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A Geoeconomic Fix? European Industrial Policy on Semiconductors Amidst Global Competition

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Abstract

This article observes that state actors in the emerging geoeconomic order are increasingly intervening in value chains that are politically regarded as strategic, with the aim of anchoring production capacities in their own territory. Drawing on David Harvey's concept of the 'spatial fix' and modifying it for the geoeconomic constellation, the article describes this phenomenon as a 'geoeconomic fix'. However, this geoeconomic fix can only be achieved in co-operation with industrial actors that possess strategic capabilities and technological know-how. In a case study of European semiconductor policy from 2012 to 2023, the contribution traces changes in European industrial policy. Using process tracing, the article analyses key documents and statements from European Union (EU) institutions and industry actors. The results demonstrate that the geoeconomization of European semiconductor policy is accompanied by an increasing political focus on the spatial reorganization of the semiconductor value chain. The European semiconductor industry is driving this geoeconomization.

Keywords: EU industrial policy; geoeconomics; transnational corporations; semiconductors; chips

Introduction: Semiconductors as a Focal Point in the Emerging Geoeconomic Conflict

In recent years, debates on the rising Sino-American rivalry have increasingly focused on geoeconomic aspects (Abels and Bieling, 2023; Babic et al., 2022; Vihma, 2018). As a competitor in the 'new triad' (Bieling, 2019), the European Union (EU) is affected by these developments and must adapt in many policy areas to a world that is increasingly in disorder (Lavery and Schmid, 2021). Authors have underlined the centrality of industrial policy in this process (Abels and Bieling, 2022; Fiott, 2024; Wigger, 2023). They observe a strong revival of state interventionism as a reaction to the intensifying geoeconomic pressure. One recent case in this development that received some attention in the literature (Bauerle Danzman and Meunier, 2024; Eckert, 2024) is the *European Chips Act* (ECA), which was announced in 2022 and adopted in 2023. The passing of the ECA is a significant development not only with respect to the volume of investments it envisages but also as it further underlines the key role that semiconductors and their related industries play in the geoeconomic competition of the new triad.

The European Commission (EC, 2022a) states that semiconductors are of significant geostrategic interest and at the core of the global technological race due to their relevance for the economic, industrial and military capacity of states. Semiconductors have indeed become an almost indispensable basis of everyday life, and their importance is increasing even further during the digital transformation. Practically every digital development, from artificial intelligence to quantum computing and autonomous driving, is dependent on

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technological progress in the semiconductor industry (Kleinhans and Baisakova, 2020). This has made them the focus of strategic interests for states. In turn, states are aiming to expand their control over the highly globalized and complex semiconductor value chain whilst reducing their dependence on foreign production (Kim and Rho, 2024; Malkin and He, 2024). Miller (2022) and others refer to this global competition over semiconductors as a 'chip war'.

Research has already been conducted on several conflicts in the semiconductor value chain. This chain is characterized by a highly transnational division of labour, strong lock-in effects due to long production times and high capital and knowledge intensity, especially in the production steps of design and fabrication (Kleinhans and Hess, 2021). These factors create barriers to entry for new competitors, resulting in a concentration of power amongst a small number of players throughout most stages of the value chain. Additionally, there is geographical concentration. US companies dominate the design and necessary software solutions, whilst fabrication for advanced technology nodes is primarily concentrated in South Korea and Taiwan.

Conflicts between the United States and China regarding the semiconductor value chain have garnered significant attention. Both China and the United States are providing extensive subsidies to their domestic industries. In 2015, China launched the *Made in China 2025* plan, which aims to reduce the country's reliance on imported semiconductors by boosting domestic production and investing in production infrastructure. The US government passed the *CHIPS and Science Act* in 2022 to bolster the American semiconductor industry. The United States furthermore aims to impede China's technological progress by imposing export restrictions. In 2018, the US government imposed 25% tariffs on semiconductor imports from China and, in 2019, implemented export controls targeting Huawei's production. Initially, the Chinese company was able to circumvent these controls by co-operating with non-US companies from other countries (Bown, 2020). Thus, in 2020, export controls were tightened further to stop foreign companies from exporting products with US technology to China. These events demonstrate that the United States dominates the global value chain and has strong extraterritorial control (Malkin and He, 2024).

The EU is arguably in a more dependent position. On the one hand, it runs a large trade deficit in the sector: since 2018, semiconductor imports have outweighed exports by over €10 billion annually (Ciani and Nardo, 2022). In 2021, exports worth €31.5 billion were even offset by imports worth €51 billion. Overall, demand for semiconductors in the EU is almost twice as high as domestic production (EC, 2022b). On the other hand, the key value-adding steps of design and fabrication take place mainly in the United States and Asia. Particularly in the case of cutting-edge chips, the EU lacks production capacity, which makes it fully dependent on foreign front-runners like Samsung (South Korea) and Taiwan Semiconductor Manufacturing Company (TSMC) (Taiwan) (EC, 2021c). The main exception is the Dutch company ASML, which controls a key bottleneck in the global value chain. ASML has a quasi-monopoly on the most advanced lithography machines [extreme ultraviolet (EUV)] for semiconductor production. However, although it is based in the EU, it is heavily integrated into the US system and dependent on US inputs and intellectual property (Malkin and He, 2024). In current disputes, it has even been leveraged by the United States as a geoeconomic tool to restrict the export of lithography machines to China (Malkin and He, 2024).

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Due to its weaker position in the semiconductor value chain, the EU is often neglected in the literature on the chip war. However, in the geoeconomic constellation of the new triad, the EU is a key actor with ambitions to play a greater role in the value chain. This contribution aims to shed light on the geoeconomization of the European semiconductor strategy. Drawing on Harvey's (2001) concept of the spatial fix and developing it further into a 'geoeconomic fix' in the context of the contemporary global constellation, the contribution analyses the significance of spatiality in the debate on the geoeconomic positioning of the EU and the reorganization of the value chain. Value chains are understood as 'geopolitical spaces' (Moisio, 2019) in which both state actors and transnational corporations (TNCs) play an important role. The article hence treats industrial actors as central players, thereby contributing to the debate on business power in the new geoeconomic order (Abels, 2024; Choer Moraes and Wigell, 2022; Eckert, 2024).

The article asks how, in the course of geoeconomization, global value chains for strategic technologies are spatially restructured by industrial policy measures at the EU level and how industrial actors influence this process. This is examined in a process-tracing case study of European semiconductor policy from 2012 to 2023. The analysis shows that in the course of geoeconomization, the spatial organization of value chains that are considered strategic is subject to state intervention as well as industrial actors' substantial influence on this process. To reduce strategic dependencies, state actors intervene and strive for a 'geoeconomic fix' to the production of strategic technologies in their own territory. However, the geoeconomic fix can only be achieved in co-operation with industrial actors that possess these strategic capabilities. These actors are therefore in a strong position: on the one hand, they contribute to the politicization of their sector by stressing the urgency of state support, for example, subsidies. On the other hand, they try to limit state intervention into their autonomy, for example, when it comes to restrictions on free trade. They thus adopt a 'best-of-both-orders' approach, trying to combine the advantages of the neoliberal and geoeconomic orders.

The contribution is structured as follows: first, the theoretical perspective is described in more detail. The article then traces the development of the European semiconductor strategy from the classification as a *Key Enabling Technology* (KET) in 2012 to the enactment of the ECA in 2023. In this time frame, it distinguishes three periods: a subordinate role of geoeconomic considerations in the first period (2012–2017), followed by an increasing geoeconomization in the second period (2018–2020), which for now reaches its peak in the third period (2021–2023). The conclusions present the key findings from this analysis and discuss their implications.

I. Geoeconomic Fixes in the New Triad Competition

In 1990, Luttwak observed that the significance of military means for exercising global power was declining compared to the Cold War era, in favour of an increased importance of economic means. States would therefore tend to act 'geoeconomically' (Luttwak, 1990). This idea is echoed in current discourses, which, in recent years, diagnose a shift from a neoliberal to a geoeconomic world order (Babic et al., 2022; Roberts et al., 2019). Herranz-Surrallés et al. (2024) characterize this shift as a reconfiguration of economic interdependencies based on relative gains. This contrasts with the former acceleration of economic interdependencies based on absolute gains in the neoliberal order. For

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global value chains, this means that states are (partly) removing those they deem strategic from the free play of market forces in order to control economic interconnectedness themselves. Discussing this strategic relevance and the vulnerabilities of value chains, Farrell and Newman (2019) introduce the term 'weaponized interdependence'. They assume that states strive for control over central hubs in global networks. This control allows them to leverage asymmetric interdependencies to their advantage.

Weaponization strategies and the exploitation of interdependencies are not limited to states alone. In a world economy marked by highly globalized value chains, TNCs have control over central network hubs, yet their economic and political interests can at times diverge from those of their country of origin (Abels and Bieling, 2023; Choer Moraes and Wigell, 2022). Therefore, the ability of a state to leverage interdependencies for weaponization is contingent on its ability to first and foremost steer and direct its own economy (Gertz and Evers, 2020). In turn, companies try to protect their autonomy from state intervention. Business action itself can therefore take a geoeconomic form: first, by pushing back against state influence, for example, through lobbying efforts; second, by adapting to the changing conditions and continuing to operate on both sides of the rivalry as much as possible; or third, by supporting state geoeconomic measures and promoting the politicization and securitization of a sector (Choer Moraes and Wigell, 2022).

Geoeconomics as a scientific lens underlying this article assumes that space is crucial for economic actions. According to Harvey (2001), the production, reproduction and reconfiguration of space are essential to comprehend the political economy of capitalism. Neoliberal globalization led to a geographical restructuring of capitalist activity, resulting in new forms of unequal geographical development and shifts in the global order. Neoliberalism is a particularly pronounced phase of capitalism's constant pursuit of a spatial fix for its crisis tendencies. When introducing the concept of the spatial fix, Harvey builds on the ambiguity of the term 'to fix': on one hand, it refers to the attempt to 'repair' crises by overcoming space; on the other hand, it refers to capitalism's need to immobilize capital for that very purpose. Therefore, the spatial fix consists of immobile capital like physical infrastructures or industrial production networks enabling the mobility of capital to overcome crises of accumulation (Harvey, 2001). The neoliberal state seeks to further the cause of all business interests and is largely limited to the task of creating a good business climate (Harvey, 2019). At the global level, this means opening markets and reducing trade barriers. This enables and benefits spatial fixes in the neoliberal order with long-lasting effects on the spatial structure of the global economy as the globalization and spatial fragmentation of value chains.

The emerging geoeconomic order entails some shifts in former neoliberal premises. Geoeconomic conflicts and protectionism threaten free trade, and states intervene in strategic value chains to reduce dependencies. This growing state activity is a key difference between the neoliberal and geoeconomic orders. The new state interventionism is particularly evident in industrial policy: since the 1980s, it primarily followed a market-liberal paradigm, with state interventionist models being pushed back in favour of a level playing field for private companies (Bulfone, 2023). In response to global geoeconomic tensions, the EU is currently undergoing a renewed state interventionist turn to (re-)gain more control in the competition for technological and industrial dominance (Abels and Bieling, 2022; Bauerle Danzman and Meunier, 2024; Herranz-Surrallés et al., 2024). This is especially visible regarding strategic high-tech sectors (Abels et al., 2024). In Harvey's

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framework, industrial political activities are state interventions in spatial fixes. These interventions aim to fix capitalist development in terms of territory and time whilst also counteracting the capitalist crisis dynamic. They mobilize large volumes of capital and channel them into projects with long-term and future potential (Abels and Bieling, 2022).

In Europe, this interventionism is often legitimized by the goal of 'strategic autonomy', although the term is used with different meanings in political discourse (Ondarza and Overhaus, 2022). In line with an increasing emphasis on technology and its role in achieving the EU's strategic goals, the term 'technological sovereignty' became prevalent in political discourse (e.g., von der Leyen, 2021). Technological sovereignty can be defined as the ability of a state to maintain and further develop the technologies it defines as critical for its welfare, competitiveness and ability to act or to be able to obtain them without unilateral structural dependence on other economic areas (Edler et al., 2020). This concept includes a spatial component, where high technological sovereignty is achieved when technologies are produced within one's own domain. One-sided dependence on foreign production puts it at risk. This indicates that past and future spatial fixes are becoming politically more important in the new geoeconomic constellation. For states, it is now crucial to consider where and by whom critical technologies are produced. Industrial policy is an increasingly used instrument to intervene in the spatial organization of value chains by anchoring important production steps on domestic territory. Therefore, in the geoeconomic order, the (re)organization of value chains that was previously driven by a capitalist logic of private business based on an efficient global division of labour is now more influenced by interstate rivalries. This leads to the rise of a territorial logic, according to which states exert control over the spatiality of capitalist production according to political interests and aim to 'capture the molecular processes of capital accumulation in space and time within their own borders' (Jessop, 2006, p. 159).

The recent spatial restructuring is not caused by a capitalist crisis of accumulation, which, in Harvey's (2005) understanding, is the trigger of spatial fixes in neoliberalism. Nevertheless, the reorganization of value chains in the geoeconomic order is a reaction to a threat to capitalist production. The geoeconomic turn coupled with protectionist measures that limit free trade threatens the functioning of global value chains and has the potential to severely disrupt them. The weaponization of strategic technologies and products such as semiconductors could lead to severe production losses in several dependent end-user industries. The asymmetrical interdependence makes some states and their economies particularly vulnerable. Therefore, the uncertainties of the geoeconomic order constitute a state of crisis that needs to be 'repaired' by reshoring strategic production capacities, that is, fixing them on domestic territory. Respective industrial policy interventions can thus be understood not only as the participation in geoeconomic competition but also as the protection of capitalist interests that are threatened by geoeconomic uncertainties. From this perspective, the domestic class power of the ruling elite, restored under neoliberalism (Harvey, 2019), is not broken by the new geoeconomic constellation but persists in the geoeconomic order as capitalist interests are safeguarded by state actors, for example, through subsidies for their investments in new production sites.

Because the trigger and the functioning of spatial fixes in the geoeconomic order are fundamentally different from the neoliberal order, this contribution will refer to the spatial fixes in the former as 'geoeconomic fixes'. Table 1 provides an overview of the most central differences.

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Global value chains represent 'geopolitical spaces that bring together the capitalist and the territorial logics of power' (Moisio, 2019, p. 9). In these geopolitical spaces, political and private entities interact and negotiate based on their political and economic interests (Moisio, 2019; Saittakari et al., 2023). Governments leverage the innovation potential of their territories, strategically positioning them within global capital flows to attract investments and high-value-adding activities of TNCs (Saittakari et al., 2023). A key aspect of the preceding considerations is that within the geoeconomic order, there is a growing emphasis on the spatial reorganization of (sections of) value chains that are deemed strategic.

I argue that the technological know-how and production capacities required for geoeconomic fixes are overwhelmingly held by private companies. This means that private actors with the sought-after strategic assets are in a strong position vis-à-vis state actors. Spatiality works differently for TNCs and state actors. States cannot migrate and are tied to their individual borders. TNCs are tied to specific domestic regulations, yet the transnational diversification of their production networks and business structure has made them more fluid and allowed them to operate across borders and shift locations (Harvey, 2005). Geoeconomic fixes, in order to be effective, thus require the co-operation of state and private actors.

Business power is therefore of importance in the geoeconomic constellation and unexplored, apart from some notable contributions (Abels, 2024; Choer Moraes and Wigell, 2022; Eckert, 2024). It is argued here that geoeconomic fixes are determined by a convergence of interests between state and business actors. Business actors thereby take a 'best-of-both-orders' approach, taking advantage of the geoeconomization of their sector, justifying demands for subsidies and other supportive state measures, whilst at the same time trying to uphold the fading neoliberal order by pushing back against protectionist state measures limiting their foreign activities. This leads to three central contradictions: first, business actors framing their sector as 'strategic' to receive industrial policy support might lead to unintended consequences like protectionist measures limiting international trade. Second, the industry-supporting measures themselves contribute to global geoeconomic competition and the fading of the neoliberal order, for example, by causing subsidy races. Third, the spatial fixing of production based on a territorial logic can lead to issues in the profitable combination of labour and capital. If there is a shortage of skilled labour or if labour costs are too high, fixed industries may not be competitive without long-term government support. Paradoxically, following Harvey (2001), it is precisely these accumulation crises that usually trigger spatial fixes.

Table 1: Spatial and Geoeconomic Fix.

	Spatial fix	*Geoeconomic fix*
Global order	Neoliberal order	Geoeconomic order
Key actors	TNCs	TNCs/state actors
Role of the state	Market-liberal regulation	Intervention in strategic sectors; industrial policy
Target	Foreign territory	Domestic territory
Direction	Expansion (off-shoring)	Protectionism (reshoring)
Trigger	Crisis of accumulation	Geoeconomic uncertainties/strategic dependencies

Abbreviation: TNCs, transnational corporations.

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II. The European Industrial Policy on Semiconductors

This chapter analyses the development of the European industrial policy on semiconductors as an empirical case study. The semiconductor sector in general is a typical case regarding the theoretical argument outlined above. Semiconductors are viewed by the United States, China and the EU as highly strategic products in the struggle for technological dominance. Because of its strategic importance, the global semiconductor value chain has been subject to politically motivated spatial reorganizations in recent years, as evidenced by the conflicts between the United States and China, for example, and also by the extensive subsidy programmes to build up production capacities in various countries. In addition, TNCs are key players in this geoeconomic competition, as they possess the highly complex know-how and the necessary capabilities to build up production facilities and, in some cases, occupy key bottlenecks, such as TSMC in contract manufacturing or ASML in the field of lithography machines. European semiconductor policy is an interesting and largely unexplored case in this context, as the EU lags behind in the global race but is nevertheless striving to gain more control over the value chain.

The analysis takes an actor-centred approach to process tracing. Process tracing allows to examine the temporal dynamics of policy decisions, their negotiation process and their causal relationships. A process can be defined as the set of events that occur between a starting point and an ending point and that are related to the event being explained. It can be divided into several periods (Nullmeier, 2021). Process tracing is seen as a useful approach for this research because geoeconomization is a process that takes place over a longer period of time and involves various state and non-state actors. With the help of process tracing, this process and the role of the involved actors can be reconstructed. To set the time frame, the year 2012 was chosen as the starting point for the analysis, as the EC classifies semiconductors as a key technology in this year, underscoring the growing interest in semiconductors as a strategic technology. In addition, this is before the increasing geoeconomic conflicts surrounding the global semiconductor value chain, particularly from 2018 onwards. This ensures that geoeconomization and the associated changes in the European semiconductor strategy can be examined. The end-point is the adoption of the ECA in 2023.

The process is furthermore divided into three periods. Whilst the transition between these periods is generally fluid, they are distinguished to demarcate the trend of increasing geoeconomization as well as changes in the constellation of actors and policy developments. The periods relate to long-term external trends that had a strong influence on the development of the EU semiconductor strategy. This is in line with process theory, as external changes in the environment shape processes even if the respective events cannot be directly attributed to the analysed process and its actors (Nullmeier, 2021). Furthermore, this is in line with the assumption that the geoeconomization of EU policy is strongly shaped by external pressures (Herranz-Surrallés et al., 2024). In the first period, geoeconomization was not playing a dominant role, even though semiconductors were considered strategic. The external pressure on the EU increased with the inauguration of Donald Trump as US President in 2017. The trade war over semiconductors between the United States and China escalated soon after in 2018, which demarcates the start of the second period. The trade war led to reactions amongst the EU institutions, member states and the industry, as well as an increasing geoeconomization of the semiconductor

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strategy. The transition to the third phase is then marked by the global semiconductor crisis that broke out in 2021 during the COVID-19 pandemic and hit various European end-user industries. This semiconductor crisis exposed the risk of dependencies in Europe and led to an intensification of geoeconomization and comprehensive responses including the ECA.

In addition to these external factors, the positioning of actors within the EU also led to the advancement of geoeconomization, which will be examined in each period. Following an actor-centred approach to process tracing, different types of events can be distinguished: activities of an actor, perceptions of an actor and interactions between actors (Nullmeier, 2021). Building on the theoretical framework, there is a particular interest in the actions of state and industrial actors. Therefore, the analysis focuses on three specific groups of actors: first, the EU institutions and member states, which decide on individual measures of the semiconductor strategy; second, the semiconductor industry, which on the one hand co-operates with the EU and on the other hand addresses demands to the EU institutions [the associations selected for their central role in the political process are the Association for European NanoElectronics ActivitieS (AENEAS), SEMI Europe and the European Semiconductor Industry Association (ESIA)]; and third, the end-user industries that are particularly relevant in the context of the semiconductor crisis from 2021 onwards. For illustration purposes, the European Automobile Manufacturers' Association (ACEA) will be used as an example, as the automotive industry has been particularly hard hit by the crisis. To reconstruct the process of geoeconomization, key events related to these actors were extracted from official documents (policy documents, press releases and other publications) and analysed in chronological order.

Semiconductors as a KET (2012–2017)

During the first period (2012–2017), the EU recognizes the importance of semiconductors for the economy, ecology and digitalization in various initiatives and supports the semiconductor industry, especially in research and development (R&D).

In June 2012, the EC declares microelectronics and nanoelectronics a KET of systemic importance to the entire economy. KETs are considered crucial for addressing social challenges. The EU's weakness in the semiconductor sector is attributed to the insufficient conversion of the knowledge base into goods and services (EC, 2012). In May 2013, the EC published the Communication *A European Strategy for Micro- and Nanoelectronic Components and Systems*. The Commission addresses Europe's gaps in design and production and highlights the ever-increasing role of semiconductors during digitalization (EC, 2013). According to the communication, European companies may face the risk of being forced out of the market. The communication focuses on the need to promote R&D. It announces efforts to invest a further €10 billion from public and private funds in R&D by 2020 (EC, 2013).

To channel these investments, the Electronic Components and Systems for European Leadership Joint Undertaking (ECSEL-JU) was established in May 2014 (Council of the EU, 2014). ECSEL-JU involves private partners from previous initiatives, amongst others AENEAS, representing the industrial interests. Funding for the initiative is provided through a tripartite model consisting of EU funds, national governments and regional actors (ECSEL-JU, 2014a). The JU aims to co-ordinate R&D from the

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semiconductor level to higher system levels (ECSEL-JU, 2014b). ECSEL-JU thus targets the entire value chain of electronic components and systems (ECSEL-JU, 2016).

The EC recognizes the shortcomings in semiconductor manufacturing in Europe, as evidenced by the Declaration on KETs and the *European Strategy* already in the early 2010s. These shortcomings are deemed problematic as (a) semiconductors are identified as strategic technology concerning digitalization and (b) the semiconductor sector is viewed as essential to the overall economic development in Europe. Overall, the first period of the European industrial policy agenda is primarily focused on supporting R&D. Whilst this represents a European approach to industrial policy, it is relatively limited in scope compared to the measures of later periods and is aimed at technological progress, not at spatial reorganization of production capacities. Despite the EC's identification of deficiencies in European production and a lack of competitiveness amongst European companies, these issues are not directly addressed.

'The Nice Part of Globalization Is Over' (2018–2020)

During the second period (2018–2020), the geoeconomic landscape is changing. The rivalry between China and the United States intensifies, and the transatlantic relationship cools further. The trade war between the United States and China emerges in the semiconductor value chain (Bown, 2020; Malkin and He, 2024). In Europe, a debate on strategic autonomy and technological sovereignty is initiated. These developments create uncertainty in the European semiconductor industry and lead to a geoeconomization of the European semiconductor strategy.

In December 2018, the EC approves the *Important Project of Common European Interest* (IPCEI) *on Microelectronics*, the first IPCEI ever. The initiative is prepared and carried out by four member states. Its aim is to promote R&D for semiconductor components and technologies to be used in various application areas of European industry. The EC expects that, by 2024, a total of €1.9 billion in public investment would lead to a further €6.5 billion in private investment (EC, n.d.). According to Margrethe Vestager, Commissioner for Competition Policy, the state funding for microelectronics is justified by the importance of microelectronics for the EU's technological progress and the fact that the risky investments would not be made without public funding (EC, 2018). Concerns about excessive technological dependency are also mentioned, for example, by the Commissioner for Digital Economy and Society, Mariya Gabriel: 'If we don't want to depend on others for such essential technology, for example for security or performance reasons, we have to be able to design and produce them ourselves.' (EC, 2018). To some extent, the launch of the IPCEI represents a continuation of the industrial policy focus on R&D. However, the intensification of state intervention by using a new instrument specifically for the semiconductor sector, as well as its aim to reduce dependencies, indicates an increasing political interest in semiconductors and an incipient geoeconomization.

Amidst the altered geoeconomic landscape, the European semiconductor industry is experiencing a noticeable level of uncertainty. Jean-Marc Chery, the President of AENEAS, remarks:

> The 'nice' part of globalization is over, with renewed trade conflicts and with increased global uncertainty, resulting in more complexity for R&D and supply chains. […] In other

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> parts of the world, very large, holistic programs are being deployed to support aspirations to technology leadership, autonomy or even dominance. (AENEAS, 2019)

According to Chery, Europe's lag in the global technology race makes it crucial to establish independent access to semiconductor technologies to increase European sovereignty (AENEAS, 2019). SEMI Europe reacts to the changing geoeconomic context as well:

> Global trade tensions can quickly ripple through the industry to increase business costs, introduce uncertainty, stifle innovation and slow the flow of manufacturing parts, components and equipment across borders. (SEMI Europe, 2019a)

According to the association, global tensions can cause production to relocate and the value chain to undergo spatial reorganization, which is why trade restrictions should be lifted. Furthermore, SEMI Europe calls on the EC to provide additional incentives for the industry to expand design and manufacturing capacities in Europe (SEMI Europe, 2019a, 2019b), particularly against the backdrop of state subsidies for the semiconductor industry in China and the United States (SEMI Europe, 2020).

In the second period, the European semiconductor industry faces an ambivalent situation. On the one hand, there is a risk of disruptions in the value chain due to global tensions that could have a significant impact. On the other hand, this situation provides industrial actors with more negotiating power vis-à-vis the member states and the EU institutions because they can use the geoeconomic constellation to justify their demands. They warn against relying on production from other regions and highlight the risk of increased subsidies and funding opportunities in these regions, which could exacerbate the imbalance. The associations are highlighting the vulnerabilities of the value chain and urging measures to support the development of European production capacities. Through these actions, they are contributing to the politicization of the sector. The demands of the industrial actors aim at reducing uncertainties by stabilizing the value chain and minimizing investment risks through new public funding opportunities.

In July 2020, Commissioner Breton states that Europe will develop its own position in the new geopolitical landscape. To defend its strategic interests and strengthen its sovereignty, expanding Europe's capacities in the microelectronics sector is a top priority. The goal is to promote both R&D and production in Europe, with the aim of anchoring 20% of global semiconductor production in the region, including cutting-edge nodes (Breton, 2020).

In December 2020, 22 member states signed the joint declaration *A European Initiative on Processors and Semiconductor Technologies*. It aims to strengthen the European semiconductor ecosystem by expanding design and manufacturing capacities, including for cutting-edge nodes. It also addresses the geopolitical context, highlighting Europe's one-sided dependency and waning share on the global semiconductor market. It points out that the support of other regions of the world is contributing to this trend (Austria et al., 2020).

The plans of the EC and member states indicate an increased political emphasis on spatiality in the second period. They recognize a potential threat to Europe's geostrategic interests posed by dependence on semiconductor production in other regions of the world. The EC and the member states aim to reduce dependencies by reorganizing the value chain and strengthening European semiconductor production. State intervention is

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therefore intended to alter the original capitalist spatial production that emerged under market-liberal paradigms. The proposed measures follow a territorial logic and aim to fix additional semiconductor production capabilities in Europe. This would represent the attempt of a geoeconomic fix to the global uncertainties in the value chain. The plans of the EC and member states are in line with the interests of industry actors seeking state support in this second period.

Semiconductor Shortages and the ECA (2021–2023)

During the third period (2021–2023), the European semiconductor industry and end-user industries are facing pressure due to the semiconductor crisis. The coronavirus pandemic has two main effects on the development of the European semiconductor strategy. The first is that a surge in digitalization in the early stages of the pandemic is further increasing the importance of semiconductors in the world of work, the education system and the healthcare sector. The full extent of the second impact is seen in 2021: the production stoppages due to lockdowns and rising demand, combined with factors such as natural disasters and the hoarding of semiconductors by Chinese companies in the face of American export restrictions, lead to massive disruptions in the semiconductor value chain (Kleinhans and Hess, 2021).

This semiconductor crisis is having a negative impact on the production of various European end-user industries. According to ACEA (2021a), supply chain disruptions pose a significant challenge to European car manufacturers. The semiconductor shortage has made it impossible to produce enough cars to meet the rising demand in 2021. In September, the number of car registrations in Europe falls to the level of 1995. Against this background, the ACEA is calling for a strategic plan for the supply of semiconductors in Europe including the expansion of production capacities:

> Looking at the geopolitical dimensions of this unprecedented crisis, we can see how extremely vulnerable today's semiconductor supply chain is. It has also become crystal clear that we urgently need to minimize Europe's dependency on overseas markets for these vital components. The rise in global tensions between major markets, and projections showing that chip demand will continue to increase, make the risks of Europe's chip dependency even more apparent. (ACEA, 2021a)

In an open letter to EU Commissioner Breton, ACEA President Oliver Zipse assures the support of the European automotive industry for a concerted European initiative to strengthen European semiconductor production (ACEA, 2021b). The example illustrates that, in contrast to the second period, there is now also an increase in demand from end-user industries for European production capacities in the face of the semiconductor crisis. This expands the politicization of the sector and increases the political pressure on the EU institutions and member states.

In 2021, the EC published a series of documents addressing dependencies in the semiconductor sector. According to the *2030 Digital Compass* (March 2021), the EU is lagging behind its economic weight (EC, 2021a). Due to the crucial role of semiconductors in digital transformation, reliance on foreign production is viewed as a vulnerability. To address this issue, the aim is to establish the production of cutting-edge and sustainable semiconductors in Europe by 2030, accounting for at least 20% of global production in terms of value (EC, 2021a).

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The *New Industrial Strategy* update (May 2021) identifies six areas of strategic dependencies that need to be tackled, including semiconductors (EC, 2021b). Due to its lack of production capacities, the EU is practically entirely dependent on Samsung and TSMC for cutting-edge semiconductors (EC, 2021c). The EC argues that this is the result of unequal production conditions, including subsidies for the semiconductor industries in China, the United States, Taiwan, South Korea and Japan, which restrict fair global competition (EC, 2021c).

Due to the unstable value chain, the semiconductor industry urges the EU to continue working with like-minded partners. SEMI Europe (2021) suggests strengthening transatlantic co-operation and developing joint plans to secure critical value chains and bolster the semiconductor industry. There are several approaches for such co-operation. The *EU-US Trade and Technology Council* (TTC) holds its first meeting in September 2021. During the meeting, the transatlantic partners pledged to ensure a stable and transparent semiconductor value chain, reduce strategic dependencies on third countries and avoid a subsidy race (EC, 2021d). Another example of co-operation in the semiconductor sector is Thierry Breton's *Tech & Chips Tour* in the United States, Japan and South Korea at the end of 2021. On this tour, Breton (2021) promotes the view that the strong position of American, European and Japanese companies offers the possibility of a partnership to protect key technologies and co-ordinate export controls: 'We cannot let key technologies go to China'. He reiterates the goal of making Europe a major production location, linking it directly to strategic autonomy:

> Strategic autonomy without production facilities is doomed to failure. This is what the current shortage is teaching us. Shifting or mitigating Asian dependence to American dependence – even though we are allies – provides no guarantee of security of supply. […] Considering the current geopolitical tensions, it is imperative that Europe can count on a production capacity that is up to the task, both in terms of volume and advanced technology. (Breton, 2021)

In February 2022, the EC publishes its proposal for the ECA (EC, 2022a), which is supplemented in May 2022 by the *Commission Staff Working Document: A Chips Act for Europe* (SWD) (EC, 2022b). The EC acknowledges the impact of the geopolitical context on the uncertainties faced, such as export restrictions, and presents the actions of other world regions as a challenge, as Europe falls behind (EC, 2022a). The EC formulates five strategic goals: strengthening leadership in R&D, expanding innovation capacity in all production stages, increasing production capacity to 20% of the global market by 2030, addressing the shortage of skilled workers and improving the monitoring of global supply chains. To achieve these goals, the EC proposes measures divided into three pillars.

Pillar 1 is the launch of the *Chips for Europe* initiative. The initiative aims to further strengthen Europe as a R&D location. Investments will also be made in competence centres and the training of skilled workers. Additionally, a 'Chips Fund' will be established under Pillar 1 to improve funding availability throughout the entire value chain. Furthermore, the KDT-JU, successor of ECSEL-JU, will be replaced by the new Chips-JU. The measures of the Chips for Europe initiative (excluding the Chips Fund) will be implemented by this new JU (EC, 2022b). The EU and participating states' contributions to the JU will be increased to €4.175 billion each.

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Pillar 2, 'Security of Supply', focuses on production capacities. The goal is to fund facilities that do not yet exist in the EU, so-called first-of-a-kind facilities. These facilities may include production capacities for more advanced semiconductors, the use of new materials, or improved energy and environmental performance. The purpose is to improve the supply of semiconductors in Europe. To achieve this goal, state aid will be provided by member states.

Pillar 3, 'Monitoring and Crisis Response', aims to establish a co-ordination mechanism between member states and the EC to assess the supply and demand of semiconductors. The objective is to identify bottlenecks as early as possible and, if necessary, trigger a crisis stage that enables the EC to implement emergency measures. The crisis response measures are the following: first, mandatory information requests to actors in the semiconductor industry in order to investigate disruptions and determine capacities; second, the ability to give priority orders to individual companies to increase the production of crisis-relevant products; third, procurement of crisis-relevant products on behalf of member states; and fourth, export controls to prevent the exacerbation of shortages caused by the export of crisis-relevant products. The EC justifies these far-reaching options by pointing to the vulnerability of critical sectors such as energy, transport, finance, health, defence and security (EC, 2022b).

The ECA is projected to generate more than €43 billion in investment by 2030, with a similar amount of private investment expected in the long term. The *Chips for Europe* initiative will receive €11 billion in public funds, including €3.3 billion directly from EU funds, whilst the Chips Fund will receive €2 billion. Furthermore, the European Investment Bank will provide loans for the entire semiconductor ecosystem. Member states are expected to invest a total of €30 billion (EC, 2022b).

After the geoeconomic tensions increased in the second period, the semiconductor crisis in 2021 marked a sharp increase in these trends. Whereas in the second period, uncertainties threatened the supply of semiconductors, now actual production losses are affecting the economic development of important European economic sectors such as the automotive industry. The globalized value chain is therefore in crisis. The EU is responding with the ECA, which is an attempt to fix and reorganize the value chain spatially by anchoring production facilities in Europe to create security of supply. The interventionism is particularly evident in three areas: first, the financial scope of the ECA, which is many times greater than that of previous initiatives like the IPCEI and joint undertakings – even though the actual scope depends heavily on the willingness of private actors and member states to invest. Second, the EC's toolbox in Pillar 3 shows that the EC perceives combating semiconductor crises and monitoring the semiconductor ecosystem as its political responsibility. Third, during the first and second periods, the focus was mainly on R&D, but Pillar 2, arguably the heart of the ECA, goes beyond this as it aims to establish production capacities in Europe.

In April 2022, ESIA and SEMI Europe, along with other industry and digital associations, published a joint statement (ESIA, 2022a, 2022b) commenting on the ECA. They welcome the proposal as a necessary step to boost investment in production capacities in Europe. However, the associations are critical of some aspects. It is pointed out that achieving the ambitious 20% target by 2030 would require significantly higher public investments. Furthermore, the EC's far-reaching powers based on Pillar 3 are criticized, as they could restrict competition between market players. For instance, the concept of

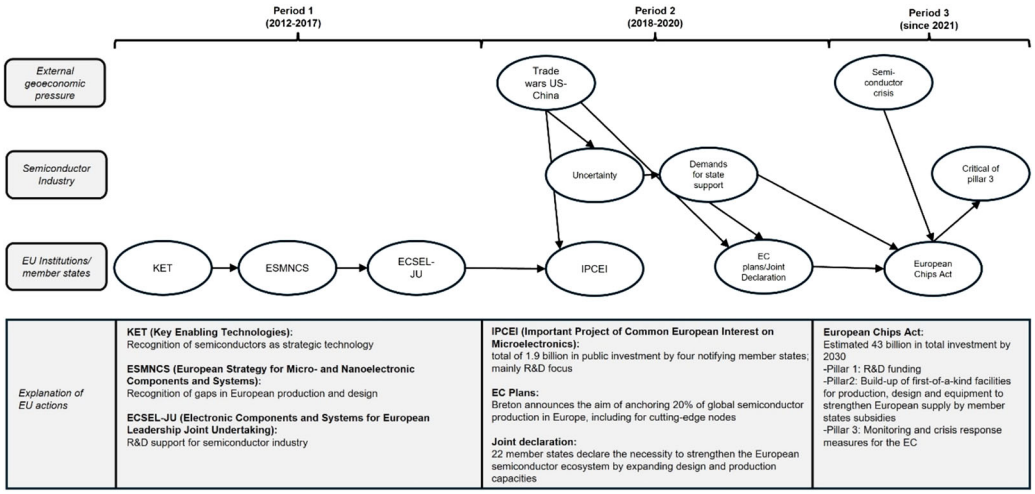
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priority orders is not perceived as suitable for the intricacies and complexity of the global value chain (ESIA, 2022a, 2022b). ESIA states that the suggested measures would not be able to prevent or halt semiconductor shortages, as they are not localized but rather global phenomena. Semiconductors are produced with a lengthy lead time for specific applications and cannot be easily redistributed. Therefore, the proposed toolbox for the EC would not be effective in combating it (ESIA, 2022a, 2022b).

SEMI Europe is critical of Pillar 3 as well. The mechanisms would pose a risk of undermining the fundamental orders of the semiconductor value chain and the overall EU economic system (SEMI Europe, 2022a). The association rejects protectionist measures and calls for increased international co-operation. Regarding Pillar 2, SEMI Europe recommends expanding the promotion of *first-of-a-kind* facilities to other important semiconductor technologies, such as equipment manufacturing and design (SEMI Europe, 2022a). According to SEMI Europe (2022b), it is crucial to provide incentives promptly, as companies may otherwise invest outside of Europe due to the favourable conditions in other regions of the world.

As already evidenced in the second period, the semiconductor industry takes a supportive stance towards the EU semiconductor strategy and actively promotes the politicization of their sector. This is in line with the findings of Eckert (2024), who diagnosed a strong support of business actors for the ECA by analysing business reactions to the proposal. The industrial actors demand state intervention to support risky investments in European production capacities. However, their strong criticism of the third pillar of the ECA shows that the semiconductor industry is also trying to push back state influence and to maintain its own autonomy. Monitoring is accepted under certain conditions, but instruments such as priority orders, redistribution or export controls are strongly rejected. All in all, state interventionism is welcomed mainly in the form of subsidies and other support, not in the form of interference in the autonomy of the industry. This can be seen as a case of

Figure 1: Overview of All Three Periods. EC, European Commission; EU, European Union; R&D, research and development.



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a 'best-of-both-orders' approach, combining the advantages of geoeconomization, that is, subsidies and other state support, with those of the neoliberal order, that is, free trade and no interference in the industries autonomy by state actors.

The final decisions on the adoption of the ECA are taken in the European Parliament (EP) and the Council in July 2023. The ECA enters into force in September 2023. The co-legislators largely follow the proposal. Notable deviations include the extension of the *first-of-a-kind* concept to facilities producing equipment for semiconductor manufacturing and the introduction of a *Design Center of Excellence* label in Pillar 2, which is awarded to innovative facilities in the design sector. All *first-of-a-kind* facilities can be supported by member states without restrictions under the usual state aid rules. Furthermore, there are some restrictions in Pillar 3: the co-legislators specify that priority orders may only be used as a last resort. In addition, only information necessary for crisis management may be obtained [European Parliamentary Research Service (EPRS), 2023, pp. 9–11]. This shows a certain responsiveness to the industry's demands, particularly with regard to the expansion of funding opportunities. It underlines the trend that the semiconductor industry, due to its strategic capabilities, is in a strong position at the European level. Figure 1 provides an overview of all three periods.

Conclusions

This contribution asked how global value chains for strategic technologies are spatially restructured by industrial policy measures on EU level in the course of geoeconomization and how industrial actors influence this process. The conceptual framework of this article proposed a twofold argument. First, it was argued that state actors increasingly intervene in the spatial organization of strategic value chains to reduce strategic dependencies that have arisen during globalization. They strive for a 'geoeconomic fix', that is, anchoring the production of strategic technologies in their own territory in order to reduce uncertainties threatening capitalist production in the geoeconomic order. Second, the geoeconomic fix can only be achieved in co-operation with industrial actors that possess these strategic capabilities. These actors are therefore in a strong position vis-à-vis state actors.

The case study shows that these assumptions apply to the development of European semiconductor policy. It demonstrates that the importance of spatiality increases in the course of geoeconomization. Against the backdrop of strategic dependencies, state actors attempt to intervene and anchor production capacities in Europe. These developments are particularly noticeable in the second period, following the start of the semiconductor trade wars between the United States and China. The first IPCEI on microelectronics marks increasing political interest in the sector and ambitions to decrease strategic dependencies. Furthermore, the EC and the member states develop additional plans to increase European production capacities. In the third period, the semiconductor crisis from 2021 onwards significantly intensifies these trends. Here, dependence leads to a sensitive vulnerability of important European industries, resulting in an economic crisis. With the ECA, the EC is proposing a comprehensive plan to promote semiconductor production in Europe, which represents an attempt of a geoeconomic fix. The new industrial policy interventionism is reflected in several aspects of the ECA: in its huge financial scope; in the EC's

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toolbox in Pillar 3, which shows that the EC considers it its responsibility to fight semiconductor crises and monitor the semiconductor ecosystem; and in going beyond R&D funding by subsidizing production capacities in Europe.

Industrial actors benefit from the geoeconomization of the sector and promote its politicization to justify their demands for subsidies. At the same time, they seek to maintain the benefits of the neoliberal order, such as free trade, and to prevent state intervention in their autonomy. Therefore, they take a 'best-of-both-orders' approach. In the second period, the European semiconductor industry contributes to the politicization of its sector in the face of trade wars and calls for the development of European production capacities. It maintains this position in the third period and supports the extensive measures taken by the ECA in Pillars 1 and 2 in this respect. However, it sharply criticized the intervention options proposed for the EC in Pillar 3, as these would constitute an interference in free trade and its autonomy. The development of an industrial policy to support European design and production capabilities demonstrates a certain responsiveness of the EU institutions to the industry's demands, particularly with regard to the expansion of funding opportunities. It underlines the trend that the semiconductor industry is in a strong position at the European level due to its strategic capabilities. However, this is accompanied by some potential restrictions on the autonomy of the industry, although it is uncertain to what extent the EC will use its new intervention instruments.

The geoeconomic fix leads to contradictions. These could be an indication of the hurdles that the measures under discussion will face in the coming years. First, government support further exacerbates the geoeconomic competition. This can be seen in the measures taken by other countries such as the United States, China, Japan, South Korea and Taiwan. The ECA contributes and further aggravates this subsidy race. In this light, it is questionable whether the ECA can be seen as a purely defensive instrument (Bauerle Danzman and Meunier, 2024). Second, it could be difficult to combine labour and capital profitably. The spatial fix in the neoliberal order followed a capitalist logic by exporting productive capital. The geoeconomic fix runs in the opposite direction, according to a politically motivated territorial logic. Extensive subsidy programmes make investments attractive to private companies and minimize their financial risk. Private capital is therefore safeguarded by state actors in the geoeconomic constellation. There is no guarantee that fixed production will be profitable without long-term state support, as it is even uncertain whether state-supported European semiconductor production will be globally competitive and profitable. In addition, qualified labour is needed to run the production, the availability of which is not guaranteed either. On the contrary, the European semiconductor industry has been experiencing a shortage of qualified personnel for years.

This suggests that the success of the new European semiconductor strategy is not a foregone conclusion. Nevertheless, the ECA shows new ambitions, and the plans of advanced semiconductor manufacturers such as Intel or TSMC to invest in European production facilities demonstrate that European industrial policy at least could contribute to a global restructuring of the strategic value chain. The case study illustrates therefore that the geoeconomization of industrial sectors is also accompanied by an increased policy focus on their spatial (re)organization, as highlighted in this article. This has an impact on global value chains and TNCs, which in turn exert influence and promote their capitalist interests from a strong position vis-à-vis state actors, whilst at the same time seeking to

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prevent interventions in their autonomy. These developments are rooted in the competition for technological dominance as a central point of conflict in the new geoeconomic order. Semiconductors may be the key to achieving this dominance.

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