

# **The Double-Edged Sword: Political Measures and Indigenous Technological Innovation**

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## **Abstract**

In a mutually connected world, indigenous technology innovation is a key driver of national prosperity, which is deeply affected by political measures. This essay investigates how sanctions, trade wars, tariffs and domestic industrial policy encourage and impede local technical advancement. While limits and conflicts of trade can, in violation of self-confidence, they often give rise to large economic costs and risk insulation. The tariff, “to protect the infant industry,” often leads to decency. Conversely, well-designed domestic industrial policy, by fostering national innovation systems and investing in human capital, can promote innovation, even if it confronts difficulties such as price demand. This essay claims that lasting innovation requires a holistic approach: Balanced strategic protection with global involvement, prioritizes basic investments and cultivates a social culture that encourages learning and adaptability, ensuring that technology supports human wellbeing.

## **Introduction**

In today's interconnected world, technological innovation is crucial for the countrywide economic system, security, and competitiveness (Aghion et al.). Governments actively interfere to form their tempo and trajectory, pushed by using targets of national protection, economic sovereignty, or global management. These interventions occur as economic sanctions, trade wars, tariffs, and domestic industrial policies (Mazzucato; Chang). Indigenous innovation, characterized as the creation and application of novel methodologies utilizing local resources and research and development inside a nation, frequently serves as a strategic response to external pressures or the pursuit of self-sufficiency (Autio et al. 1790–1805). This essay systematically examines the complex and paradoxical ways these political measurements can both accelerate and impede indigenous technological innovation, drawing on economic theories and real-world case studies.

## **The dual impact of economic sanctions on innovation**

Economic sanctions have complex impacts on innovations to limit the country's economic activities (Hufbauer et al.). Sanctions present substantial difficulties by limiting access to foreign technologies, components and expert knowledge (Parsi). This influences academic and industrial advancement, which prevents disturbance chain disorders and R&D inserts (Parsi). For example, US sanctions against Iran Banned Technology Exports (Parsi) and Russia's post-2022 insulating Knowledge transfer (IISD). Macroeconomic results such as currency evaluation, inflation and R&D financing (Afshari 581–597) in the future are likely to lead to technical obsolescence.

Paradoxically, sanctions can drive targeted nations to self-sufficiency (Afshari 581–597). It forces the “needs-driven innovation” (Mohammadpour et al.) in local R&D and production (Kim). Despite sanctions, Iran's military, nuclear and missile technology sectors have grown

(Afshari 581–597), and Cuba has created its own COVID-19 vaccines under embargo (Feinberg). Similarly, US sanctions on semiconductor and 5G regions in China undermine China's self-related driving force, exemplified by Huawei's Kirin 9000s chip (Segal). This illustrates the contradiction of sanctions as an unanticipated innovation accelerator, as external pressure technology causes an immediate internal desire for self-reliance. The effect is also sector-specific, as governmental support (Afshari 581–597) is obtained with vital areas like as defense and AI.

### **Trade wars: disrupting global chains, forcing domestic drives**

Trade wars, characterized by protectionist policies (Irwin; Bown), often escalate beyond economic concerns (Bown). Trade wars introduce unpredictability, reducing business investment and long-term planning (Amiti et al. 187–210). The U.S.-China trade war has been seen as an “Innovation Winter” due to its impact on global collaboration. Trade wars also impede knowledge flow, leading to “technological decoupling” (Segal) and making domestic high-tech goods uncompetitive (Amiti et al. 187–210).

Trade wars can compel companies to reshore or nearshore manufacturing to avoid tariffs (Fajgelbaum et al. 5; Hortaçsu and Syverson), creating domestic jobs. To mitigate rising costs, companies may increase domestic R&D to develop efficient, integrated solutions (Fajgelbaum et al. 5). Businesses are also forced to diversify supplier bases, fostering new partnerships and export markets (Fajgelbaum et al. 4; Hortaçsu and Syverson). The US-China trade war inadvertently spurred China's AI development and semiconductor self-sufficiency (Segal; Lian and Liu; Kim), and the US CHIPS Act reflects a similar strategic move (Bown). This highlights the geopolitical imperative of technological self-reliance, where national security drives investment in domestic development, even at higher costs (Segal; Bown), potentially leading to a “more paranoid world” (Segal). A ripple effect on global innovation

ecosystems also creates opportunities for third parties, as companies diversify supply chains away from conflict zones (Bown; Kim).

### **Tariffs: protection, costs, and innovation incentives**

Tariffs, taxes on imported goods (Irwin; Bown), are a primary tool of protectionism. Tariffs directly increase the cost of imported materials and components (Fajgelbaum et al. 3; Bown; Furman and Russ), leading to higher prices and inflation (Bown; Furman and Russ). This reduces domestic manufacturers' export competitiveness (Amiti et al. 187–210). By shielding domestic industries from foreign competition, tariffs can reduce the pressure to innovate and improve efficiency (Chang; Furman and Russ), leading to complacency and stagnation. They can also distort markets, misallocate capital and stifle economic dynamism (Rodrik). Economists often dismiss tariffs as “blunt, outdated tools”. The Smoot-Hawley Tariff Act of 1930, intended to protect American jobs, instead exacerbated the Great Depression by plummeting world trade and stifling innovation (Bown; Irwin).

Tariffs can provide temporary protection for “infant industries,” allowing them time to develop and become globally competitive (Irwin; Chang). This economic concept posits that fledgling domestic industries need temporary shelter to achieve economies of scale and accumulate know-how. By increasing import costs, tariffs incentivize investment in domestic industries (Fajgelbaum et al. 3). Strategically targeted tariffs, combined with complementary industrial policies, can also encourage R&D investment in specific domestic technologies (Chang; Aghion et al.).

A crucial consideration is the tension between the “infant industry” argument and long-term complacency. While initial protection can be beneficial, it can foster complacency if not coupled with strict performance targets and sunset clauses, leading to inefficiency and reduced R&D (Chang; Irwin). Tariffs alone are often a symptom, not a cure, for deeper

industrial challenges (Bown; Furman and Russ), failing to address fundamental issues like insufficient R&D or outdated processes (Lian and Liu).

### **Domestic industrial policies for directing and fostering innovation**

Industrial policy refers to active government involvement meant to foster indigenous technical innovation (Mazzucato). Governments give substantial financial incentives such as R&D supplements and tax credit (Mazzucato; Aghion et al.). Investment in education and training is vital for the development of human capital (Aghion et al; Nelson and Winter). Politics can guide strategic resources for high-potential industries (e.g., AI, semiconductors) to enable “leapfrogging” (Chang; Lee and Lim). Governments encourage the National Innovation System (NIS) by establishing relationships between research institutes, universities and the corporate sector (Lundvall), and gain from public procurement (Mazzucato) to make demands. Stories of success include MITI (Chang) from Japan, the semiconductor sector in the South Korea (Kim; Chang; Lee and Lim) and China’s “Made in China 2025” initiative.

Industrial policies can distort market efficiency, leading to overproduction and misallocation of resources (Chang), and “deadweight loss” (Arrow 609–626). A significant challenge is the “picking winners” problem (Chang; Mazzucato), leading to misallocation. Policies are susceptible to political influence and rent-seeking (Chang), directing support to inefficient firms. India’s “Atmanirbhar Bharat” initiative, for example, has lagged due to fragmented infrastructure and bureaucratic inertia (Mukherjee). Entrenched policies can become fossilized, hindering adaptability (Lee and Lim), and countries can get trapped in a “middle-innovation trap” (Lee and Lim).

A key principle for success is the imperative of a “learning society” (Greenwald and Stiglitz), emphasizing continuous adaptation and learning (Nelson and Winter; Lee and Lim).

Successful industrial policy is a dynamic “discovery process” (Rodrik) that fosters continuous learning and institutional capacity. Another important aspect is the dual role of manufacturing as an “innovation commons,” providing a tangible platform for prototyping and refining new technologies (Lee and Lim).

### **Cross-cutting factors and systemic considerations**

The success of political measurement in encouraging indigenous people’s technical inventions is profoundly related to wide systemic issues. NIS is a comprehensive structure of institutions, policies and conditions that will develop and spread knowledge in a country (Lundvall). A well-working NIS with strong linkages between government, business, universities and financial institutions is crucial for attracting economic development and talent (Lundvall). The success depends on the synergy and trust-based linkages (Lundvall).

Human capital is vital for collective education, knowledge and skills in the workforce of a nation (Nelson and Winter). Investment in human capital through education and training boosts productivity and increases the supply of innovators (Nelson and Winter). Public and private R&D funding is necessary for groundbreaking findings (Mazzucato; Aghion et al.). Innovation typically suffers market failure owing to underestimation (Arrow 609–626; Mazzucato), and “brain drain” might erode human capital (Rodrik).

Techno-nationalism, the intersection of technological advancements with nationalist ideologies (Mazarr), drives protectionist policies for self-sufficiency in critical tech domains (Mazarr). Rising US-China tensions are driving technological decoupling (Segal), leading to increased global competition and a “more paranoid world” (Segal; Mazarr). The growing securitization of data and technology deepens mistrust (Segal).

A basic concept highlights that innovation is a systemic, not isolated event (Lundvall). NIS Framework highlights the complex connection between different actors and policies.

Policymakers should adopt a holistic approach and prioritize fundamental pillars, such as education and R&D infrastructure. Another important factor for innovation policy is the cultural basis for success. A culture that embraces the experiment sees the failure as an opportunity to learn and encourage to take risks is more conducive for technological growth (Lundvall; Lee and Lim; Mazzucato). The effective policy extends beyond economics, incorporating deliberate cultural form.

## **Conclusion**

Political measures sanctions, trade wars, tariffs, and domestic industrial policies exert a complex, often paradoxical influence on indigenous technological innovation. While certain initiatives may unknowingly elaborate on local innovation, they typically achieve considerable financial expenses. Conversely, well-designed industrial policies, integrated within a robust NIS, can powerfully accelerate innovation, despite challenges like “picking winners.” The financial concept of comparative benefit highlights the disability for limited trade.

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