

SEMICONDUCTORS, GEOPOLITICS, AND SOVEREIGNTY: STRATEGIC CONSIDERATIONS FOR TÜRKİYE

The rivalry between the United States and China has escalated into a competition over who controls the crucial semiconductors or chips technology, since this technology is essential for many electronics, development of the Information and Technology (IT) industry as well as Artificial Intelligence (AI) and Electric Vehicles (EV). Maintaining a stable chip design and manufacturing capacity is essential to maintain one's technological and geopolitical dominance, and is a matter of national technological sovereignty. Other countries that are either already manufacturing substantial amounts of semiconductors, such as Taiwan, or countries aspiring to develop them further, face the challenge of balancing the United States and China, while maintaining technological sovereignty. Such countries such are trying, to secure their own digital futures while balancing between East and West. The article makes certain strategic considerations for Türkiye, and especially comparing to what India has been doing in recent years, and why such a model is relevant for Türkiye.

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Introduction

This article expands on the Turkish analysis, bringing in global debates on the U.S.–China rivalry, Europe's struggles, and the fragility of global supply chains. It argues that for Türkiye, national semiconductor capacity is not a luxury but a necessity — both for sovereignty and for balancing between East and West. Particularly the case of India is analyzed and discussed as a model that develops technology through international cooperation and partnerships.

In the 21st century, semiconductors are no longer peripheral components of the global economy; they are essential components that are much in demand

in an increasingly digitalizing world. These small chips, packed with billions of transistors, are essential technological components for several key industries such as telecommunications, artificial intelligence, defense systems, satellites, electric vehicles (EV), and energy grids. They are on one hand key components of a digitalizing economy at the age of globalization, and due to their importance, can be considered as the foundations of technological sovereignty. Technological sovereignty, for the purpose of this article, is defined as a sovereign and independent nation's ability to design and manufacture the most important key technological components necessary to allow the ability of its technology industries and main industries of its economy to function without significant interruptions or shocks.



Technological sovereignty, as described by March & Schieferdecker (2023)¹, is an economic and industrial ability, that should not be confused with a quest for “autarky.” Autarky, attempts to produce most or almost all things domestically, can often be accompanied with resource nationalism and general anti-globalization attitudes. Achieving technological sovereignty, by contrast, aims to reduce the “vulnerabilities” or total import dependence of certain key technologies, whose shortage would challenge state sovereignty. March & Schieferdecker (2023) develop “a competence-based definition, which puts innovation policy at the core of fulfilling sovereignty aspirations.” March & Schieferdecker still see an important role of international cooperation and trade to enhance technological sovereignty understood as an ability, and by contrast consider autarky as potentially detrimental to technological sovereignty.

This is specifically why on one hand Türkiye’s *Technology Leap* is important, while on the other hand, it is necessary to closely look at the case of other countries in South Asia and the Pacific (such as India), and not just China as a case study for developing domestic

semiconductors (chips) design, test and production capacity. For Türkiye, which has announced the *Millî Teknoloji Hamlesi* (National Technology Leap), semiconductors represent both a challenge and an opportunity. The challenge lies in the country’s heavy reliance on imported chips. The opportunity lies in using strategic investment, partnerships, and industrial policy to transform this vulnerability into a potential strength.

Considering that Türkiye is trying to be compatible with the rules and regulations of the European Union, India’s semiconductor program (which focuses more on foreign partner and investor friendly approach) is a practical model from which Türkiye can draw lessons from.² Türkiye is a NATO member, and has a Customs Union agreement with the European Union (EU). Furthermore, Türkiye has time and again affirmed that Türkiye is a member of the European Environment Agency³, and will also undergo a green economy transition that is compliant to the standards of the EU’s Green Deal.⁴ Therefore, although the examples from South Asia (India, Pakistan, Bangladesh, Sri Lanka, Nepal), South East Asia (Malaysia, Indonesia, and Singapore), and the Asia Pacific region (Japan, South

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Korea, China and Taiwan) in general, i.e. the Indo-Pacific region⁵, are valuable cases for Türkiye. Türkiye's institutional ties to European economies mean that it would be difficult to replicated some of the policies of the Indo-Pacific countries due to the rules and regulations of European institutions (including compliance to certain environmental standards).

For instance, India has turned chip production into a national mission, combining public subsidies, international partnerships, and long-term planning. Türkiye faces a similar imperative for achieving a national drive for technology. Without indigenous chip capabilities, it risks being trapped as a passive importer of semiconductors (chips), in a world where digital dependence can translate into political dependence.

Considering Türkiye's integration with NATO, OECD and EU economies, contrary to China's strongly domestic production focus (arguably a form of autarky-seeking), a model of addressing semiconductor production enhancement through attracting foreign investments and international partners (a partnership model) is an initial step to be considered by Türkiye. Through cooperation with international partners, Türkiye can attract more investments and know-how, which makes such '*partnership model*' a more suitable model than an autarky seeking approach.

Hence the following section will discuss in more details the importance of semiconductors and technological sovereignty.

I. Semiconductors and Sovereignty

Semiconductors are the foundational layer beneath nearly all high-technology systems — digital infrastructure, communication networks, autonomous systems, defense electronics, energy grids, advanced sensors, electric vehicles (EVs), 3-D printers and Artificial Intelligence (AI) accelerators. Without

control over chip supply, a state cannot guarantee the operation of its energy systems, its digital infrastructure, its economy, its industry, its financial services, nor its defense capabilities.

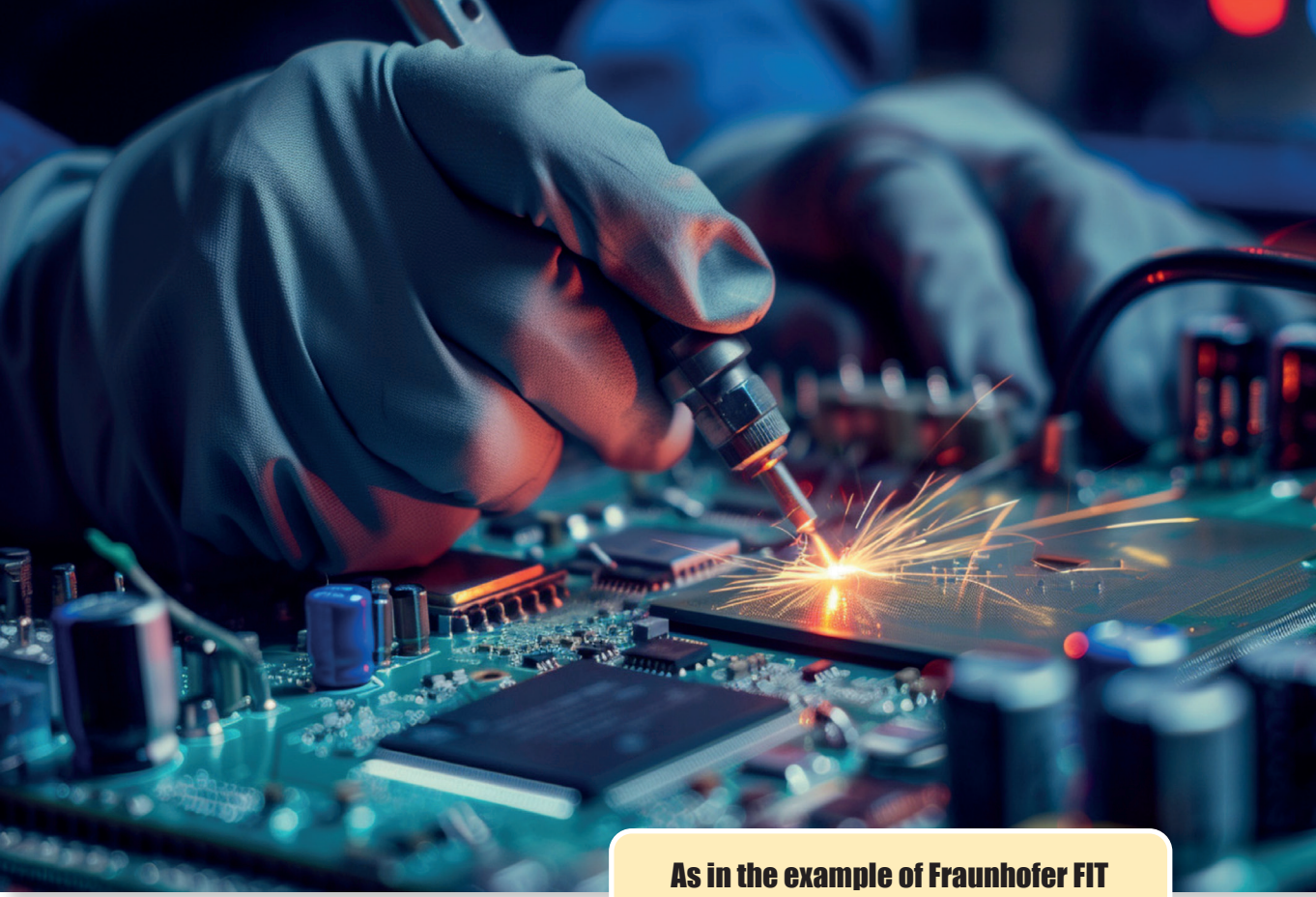
In our increasingly digitalizing and technology driven economy, accessing semiconductors (chips) have become as vital as accessing water, energy resources, or rare earth minerals. Dominance over these technologies and resources is key for to technological or digital independence, hence for sovereignty.⁶ Many energy-system technologies, electrical vehicles, also require semiconductors.

In this sense, the strategic significance of semiconductors, as well as rare earth minerals in 2025, are comparable if not more significant than petroleum has been to the global economy since 1973. It was as a consequence of the 1973 OPEC embargo that OECD economies started taking counter-measures. Following the oil shocks, the International Energy Agency was established and as a rule has since been requiring member states to stock strategic oil reserves.⁷

Oil shocks of the 1970s taught states the perils of energy overdependence to a single type of energy natural resources. Today, we see a similar shortage crisis instigated by the semiconductor shortages of the 2020s. In a similar fashion, the global chip shortage crisis and challenges to access other critical technological components (as well as rare earth minerals), are teaching us the dangers of digital dependence, and overall the dangers and vulnerabilities of over-reliance to a single source of supply, or a single route.

In fact, famously the concept of complex interdependence in information age by Keohane and Nye (1998)⁸ was an influential concept that was distinguishing sensitivities versus the vulnerabilities in economic interdependence. While Keohane and Nye are considered scholars known to be in favor of economic interdependence and cooperation, they did nonetheless warn readers and policymakers against the perils of economic vulnerabilities to certain strategic imports or over-reliance to a particular type of resource.

Hence, while criticizing economic interdependency and the *Neo-Liberal* system, one should not assume that interdependency means blindly accepting all potential vulnerabilities in the supply chain. On the contrary,



even in economic interdependence the policy goals try to address and minimize economic vulnerabilities.

However, over the last decade, we can observe that while trying to de-couple from mutual economic over-dependence, the United States and China's approach seem to have evolved to an increasingly more competitive global economic rivalry.

Wu (2020) has shown that the U.S.–China rivalry has shifted from tariffs to technology.⁹ In other words, power in the 21st century is not only about controlling resources and the trade flows but also about controlling the technological arteries of the global economy. Hence, the access to technology and the ability to have safe and uninterrupted access to key components such as semiconductors, is essential to even further develop technological advantages.

The global semiconductor supply chain is one of the most complex and geographically concentrated on earth.

As in the example of Fraunhofer FIT 2025 as a clear form of India-Germany cooperation (a type of cooperative partnership), similar collaboration initiatives with European economies such as Germany, could be a realistic option for Türkiye as well.

Taiwan (*Taiwan Semiconductor Manufacturing Company Limited – TSMC*) produces over 90% of the world's most advanced chips. Furthermore, even mainland China is relying on TSMC for the supply of chips.¹⁰ Another Asia-Pacific country, South Korea (Samsung, SK Hynix), is dominant in memory processor and storage devices¹¹, and probably second most important chip manufacturer after Taiwan. The U.S. and the Netherlands also have advanced design tools and lithography equipment. Japan supplies essential materials like photoresists and has edge on various lenses. Thus, although the supply chain is global, the specialization is concentrated to OECD economies or 'Western States.' This concentration means that a disruption in one key area of the production chain

can paralyze entire industries and cause large scale global economic disruptions. This concentration is also while especially non-OECD countries such as China, India or Pakistan are aspiring to develop semiconductors, chips, and other technologies. For the case of Türkiye, developing such a capacity would be a strategic advantage, yet Türkiye can use the advantage of being part of OECD and NATO to attract foreign investors.

During the COVID-19 pandemic, this fragility was painfully exposed. The COVID-19 pandemic demonstrated that a disruption in one part, no matter how small a component it is, of the semiconductor production and supply chain can cause a halt at the global scale. Automakers faced billions in losses, hospitals struggled with shortages of medical devices, and national defense contractors delayed projects. Supply chain fragility was clearly revealed under the global pandemic¹² and also with supply chain disruption fragility revealed with the Ever Given accident.¹³

For Türkiye, which imports the vast majority of its chips, such disruptions are major risks and vulnerabilities that must be addressed. However, Türkiye's economic model should be more compatible with a model arguably

adapted by India, rather than the strongly 'national' model of China.

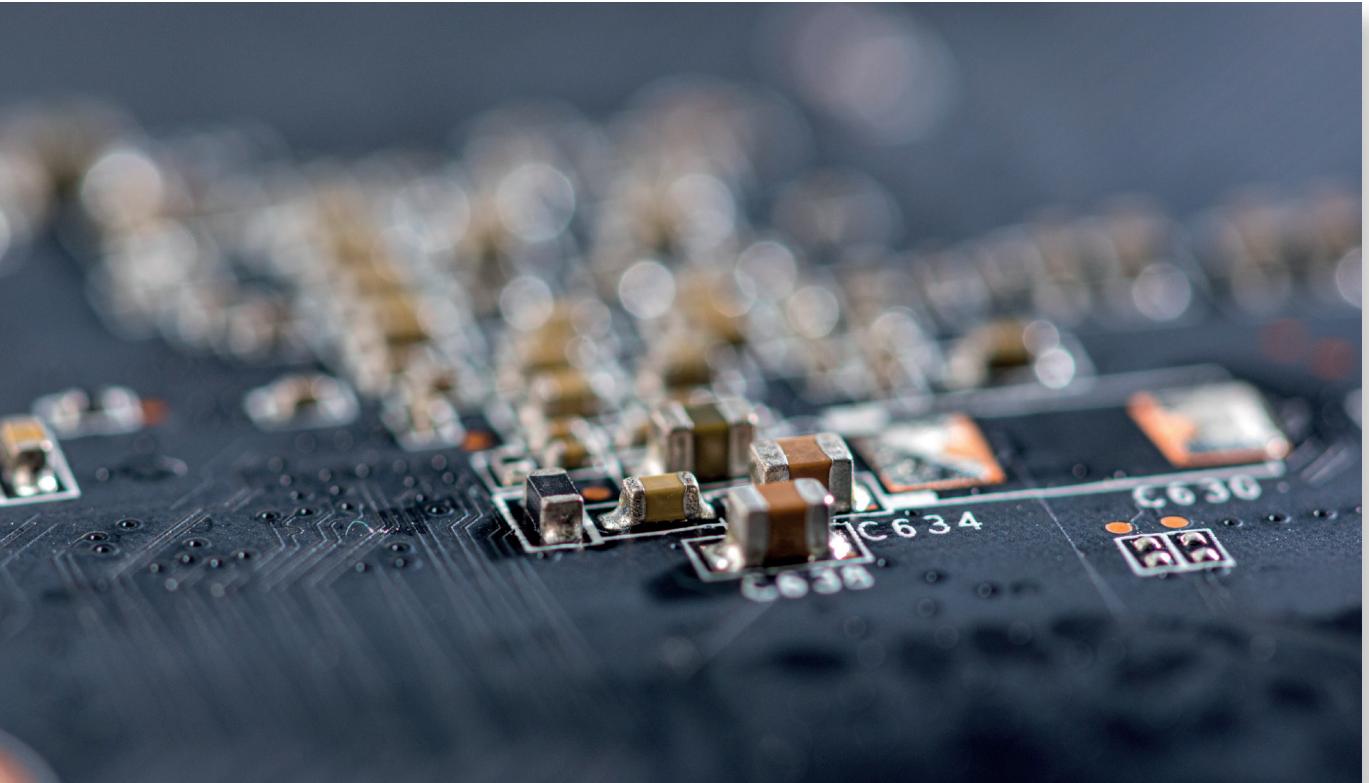
II. India's Strategy: Some Key Observations for Türkiye

In December 2021, India launched the India Semiconductor Mission (ISM), with an incentive pool of about \$10 billion.¹⁴ The program is designed to develop the full spectrum of the chip value chain: design, fabrication, testing, packaging, and downstream integration. Projects include Micron's ATMP facility in Gujarat, Tata-Powerchip manufacturing facilities in Dholera, CG Power-Renesas joint ventures, and partnerships with Kaynes Semicon and HCL-Foxconn.

India has forged several international partnerships. Under the Fraunhofer FIT 2025 program, India and Germany are collaborating on CMOS design, MEMS, sensors, packaging, and training.¹⁵

India's approach yields several lessons:

1. Full-chain: Cover the whole value chain.



2. Public incentives: Use targeted subsidies, tax breaks, and other incentives that would be significant advantage for potential investors.

3. International partnerships: Attract foreign firms and research institutions without giving up sovereignty.

4. Workforce training: Build an ecosystem that would be a natural training ground for engineers, technicians, and researchers.

5. Gradual approach: Setting targets of overnight independence are unrealistic. It takes time to achieve significant goals. Hence a gradual and patient approach that would promote long-term consistency would aim for phased import substitution. It took decades of gradual investments for India to become a center of software development, and technology.

For Türkiye, observing these key takeaways from the case of India, are highly relevant. Domestic efforts must not be limited to design or packaging. They must integrate into a patient yet consistent, sustainable and comprehensive national strategy. As in the example of Fraunhofer FIT 2025 as a clear form of India-Germany cooperation (a type of cooperative partnership), similar collaboration initiatives with European economies such as Germany, could be a realistic option for Türkiye as well. It may take time to make significant achievements in producing semiconductors, but the worse mistake would be to impatiently expect overnight results.

Particularly, as a key discussion in this article, the balance of achieving a national technology leap while cooperating with international partners (cooperative partnership), is considered a suitable and desirable model for Türkiye. The rhetoric of achieving national technology should not be confused with an envy of autarky, a mostly self-sustaining economic production capacity; which inevitably is often strongly linked with resource nationalism.¹⁶ For most countries, even those that have very vast territories or overseas territories, it is very difficult to achieve an entirely self-sustaining economic production capacity. It is particularly difficult to do so without controlling global resources in a neo-colonialist or neo-imperialist manner. For most countries autarky is not a realistic option, and furthermore, it runs counter to the concept of promoting international economic cooperation based on free trade. Promoting economic cooperation and international partnerships

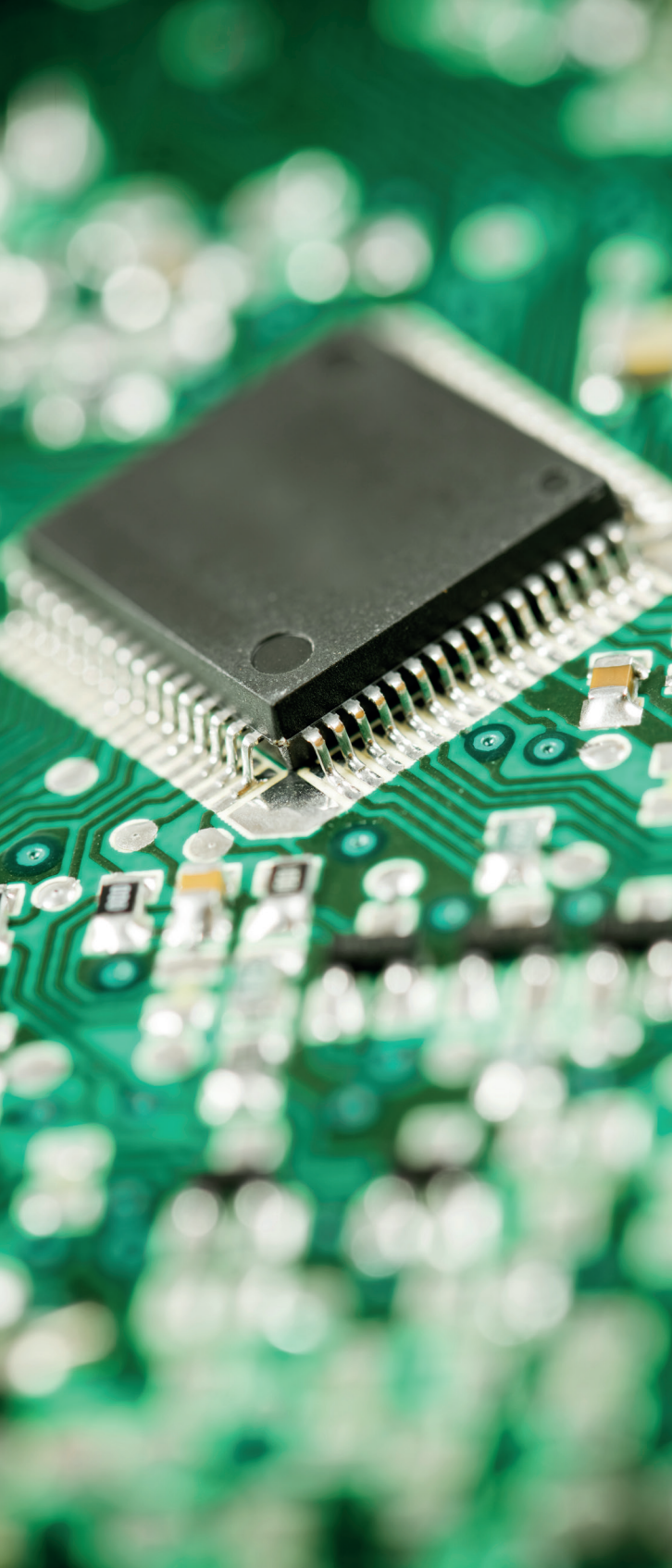
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have been a key aspect of Turkish foreign and economic policies for several decades now. Hence, Türkiye needs to consider many factors in its current position and how both the opportunities and vulnerabilities could be addressed.

III. Türkiye's Current Position: Opportunities and Vulnerabilities

Türkiye has already significant strengths to further become a center for semiconductors as well as other technologies. Türkiye has a strong defense electronics sector, experience with communication technologies, and a relatively younger workforce than most European countries. Furthermore, Türkiye also has significant consumer appliance and electronics production capacity, as well as an automotive industry. However, Türkiye lacks advanced manufacturing facilities for many advanced technologies, specific know-how and experience on semiconductors, and raw material suppliers for further specializing on semiconductors production. It would take time and patience to develop a domestic semiconductor capacity.

Europe's struggles show that delays in semiconductors cripple entire industries and have consequences beyond the technology sector. The EU Chips Act seeks to raise Europe's global share to 20% by 2030. Yet IndustriAll Europe (2024) observes that the continent remains far from its goals.¹⁷ Türkiye's starting position is perhaps not necessarily better. Hence, rather than seeking individual efforts, concentrated specialization within further cooperation with European partners might allow Türkiye to attract more tangible investments. This would allow Türkiye to capitalize on its advantage to be in proximity with the EU and at the same time closer to many other alternative markets.



Under the US-China rivalry, Türkiye can and should strategically balance the options of several partnerships. However, Türkiye's attempts to balance several partners should not be at the expense of losing out already established precious special partnerships with NATO, EU and OECD countries.

U.S. export controls demonstrate how technology access can be arguably 'weaponized', and even allies can feel ripple effects.¹⁸ Türkiye, positioned at the crossroads of NATO and Asia, is particularly exposed to such pressures.

Thus, it may be useful for Türkiye to carefully balance East and West. Under the US-China rivalry, Türkiye can and should strategically balance the options of several partnerships. However, Türkiye's attempts to balance several partners should not be at the expense of losing out already established precious special partnerships with NATO, EU and OECD countries.

If successful at balancing, Türkiye's position between East and West is actually a geopolitical advantage that would be significant factor in the decision to invest in Türkiye. Türkiye's special position on global supply chains make investments attractive to Türkiye. Yet Türkiye's proximity to NATO and EU is not only related to its geographic closeness, but also due to its institutional relationship. Hence, while there could be perceived difficulties, in the long term, the advantages of cooperating with OECD, NATO and EU partners in the production of semiconductors is a realistic option that would eventually also contribute to the long-term goal of developing technological sovereignty.

The rivalry between the U.S. and China is so far defining the last decade. Semiconductors, trade routes and rare earth minerals are at the core of such rivalry. The U.S. CHIPS Act, combined with export controls, seeks to slow China. China invests billions in domestic factories and production facilities.

Park et al. (2023)¹⁹ argue that such competition is intensifying not only resource nationalism but "techno-nationalism"; which they suggest is reshaping global value chains. This competition, makes the balancing of these

rivals more difficult, leaving ‘*Middle Powers*’ less room to maneuver. Both USA and China are pressuring partners and ‘Global South’ countries to align with them, even when it would be to the latter’s interests to balance both USA and China.

For instance, other South Asian states such as Pakistan, are also trying to carefully balance the current USA-China rivalry as an opportunity to capitalize. Pakistan and other South Asian countries aspiring to develop semiconductors (chips), need to make significant investments in order to develop domestic semiconductors designing, testing and manufacturing capacity.²⁰ Developing capabilities for domestic semiconductors manufacturing, design and test centers, is considered a way to provide leverage to the national economy, and therefore be able to capitalize on the China – USA rivalry. However, developing such capacity requires significant investments, which the countries aspiring to develop semiconductors production capacity need to somehow secure. In order to ensure the long term benefits of uninterrupted domestic production capabilities, significant investments from both domestic and foreign funds are necessary.

States lacking domestic capabilities face limited choice: dependency on Washington or dependency on Beijing. Arguably, this is no longer just a trade rivalry, but a contest for technological supremacy.²¹ The competition is on global governance as well as controlling trade routes and accessing strategic raw materials.

Türkiye’s geography and its cultural and political location between East and West makes it more willing to try to balance East and West. On technology sovereignty, Türkiye might try to hedge between U.S. and China, and not categorically rejecting either but rather try to seek the best deals from both. However, while trying to balance, Türkiye should not be excluded from ecosystems of dominant OECD economies, otherwise the risk would be to depend on imports alone from either one, rather than to cooperate on technology development.

Hence, a clear strategic roadmap needs to be carefully thought and designed for Türkiye. For instance, Türkiye should focus on certain defense industry relevant productions as an area of strength, particularly with drones and unmanned vehicles technologies. As the following step, Türkiye should selectively promote certain investments that have strong research and development.

Conclusion

Semiconductors strategic significance in the digital era is comparable to the strategic of petroleum from 1973 until today. For Türkiye, developing a domestic chip industry is essential, especially considering that other countries of the Global South, such as Pakistan, may likely pursue developing such strategy. India’s existing strategy to develop a domestic semiconductor (chip) industry, shows what are some of the possible ways to foster domestic semiconductor industry while developing cooperative international partnerships. Europe’s struggles with the shortages of chips, show what happens when action is delayed (a sudden shortage that would paralyze key industries). The U.S.–China rivalry shows why sovereignty matters, and thus action to develop key technologies production domestically should not be delayed. By investing in chips, Türkiye would also be investing in strengthening sovereignty. Domestic technology design and productions, will ensure those nations developing such technologies, that in the 21st century, they would not merely remain a consumer of technologies designed elsewhere, but become masters of their own destiny.

Türkiye has existing partnerships and should develop initially and as much as possible through partners (as India and Germany seem to be doing on specific cases). It would be time-consuming and challenging to try to single handedly manufacture everything in an autarky-style self-production drive. Specializing on certain areas of strength (particularly related to drones and unmanned vehicles) with partners would allow long-term consistent development of these strategically significant technologies.

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Finally, it is essential to bear in mind that the current supply chain of semiconductors and their technologies are concentrated to OECD economies or what according to China, would be considered as ‘Western States.’ Yet a significant part of the raw materials needed for these chips are not produced by Western States, which leads to certain frictions and geopolitical rivalries. This means that a disruption in one key area of the production chain can paralyze entire industries and cause large scale global economic disruptions. This concentration means that especially non-OECD countries such as China,

India or Pakistan are searching for specific ways to develop semiconductors, chips, and other technologies as a way to enhance national technology needs. For the case of Türkiye, developing such a capacity would be a strategic advantage, yet Türkiye can and should use the advantage of being part of OECD and NATO to attract foreign investors to develop the early stages of a domestic industry. If this is a long-term goal, Türkiye needs to invest into multiple options strategies to develop a National Technology Leap, including a model of cooperation with international partners (cooperative partnerships).

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