Industrial Policy and the Great Power Competition

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Abstract: *Since the end of the Cold War, major powers have avoided direct military confrontation, wary of the devastating consequences of nuclear warfare. Yet the arms race and regional conflicts remain important forms of power competition. Nonetheless, in the era of globalization, rapid advancements in new technologies and industries have eclipsed the utility of geopolitical maneuvers and military competition. In today's world, the great power competition goes beyond the arms race and GDP aggregates. What matters more is the race to innovate and apply new technologies through a complete range of industrial sectors. In a world where technology has a controlling influence, industrial security has become the linchpin of national security. As globalization reshapes the world's industrial landscape, a country's economic influence, military might and national security depend increasingly on its industrial structure. National security is contingent upon industrial strength. In the era of globalization, industrial policy, cutting-edge technologies and market size are dominant factors influencing a country's competitive position. The essence of the great power competition are industrial policies that fully unlock a country's industrial potential and implementation of the policies.*

Keywords: *globalization, geopolitics, industrial policy, great power competition, late mover advantage*

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In 2018, US President Donald Trump initiated trade conflicts with major trading partners, particularly with China. In response, the Chinese government has expressed its readiness to address China's trade surplus with the US on various occasions, made compromises in bilateral trade talks, and agreed to purchase more American goods to narrow US trade deficits. Yet Trump administration has continued to escalate the trade conflicts with China and appears determined to cause the deterioration of China-US relations. Why is the China-US trade conflict not yet resolved despite the narrowing trade deficit? What is this great power competition all about in the era of globalization? This paper attempts to answer those questions from a global industrial structure and industrial policy perspective.

1. What Is the Great-Power Competition All about in the Era of Globalization?

As nuclear weapons raised the cost of waging war after the World War II, the great powers have carefully avoided direct military confrontation on a mass scale. In a world where technology has a controlling influence, major powers compete by creating and deploying innovations through their industrial systems. Instead of preparing for war, countries increasingly see their industrial security as

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pivotal to their national security. Amid tectonic shifts in the global industrial landscape in a globalized world, industrial policy has become a new arena for the great power competition.

1.1 Globalization Reshapes the World's Industrial Landscape

A country's industrial system can be imagined as forming a pyramid, with the energy and mining industries on the bottom forming the base, the labor-intensive manufacturing industry forming the next higher layer, followed by the capital-intensive industries, and with the technology-intensive industries at the top of the pyramid. A large country needs the complete industrial structure. While advanced industries hold the key to technological leadership, a country also needs low-end industries to create jobs and medium-end industries to propel its economy. Creating a complete range of industrial sectors is vital to a country's industrial security. No country can afford to rely on only a single sector. Once a country's competitive industries are overtaken by those of another country or lose steam, a structural crisis may occur throughout its economy.

Without high-end industries, a country will remain at the bottom rungs of the global value chain ladder, paying a high price to import high-value goods from advanced economies while exporting cheap labor-intensive goods. An industrialized country also needs medium- and low-end industries if it is to sustain its technological prowess. Having a complete range of industrial sectors offers a country fertile ground for innovation, allows new technologies to profit, and incentivizes further research. For the government, a complete industrial system creates jobs and revenue to fund social security, cut fiscal deficits, and ramp up military supremacy undergirding national security.

With the concept of sustainable growth gaining currency since the 1980s, some economists have been promoting the service-based economy to create wealth with fewer resources and move towards a "de-growth" path in rich nations (Smil, 2017). In their view, developed countries should focus on services and outsource manufacturing to developing countries. With their financial hegemony and technological supremacy, the West, led by the United States, has enjoyed growing prosperity despite trade deficits on the book. In tandem with global capital flow, developed countries saw their manufacturing activity supplanted by services as a share of GDP.

The most salient features of globalization are the shift from the domestic division of labor to the global and the two-way flow of capital across borders. While financial capital moved to financial markets such as the US, manufacturing capital headed for labor-intensive industries in emerging economies like China. As a recipient of financial profits, the United States let its manufacturing activity relocate to the developing world where cost is low. After the Cold War, globalization reshaped the world's industrial landscape. Factory jobs in America were lost due to the global flow of profit-seeking industrial capital as the domestic division of labor gave way to the global division of labor, and were not "stolen" by emerging economies. The global flow of manufacturing capital induced the global division of labor, and industrial relocation and technology diffusion helped bring a global industrial chain into shape. For industrial capital seeking to raise productivity at lower cost, a desirable manufacturing destination must have a cheap and well-trained workforce, an adequate infrastructure, access to transportation, a stable social and political environment, and a growing consumer market. With all these conditions, China has emerged as the world largest manufacturing powerhouse, eclipsing the US in 2010 (Smil, 2017).

The tectonic shifts in the global industrial landscape have challenged an established power: First, the rising powers are not satisfied with their status quo and strive to climb up the industrial ladder, eyeing high-end industries in which the established power wields control. Second, vested interests in the established power resist the new technology that threatens to break their monopoly. Third, manufacturing decline gives rise to unemployment, and financial profiteering and yawning wealth gaps fuel populism and extreme conservatism, leaving the government with fiscal red ink, faction and social cleavage.

Amid globalization, the industrial re-division of labor is a dynamic process. A country's industrial security depends upon it having access to the global supply chain and markets. Exhaustion of technology

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dividends, the emerging of rising powers and the aversion of domestic vested interests to new technology threaten the industrial security of an established power. In the context of the global industrial re-division of labor, traditional market competition theory ceases to apply. With their aggressive industrial policy, rising powers chip away at the competitive edge of established powers in the global industrial competition.

In the post-Cold War world, globalization, industrial outsourcing and the IT revolution have transformed the great power relations. In the new round of industrial and technological competition, industrial policy is essential for a country to make the most of its present and future potential, either through a state-led or market-based model, and thus catch up with major powers or reinforce its supremacy. While rising powers strive to emulate the technology and market influence of developed countries established powers are preoccupied with guarding their technological superiority. For both rising and established powers, the invention and application of technology lie at the heart of their economic development. In the modern world of mass capital inputs and collaboration, an effective organizational system is vital for the economy to function properly. Industrial policy cannot guide innovations, which are generated by firms; its role is to offer external assurance for innovations to occur and be applied in the industrial system.

1.2 Industrial Policy Competition: Free Market Versus the State-Led Model

Instead of propping up high-end industries in a particular domain, a complete industrial policy should strive to maximize employment, economic development and technology-driven development. The goal of an industrial policy is to safeguard industrial security and competitiveness, and cushion the social impacts from the demise of sunset industries and cyclical declines. By fostering effective mechanisms, an industrial policy should support a complete range of sectors, from energy and mining to labor-intensive, capital-intensive and technology-intensive sectors, including high-end sectors.

The free market and the state-led model represent two different types of industrial policy approach. Free-market theories contend that firms must churn out more advanced yet cheaper products to survive competition. Once firms become more competitive by applying new technology, they will gain more profits to reinforce their technological leadership. In this manner, free competition expedites technology innovation and application underpinning industrial upgrade. Free-market theories played an important role in policy-making during the first and second industrial revolutions. However, in the information era, new technologies require massive resources and coordination to develop and a sophisticated infrastructure in order to be deployed. The significant costs and market uncertainties are beyond the ability of individual firms to assume. Without the support of national industrial policy and government funds, firms and capital markets are often deterred by the risks and uncertainties inherent in developing new-generation technology. That is why many incumbent firms are either unable or unwilling to invest in disruptive innovation.

For an established power, cost is the main consideration in determining the timing, speed and order of applying new technology. With infrastructure networks in the hands of vested interests in a free-market system, emerging industries are not able to afford the cost of building the new infrastructure on which they increasingly rely. As a vanguard of the free-market system, the United States finds itself unable to invest in building new infrastructure directly. The US, therefore, gradually loses its competitive advantage in the new round of global infrastructure construction.

In spite of the obstacles, globalization and technological innovation are gaining momentum. It took over a century to upgrade industry and technology in the first and second industrial revolutions. Today, rising powers have started to construct 5G networks, but the 4G network has not yet fully covered in the US. In other words, it took such a short time for 5G applications to become an irresistible trend that 4G networks are still being deployed globally. More importantly, under the influence of the free market concept, it is difficult for the US federal government to directly undertake the infrastructure construction

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of 5G network. Ajit Pai, Chairman of the Federal Communications Commission, insisted "I oppose any proposal for the federal government to build and operate a nationwide 5G network. The main lesson to draw from the wireless sector's development over the past three decades is that the market, not government, is best positioned to drive innovation and investment" (McKinnon et al., 2018). However, free-market economies struggle to keep up with rapid commercial and technological innovations driven by fast-changing markets and technology landscapes, under the belief that the government should act as a "night watchman."

In contrast to the flaws of free-market mechanisms, the state-led model is an alluring alternative. The latter's advantage lies in the ability to formulate a mid- and long-term industrial policy and mobilize funds and talents. Unlike the planned economy, the state-led model supports technology R&D and application through a proactive fiscal policy and a robust monetary policy and shares the cost of technology catch-up and risks between the state and enterprises. In the first stage of national coordination, the state enacts an industrial policy that is similar to some elements of the planned economy. In the second stage, the state invests in target technologies, builds infrastructure, and improves market supervision. Enterprises then can provide products and services in a competitive market. In the end, both the enterprises and the government will gain in terms of profits and tax revenues respectively. Considerable cash return allows the government and enterprises to reinvest in the development and deployment of the technology, forming a cycle of R&D and market-based applications.

The state-led model is a highly coordinated and efficient organizational structure for mobilizing nationwide resources at the lowest cost. Both market competition and state mobilization will direct resources towards developing cutting-edge technologies, but the latter offers an advantage in terms of overcoming the risks of technology development and barriers from vested interests. Only the applied technology is technology, otherwise it is only laboratory research.. Market application determines where research should focus and whether funds will stream in for new technologies. By unlocking the market potential, the state-led model expedites an efficient cycle of technology R&D and commercialization, thus bolstering national industrial strengths in all sectors. In a free-market system, capital influences government decisions, whereas in a state-led model, capital is mobilized and leveraged by the government. In an era of rapid technology commercialization, the state-led model plays an indispensable role in coordinating capital and industrial interests.

Industrial policy helps rising economies catch up with advanced economies in terms of innovation and commercialization. With their large workforce and newly built infrastructures, rising economies have a complete range of labor-, capital- and technology-intensive sectors, and are eagerly climbing up the ladder of the global value chain. Their rise signals established power to remain alert. Such a shift in the balance of power arises from the established power's inability to implement an industrial policy. With fundamental science and industrial capabilities yet to reach beyond their current limits, the potential for innovation becomes exhausted, and developed countries are approaching their production frontier. Despite their absolute technological superiority, incumbent nations will see their advantages whittled away as emerging powers move up the value chain and become more competitive. Industrial policy, core technologies and market size jointly determine a leading nation's competitive position in the global industrial chain. In the era of globalization, various industrial polices represent competition among great powers.

2. Rise of Industrial Policy

According to realism theories, security and survival are high politics. Security competition compels nations to emulate the successes of their rivals (Mearsheimer, 2007). While established powers invest in innovation to guard their technological high ground, rising powers are well-positioned to catch up through emulation; avoiding the costly mistakes made by established powers. The external support and

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roadmap offered by industrial policy enable a country to embark on such a technological catch-up, which has been at the center of controversies in economics.

2.1 Rise of Industrial Policy

The first factor that led to the rise of industrial policy was a sharp increase in the economic aggregate. In the early stages of the Industrial Revolution, Adam Smith's theories on economic efficiency and the division of labor and David Ricardo's comparative advantage theory laid the groundwork for international trade. According to neoliberalism, enterprises must strive to reduce costs and stay innovative to survive and thrive in a free market. In a fully competitive market, enterprises must give priority to innovation and take the lead in applying new technologies. Free market without government intervention became a key driver for economic development. To gain an upper hand in international trade, countries focused on industries in which they had a competitive advantage.

As the economic aggregate expanded, the division of labor led to the emergence of a pyramid structure within industries, with industrial clusters centered on large enterprises, also known as the "Marshallian externalities." With the industrial clusters came steadily rising industrial concentration - an important indicator of a country's industrial structure's sophistication, which in turn led to conglomerates becoming leaders in technological innovation. In the era of industrial clusters, innovation and new technology application are vital to a country's industrial development, economic growth and national security.

Another factor behind the rise of industrial policy is the changing relationship between the state and the market. In free competition and free trade systems, the primary responsibility of government is to serve as a "night watchman." Yet the cyclical outbreaks of economic crises present market failure as an unavoidable question in economic liberalism. After the Great Depression of the 1930s, all liberal democracies resorted to government interventions and macroeconomic management and increased public budgetary spending (Caporaso, 1992). Keynesianism became a panacea to economic crises, and the "visible hand" of government regained importance. Industrial policy was believed to be an important way out from "market failure." After the World War II, the economic miracles of Japan and South Korea led to broad acceptance of the "developmental state" concept, of which industrial policy was the focus.

In the mid-1970s, societies struggled to cope with fierce international competition fraught with uncertainties. Even the United Kingdom and the United States had to "Bring the State Back in" (Skocpol, 1985). It was in the context of expanding the economic aggregate and national competition that industrial policy took hold. In essence, industrial policy is a set of laws to regulate and protect the market and share the costs and risks of technological leapfrogging. By extending state support to the market, industrial policy aims to create industrial clusters and ecosystems based on Marshallian externalities and factor endowment, and to promote economic growth, innovation and international trade competitiveness through industrial upgrade.

Changing the state-market relationship does not mean that state interventions and market protection will always induce economic growth. In fact, excessive protection or inappropriate industrial polices will also lead to "government failures." Wrong industrial targets or costly but inefficient interventions will lead to worse consequences than the absence of government intervention (Tommaso et al., 2013). Yet despite "government failures" arising from excessive state intervention, industrial policy remains a *sine qua non* for late-moving countries to catch up with and overtake established powers. That is why rising powers are zealous proponents of industrial policy.

The third reason behind the rise of industrial policy lies in the late mover advantage. According to Alexander Gerschenkron, late movers enjoy a special advantage when it comes to industrialization. Despite their lack of capital and technology, industrial policy allows late movers to concentrate their limited resources in specific sectors. Many late movers managed to industrialize by emulating the advanced technology and experience of industrialized powers. In the final analysis, the late mover

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advantage is that it allows a country to industrialize in a short period.

The late mover advantage has two levels:, the first level is the necessary conditions for rapid industrialization, including technologies, industrial structure and financial instruments; the second level is the institutional advantage that brings about an interplay between the state and the market. In addition to creating possibilities for late movers to stay competitive, the importance of industrial policy is also reflected in the state-market synergy. While industrial policy itself does not necessarily bring about a competitive edge, the key to its effectiveness lies in the policy-making approach. Compared with industrialized countries, late movers often lack an advantage in domestic industrial development and international trade, and thus cannot achieve their industrial policy goals in free market and free trade systems. In a less developed country, capital is scarce and scattered, and distrust of industrial activity is widespread (Gerschenkron, 1962).

Late movers or rising industrialized countries have embraced either the developmental state model or the corporate state model, both of which rely heavily on industrial policy as the basis of their institutional strength. In developmental and corporate states, the government is responsible for regulating market competition and developing an industrial policy to emulate that of developed countries. Yearning for high technology is particularly striking in the industrial policy of corporate states, which determine what the industrial policy should achieve and how, based on their views about technology trends.

Corporate states rely on industrial policy to spur technology research and commercialization. They also assume market risks, shocks to traditional industries and associated social pressures arising from the application of the technology. In the era of globalization, the state-led model has played a vital role in safeguarding political and social stability, promoting economic growth, implementing industrial policy, and propping up high-tech industries in late movers. This institutional strength poses a great challenge to established powers characterized by free-market.

2.2 Market Competition, Industrial Policy and Original Innovation

During the first and second industrial revolutions, the market competition mechanism played an important role in the original innovation of science and technology. In these periods, the cost of technological innovation and application is relatively low. Industrial policy did little to incentivize original innovation. Price as an “invisible hand” played a decisive role. Due to the low technological barriers, homogeneous companies sprang up within and across countries emulating each other’s know-how. Instead of specializing, all developed countries created the same industrial sectors with fierce competition in domestic markets and international trade. Cruel competition forced enterprises to constantly develop new technologies. For industrialized powers, it was the free market rather than industrial policy that catalyzed innovations. However, late movers found industrial policy useful in planning development paths, imitating advanced technologies from developed countries, and devoting their limited resources to complete industrialization.

Rapid advancement in science and technology after the World War II led to increasingly specialized scientific research. With the rise of the third and fourth industrial revolutions spearheaded by information technology, aviation and aerospace, genome sequencing, artificial intelligence and 5G mobile communication technologies, the cost of developing and commercializing new technology has skyrocketed. Frontier technologies like wireless communication, aviation and aerospace, supercomputer, high-speed railway and ultrahigh-voltage power grid entail the construction of massive infrastructures, which private entities cannot afford to build. High costs and risks often deter market-based companies from undertaking large-scale R&D programs.

Unlike traditional industries, rising industries have a high technology threshold, standardization, sizeable market capacity and costly infrastructures. In this case, price fails to guide investment decisions. For the 5G telecom industry, the natural monopoly arising from the high-technology threshold prevents investors from creating a new industry by making continuous investments, as they do in traditional

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industries. More importantly, rising powers with their late mover advantage have started to challenge established powers, which struggle to succeed in a fully competitive market and through free trade.

It takes a massive amount of capital and broad inter-sectoral coordination to develop and commercialize modern technology. As a result, innovation is becoming more elusive, and unlocking the potentials of new technologies is becoming more costly, challenging and risky. New technologies, once developed, cannot be deployed without expensive infrastructure. Private companies are not motivated to share the costs of public goods for industrial upgrade, or simply cannot afford to do so. As a result, original, cutting-edge innovations only occur in a few countries; this raises the barriers for other countries attempting to move up the industrial chain. When innovations and the commercialization of new technologies are too expensive for individuals and firms to afford, free-market systems become less innovation-inducing. Both established and rising powers must turn to the state in developing economies of scale, optimizing resource allocation, and garnering competitive advantage. Higher industrial concentration puts the government in a better position to influence the quality of economic development (Hannah et al., 1997).

The third and fourth industrial revolutions have raised the threshold for inventing new technologies, in which the state plays an irreplaceable role. Only state can undertake the extra large-scale capital investment required for technological innovation, and can organize the collaborative research among enterprises, colleges and universities and research institutions across the country. In this sense, the state-led industrial policy has replaced free-market competition as the key driver of innovation. Industrial policy is a technology roadmap developed with inputs from companies, universities and research institutions, comprising pro-innovation laws, policies and financing arrangements.

3. Industrial Policy and the Great Power Competition

In contemporary world, the essence of arm race among great powers is to demonstrate theirs the highest benchmark of military equipment and scientific and technological capability. Military competition between the great powers is based on their defense R&D and manufacturing capabilities. The industrial structure, in turn, determines a country's economic clout and military might that are vital to national security.When the free market system cannot support large-scale technology R & D and market application, the major powers realize that only industrial policies can guarantee the high-end manufacturing. That explains the recent resurgence of industrial policy in the developed world. Globalization highlights industrial policy's relevance as existing free-market systems fumble to finance and launch new-generation technologies.

Globalization has reshaped the world's industrial landscape. As a result of manufacturing industry outsourcing, the United States has suffered a drain of labor-intensive industries and has lost strength in medium-end manufacturing. US strategic anxiety today echoes Vaclav Smil's argument that "a nation cannot prosper without manufacturing." With medium- and low-end industries offshored and "Moore's law" collapsing in high-tech sectors, US politicians consider revitalizing its manufacturing industry and keeping rivals in check as the only viable strategy to maintain US supremacy. Without a full spectrum of industrial activity, the US military industry will suffer in the long run, and then seriously impact its global hegemony. In this context, industrial policy increasingly comes to the forefront in the great-power competition.

When the world stepped in new millennium, countries became enmeshed in the global division of labor. China is the only developing country that seized the opportunity of new round industrial transformation from globalization in this period. It is also the only developing country hopeful of altering the global power landscape dominated by the developed world since the first Industrial Revolution. China's industrial policy is not driven by a fanatical arm race or ambitions to replace the United States. The goal of China's development is to steadily move up the rungs of the global industrial

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ladder according to its economic and technological strengths.

Since the World War II, all US administrations have attached great importance to invest in its high-end industries. Yet the level of urgency and anxiety that exists today has never been seen before. The increasing external pressure from rising powers has deeply unsettled the US government. Industrial policy is the basis of US efforts to dominate and lead the global value chain. Over the years, the goal of the US federal industrial policy has evolved from revitalizing low-end industries to promoting medium-end industries and ultimately to protecting its high-tech dominance.

The current industrial policy of the United States can be described as "supporting American industries while suppressing overseas rivals." The Trump administration has enacted an integrated industrial policy unprecedented in American history to revitalize and strengthen manufacturing at all levels with a broad range of fiscal, financial and judicial incentives, aiming to regain US global industrial leadership. In essence, the United States is attempting to reshape the global value chain and trade and investment rules. There is no doubt that the Trump administration has seen a return to the state-led model as the only choice when free-market systems fail to serve its interests.

In setting industrial policies, China and the United States aspire to achieve different goals. While China strives to upgrade from labor-intensive to capital- and technology-intensive industries, the United States vows to revitalize labor-intensive manufacturing, strengthen capital-intensive industries, and dominant high-tech industry. It is structural contradictions between China and the U.S that reach far beyond the fight for a technology advantage point. Instead, the United States is seeking to regain leadership in a complete range of industrial sectors, including labor-intensive sectors for jobs, capital-intensive sectors for commercializing new technologies, and technology-intensive sectors to spearhead future development.

4. Conclusions

International relations have entered an era that it is impossible to curb the rising powers through war. In today's world, what countries strive to achieve is to dominate the global industrial structure by taking control of a complete industrial chain, from low-end to high-end sectors. Major powers have embraced industrial policy to steer domestic industrial development. It is fair to say that the great power competition has entered a stage of industrial policy competition. Central to such competition is the creation of complete industrial sectors through geopolitical maneuvers. For a major power, manufacturing is essential to create jobs and commercialize new inventions. Since the emerging of rising powers cannot be stopped by war, established powers have opted to strengthen their industries and deprive rising powers of their opportunity to climb up the industrial ladder by shutting their domestic market, restricting technology transfer and knowledge diffusion and curbing rising powers from accessing global markets. In the coming decades, major powers will compete to seize control over a complete range of industrial sectors as part of their national strategies. Countries that lose this competition may never have a chance to upgrade their industrial structure. The formulation and implementation of industrial policies has become the top priority in the competition among major powers.

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