundation remains firmly bound to physical geographical realities,

mineral access, and clear sovereign borders. For modern students of law and international strategy, understanding the tech supply chain is no longer just a technical focus—it is essential to understanding the future of global power. By building domestic wafer capabilities under the India Semiconductor Mission, India is moving beyond dependency, ensuring its strategic autonomy stands resilient against future technology blockades.

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