

Geopolitical risks in international business – managing strategic resource dependence

A semiconductor industry perspective

Master's thesis
in International Business

Author:
Onni Lundén

Supervisors:
Ph.D. Eriikka Paavilainen-Mäntymäki
Ph.D. cand. Elena Sivolapova

15.04.2025
Turku

The originality of this thesis has been checked in accordance with the University of Turku quality assurance system using the Turnitin Originality Check service.

Master's thesis

Subject: International Business

Author: Onni Lundén

Title: Geopolitical risks in international business – managing strategic resource dependence, A semiconductor industry perspective

Supervisors: Ph.D. Eriikka Paavilainen-Mäntymäki, Ph.D. cand. Elena Sivolapova

Number of pages: 68 pages

Date: 15.04.2025

In an increasingly interconnected global economy, control over strategic resources such as semiconductors has become a critical issue for governments, as they are essential in reinforcing national security and technological innovation. The COVID-19 pandemic and rising geopolitical tensions between major powers, particularly the US and China, exposed significant vulnerabilities in the semiconductor supply chain, highlighting how disruptions from external shocks to that industry can affect the wider business environment. This leads to the central topic of the study: How can multinational corporations manage strategic resource dependency in a volatile geopolitical environment. This study examines the connections between geopolitical risk and resource dependency from the perspective of the semiconductor industry, focusing on the analysis of how firms navigate in a business environment where inputs are concentrated in politically sensitive regions, and where government influence restricts decision-making.

The study uses a qualitative approach, supported by three connecting theoretical frameworks: resource dependence theory, strategic resource management theory, and techno-nationalism. The investigation is based on secondary data, consisting of journal articles, industry reports, policy documents and media coverage discussing the semiconductor industry. The collected data was analysed with a thematic methodology to identify key themes in the sources, based on a process of tagging, categorising, and refining the data to discover the main issues the industry is faced with. To complement this broad analysis, Intel Corporation was selected as a case example to analyse the findings from the practical perspective of a major company in the industry.

The findings suggest that the primary geopolitical risks to the semiconductor industry are focused on the uncertainty with regards to trade restrictions and export controls, and the concentration of production to East Asia. Governments have started to put more emphasis on securing their semiconductor supply chains, with the US and EU enacting CHIPS Act-initiatives to reshore production and improve technological sovereignty. Intel has aligned with these objectives, taking advantage of the governmental support to restructure supply chains and geographically diversify production. The findings conclude that firms operating in geopolitically exposed industries must manage external dependencies by aligning with government industrial policies, while simultaneously developing internal capabilities to maintain a level of strategic autonomy. These insights contribute to both the theoretical discussion of resource dependence, and the practical discussion of geopolitical risk management in international business. The study can be seen as a snapshot of the current developments in the semiconductor industry, providing context for future research of the industry

Key words: geopolitics, risk management, resource dependence, techno-nationalism, supply chain resilience, semiconductor industry, international business strategy.

Pro gradu -tutkielma

Oppiaine: Kansainvälinen liiketoiminta

Tekijä: Onni Lundén

Otsikko: Geopoliittiset riskit kansainvälisessä liiketoiminnassa – resurssiriippuvuuden hallinta, puolijohdeteollisuuden näkökulma

Ohjaajat: KTT Eriikka Paavilainen-Mäntymäki, VKT Elena Sivolapova

Sivumäärä: 68 sivua

Päivämäärä: 15.04.2025

Yhä verkottuneemmassa globaalissa taloudessa strategisten resurssien, kuten puolijohteiden, hallinnasta on tullut valtioille keskeinen aihe, sillä ne ovat olennaisia resursseja kansallisen turvallisuuden ja teknologisen innovaation vahvistamisessa. COVID-19-pandemia ja suurvaltojen, erityisesti Yhdysvaltojen ja Kiinan, väliset kiristyneet geopoliittiset jännitteet paljastivat merkittäviä haavoittuvuuksia puolijohteiden toimitusketjuissa, tuoden esiin miten toimialan ulkoisista häiriöistä johtuvat katkokset voivat vaikuttaa laajempaan liiketoimintaympäristöön. Tutkimuksen keskeinen tavoite on analysoida, miten monikansalliset yritykset voivat hallita strategisia resurssiriippuvuuksiaan epävakaa geopoliittisessa toimintaympäristössä. Tämä tutkimus tarkastelee geopoliittisten riskien ja resurssiriippuvuuden yhteyttä puolijohdeteollisuuden näkökulmasta, keskittyen analysoimaan miten yritykset navigoivat toimintaympäristössä, jossa tuotantopanokset ovat keskittyneet poliittisesti herkille alueille ja jossa valtioiden vaikutusvalta rajoittaa yritysten päätöksentekoa.

Tutkimuksessa käytetään laadullista lähestymistapaa, jota tukevat kolme toisiinsa linkittyvää teoreettista viitekehystä: resurssiriippuvuusteoria, strategisen resurssienhallinnan teoria ja teknonationalismi. Tutkimus perustuu toissijaiseen aineistoon, joka koostuu tieteellisistä artikkeleista, toimialaraporteista, poliittisista asiakirjoista ja median raportoinnista puolijohdeteollisuudesta. Kerätty aineisto analysoitiin temaattisella menetelmällä, jonka avulla tunnistettiin lähteiden yhdistävät teemat. Analyysi perustui aineiston koodaukseen, luokitteluun ja jalostamiseen, joiden kautta hahmottuivat toimialan keskeisimmät haasteet. Tämän laaja-alaisen tarkastelun tueksi Intel Corporation valittiin tapausmerkiksi, jotta havaintoja voitiin tutkia myös käytännön näkökulmasta suuren toimialayrityksen kautta.

Tutkimuksen tulokset osoittavat, että puolijohdeteollisuuden keskeiset geopoliittiset riskit liittyvät epävarmuuteen kaupan rajoituksista ja vientivalvonnasta, sekä tuotannon keskittymiseen Itä-Aasiaan. Hallitukset ovat alkaneet kiinnittää enemmän huomiota puolijohteiden toimitusketjujen turvaamiseen; Yhdysvallat ja Euroopan unioni ovat toteuttaneet CHIPS Act -aloitteita tuotannon palauttamiseksi kotimaahan ja teknologisen suvereniteetin vahvistamiseksi. Intel on linjannut strategiansa näiden tavoitteiden mukaisesti, hyödyntäen valtiollista tukea toimitusketjujen uudelleenjärjestelyssä ja tuotannon maantieteellisessä hajauttamisessa. Tulosten perusteella geopoliittisesti herkille toimialoille sijoittuvien yritysten tulee hallita ulkoisia riippuvuuksiaan asettumalla linjaan valtion teollisuuspoliittisten tavoitteiden kanssa, mutta kehittäen samalla sisäisiä kompetenssejaan strategisen autonomian säilyttämiseksi. Havainnot edistävät teoreettista keskustelua alan resurssiriippuvuudesta, ja käytännön ymmärrystä kansainvälisen liiketoiminnan geopoliittisesta riskienhallinnasta. Tutkimus toimii myös ajankohtaisena kuvauksena puolijohdeteollisuuden nykykehityksestä, tarjoten lähtökohtia alan tulevalle tutkimukselle.

Avainsanat: geopolitiikka, riskienhallinta, resurssiriippuvuus, teknonationalismi, toimitusketjujen resilienssi, puolijohdeteollisuus, kansainvälinen liiketoimintastrategia.

TABLE OF CONTENTS

1	Introduction	8
1.1	Background and context	8
1.2	Purpose of the study	10
1.2.1	Research questions	11
1.2.2	Justification and significance of the study	12
1.3	Structure of the study	12
2	Semiconductor industry overview	14
2.1	COVID-19 response and recovery	14
2.2	Rising geopolitical tensions	15
2.3	Case example: Intel Corporation	16
3	Theoretical background	19
3.1	Resource dependence theory – external control over organisations	19
3.2	Strategic resource management theory – internal emphasis	23
3.3	Techno-nationalism and industrial policy	24
3.4	Theory synthesis	27
4	Methodology	29
4.1	Research approach	29
4.2	Research design	30
4.3	Data collection	32
4.4	Thematic analysis	34
4.5	Evaluation of the study	36
4.6	Assessment of research ethics	38
4.7	Use of generative AI	39
5	Findings & discussion	41
5.1	Geopolitical risks affecting semiconductor supply chains	41
5.2	Government policy and international agreements in risk management	44
5.3	Intel Corporation’s strategy	47
5.3.1	Resource dependence perspective	48

5.3.2	Strategic resource management perspective	49
5.3.3	Techno-nationalism perspective	50
6	Conclusions	52
6.1	Risk mitigation strategies for semiconductor firms	52
6.2	Theoretical implications and future research	53
7	Summary	57
	References	60

LIST OF FIGURES

Figure 1: Synthesis of theory framework	27
---	----

LIST OF TABLES

Table 1: Data sources grouped by their relevance to RQ themes.	35
Table 2: Key risks in the semiconductor industry, responses and theoretical interpretation.	52

1 Introduction

1.1 Background and context

Strategic resources are, by definition, highly valuable and sought after assets in the global economy. They are resources possessing aspects of “imperfect imitability and imperfect mobility” (Chi 1994, 271), meaning they cannot be easily substituted. Classic examples of these resources include oil and rare minerals, with advanced components such as semiconductors acting as modern examples. Semiconductors are essential materials that partially conduct electricity, becoming the base component in the manufacturing of countless devices, from transistors and diodes to integrated circuits such as microchips. Control over these crucial resources is often vital for national security, technological advancements and economic stability, as the dominance or shortage of strategic inputs like semiconductors can sway the balance of global power, shaping economic relations between countries (Lamsal et al. 2023).

The semiconductor sector in particular is heavily dependent on certain rare inputs and an intricate global supply chain. It exemplifies a strategic resource on which modern technological development is reliant on, yet one that is inherently volatile. Since computing is a relatively recent advancement in technology, the semiconductor supply chain takes full advantage of the modern globalised business environment in optimising production and reducing costs. Rare-earth minerals are mined in resource rich areas of China and Australia, design and manufacturing are dominated by a few advanced economies like Taiwan and the US, while assembly and testing is often outsourced to low-cost areas of Southeast-Asia. (Wang et al. 2024)

Semiconductors have thus become a foundational component of virtually all modern electronics and emerging technologies, having accordingly grown into a focal point for innovation and, more recently, for geopolitical manoeuvring (Park 2023). The World Economic Forum has highlighted the importance of semiconductors not only for the technology sector, but across the whole economic landscape given the proliferation of computing in all aspects of life, from smartphones and appliances to critical medical equipment (Aboagye et al. 2022).

Recent global supply disruptions during Covid-19, shipping lane blockades, and heightened political tensions between the US, China and Taiwan have highlighted the vulnerability of international business to geopolitical shocks. This is especially true for industries dependent on specific strategic resources such semiconductors (Lamsal et al. 2023). Geopolitical conflicts or rising tensions in global relations can greatly hinder the access to critical resources, create barriers

for trade, and introduce notable uncertainty for MNC's in the affected sectors (Dannreuther 2013). Companies must therefore devise complex risk management strategies to navigate disruptions largely driven by external factors beyond their control.

The semiconductor industry is a contemporary example of these external challenges, as a substantial share of the essential raw materials and manufacturing capacity for microchips is concentrated in politically sensitive areas, particularly in East Asia and near the South China Sea, where China has increased its military presence and posturing through military exercises around its neighbours' borders (Jash 2024). Taiwan's TSMC (Taiwan Semiconductor Manufacturing Company) controls 61,7 % of the global semiconductor foundry market (Statista 2024a), and serves as the primary supplier of cutting-edge chips for leading technology firms such as Nvidia and Apple.

To complicate things, majority of the critical rare earth minerals that are needed in semiconductor manufacturing are procured from China, which is responsible for more than two-thirds of the global production (Statista 2024b). This heavy reliance on a single country represents a significant vulnerability in the semiconductor supply chain, particularly for Western companies, that could face severe disruptions if China were to impose sudden export restrictions or sanctions. China's growing regional influence and its ambitions to become more self-sufficient in technology add another layer of complexity. Driven in part by pressure from the West, China is rapidly advancing toward technological autonomy at a pace many Western nations struggle to keep up with.

During the Covid-19 pandemic, markets saw the effects of disruption in the semiconductor industry, slowing down or completely halting production downstream of the semiconductor supply chain, which caused a rush to prevent similar crises in the future. Companies responded by diversifying suppliers and forging new partnerships, while governments stepped in more forcefully to safeguard the supply of this strategic resource. For example, the CHIPS Act (US Congress 2022) aims to increase domestic semiconductor manufacturing and research, aiming to secure a stable chip supply and reduce vulnerability to geopolitical shocks or global crises, akin to the pandemic. A similar act was also passed in the EU (European Union 2023), seeking to reduce the unions dependence on external regions for the production of semiconductors.

The complexity and importance of the semiconductor industry mean that it is heavily influenced by external forces, limiting companies' autonomy in decision-making. Semiconductor firms are affected by government policies, geopolitical relations and other factors, which shift the balance of power away from them. This external control aligns with Pfeffer and Salancik's (1978) resource dependence theory, which explains how an organization's behaviour is shaped by external

constraints and dependencies in its environment. Contrasting this view, strategic resource management theory (Barney 1991) emphasises the firm's internal competencies, such as intellectual property and specialist skills, and how leveraging these capabilities can shift the balance of power in decision-making back towards the firm. However, as these theories usually focus on inter-organisational relations, they often omit the relationship between firms and government, as in most industries it is not a central concern. The semiconductor industry is a unique subject, as it is in the intersection of business and geopolitics. Managing dependency in this industry requires accounting for direct government influence and international power struggles, making its approach to resource dependence distinctly different.

Strategic resources remain central to the global economy, though the particular resource in focus may change over time. Shifting throughout history from iron and steel to oil and gas, and now to high-tech manufacturing and semiconductors, the constant technological development has tipped the scales of geopolitical power many times, favouring nations that have been able to support and adapt to the key resources of the era (Overland 2019). Today, semiconductors are at the center of economic development and technological progress. Control over chip production and the materials supporting it is no longer just a commercial advantage; it has become a matter of national security and leverage for global influence. The industry's reliance on a geographically dispersed supply chain, with critical production steps located in politically uncertain regions, has highlighted some critical vulnerabilities, with disruptions in this sector having enormous consequences for firms, governments, and the world economy. In response, the strategic importance of semiconductors has fuelled a wave of techno-nationalism, wherein states take a more active role in controlling critical industries to secure access to vital resources and technologies (Park 2023).

1.2 Purpose of the study

The semiconductor industry's fragile environment has been repeatedly threatened in recent years, forcing both firms and governments to adjust their decision-making. The disruptions mentioned earlier have compelled the industry players to re-evaluate their resource dependencies and global operations, with geopolitics at the core of the matter. This situation presents the fundamental problem: how can semiconductor firms secure stable supply chains and strategic resources when faced with geopolitical uncertainty? In other words, companies must determine how to manage critical resource dependence when key aspects in their business environment are subject to external political forces beyond their direct control. This challenge of managing strategic resource dependency in a highly uncertain environment is the main topic of this study.

In order to find answers to the challenge above, the aim of this study is to examine the influence of geopolitical risk in strategic resource management, at both the firm and national level. The research examines the interdependencies that shape the industry's response to external risks, highlighting how companies have reacted to recent geopolitical pressures and what strategies they have used to manage uncertainty in a volatile market environment by exploring the interdependencies and relationships in the semiconductor industry. A central focus is placed on the East Asian region, as it is critical to semiconductor supply chains and at the center of geopolitical risk for the industry. To provide real-world insight into these topics, the study builds upon a case example of Intel Corporation, which is used to illustrate how a major firm navigates these challenges in practice.

1.2.1 Research questions

This study is guided by one primary question, with three sub-questions further detailing the objectives of the thesis. The main research question is:

What risk management strategies can multinational corporations (MNCs) employ to safeguard their semiconductor supply chains from geopolitical instability in East Asia?

To provide further context, the following sub-questions are answered:

1. *What are the primary geopolitical risks affecting semiconductor supply chains in Eastern Asia?*

This question identifies the specific risks that MNCs face in the region, contextualising the need for the risk mitigation strategies at the focal point of this study.

2. *What is the role of government policies and international trade agreements in shaping MNCs' risk management strategies in the semiconductor supply chain?*

This sub-question analyses the external factors that impact the strategic decision-making of MNCs to secure their supply chains, such as trade agreements and government incentives for domestic production.

3. *How are MNCs restructuring their global supply chains to mitigate the geographical dependence for critical semiconductor components?*

This question addresses the specific strategies that Intel and other MNCs in the semiconductor industry are using to secure their critical resources, such as reshoring and diversification.

1.2.2 Justification and significance of the study

This study has significant implications, both in terms of academics and in practice. Academically, this study contributes to established literature and theory with an analysis of a critical industry at the intersection of business and geopolitics. It also extends the existing theories surrounding strategic resource management by putting a larger emphasis on governments and geopolitics as factors in an organisation's external environment, examining how firms manage these external constraints. This focus addresses a gap in current research, which is mostly concerned with inter-firm relationships rather than firm-government dependencies.

The findings of this study also have a practical relevance for companies and governments that are connected to the semiconductor industry. For companies, the analysis of strategies to anticipate and mitigate geopolitical risks is valuable for aiding decision-making in the company, and the case example of Intel gives a template on possible directions to take. The study is also a valuable resource for policy makers to understand the importance of the industry, and how the challenges within it can be addressed through government actions to gain the upper hand in securing the supply of strategic resources.

1.3 Structure of the study

After a brief explanation into the background of the study, an overview of the industry and the case analysis of the Intel Corporation is introduced in chapter 2, examining the factors that have led to changes in the semiconductor business environment, and how one company has approached these shifts. Based on this examination, the theoretical framework is introduced in chapter 3, building on theories around resource dependence, management and techno-nationalism, which are relevant to the examination of the industry. The chapter culminates to a graph displaying the interconnections between the theories.

Following the theoretical discussion, chapter 4 elaborates on the chosen research design. The secondary data approach was chosen considering the limitations that a study examining geopolitical strategies may have, such as lack of access due to the sensitivity of the topic. Given the exploratory nature of the study, thematic analysis was selected to support the inductive approach to data collection, where emerging themes were refined during the data collection process by coding and categorising data points based on their main subjects. These themes are collated into a table, illustrating which themes and sources best support the research questions. The chapter continues by

evaluating the trustworthiness and validity of the study, including an analysis of the ethical aspects of the research and usage of AI tools.

Chapter 5 presents the findings of the study, discussing how the primary themes discovered during data collection and the case company analysis link to the theoretical framework. These results detail what are the main risks affecting companies in the semiconductor industry, and shows through the Intel example, how these risks concerning geopolitical tensions and supply chain uncertainty can be managed, connecting these topics to the wider theme of techno-nationalism. The findings are summarised into a table consisting of key risks in the semiconductor industry, strategic responses to these risks, and their theoretical interpretation. Chapter 5.5 discusses the limitations and theoretical implications of the study, providing possible directions for future research topics concerning the subject. Finally, chapter 6 summarises the key points of the thesis.

2 Semiconductor industry overview

This chapter provides background to the drivers behind the current semiconductor industry environment, emerging from the supply chain vulnerabilities that were exposed during the COVID-19 pandemic. The intensifying geopolitical tensions concerning the industry are examined, which has prompted the US and China to prioritise developing domestic manufacturing to improve their strategic resource autonomy. The case example of Intel Corporation is included to illustrate how industry leaders are adapting to the changing business environment by shifting their production and partnership strategies, with the aim of reducing supply chain uncertainty.

2.1 COVID-19 response and recovery

To analyse the uncertainties and challenges facing the industry, it is essential to examine the most recent events that have driven changes in the environment. The COVID-19 pandemic had a profound impact on the semiconductor industry, as the sudden disruption brought many of the industry's vulnerabilities to light. Comparing this recent shock to the financial crisis of 2008 and the recession that followed for example, which expectedly reduced global demand, the pandemic rather caused a shift in the global demand while simultaneously introducing abrupt issues in the supply chain, becoming an unprecedented challenge for the industry (Smit et al. 2020).

During the early stages of the pandemic illness among workers as well as lockdowns and restrictions enforced by the governments in the affected countries halted production in many steps of the manufacturing process, creating bottlenecks down the supply chain due to the global scale and interconnectedness of the industry. (Ramani et al. 2022) These challenges were further exacerbated by the coinciding shift in demand, as the pandemic forced companies and workers into a remote environment, therefore increasing the demand for personal computers and devices required for a work-from-home setup. (Xiong et al. 2024) The sudden change required the chip manufacturers to react quickly, with no time to build new production capabilities. Therefore, production was shifted from other business areas to meet the consumer demands, leading to shortages in other sectors, such as the automotive industry. (Smit et al. 2020)

The disruption to the global supply chain caused by the pandemic forced companies and governments to look for alternative solutions for securing their strategic semiconductor supplies, ensuring constant resource availability. This has led to diversification of suppliers and an increase in vertical integration in production where possible. (BCG 2021) Both of these factors aim to reduce the dependency on China and the larger region, in pursuit of ensuring a timely supply of

semiconductors as demand increases. Partnerships between chip manufacturers and their end-customers have become more prominent, including public-private partnerships, especially in the USA and the European Union (Shivakumar et al. 2024), where governments have invested heavily to develop more robust domestic production capabilities to mitigate the disruptive effects of a future disruption in strategic manufacturing regions. (Yang 2023)

2.2 Rising geopolitical tensions

The COVID-19 pandemic coincided with escalating trade tensions between China and the USA, which further aggravated the struggles of the industry. Advanced semiconductors were a central focus of the export controls levied by the US government against China as a maneuverer to limit their access to critical technologies that were rising in importance, such as artificial intelligence (Sevastopulo and Liu 2023). Justified by being essential to national security, these political moves greatly disrupted the global supply chains of the industry and established semiconductor companies firmly as major players in the geopolitical environment between regions. (Wong et al. 2024)

Due to the restrictions based on China as a result of the trade war, the global semiconductor ecosystem has become increasingly polarised, with two distinct technological spheres. As companies such as Huawei faced bans in the West due to strategic concerns that arose with a Chinese company building critical infrastructure in the form of 5G networks (BBC 2022), China was compelled to accelerate its own efforts to build a self-sufficient semiconductor industry domestically (Reuters 2024). Similarly, Western companies such as Intel must adhere to US regulatory constraints, while simultaneously balancing their relationship with China to maintain a market share in the region. This divergence in the industry has fragmented the environment, where businesses are made to balance geopolitical allegiances with their own commercial interests. (Wong et al. 2024)

As the strategic nature of semiconductors has become more apparent to governments, policies to build up domestic production through extensive governmental support and subsidies have been put into action. In the US, the CHIPS Act was enacted to put aside \$52 billion dollars to re-shore manufacturing capabilities and research closer to the American market (Arcuri 2022). Through these incentives, companies such as TSMC (2020) and Intel (2024) have built new semiconductor foundries in the US, mitigating risks caused by the unbalanced dependency to the increasingly uncertain East-Asian market. Similar fund allocation policies have also been made in the EU, to enhance the regions market share and relevance in the industry, protecting their strategic sovereignty (Farrer 2022).

In response to these policies and their intensifying effect to geopolitical isolation, China has substantially increased investments in self-reliance by expanding funding for domestic semiconductor research and development (Goodrich 2024). This strategy is further reinforced by broader governmental policies, including the Belt and Road Initiative, which seeks to integrate regional neighbours more closely into China's sphere of influence through infrastructure projects and financial partnerships, thereby safeguarding the country's resource availability in the long term. (Huang 2016)

2.3 Case example: Intel Corporation

Intel serves as an exemplary case for examining the changes in the semiconductor industry, and how resource dependence theory, strategic resource theory and techno-nationalism appear in the business environment. Intel has declared a major shift in its strategy towards self-reliance, bringing the company to closer alignment with US government objectives. The strategy focuses on taking advantage of the firm's internal capabilities, as the global environment becomes increasingly uncertain. Analysing Intel's methods of navigating these geopolitical tensions gives a great insight into how firms react to the situation and what strategies they use to mitigate risks.

As one of the longest-standing companies in the semiconductor industry, Intel has a long history in semiconductor innovation and manufacturing, with a 62 percent market share in x86 computer CPUs (Statista 2025). However, supply chain disruptions and heightening geopolitical tensions due to the increasingly strategic nature of the industry have caused Intel to adapt their strategies in order to mitigate risks and reduce dependency on its East-Asian competitors.

The major semiconductor companies' approach to manufacturing can be grouped into three categories: Integrated Device Manufacturers (IDMs), fabless, and foundries. IDM, such as Intel, design and manufacture their own chips, but due to the initial and upkeep costs, most large companies (AMD, Nvidia, Apple) adopt the fabless model, where they are only responsible for the chip design, with foundries such as TSMC manufacturing the chips according to their specifications. (Hurtarte, et. al. 2011)

The industry has been slowly moving towards a fabless production cycle since the 1970s, when the semiconductor industry consisted of mostly vertically integrated manufacturers, where majority of the process were completed in-house. As the technology advanced, parts of the manufacturing were split off and outsourced in order to cut costs and increase efficiency in a quickly expanding and competitive industry (Sarma and Sun 2017). This, in turn, caused a consolidation of manufacturing

the most advanced semiconductors to only a few foundries: TSMC, Intel and Samsung. The high capital cost of starting a new foundry, as well as the level of technological knowledge required make building new foundries an insurmountable task to most firms without government involvement, leading to centralisation.

In order to mitigate future uncertainties in the semiconductor supply chain and to address strategic resource dependencies, Intel adopted their IDM 2.0 strategy, outlined in an announcement by the CEO Pat Gelsinger (Intel Corporation 2021). First, to reduce dependence on East Asia for the production of advanced microchips, a \$20 billion investment in expanding manufacturing facilities was made in Arizona as a strategic move to counteract this dependency. By developing domestic production and spreading out the risks of supply chain disruptions to more locations, Intel aligns itself with U.S. national security interests, benefitting from the government's increased interest in securing its semiconductor supply through granting subsidies for companies willing to support local production. It also mitigates the risks associated with geopolitical tensions in East Asia, including those stemming from US-China relations and Taiwan's precarious geopolitical position (Shivakumar et al. 2024b).

To further protect itself from the uncertainties associated with the semiconductor business environment, Intel Foundry Services (IFS) represents a broader strategic focus within IDM 2.0. With the aim of decentralising production in the industry by offering foundry services in both the United States and Europe, Intel planned to reduce the consolidation of manufacturing capacity in Asia, also diversifying the geographic distribution of its operations (McGregor 2024). This diversification further aligns with geopolitical strategies of both the U.S. and Europe, supported by the CHIPS act and the European Chips Act, respectively.

The IFS initiative also addresses the dependency of fabless companies, such as Nvidia and AMD, on East-Asian foundries, particularly TSMC. Through the construction of an alternative foundry ecosystem located in the Western markets, Intel envisioned to contribute to the broader goal of reducing global dependencies on single regions for critical semiconductor manufacturing, while also introducing new revenue streams for the company (Intel Corporation 2022). This pursuit of diversification aligns with strategic resource management theories, which put an emphasis on the importance of reducing single-point vulnerabilities in the supply chain.

To increase the firm's competitive advantage in the global industry landscape, a partnership with IBM was announced, focusing on developing the next-generation technologies in the advanced semiconductor sector (Gil 2021). This move was among the ways that Intel aims to bolster its

technological sovereignty, achievable through investments into a joint research partnership and domestic R&D capabilities. Gaining control of valuable intellectual property and reducing reliance on foreign technology is an important step in reaching the self-reliant manufacturing capability that governments are striving for.

Despite these initiatives, however, Intel still relies on third-party foundries, such as TSMC, for their most modern chip designs (Jiarui 2024), highlighting the complexity of the industry and resource dependence management, as well as the difficulty in achieving true self-reliance in semiconductor production. Intel has made significant progress in reducing its geographic dependency, but technological dependency remains an issue, among other challenges. By reshaping their operational model, Intel aimed to answer the dual pressures of geopolitical risks and supply chain vulnerabilities (Martin et al. 2024), which will be further discussed through the lens of strategic resource dependency theory. The way Intel aimed to address the changes in the environment and their IDM 2.0 initiative may show a blueprint for the direction that the semiconductor industry is heading towards.

3 Theoretical background

The semiconductor industry forms a complicated web of interconnected actors, from companies to governments, exerting and withstanding pressure from each other in order to cement their positions in this increasingly critical, but vulnerable field. As nations compete for technological dominance for geopolitical advantage, MNCs in the semiconductor sector find themselves in a challenging position, manoeuvring in a tense environment to secure their supply of this strategic resource. For companies to develop effective strategies in response to these mounting challenges and dependencies, while mitigating the associated risks, it is crucial to have a solid theoretical foundation in place to provide a broad understanding of the factors at play.

To analyse the complexities of the semiconductor industry, the foundational resource dependence theory (RDT) by Pfeffer and Salancik (1978) was selected to provide insight into the ways organisations manage dependencies of critical external resources, responding to shifts in their environment. Additionally, this chapter examines theories related to the RDT, to give a wider perspective of the semiconductor industry. The geopolitical context, central to the risks in strategic resource management, is considered, together with the added ramifications brought on by global supply chains. Recognising the theoretical background behind managerial decision-making is essential in providing answers to the questions posited in this study.

3.1 Resource dependence theory – external control over organisations

The central theme in Pfeffer and Salancik's (1978) resource dependence theory is highlighting the importance of the environment that a firm resides in. Organisations are “open systems”, which depend on the interorganisational relationships in their external environment. Therefore, to understand an organisations decision making and behaviour, one must understand the context where that behaviour is taking place.

Resource dependence theory acknowledges the influence of external factors on firm behaviour, but although the management is under constraint by their environment, the underlying uncertainty and dependence on external factors can be managed. Namely, through the exploitation of a power imbalance, such as control over vital resources that an organisation has over its constituents in the environment, control over the environment can be regained. Organisations and other actors in the environment are in a constant power struggle, often vying for a limited advantage to hold over their competitors. The balance is continuously in flux. If there are asymmetries in the dependency relationships of organisations through, for example, a resource exchange relationship where one

resource is more valuable than the other, power accrues to the less dependent party (Pfeffer and Salancik 1978, 53). This enables the stronger organisation to use that power to influence or constrain the weaker organisation. The potential to influence another is therefore attained through the control of valuable resources under the organisation's discretion, and the lack of reliable alternative sources.

One party is rarely in total control of achieving their desired actions or outcomes, and therefore the interdependence between actors is relevant to study. The level of interdependence varies based on the scarcity of resources, characterises transactions within the same environment, and is an outcome of the open systems nature of organizations; it is virtually inevitable (Miner 2006, 357). According to Pfeffer and Salancik (1978), the degree of control an organisation is subjected to and the extent of control to which an organisation is willing to comply to depends on the following conditions:

1. The focal organization is aware of the demands.
2. The focal organization obtains some resources from the social actor making the demands.
3. The resource is a critical or important part of the focal organization's operation.
4. The social actor controls the allocation, access, or use of the resource; alternative sources for the resource are not available to the focal organization.
5. The focal organization does not control the allocation, access, or use of other resources critical to the social actor's operation and survival.
6. The actions or inputs of the focal organization are visible and can be assessed by the social actor to judge whether the actions comply with its demands.
7. The focal organization's satisfaction of the social actors' requests are not in conflict with the satisfaction of demands from other components of the environment with which it is interdependent.
8. The focal organization does not control the determination, formulation, or expression of the social actor's demands.
9. The focal organization is capable of developing actions or outcomes that will satisfy the external demands.
10. The organization desires to survive. (Pfeffer and Salancik 1978, 44)

Influence can be observed if any of the above conditions are met, but the probability of external control intensifies as more of them are present. These conditions are not immutable and may be amended given the situation. In order to tip the scales in their favour, social actors will attempt to change the conditions to improve their likelihood of gaining control and exerting it over other

organisations in the environment. Access over information and valuable resources, as well as increasing the perceived value of one's own offering are strategies employed to increase one's leverage and influence the other party.

Although organisations strive to escape from external control, ultimately aspiring for certainty and stable, long-term survival through autonomous governance of their environment, stability often necessitates co-operation between organisations, therefore leading to a reduction in self-governance. This challenge is prevalent in every collective system, as exerting control over another organisation requires sacrificing some degree of one's own independence in decision-making. (Pfeffer and Salancik 1978). For instance, deeply integrating with a certain supplier or partner to secure resource access – by exerting control – inevitably introduces constraints on the controlling organisation's autonomy, as the flexibility in choosing alternative sources for resources or changing their strategy becomes more limited, when the interests of the controlled entity must also be taken into consideration.

The need for stability drives organisations to seek strategic interorganisational arrangements, which have the potential to reduce external resource dependencies. For example, *Interlocking the directorates* by sharing members of the board of two interdependent organisations enhances and facilitates cooperation between them through the improved social cohesion between organisations and the unobstructed communication, leading to faster and better-informed decision-making. *Joint ventures and business alliances* are formed to promote reliable access to the resources and knowledge of the partner organisations, improving efficiency by eliminating redundancies between the operations. (Drees and Heugens 2013).

Often, *mergers and acquisitions* are similarly recognised to be the result of interorganisational dependencies. The acquisition of a resource supplier offers organisations a reliable and stable source of inputs, which can be a crucial factor in vulnerable and competitive industries, where timely delivery is essential for production. It widens the organisations expertise, facilitating future collaborative developments and strategy execution. However, as mergers and acquisitions may run into issues concerning integration and overcapacity, the decision to *in-source production* can be viewed as a safer approach for reducing external resource dependencies. (Pfeffer and Salancik 2003)

Organisations enter into different interorganisational arrangements to secure access to resources that are essential in the pursuit of their goals but are at least partly controlled by other organisations in their shared environmental context. By that merit, interorganisational cooperation is a way for the

participants to take control of their dependence on other organisations in an attempt to mitigate the uncertainty created by that dependence (Gulati and Gargiulo 1999). Organisations can either actively engage with powerful actors, or build buffers to reduce their dependence, therefore retaining more control.

Although interdependence is a critical condition in the formation of interorganisational alliances, it may not sufficiently account for establishing one between organisations. When organisations decide on a strategic alliance to cope with their uncertain environment, they are confronted with the issue of identifying an appropriate partner. As information about the potential partner may be limited, intensified depending on the level of competition and proprietary intelligence in the industry, reducing the uncertainty required for a partnership to form may be difficult. Organisations can lose their share of control in an industry if a partnership falls through after sharing critical information to alleviate that uncertainty.

To alleviate these uncertainties, organisations rely on the wider network of interdependent and interorganisational connections, basing their partnership decisions on earlier alliances to guide future decision-making. The creation of new ties, stemming from the relationships between parties in the network, is conducive to the development of that very network, which augments its capability to further determine future alliance forming between the network participants (Gulati and Gargiulo 1999). In this way, to once again reduce uncertainty in their surroundings, organisations seek to shape their environment by distributing the associated risks of an alliance decision throughout their network.

To summarise the basic principles of the resource dependence perspective, Pfeffer (1987) provides the following tenets:

1. The fundamental units for understanding intercorporate relations and society are organizations.
2. These organizations are not autonomous, but rather are constrained by a network of interdependencies with other organizations.
3. Interdependence, when coupled with uncertainty about what the actions will be of those with which the organization is interdependent, leads to a situation in which survival and continued success are uncertain
4. Therefore, organizations take actions to manage external interdependencies, although such actions are inevitably never completely successful and produce new patterns of dependence and interdependence.

5. Furthermore, these patterns of dependence produce interorganizational as well as intraorganizational power, where such power has some effect on organizational behaviour.

Based on these principles, the core of the resource dependence theory culminates in answering the question: “why do organisations enter into interorganizational arrangements?” (Drees and Heugens 2013). The external dependencies, which can stem from a wide range of factors, such as increased market competitiveness due to globalisation or material shortages caused by geopolitical tensions, spur companies and organisations to find ways to increase control of their environment (Davis and Cobb 2010).

3.2 Strategic resource management theory – internal emphasis

Building upon the theories of Pfeffer and Salancik (1978), which focus on the importance of external resource dependencies that inform decision-making and are vital for the survival of organisations, Barney's (1991) resource-based view (RBV) highlights the strategic importance of internal resources of an organisation in order to gain sustainable competitive advantage and mitigating risks. In order for these internal resources to provide an advantage, they must be *valuable*, improving efficiency or effectiveness, *rare*, not widely available to competitors, *inimitable*, difficult to replicate or *non-substitutable*, no equivalents that can provide the same function. If these attributes are met, together with the organisation's unique resources, be it intellectual property, specialist skills or brand recognition, a sustainable internal advantage can be achieved, which is difficult for competitors to control (Barney 1991, 105-112). For example, firms that develop unique process technologies or hold patents for specific chip architectures can achieve a sustainable internal advantage, making it difficult for competitors to replicate their success. The theory emphasises the value of intangible resources such as knowledge and culture in pursuit of long-term power over the organisation's environment (Barney 1991, 110-111).

Both Pfeffer's resource dependence theory and Barney's strategic resource theory recognize that access to critical resources is a fundamental determinant to an organisation's success and survival. The differences appear in the selected perspectives: Where Pfeffer and Salancik (2003) focus on the external environment and how the dependencies in that context can be managed, Barney (1991) refines this theory by looking at the internal competencies of firms, and how they can produce competitive advantage.

Resource dependence theory posits that a company cannot be understood without examining its external environment, and the resource constraints and interdependencies that are born from those

relationships. In the semiconductor industry, companies often depend on external suppliers for critical materials, such as rare earth elements used in chip manufacturing. Disruptions in the supply of these materials can significantly impact production. For example, geopolitical tensions affecting the availability of rare earth elements have prompted companies to seek alternative suppliers for materials, illustrating the industry's vulnerability to external resource dependencies. Strategic resource theory explains how firms that gain control over critical resources, even if they originate from the external environment, can embed these resources, internalising and protecting them, while transforming them into sustained advantages. A notable difference between these theories comes from the timeline they address.

Resource dependence theory focuses on the survival of a company, in the face of external pressures and uncertainties, with an emphasis on collaborative relationships and company restructuring strategies to mitigate risks. Building upon the baseline of survival, Barney's approach focuses on the period after the organisation has stabilised, looking into the unique resources and capabilities that facilitated the firm's survival, and how they can provide an advantage into the future of the company. By looking into the properties of those resources, the resource dependence theory's argumentation is extended from the short-term survival into the firm's long-term strategic position in its environment. (Barney 1991)

The core difference in outlook appears in the form of strategic agency. Resource dependence theory highlights the external dependencies which limit a company's autonomy in their strategic choices. In contrast, strategic resource theory shows how, even while constrained, firms can shape their environment and leverage their distinctive capabilities. This approach offers a perspective focusing on the agency companies do have, rather than what they do not, giving managers more tools for their strategic decision-making.

3.3 Techno-nationalism and industrial policy

Technological innovation, primarily driven by market forces, has increasingly become a tool for securing geopolitical advantages. Techno-nationalism is an ideology, which directly links a nation's technological capabilities to its security and economic prosperity. This perspective puts an emphasis on developing and maintaining domestic technological advancements, increasing a nation's standing in the global hierarchy. The theory is based on the realism doctrine of geopolitical relations, framing the international power structure as a zero-sum game, where technological gains by one nation are a potential security threat to others (Shih 2020).

As advanced technologies, such as artificial intelligence and quantum computing are increasing in strategic importance, governments have started to adopt a more protectionist and interventionist mindset in controlling the factors facilitating these developments, including the semiconductor industry, the products of which are directly responsible to the speed of development in many related tech sectors. This perspective is closely related to strategic resource management theory, which traditionally focuses on physical resources akin to oil and rare earth minerals, techno-nationalism posits that these resources can be intangible, such as intellectual properties or worker expertise, following the strategic resource theory of Barney (1991).

According to Park (2023, 10), the increasing geopolitical friction around the globe has brought on a resurgence of techno-nationalism, a contemporary form of mercantilism, causing some nations to pull back from global co-operation in favour of shifting to a more geo-economic stance in critical industries. It can be defined as the converging of technological innovations and national security policies, where governments deem certain technologies so critical to national interests that they justify significant intervention (Breznitz 2021). These interventions can range from government subsidies and grants to promote domestic industries, to protectionist trade policies like export controls.

Techno-nationalism is not just a recent phenomenon, as there have been many stages in technological development that have warranted governments to take a more active approach in ensuring international competitiveness. During the Cold War for example, the importance of technological relevancy could be seen through the extreme focus on the space race between USA and the Soviet Union at the time, as well as the need to develop nuclear power and early computer technology (Friedman 2009). This historical context highlights the link between heightened geopolitical tensions, and the prevalence of techno-nationalist policies, as uncertainty leads to a need in wresting back control, in accordance with the strategic resource management theories' core tenets.

The drivers behind the current resurgence of techno-nationalist ideas in global politics can be tracked to several changes in the environment. Supply chain vulnerabilities, brought to light by the disruptions caused by the COVID-19 pandemic, started the discussion around reshoring critical industries to reduce reliance on external suppliers (Fang et al. 2021). Simultaneously, political sentiment, especially in the US has shifted towards an increasingly populist and nationalist ideologies, which often promote economic self-sufficiency in their policies (Breznitz 2021). According to techno-nationalist ideas, by prioritising domestic economic competitiveness and

national security, governments can take advantage of the political environment to enact more controls on industries, gaining leverage in geopolitical contexts as well.

Connecting techno-nationalism to the strategic resource management theory shows, how geopolitical factors shape the business environment of semiconductor production, as governments seek to internalize these valuable manufacturing assets.

1. *Identification of strategic technologies:* Governments assess which technologies are important for national interests, forecasting their future relevance. In 2021, a study for the European Parliament highlighted six Key Enabling Technologies; advanced manufacturing, advanced materials and nanomaterials, life-science technologies, micro/nano-electronics and photonics, artificial intelligence and security and connectivity technologies, “identified as critical for Europe to reach technological sovereignty” (Ramahandry et al. 2021, 1).
2. *Acquisition and localisation strategies:* The US and EU enact their respective CHIPS Acts, encouraging companies to develop domestic production through subsidies and other benefits, enhancing the autonomy and resilience of the technology sector. (Feingold 2023)
3. *Protection of acquired capabilities:* The US enforces trade controls of their strategic resources against China, slowing down the competition by disincentivising exports of cutting-edge technology and protecting intellectual property rights of domestic companies. (Ip 2021)
4. *Utilisation of gained technological advantage:* Governments take advantage of these strategic resources by integrating them into critical industries such as defence, also promoting innovation in commercial sectors (Stowsky 1996)

This emphasis on controlling strategic resource through industrial policy signals a change to a more locally resilient, albeit globally fragmented, approach to securing strategic resources, highlighting the complexities of balancing interdependency with self-sufficiency and autonomy in a globalised economy, establishing the context for examining how firms and nations navigate through these challenges in an increasingly multipolar and uncertain business environment.

3.4 Theory synthesis

To synthesize the theories covered in this chapter, the following graph illustrates the relationships between them, highlighting how these theories feed into each other, connected by the main concepts discussed in this study.

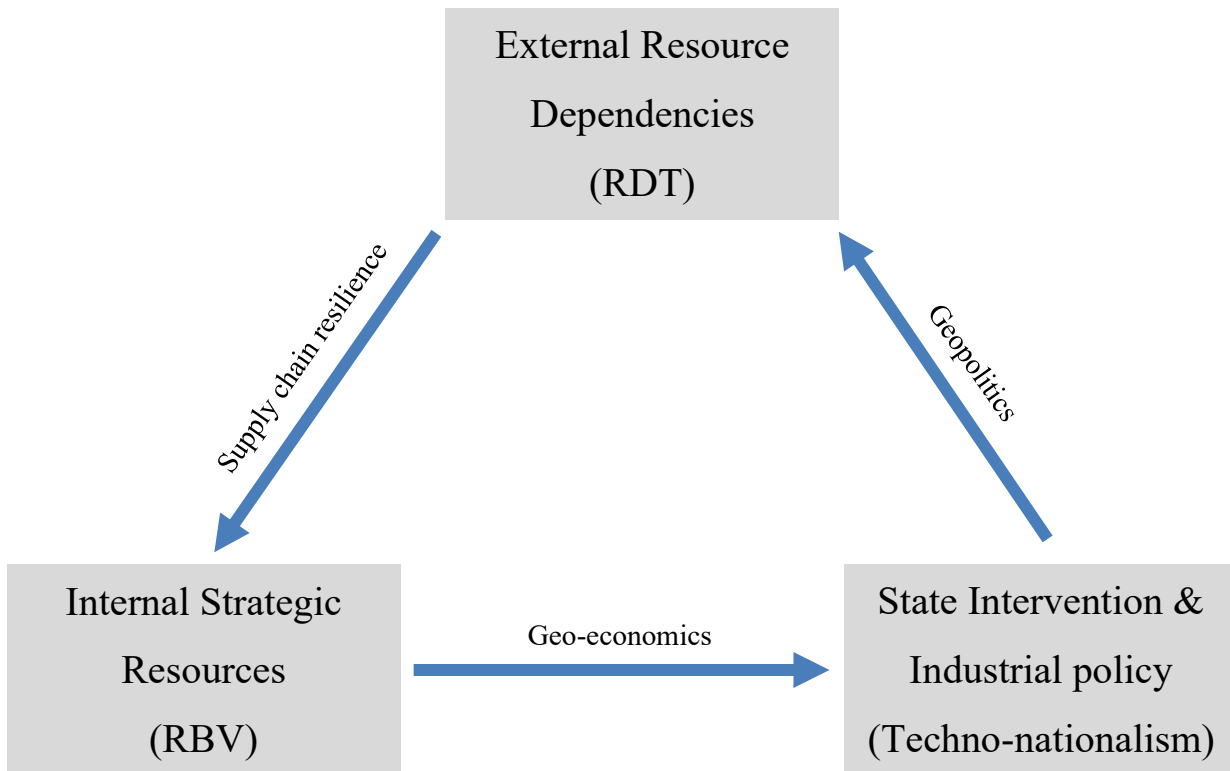


Figure 1: Synthesis of theory framework

Each theory gives a different perspective on the factors affecting firm strategy in the semiconductor industry: resource dependence theory emphasizes how external resource dependencies shape firm behaviour, such as the formation of partnerships. The resource based view focuses on leveraging internal capabilities for competitive advantage, and techno-nationalism highlights the role of the state in securing and controlling critical technologies. Together, they form a logic that acts as a driver for the current shift in the semiconductor industry: increased uncertainty due to external dependency pushes firms to leverage internal strategic resources to gain back control, building *supply chain resilience*. This often leads to, or even necessitates state intervention in industries with strategic importance, manifesting as techno-nationalism. Governments act as the theoretical “firm”, internalising critical capabilities, such as subsidising domestic semiconductor production, to reduce

external dependence and uncertainty. This government strategy of using economic means to achieve geopolitical goals, *geo-economics*, reflects on the current state of the semiconductor industry.

Geopolitics reinforces the feedback from state intervention to external resource dependence. National security concerns and power rivalries drive techno-nationalist policies, which then reshape external dependencies. This circular nature of techno-nationalism is induced by the zero-sum logic around strategic resources, where countries seek to “weaponize” supply chains through export controls and sanctions.

The theories are complementary: RDT identifies the problem to be the exposure to external resource constraints, and RBV suggests a solution, which is to develop internal capabilities to mitigate that exposure. In the case of the semiconductor industry, firms first recognize critical external dependencies, such as resource sourcing or the power imbalance in manufacturing capacity, and then seek to leverage existing resources or acquire new ones to regain bargaining power or self-sufficiency in the environment.

4 Methodology

This chapter goes through the research methodology of the study, giving justifications for the chosen approaches and illustrating the different stages of the data collection and analysis processes. The trustworthiness of the study is then evaluated, in addition to the ethical considerations that need to be addressed with the chosen methodology.

4.1 Research approach

To understand the uncertain environment of the semiconductor industry, this study adopts a qualitative approach for its research, attributable to the complexity of the topic and the selected research questions. The semiconductor industry is characterized by its elaborate global supply chain dependencies, rapid development and geopolitical implications presents a multifaceted environment, which is hard to analyse with quantitative methods, without going to extreme specifics. Understanding the uncertainties that affect management decisions and relationships in this complex environment warrants a nuanced outlook, facilitated by a qualitative research approach (Denzin et al. 2024). Qualitative studies often prioritise depth over breadth in their scope, offering insights into the unquantifiable aspects of a subject, such as relationship dynamics in a complex industry.

The rationale for why a qualitative approach was selected over a quantitative one was due to the exploratory nature of the study. Quantitative approaches, while effective when measuring variables and their development, often fail to give a deeper explanation behind these variables, falling short in capturing the complex interplay of factors that create the environment for the study to take place in. A qualitative approach, consisting of case study and secondary document analysis in this thesis, allow for a deeper understanding of the wider context surrounding the decision-making in the semiconductor industry. Qualitative research can be used to help in explaining the results of a quantitative research, or build a theoretical framework which may facilitate in conducting a more specific quantitative analysis (Creswell 2013).

Given the fast-evolving nature of the semiconductor industry and the uncertainty surrounding the topic, a qualitative approach lends itself for approaching the topic with inductive reasoning. As the study progresses and data is collected, patterns and themes emerge, providing grounds for theoretical development. Using this approach, being open to change is necessary, as understanding of the topic grows, the research questions and theoretical background may need to be modified as well. Although the semiconductor is widely studied, it is still a relatively “new” field, which is

constantly in flux. Therefore, an inductive approach may aid in developing contemporary and relevant theoretical frameworks (Eisenhardt and Graebner 2007).

As qualitative research methods are inherently flexible, they lend themselves well for analysing emergent phenomena, especially pertinent in researching the semiconductor industry, where sudden shifts in geopolitical tensions or technological developments may have great implications for its environment. (Merriam and Tisdell 2015)

4.2 Research design

This study uses a multi-modal research approach to explore the current trends and uncertainties in the semiconductor industry. First, a thematic data analysis of the field is conducted, to gain a deeper perspective on the industry in general, giving a contextual foundation to the prevailing semiconductor business environment. Building on that foundation, a case study on Intel, a major actor in the industry, is conducted, which provides a more practical view of the uncertainties that companies and organisations in the semiconductor industry are faced with, and what methods they employ to mitigate these uncertainties. This approach contextualises the broader thematic study of secondary data, and relates it to a case with real-world practicality, which promotes the finding of both theoretical and pragmatic insights that can be utilised in future research, as well as the management of the semiconductor industry.

The Intel Corporation was selected as the case example, as it is a key player in the industry as a long-standing MNC with a long history of technological advancements and innovation, together with many highs and lows with the shifting market conditions. It has a global supply chain and is also closely linked to the changing geopolitical environment due the partnership with the US government through the CHIPS Act (intel.com 2024). It is therefore representative of many of the challenges that companies in the field are faced with, making it an ideal candidate for examining the resource dependency mitigation and uncertainty management strategies that are used in the industry.

The single-case design of the study with Intel offers in-depth insights on the specific company, but this approach comes with certain limitations. The focus on Intel may limit the generalizability of the findings to other companies in the semiconductor industry, particularly smaller firms with different resource capacities. However, the objective of this study is not to find an all-encompassing framework for every industry participant, but to provide a rich and detailed understanding of uncertainty management in a global multinational corporation. As Intel is involved in many of the

critical operations in the industry, it was selected as a case as one of the more widely applicable and well documented examples in the industry. Future studies around the topic could complement this research by examining additional case companies to provide alternative perspectives for comparison.

According to Yin (2017), a single-case analysis is a reasonable approach, when the case represents a critical example of the chosen phenomenon. As Intel is a central actor in the contemporary semiconductor industry, including the path that led to the current environment, analysing the company's active engagement in uncertainty management makes it a compelling case-subject for this thesis.

Secondary data analysis consists of analysing data collected by someone else, not necessarily in the exact context as the study it is supporting. Utilising this pre-collected data is viable in cases where collecting accurate information may be difficult or time consuming. Through analysing past data, the gaps left in the research are also highlighted, which can lead to new findings or approaches to a topic (Johnston 2014). Secondary datasets allow a more extensive look into an industry, helping in uncovering historical trends, which are crucial to understanding the rapidly changing semiconductor industry dependencies and its environmental shifts. Leveraging existing data allows the study to take more factors into account, therefore increasing the likelihood of relevancy for an extended period of time (Bowen 2009). As a multinational phenomenon, utilising secondary data allows for a more global perspective, as large industry datasets often include cross-national insights, which can be difficult to attain with a primary data collection-approach. (Johnston 2014)

By utilising thematic analysis techniques, the secondary data can be organised by analysing central themes found in the data (Braun and Clarke 2006). Due to the complexity of the topic, using thematic analysis to discover the most prominent topics around the phenomena aids in narrowing the study to the most relevant areas of uncertainty for MNCs. Thematic analysis is a systematic approach to data collection and analysis, where datapoints are given certain codes or tags, which are then used to build larger themes that can be used as a framework for reporting the inductive analysis of the research questions.(Clarke and Braun 2017)

Thematic analysis is a flexible research method for pattern recognition within data, which supports the interpretive approach of this study. It offers a systematic approach of theme recognition, which lends itself well to finding emergent uncertainties in the semiconductor industry. Building the research framework from codes, to themes, to overarching concepts gives the study a robust

framework, showing the reasoning behind the selection of themes under observation. (Braun and Clarke 2006)

To enrich the insights that can be gained from this study, a case example analysis of Intel, a central company in the industry, was conducted. This approach complements the secondary data analysis of the broader industry trends and environmental conditions, contextualising these aspects from the firm's perspective and offering more empirical descriptions for how these factors affect the operations in practice (Eisenhardt and Graebner 2007). This approach functions as a way to answer questions such as how certain things became to be, or why they are as they are, which lends itself well to the purposes of studying multifaceted phenomena. (Yin 2017)

Combining secondary content analysis based on themes and a case study creates complementary strengths, making up for some lacking aspects of both approaches. Case studies are useful in bridging the gap between theory and practice, which leads to more actionable implications from the study, which can be utilised by companies in the semiconductor industry (Eisenhardt and Graebner 2007). Integrating two methods also acts as a form of triangulation, which aids in ascertaining if the findings from one method corroborate with the findings from the other (Thornhill 2023). For example, insights drawn from Intel's annual reports can be validated and expanded by cross-referencing with independent industry reports and media coverage, supported by academic studies. This improves the validity of the findings and provides support to any generalisations that can be drawn from the results of this study.

4.3 Data collection

This study utilises a thick description-method for data collection and analysis, adapted from the methodology developed by Geertz (2008). Although the method has its origins in Geertz's anthropological studies, the core of the theory is adaptable to studying the semiconductor industry environment: it can be used to situate decisions and actions into a larger context of the specific phenomenon, going deeper into the analysis of why certain things happen. It is focused on interpreting phenomena in their extended environment, such as the geopolitical or economic drivers that can be used to explain certain outcomes.

This study deliberately used a diverse selection of documents as material in order to triangulate the information and different viewpoints around the topic. This also reduced the bias present in certain categories, increasing the reliability of the findings. Sources were collected from several categories: industry reports by consultancy and research firms, company reports from Intel, government policy

and legislative documents, academic journal articles, news media coverage, and geopolitical risk analyses by research institutes. The goal was to ensure that different perspectives on the semiconductor industry, the commercial, technical, political, and scholarly, would complement each other.

For example, a Boston Consulting Group (BCG 2021) report produced with the Semiconductor Industry Association provides quantitative data on global supply chain capacities and highlights vulnerabilities, while analysis from the Center for Strategic and International Studies (Shivakumar et al. 2022) offers insight into government reactions to the geopolitical shifts, such as their role in chip manufacturing. Intel's own annual reports (Intel Corporation 2022; 2024a) present the company's IDM 2.0 strategy, whereas legislation like the US and EU's CHIPS Acts (US Congress 2022; European Union 2023) go over the policy tools that are being deployed to reshape the industry. Academic articles were included to frame concepts like techno-nationalism (Park 2023) or to apply strategic management theory to the semiconductor context, grounding the analysis in established research (Pfeffer and Salancik 2003; Barney 1991). Meanwhile, reputable news sources (Reuters 2024; Schuh et al. 2022; McGregor 2024; BBC 2022) captured the developments in supply chain disruptions, trade tensions, and other current events, showing the timeline of industry trends.

Using this wide variety of sources enabled convergence of evidence: themes or facts that appeared across independent sources could be regarded with greater confidence, thereby increasing the credibility of the findings in this study.

The source data was identified by first defining the key topics concerning the study, based on the research questions. Semiconductor industry trends, government initiatives and Intel's strategy were used as search queries in academic databases and other search engines, utilising the snowball method (Naderifar et al. 2017) to drill into the bibliographies found in these precursory results to discover further relevant documents to add to the database. The criteria for including a document prioritised *credibility* of the source, by limiting options to reputable news organisations, official reports and peer reviewed journals, and the *relevancy* of the documents, meaning that they clearly addressed one or more parts of the research focus. Recency was also factored into the selection, concentrating around the past 5-10 years, as the objective of this study was to capture the current business environment of the semiconductor industry.

At the point of adding the document to the database, each document was coded with preliminary tags based on the keywords in the document itself and the themes found in the reading process. For example, a news article about the US-China trade relations (Ip 2021) might be tagged with

“geopolitics” and “techno-nationalism”, and an Intel investor report (2022) detailing new chip fabrication plants might be tagged “IDM 2.0”, “reshoring”, and “supply chain resilience”. This process helped in becoming familiar with the common threads around the topic and highlighted the recurring themes to guide the analysis.

4.4 Thematic analysis

Once a sufficient amount of data was reached, this study used Braun and Clarke's (2006) approach to analyse the patterns found in the database. They provide a six-step system for discovering themes, with the first two, *familiarisation with the data* and *generating initial codes* having been completed during the collection phase. The third step, *searching for themes*, built upon the preliminary tags assigned to each document. According to Braun and Clarke (2006, 82), a theme “captures something important about the data in relation to the research question, and represents some level of patterned response or meaning within the data set.” In accordance with this description, tags like “export controls”, “trade war impacts”, and “national security” were grouped under the theme of Geopolitics. While *reviewing the themes* by reading their assigned sources once more, some adjustments needed to make sure the major themes were well supported by multiple data sources. After review, the themes were *named and defined*. For example, “Techno-nationalism” was defined as “competition driven by nationalistic goals for tech dominance, including policies to onshore semiconductor capabilities”, separating it from the broader “Geopolitics” theme which covered geopolitical power plays and alliances beyond just technology policy. Lastly, the analysis was *reported* by integrating the themes into the findings and discussion, using quotes and evidence from the documents to illustrate each major theme that provide answers to the research questions.

As this thesis was formulated around answering the specific research questions, the thematic coding was roughly following the outline they set. As stated by Braun and Clarke (2006), thematic analysis in qualitative research is highly adaptable. This study leveraged that flexibility, with some codes being theory-driven (resource dependence), while others were purely data-driven (Intel’s IDM 2.0). While adding documents, a tag was added to denote which research question it could be grouped under, based on the following principles:

RQ1, industry context and theory: Codes that covered broad industry trends, conceptual frameworks, or historical context factors. For example, if an academic paper discussed the concept of “techno-nationalism” or if a report analysed “global value chains”.

RQ2, Intel's strategy, firm response: Codes capturing Intel's internal strategy, competitive manoeuvres, or business model. For example, "foundry service expansion", "Intel's IDM 2.0" were common themes in news articles and company reporting.

RQ3, government policy, geopolitics: Codes related to government action or international politics, such as "CHIPS Act", "export control policy", "supply chain decoupling", themes present in government reports and policy institute papers.

The table below summarises the key sources for each thematic category and how they are relevant to the research questions:

Table 1: Data sources grouped by their relevance to RQ themes.

Research question / theme	Representative data
<p>RQ1: Global industry context and theory <i>How are geopolitics shaping the semiconductor industry?</i> <i>What conceptual frameworks explain these dynamics?</i></p>	<ul style="list-style-type: none"> • Academic literature: e.g. studies defining technological nationalism and geo-economics in technology industries (Park 2023; Luo and Van Assche 2023) • Industry reports: World Economic Forum report on global semiconductor value chains and geopolitical shifts. (Feingold 2023) • Institution analysis: CSIS reports on international chip supply interdependencies (Shivakumar et al. 2022; 2024a) • News features: Wall Street Journal report on the geopolitics of semiconductors. (Ip 2021)
<p>RQ2: Intel's Corporate Strategy, firm responses <i>How is Intel strategically positioning itself amid industry changes?</i></p>	<ul style="list-style-type: none"> • Company reports: Intel Annual Reports (2022; 2024) and presentations detailing IDM 2.0, future roadmaps • Consultancy/ industry reports: BCG & Semiconductor Industry Association report for industry development (Varas et al. 2021) • Technical press/news: Articles from Forbes (McGregor 2024), Reuters (Sen 2023) on Intel's expansion plans, partnerships
<p>RQ3: Government policy, supply chain resilience <i>What is the role of government policy in the semiconductor industry, how does it affect supply chain security?</i></p>	<ul style="list-style-type: none"> Legislation and policy documents: US and EU CHIPS Acts (2022; 2023), EU Commission communications. • Policy institute reports: CSIS analysis on semiconductor supply chain resilience and national security implications. (Shivakumar 2024a) • Academic journals: supply chain resilience, friendshoring (Gupta & Sharma 2024) • Media coverage: articles covering government initiatives (Sevastopulo et al. 2024)

Each theme is explicitly linked to the research questions, ensuring the findings are structured in a way that directly responds to what the study strived to explore. This mapping of themes to RQs also helped in writing up the results: the presentation of findings is structured following these main themes.

4.5 Evaluation of the study

The trustworthiness of this research approach will be evaluated utilising the qualitative study criteria of Lincoln and Guba (1985, 218-220; 289-330), examining the level of *credibility*, *transferability*, *dependability* and *confirmability* of the research.

Credibility refers to the writer's confidence in the truth of the findings, the extent to which the results posed by the research are believable and accurate representations of the topic. To increase the internal validity of the study, Lincoln and Guba (1985) propose multiple strategies, of which this study extensively utilised triangulation by using multiple data source to build confidence in the statements that were made, thereby increasing the credibility of the findings. Similarities between different independent sources were treated with greater confidence and utilised in establishing the categories for thematic analysis. Source credibility was evaluated at the point of inclusion to the database, contributing to the credibility of the study. Additionally, the work was supervised and reviewed by academic advisors and other students. In naturalistic inquiry, peer debriefing by discussing findings and methodology with peers or mentors, helps the researcher to realise their biases and strengthens credibility. (Lincoln and Guba 1985, 308)

Although secondary data analysis has many strengths, it requires careful consideration concerning the dataset relevance, quality, and limitations. The time saved in using pre-existing data sources should be used to analyse the suitability for specific research questions, recognising the absence of control over data collection methods. Critically evaluating the chosen data, remaining objective, and using a wide range of sources increase the legitimacy of the study. Especially considering company and stakeholder reports, some data may not be falsified, per se, but the selection may be skewed to make the company appear in a better light than is necessarily accurate. The lack of primary stakeholder data is an inherent limitation of secondary data analysis and therefore, a certain scepticism is required to ensure the credibility of the study. (Johnston 2014)

Transferability is concerned with the applicability of findings to other contexts or settings – the qualitative analogue of external validity. Because qualitative results are often specific to their context, Lincoln and Guba argue that researchers should provide rich, “thick description” of the

context so that readers can determine whether the conclusions can be adapted to their own situations. Instead of making statistical generalisations, the goal is to give enough detail on the context for others to be able to judge the similarity. The thesis gives a thick description of the events and phenomena leading to the current situation in the industry, through an overview of the industry and a case example of a firm central to the topic. This provides the reader with a nuanced understanding of the environment in which strategic resource dependence is being managed. Lincoln and Guba (1985, 214) state such contextual richness to be “essential for enabling transferability judgments”. The case example of Intel, involved in many of the factors behind the semiconductor industry environment, lent itself for broadly analysing the phenomenon, while producing grounded findings for readers or companies in similar industry-situations to relate to.

Despite the rich context, there are some limits to how far the findings can be generalised. The semiconductor industry is a complex environment, where no two companies operate in completely identical contexts. In terms of Lincoln and Guba’s criteria, this is not so much a flaw as a reality of qualitative research, as transferability is largely the reader’s decision, based on the provided detail. The study’s scope is deliberately narrow, so the results are most directly transferable to contexts that closely resemble that scope, such as other major semiconductor companies, or industries with similar struggles in their geopolitical environment. To acknowledge the narrow scope, the study suggests future topics and case companies, which can be used to extend the transferability to different contexts.

The *dependability* or reliability of the study, meaning the consistency and repeatability of the methods and findings, is addressed through a clear explanation of the research process. As expecting an identical result in a qualitative study is difficult due to the changing context (Lincoln and Guba 1985), the research process should be logical and well-documented. The dependability of this study is based on the clear layout of the research design, going through the data collection and analysis methodology in detail. Using an established thematic analysis approach by Braun and Clarke (2006) gives the study validity and clearly lays out the steps that were followed to reach the conclusions. Similarly, coding the database at the point of inclusion built an audit trail to examine the process of first gathering the raw data and then categorising the material under different themes based on the research questions.

The limitations in the approach appear in the form of subjectivity when forming the thematic base for this research. The relationships between different codes were not based on calculations, but on the researcher’s own viewpoints, which may affect the repeatability of this study. However, as the

context of the semiconductor industry is quickly developing, repeatability of the findings would likely be difficult. Therefore, the focus on providing enough detail for the methodological steps is more important for increasing the dependability of a qualitative study. (Lincoln and Guba 1985)

Confirmability refers to the objectivity of the research, the degree to which the findings of a study are based on the collected data, rather than the researcher's own predispositions and imagination (Lincoln and Guba 1985, 324). To demonstrate confirmability, the logic behind the conclusions and the process they have been reached must be clearly documented, so the claims made can be audited by the reader. This logic is illustrated by the graph in chapter 4.4, indicating the representative sources behind each major theme. Additionally, the approach of including a diverse range of documents such as industry analyses, academic studies and media from different countries shows attempt to balance perspectives and avoid one-sided interpretations of the phenomenon.

One limitation related to confirmability is that the interpretation of data is ultimately the researcher's own construction. Different analysts might highlight different aspects of the large amount of information on geopolitical risks. To increase the objectivity of the study and reduce any visible bias of the researcher, the statements made are supported by direct quotes from representative data sources in Chapter 5 - Findings and discussion.

4.6 Assessment of research ethics

As this study relies solely on secondary data sources, it avoids many of the ethical challenges associated with primary data collection, such as personal privacy concerns and informed consent (Arifin 2018; Denzin et al. 2024). By that merit, using publicly available is generally considered ethically sound, since it minimizes intrusion or impact on individuals. The absence of direct participants does not exempt the researcher from ethical responsibility: the focus shifts to how the existing data are obtained, analysed, and presented. This section examines the ethical implications of secondary data usage in qualitative research, building on the principles of research ethics by Orb et al. (2001)

Although Orb, Eisenhauer, and Wynaden (2001) focus on primary human participants in qualitative research, the themes of autonomy, beneficence and justice can also be used to evaluate the ethics of secondary data studies as well. *Autonomy*, in this context, is connected to the intellectual property rights and the proper acknowledgement of the original data sources, ensuring that it is portrayed truthfully, as misrepresentation of the data would undermine academic integrity. This attribution is not just a technical requirement, it is also an ethical obligation to uphold the transparency and

honesty in research (Tracy 2010). Additionally, accurate attribution allows readers to trace the ideas in the research back to their sources, which supports the transparency and trustworthiness of the study. Understanding one's biases as a researcher is important to acknowledge, to avoid taking a one-sided stance. Remaining neutral and understanding the causes for different perspectives lends itself to an objective result.

Even without human subjects, qualitative research must ensure it is *beneficent*, producing something positive with identifiable benefits and avoiding harm (Denzin et al. 2024, 37). In secondary data analysis, this "harm" is not physical or psychological to participants, but the potential risk of distorting or oversimplifying the studied phenomena if the collected data is misrepresented or misinterpreted. To avoid perpetuating misinformation, particularly with regards to geopolitically sensitive issues such as national strategies, it is important to contextualise where the data is coming from and highlight its limitations (Johnston 2014). To guard against misinterpretation, direct quotes are used when there is risk for confusion, and paraphrasing is done carefully to ensure that the original meaning is not lost.

When utilising secondary data, *justice* in research involves the representation of multiple perspectives. To ensure a balanced look at the topic, this study utilises a diverse range of materials, from industry reports and government publications to independent analysts. By incorporating varied sources, the research avoids an ethical problem of bias and partiality to certain viewpoints. (Tracy 2010, 844) refers to this as "multivocality," stating that the inclusion of multiple and even contrasting voices in analysis provide a richer and more just result. For example, the study utilises sources from Western and East-Asian circles, both from government aligned and independent perspectives. This approach ensures that the study presents a broad depiction of the semiconductor industry, as well as the supply chain vulnerabilities, national industrial policies and global business factors affecting it, which helps in mitigating the reinforcement biases that are present in the discussion around this topic, partly due to the strategic importance and competitiveness of the semiconductor industry.

4.7 Use of generative AI

The idea for studying the semiconductor industry came from the researcher's general interest in the topic, and artificial intelligence was used in the early stages of research to map out the topic and scope of the study, as it is a complex phenomenon to grasp. A large language model, specifically *ChatGPT*, was used to quickly explore key issues in geopolitics and the global supply chains that affected the industry, giving an overview of the topic and serving as a brainstorming aid in

developing the research focus further. The prompts that were used consisted of broad keywords and questions around the business environment, such as “what are the main issues semiconductor firms are faced with” and “what are the main actors in the semiconductor supply chain”. None of the outputs were used word for word, they were merely used as a way to clarify the topic to fit into a thesis context. Any sources provided by the AI were vetted and evaluated against other academic sources, triangulating any insights with multiple data points to confirm their authenticity. This approach follows the recommendations that such tools should be used only as complementary assistance, not as a “replacement for human effort” (Mondal & Mondal 2023)

Consensus was another AI tool that was used in this study. As a research-focused AI search engine, it was utilised to aid in the collection of sources for the literature review and focusing the theoretical framework of the study. The tool searches through a database of peer reviewed academic publications, with the benefit of understanding more natural language search queries from the user. This was helpful when the exact supporting theories were not yet clear, as the search also provided a short summary of the results. By using queries similar to the research questions, central academic papers on the topic were found quickly. By utilising the snowball method (Naderifar et al. 2017) through looking into the sources in these publications, a broad understanding of the topic was accelerated, highlighting some of the commonalities and divergences in the discussion.

In combination, the use of ChatGPT and Consensus significantly sped up the early research process by aiding in the preliminary framing of the topic and the collection of foundational materials around the topic through summaries, which gave more time to the analysis of the data. This has been found to be the major benefit of AI tools in research, as summaries generated by an AI are potentially more objective than human interpretation, with no inherent bias (Mondal and Mondal 2023; Dergaa et al. 2023).

Despite these advantages, AI tools have their limitations that must be considered. A primary concern of large language models such as ChatGPT is their tendency to hallucinate information, such as producing scientific sources for its claims, which were found to be made up (Dergaa et al. 2023). This thesis treated any AI-produced content with scepticism, finding actual sources to verify any claims that it made to avoid accidentally transferring any hallucinations into the study. The current consensus around the use of artificial intelligence in research is to limit its utilisation to assisting tasks, merely complementing the human judgement and expertise in research and not replacing it (Mondal & Mondal 2023; Dergaa et al. 2023; Khalifa & Albadawy 2024)

5 Findings & discussion

This chapter synthesizes the findings from the industry overview and case analysis, presenting the conclusions that can be drawn about managing geopolitical risk in the semiconductor industry. Utilising thematic analysis, the emphasis is to highlight the major themes and uncertainty factors that emerged from the secondary data analysis. By applying the theoretical framework of strategic resource dependence theory and techno-nationalism, understanding the dependencies that control the different participants in the semiconductor industry become apparent, leading to ways in which these dependencies can be mitigated. Through this analysis, the following chapters answer the question of “what uncertainty factors are present in the current industry environment” and “how government policies and geopolitical strategies affect company decision-making”, ultimately acknowledging the main research question of “*What risk management strategies can multinational corporations (MNCs) employ to safeguard their semiconductor supply chains from geopolitical instability in East Asia?*”

5.1 Geopolitical risks affecting semiconductor supply chains

The analysis suggests that dependence on select geographical locations is the central vulnerability for companies and other actors in the semiconductor industry, with the dominance of the Taiwanese and South Korean foundry manufacturing model. As these countries alone account for over 70% of the global chip production, as well as the supply of key materials in their manufacturing, the concentration risk sustained by the semiconductor supply chain is notable (Varas et al. 2021). This concentration increases the industry’s exposure to any geopolitical risks. Any disturbance in the region can become catastrophic for the industry, be it from political conflict, disagreements in trade conditions, or natural disasters, could sever the global supply lines of the semiconductor industry and the whole technology sector downstream of it. The COVID-19 pandemic was an important reminder of this vulnerability, and a catalyst for many of the changes in the industry after being resolved. In a paper discussing the effects of the pandemic, to exemplify these changes, Yang (2023) states the following:

“--starting from the USA, trade protectionism has gradually risen in the international market to stabilize domestic economies and ensure growth since the COVID-19 outbreak. Governments prefer policies that help stabilize preprocessing and demand/supply of components in the ICT industry to rebound the country’s economy than the uncertain GVC (global value chains).” (Yang 2023, 66)

This protectionist shift was widely observed in the data and is a major connecting theme in linking the theoretical framework of resource dependence to the discussion surrounding the current state of the semiconductor industry.

In the East Asian region, the tension around Taiwan is one of the key uncertainties for the industry, given its importance as the key manufacturing hub. The ambiguous political status of the island and China's ambitions of reunification, exemplified by an increasing trend in military drills and airspace violations around Taiwan's territory (Jash 2024), bring a constant uncertainty to industries dependent on uninterrupted production. A full scale disruption brought on by a blockade or other military actions, "would have an annual spillover impact of a US\$490 billion in lost revenue for electronic device manufacturers across different markets" (Lee and Shaw 2024, 2). The mere threat increases the volatility of the industry, pushing companies towards establishing contingency plans in case of disruptions. Governments have also recognized the risks, with Taiwan and its security becoming an increasingly important strategic priority for countries still dependent on semiconductor production in the region, as alternative supply chains cannot yet meet the global demand (Lee and Shaw 2024).

Geopolitical tensions between the United States and China are increasingly focusing on semiconductors, changing their role from a commodity to a vital resource with major strategic implications. In recent years, the US government has imposed multiple export controls on companies, with the aim of denying China the access to the most advanced components or manufacturing technologies, trying to stop them from catching up to the US in critical industries. For example, Nvidia, a graphics card manufacturer behind the current advancements in AI, was forced by the US government to cease its sales of the most powerful AI development components to China, as a way to give a lead for the domestic development (Nellis & Lee 2022). In response to these restrictions, China has increased its support for domestic development of semiconductors, pursuing self-sufficiency as well. A recent example of this is the success of DeepSeek AI, which, due to the restrictions placed on AI hardware, innovated in efficiency to catch up to its US competitors (Chen 2025).

This new techno-nationalist outlook, where governments treat technological advancements as a zero-sum game of amassing national power, is a cause of heightened uncertainty for companies in the semiconductor industry. Firms find their supply chains becoming a part of a power struggle between governments, with possible sudden trade rule changes disrupting the already fragile production of semiconductors (Luo & Van Assche 2023). This global rivalry may induce a supply

chain bifurcation, where MNC's are forced to select a side in the trade conflict, or maintaining a separate supply chain network for both East and West-blocks, which may be undesirable, but necessary outcome for companies to mitigate the risks of sudden, geopolitically motivated sanctions, which may cut them off from suppliers or customers. Intel Corporation, for example, had its acquisition of Tower Semiconductor denied by Chinese regulators, likely as a retaliation to US policies (Sen 2023). Actions such as these are an indication that export controls and resource nationalism are becoming a new uncertainty vector for firms to manage, as supply line continuity cannot be taken for granted. Political decision-making can change the semiconductor landscape in an instant (Antonio Varas et al. 2021).

The findings on the first sub-question are strongly aligned with Pfeffer and Salancik's resource dependence theory (1978), and their observation that organisations are constrained by their external environment's dependencies. Wong et al. (2024) portray these interdependencies as follows:

“There is an incumbent hegemon of the US that is capable of generating source technologies and also commands significant market power. Then, there is a rising hegemon of China which commands some market power and rising manufacturing capabilities. Finally, there are several middle-level players, such as South Korea and Taiwan, which command advanced manufacturing capabilities that rely on US technologies but serve both the Chinese and the global markets. Whereas China needs access to US technologies, many US firms also need access to the large China market and rely on middle power's manufacturing capabilities. In other words, one essential aspect of this emerging geopolitical structure is mutual interdependence.” (Wong et al. 2024, 16)

Semiconductor firms and manufacturers downstream from them are highly dependent on resources concentrated in East Asia, creating a power imbalance, where suppliers and governments in the region have disproportionate influence on the industry. This reliance is a constraint on the autonomy of firms, which exposes them to external uncertainties outside of their direct control. Organisations, faced with critical resource dependencies, will perceive threats to their autonomy, constraining decision-making.

According to the theory, such dependencies are a source of uncertainty for firms, exacerbated by the identified geopolitical risks, which are a manifestation of this external control. This theoretical perspective helps in explaining why and how companies are driven to mitigate these dependencies, reducing the power given to the East Asian region over MNC's, due to the extreme concentration of critical resources.

The primary geopolitical risks affecting the semiconductor supply chains in East Asia can therefore be summarised as follows:

1. *Concentration risks* and the single point of failure around Taiwan, increasing vulnerability to sudden shocks
2. *Geopolitical power rivalries*, especially between the US and China, leading to trade restrictions and the politicization of semiconductor resources
3. *Local geopolitical disputes*, uncertainty around the Taiwan-China relations, which can disrupt supply chains
4. *Government interventions*, reflecting the rising trend of techno-nationalism in geopolitical discourse,

With these rising geopolitical tensions, the semiconductor companies are compelled to re-evaluate their supply chains, which will be discussed in the next section. The industry is likely due for a change, with the focus shifting from efficiency to resilience in the short term, as geopolitics are directly shaping the supply chain security of semiconductor manufacturing (Feingold 2023).

5.2 Government policy and international agreements in risk management

As governments recognize the strategic importance of semiconductors and their manufacturing processes, new policies have been enacted to increase the control over this industry, shaping the environment in which companies build their risk management strategies. This techno-nationalist shift, where national policies link technological advancement to national security and development, is exemplified by the CHIPS Act in the US and Europe as governments take a larger role in securing their modern strategic resource availability through significant interventions and subsidies, especially targeting the semiconductor industry and its constituents. By increasing domestic manufacturing capabilities, governments aim to mitigate their exposure to global supply chain risks, while simultaneously increasing their own bargaining power in the global economy by controlling critical resources (Shivakumar, et al. 2022). As these policies are just ramping up, with long lead

times and high capital investment requirements, their impact is difficult to gauge. Reliance on existing supply networks is still necessary, but governments are gradually moving towards increasing their strategic resource autonomy, adapting as the industry develops.

As noted by Luo and Van Assche (2023), in addition to providing subsidies for domestic chip fabs, the CHIPS Act also includes limitations that prohibit companies that receive government funding from significantly expanding advanced capacity in China. This approach moves the outlook on semiconductors “from market-oriented liberalism to intervention-oriented techno-nationalism” (Luo and Van Assche 2023, 1) to secure supply chains for geopolitical reasons, which forces MNCs to consider not only the incentives from governments, but the restrictions as well. In the case of Intel Corporation, the decision to build new fab capacity in the US was greatly influenced by the CHIPS subsidies and the broader political push in the country to reduce reliance on Asia, which put the company in alignment with the wider geopolitical strategy (Varadarajan et al. 2024). These incentives warp the risk management thinking of companies, as a government subsidy may change a plan of building fabs in new locations from redundant and wasteful to a feasible course of action. Therefore, MNCs aim to capitalize on supportive government measures, while trying to mitigate any limiting factors that come with those benefits.

Traditionally, international trade agreements have played their part in the semiconductor industry, with frameworks such as the World Trade Organisation's (WTO) Information Technology Agreement aimed at reducing trade restrictions and tariffs of semiconductors and related products, which was a major factor in facilitating the prior arrangement of a globally dispersed supply chain for the industry (Portugal-Perez et al. 2010). However, as the strategic element of these products has been rising, new trade agreements have been made, which reflect on the increasingly techno-nationalist thinking in governments. For instance, the US, Japan, and the Netherlands reached a trilateral agreement in 2023 to coordinate export restrictions on advanced lithography equipment (Allen et al. 2023) circumventing the WTO agreements with the aim of denying rivals access to critical technologies.

In addition, multilateral initiatives such as the proposed “Chip 4” alliance, involving the US, Taiwan, South Korea, and Japan seeks to institutionalize closer cooperation on supply chain security, data sharing, and backup arrangements among the allied countries (Jung 2023). While these initiatives are not formal trade deals, these agreements affect corporate risk management by creating trusted networks. A South Korean memory manufacturer, for example, knows that being a member in a US-led alliance may secure priority support in a crisis, but that it would also be

expected to comply with alliance-driven export restrictions. In effect, the global trade environment for semiconductors is becoming bifurcated, where older chips and commodity chips can be traded within the more liberal WTO framework, and the cutting-edge products are subject to more restrictions. Companies must therefore be cognizant of this division, possibly creating separate product lines for different markets to comply with restrictions and policies.

This complexity is highlighted in Park's (2023) analysis of the industry, reflecting on how the semiconductor industry's business environment is constantly changing:

“These findings illustrate a complex interaction of high-tech strategies for geopolitical considerations. They mirror the constantly transforming nature of technonationalism from a developmentalism-oriented industrial policy promoted by a single state to a security oriented geoeconomic strategy promoted by a group of like-minded states. Thus, the strategic balancing between retaining domestic industrial prowess and coordinating global partnerships is required for promoting national interests in the high-tech sector.” (Park 2023, 12)

As the semiconductor business environment becomes increasingly driven by geopolitical factors, firms have adapted their risk management strategies to combat this uncertainty. Compliance and monitoring have become a core factor to strategy, with internal resources allocated to tracking geopolitical shifts and ensuring that the changing regulations are followed. Similarly, the sales network must be monitored more closely, as letting advanced products reach restricted customers may lead to penalties or the loss of export rights for the company. Firms are also participating in lobbying actions to regain some power over their external environment, as government policies play a larger role than ever in business results. For example, when the CEO of Intel apologised to the Chinese public when US policy blocked them from doing business with firms in the Xinjiang region (*Reuters* 2021) it showed how companies have to balance between the conflicting national pressures of China and the US.

Friendshoring production has emerged as new trend in restructuring strategic supply chains. Encouraged by governments, it refers to moving supply chain elements to politically allied or friendly nations as a method to reduce exposure to risks related to operating in adversarial regions. Many MNCs have adapted these practices, choosing to, for example, locate factories in Vietnam or Malaysia over China (Huld 2023). Politics do not overrule all other decision-making, but the risk calculations have been changed to accommodate the risen regulatory and reputational risk factors, which may be valued above lower costs and efficiency in the current geopolitical climate (Gupta and Sharma 2024). The same risks are weighed when considering the whole supply chain, which

necessitates vetting the entire network for political reliability, not just technical or cost performance. (Zurich 2024)

From a theoretical perspective, this dynamic underlines the connection between resource dependence theory and institutions in international business. Governments have taken a more central role in controlling strategic resource access, utilising export licenses for advanced equipment or subsidies for fab construction as a way to exert control. As RDT suggests, firms adapt by engaging with or buffering against these powerful entities, either through lobbying and political action to manage dependence, or by reconfiguring operations to reduce reliance to a single government's strategies. Techno-nationalism adds a new layer of complexity, as it increases the dependency of firms on their home government's favour, through subsidies and protection for example, while also increasing their susceptibility to being targeted by rival nation's restrictive actions. As stated by Luo and Van Assche (2023), this requires firms to have a high level of "geo-strategic" ability at the core of their operations to navigate the uncertain techno-geopolitical environment.

The main ways in which government policies and international trade agreements shape MNCs' risk management strategies can be summarised as:

1. *Industrial policy incentives*, such as the CHIPS Act, which drive geographical rebalancing of the supply chain
2. *Export controls*, and other techno-nationalist measures, forcing firms to weigh up partnerships and profitability
3. *Alliances and agreements*, which encourage firms to "friend-shore" production and increase cooperation within a limited framework
4. *Importance of political engagement*, leading to an internal shift in focus to better comply and react to geopolitical changes

5.3 Intel Corporation's strategy

Intel's IDM 2.0 strategy is a part of a larger shift in the management of the company's supply chain. By increasing internal chip manufacturing capabilities and services, in combination with external partnerships with other foundries, Intel aims to mitigate its single-point geographical dependencies (Singer 2021). This more widely distributed network mitigates the effects of regional disruption to the broader supply chain. The strategy trades some duplication of capacity for greater resilience,

forcing a shift from the past focus on extreme cost optimization present in single-region hubs. This section analyses how Intel's strategic decisions reflect on the theoretical framework of resource dependence, strategic resource management and techno-nationalism.

5.3.1 Resource dependence perspective

From the perspective of strategic resource management, Intel's new strategy supports the principles of resource dependence theory, which suggest that firms take control over their external dependencies and secure critical resources to reduce uncertainty (Gulati and Sytch 2007). Intel was historically a vertically integrated company, precisely to reduce this external dependence, but as the industry developed, the company became dependent on external manufacturers such as TSMC and its Asia-centric supply chain. Intel's former CEO Pat Gelsinger has emphasised the need to adapt to the changing market conditions, stating that "We needed a global crisis to realize we had allowed ourselves to become dependent on single points of failure in the supply chain." and that "We need resilient supply chains for the future." (Strumpf 2023, 1) In line with RDT's principles, Intel is reducing its dependence on any one region by investing in new production capacity in the US and Europe, thereby lessening exposure to Asia-centric risks and building its position to serve customers with similar strategic intentions.

In addition to expanding their manufacturing geography, Intel's efforts in building relationships within the government through lobbying demonstrates the firm's effort to control its environment, using political action to gain access to strategic resources and state subsidies for funding its expansion. In a statement to the Congress, Gelsinger said that "The concerns that I have around the geopolitical situation drive the passion and urgency to build this industry in the US," and that "This is a core reason why we are here. We have allowed this industry to shift to Asia. It is time for us to get it back onto American soil." (Martin 2022) Such alignment with the government not only provides Intel with investment capital and policy support, but also reduces uncertainty in its operating environment, following the principles of RDT.

The strategy does also deviate from the theory at times. As the industry was largely split between fabless companies that design chips, and fabs that manufacture the products based on these designs, both parties benefitted from the reduction in complexity in their operations, leading to increased specialisation in their specific operations. Although it freed up resources and helped companies focus on their strengths, it also introduced dependency. Western firms, including Intel Corporation, continue to rely on the advanced manufacturing capabilities of TSMC and other Asian foundries,

which are the only fabs currently capable of manufacturing chips using the sub-3 nanometre process, necessary for the most advanced applications of semiconductors.

Resource dependence theory highlights, how such a critical dependence reduces the firm's autonomy, which, in turn, exposes it to supply chain risks that are out of its direct control. In the case of Intel, this dependence is a greatly limiting factor in their goal of self-reliant production, as it must balance the relationships between the Asian fabs, while trying to reduce its dependence over time. The power imbalance between companies such as TSMC and Intel makes the situation more complex, as TSMC can survive without Intel's designs by focusing on their other manufacturing partners, while Intel is dependent on the manufacturing capabilities of these Asian fabs.

5.3.2 Strategic resource management perspective

Intel's IDM-model has been a significant competitive advantage, with the ability to design and fabricate its own semiconductors that few other firms in the industry possess. In recent years, Intel's manufacturing had fallen behind its Asian competitors, but the IDM 2.0 initiative was enacted to refocus on this valuable internal capability. Intel's 2022 annual report represents this adjustment towards developing its internal strengths:

“Intel is in a unique position to help anticipate and prepare for the continuous increase in long-term semiconductor demand. With our differentiated IDM 2.0 approach, we can deliver a new era of innovation, manufacturing, and product leadership through the powerful combination of three capabilities: expanding our global internal factory network; strategic use of foundry capacity by building on existing relationships with third-party foundries; and becoming a major provider of U.S. and European-based capacity through Intel Foundry Services.” (Intel Corporation 2022, 2)

As part of this foundry model, Intel offered customers the ability to license its own “technological crown jewels” (Nellis 2021, 2), namely the x86 chip architecture, leveraging this unique intellectual property and gain new value from it.

Intel's renewed focus on developing its internal capabilities aligns with the theory on strategic resource management, but it also shows how these capabilities require constant maintain. As the company let its valuable manufacturing capabilities fall behind the Asian competition, they became imitable and therefore lost their value. Intel's response reinforces strategic resource management's core idea that distinct resources are the key to survival, but it also highlights that those resources can diminish if they are not adequately supported. If Intel's massive capital expenditures lead to renewed success, Intel will have strengthened its position in the industry, therefore validating the

theory by showing that sustained advantage comes from continually developing and leveraging internal capabilities that are difficult for competitors to match.

5.3.3 Techno-nationalism perspective

Intel strategies have a clear foundation on the broader influence of techno-nationalism. The industry's increasing geopolitical importance is explicitly recognised by the company, with the former CEO stating in an interview that "Geopolitics has been defined by where the oil reserves have been for the last five decades. Where the technology supply chains are is more important than that for the next five decades." (Henshall 2024, 6) This statement captures the core of techno-nationalism, where critical technologies are used as strategic tools in geopolitical contexts (Park 2023).

Intel's strategy is to align with US and EU objectives to localise advanced semiconductor capabilities, illustrating how corporate strategy and national policy can reinforce each other. A clear case of this alignment is the company's close collaboration with the US Department of Defense, where Intel provides microchips for defence systems as a trusted and domestic partner (Bailey 2025). This benefits both parties, as Intel gains a secure customer for its products and funding for improving its manufacturing capabilities, and the US government bolsters its national security by reducing reliance on foreign parts in its critical systems.

However, Intel's engagement with techno-nationalism is not without tension, even if they were coerced to go on this path by the government intervening in the semiconductor industry. On one hand, Intel benefited from the increased geopolitical interest in the industry, which the company leveraged to secure funding and support from governments that were eager to build domestic production. On the other hand, Intel must balance political expectations with its business decisions, leading to some loss of autonomy. Intel is still an international firm with global customers, so the close ties to one government may dissuade businesses under another one from doing business with them.

The Intel case example shows how these theoretical perspectives are not mutually exclusive, but cover different aspects of the industry environment, where resource dependence theory focuses on the external dependencies, strategic resource management highlights the importance of nurturing internal capabilities, while techno-nationalism serves as a backdrop for the developments in the role of the industry; Intel is leveraging internal strengths while reshaping external relationships and

positioning itself within national policy frameworks to survive in the increasingly complex industry conditions.

6 Conclusions

6.1 Risk mitigation strategies for semiconductor firms

This section synthesises the key findings from examining the wider trends in the semiconductor industry and Intel's strategic approach to risk mitigation in the previous chapters, outlining the general responses to uncertainty in the environment by linking them to the underlying risks and the theoretical reasoning. These strategies serve as examples for responding to geopolitical and resource dependence-related risks in this industry. Each strategy aligns with elements of resource dependence theory (RDT), the resource-based view (RBV), or techno-nationalism, displaying how firms balance external pressures with internal capabilities in the semiconductor industry.

Table 2: Key risks in the semiconductor industry, responses and theoretical interpretation.

Key risks	Strategic response	Theoretical interpretation
Geographical concentration of production <i>Overreliance on single points of failure</i>	Diversify manufacturing and sourcing <i>Avoid concentration in any one country</i>	<i>RDT</i> : Multi-region diversification as dependency mitigation <i>Techno-nationalism</i> : Aligns with government objectives to secure strategic supply chains through e.g. friendshoring production
Supply chain dependency and uncertainty <i>Overreliance on a limited set of suppliers or customer</i>	Build strategic partnerships and alliances <i>Collaborate with key partners to establish long-term agreements</i>	<i>RDT</i> : Inter-organizational alliances can exert greater control over resources, reducing uncertainty <i>RBV</i> : Collaborative networks can evolve into inimitable capabilities and competitive advantage
High capital costs and policy risks in expansion <i>Redundancy for resilience is expensive, uncertainty of trade restrictions</i>	Leverage government incentives and initiatives <i>Engage in public-private partnerships to share information and influence policy</i>	<i>Techno-nationalism</i> : Aligning with industrial policy allows firms to mitigate risk by securing state support <i>RDT</i> : governments are key external actors, so strong ties help firms manage dependency on regulatory and political resources
Regulatory and geopolitical volatility <i>Disruptions from sudden export controls, sanctions, or political shifts</i>	Build corporate diplomacy capabilities <i>Engage with policymakers, lobby for the firm's interests, proactively adapt to changing regulations</i>	<i>RDT</i> : Engaging in corporate diplomacy is a way to manage external dependencies. By participating in politics, firms attempt to gain control over regulatory resources in their environment <i>Techno-nationalism</i> : as policies shape industry outcomes, developing diplomatic capabilities allows a company to balance allegiance to different nations'

		interests and avoid being overly constrained by any single country
Efficiency-centric metrics undermining resilience <i>Cost minimization and efficiency can leave supply chains vulnerable</i>	Refocus performance metrics for resilience <i>Put emphasis to resilience and risk mitigation in supply chain strategy</i>	RBV: Resilience can be seen as a valuable internal strategic capability, increasing competitiveness in uncertain times. RDT: Acknowledgement of external factors, internalising the cost of uncertainty into the business strategy
Technological and supply chain dependence <i>Dependence on specific technologies from external parties</i>	Strengthen innovation, self-sufficiency in technology <i>Invest in R&D to develop alternative technologies that reduce reliance on few suppliers</i>	RBV: Innovation builds proprietary capabilities in the firm, aligning with the RBV on developing unique internal resources. Creating in-house alternatives secures strategic assets that competitors cannot easily replicate RDT: Such technological capabilities become a buffer against external control. the firm reduces uncertainty by internally generating new inputs, breaking exclusive dependencies and increasing autonomy

These risks, and the strategies to mitigate them, illustrate the need for semiconductor firms to examine their internal and external capabilities to mitigate risks brought on by the changing geopolitical climate in the industry. The Intel case demonstrates that managing external resource dependencies and building unique internal capabilities are complementary aims, rather than contradictory. Theoretically, a firm that reduces its reliance on external entities, while simultaneously developing its internal competencies and resilience through innovation, is better positioned to survive in the uncertain semiconductor business environment. In practice, those companies that can ensure a continuous stream of supply during uncertain times become highly valued partners to both customers and governments, gaining them competitive and political advantages in the process.

6.2 Theoretical implications and future research

The increasingly geopolitically charged semiconductor industry serves as a contemporary example of Pfeffer and Salancik's (1978) resource dependence theory, showing how organisations are constrained by their reliance on external resources, and how they act to manage these dependencies: organisations seek alternative sources through supply diversification, pursue vertical integration, form inter-organizational alliances and long-term partnerships, and engage in political action such

as lobbying to mitigate their dependency risks. Intel's IDM 2.0 initiative also follows these strategies. However, the semiconductor industry's specific environment introduces a new actor to the resource dependence theory in the form of governments, who control market access due to the products strategic nature. Therefore, in addition to buyers and suppliers, firms must manage their dependence on governments and other regulators as important gatekeepers for business (Meyer & Li 2022).

The concept of "constraint absorption", where a firm reduces uncertainty by internalizing or buffering a dependency (Casciaro & Piskorski 2005), is being actualised at a geopolitical scale, as companies are mitigating the risk of focusing operations to East-Asia by building capacity "in-house" in the West. This thesis contributes to the resource dependence theory by highlighting how it can be applied to global supply chain risks, and by suggesting that effective management of geopolitical resource dependence can be a differentiator in firm performance. It maintains that power dynamics can shape strategic moves, and firms that successfully reduce unfavourable dependencies, such as over-reliance on a specific region, gain more autonomy in their decision-making.

From the perspective of Barney's (1991) resource-based view, technological capabilities and supply chain resilience are strategic resources for organisations. Therefore, managing these supply chains and the relationships that protect them are core competencies for firms in the semiconductor industry, intangible, valuable and hard to imitate.

One of the key findings is that some resources that are traditionally thought of as external, such as a reliable supply chain, could be interpreted as closer to an internal resource, as when a firm invests in its supply relationships, it may be able to capitalise on them uniquely compared to the competition. The concept of dynamic capabilities, as in the ability to adapt to changes and disruptions, is also relevant. Firms with strong dynamic capabilities have been quicker to adapt their supply chains to geopolitical shocks, protecting their competitive advantage. This suggests that the strategic resource management should broaden what factors are considered to be a source of sustained advantage for the firm, incorporating supply chain architecture as a source of sustained advantage. In addition, resource-based view traditionally assumes relatively stable factor markets (Priem and Butler 2001), a perspective which does not align with the current semiconductor industry environment. Factor markets for manufacturing and materials are heavily affected by geopolitics, so firms must strategize to create or secure resources in ways that combine the insights from the resource dependence theory and strategic resource management.

Techno-nationalism and geo-strategic management emerged as the critical themes for firms to integrate into their business strategies in this study. Governments are asserting control over technological development and supply chains for national gain, leading to a more fragmented and politically charged business environment (Luo 2022). With government involvement, traditional theories around comparative advantage and optimisation are undermined, as trade restrictions and incentives allow states to pick winners. This highlights the importance of a firm's geopolitical capabilities, with the need to understand country risk and alliance politics as part of their business strategy. Bifurcating operations, such as splitting production into China-West blocks to appease regulations in both environments, require a new level of strategic adaptability, which combines aspects of business and geopolitical planning.

The theme of rising techno-nationalism in the semiconductor industry warrants, as mentioned before, a heightened importance of non-market resources in strategic frameworks, such as political capital or alliance resources. The weaponisation of interdependence is evident, where governments exploit global network positions (Farrell and Newman 2020), like USA's control over intellectual property of chip designs, or China's control of critical materials, to achieve strategic aims. Firms caught in the middle must innovate on their strategies to cope with the challenges of a changing environment.

In the semiconductor industry, a partial unwinding of the old globalization model, epitomised by extreme specialization and global integration for cost-efficiency, is taking place, replaced by a more distributed and redundancy-focused model. The classic business theories are not invalidated, but the context has shifted, as cost advantages are now frequently overridden by risk considerations. Strategic management theory should therefore incorporate risk and uncertainty, especially geopolitical, as core to strategy development, not just as an afterthought. In alignment with Intel's long-term strategy, companies must keep options alive in case of geopolitical disruptions.

For future research, seeing the lasting effects of this environmental restructuring will be an important topic to study. For example, the Donald Trump's second term as the president of the USA has changed the geopolitical relationships of the traditional Western block in an extremely fast pace, be it through tariffs on friendly nations or threats of annexation towards neighbouring states (Stavis-Gridneff 2025). It remains to be seen if these statements will have lingering consequences on the Western relationships past the current term, but the possibility of a bi-polar West-China divide in the semiconductor industry turning into a tri-polar one, where the EU bolsters its own production as a growingly more separate actor from the US is a real possibility. Additionally, seeing

how the increased governmental involvement in the semiconductor production process shapes the industry and its strategic valuation is an important topic for the future of chip manufacturing.

7 Summary

The semiconductor industry is one of the cornerstones of modern technology and central to the development of advanced economies. Recent geopolitical tensions, along with unexpected disruptions in the global supply chain have highlighted the vulnerabilities of this critical industry. Governments have started to take notice of the strategic importance of these resources, leading to uncertainties in the supply chains. This has forced the companies involved to rethink their strategies and adapt to the changing business environment.

To examine these changes, a broad overview of the industry was conducted, utilising Intel Corporation as a case example to contextualise the changes with a concrete example of a business that was facing them. The main purpose of the study was to answer: *“What risk management strategies can multinational corporations (MNCs) employ to safeguard their semiconductor supply chains from geopolitical instability in East Asia”*, uncovering how semiconductor companies navigate in the increasingly uncertain global business environment, and what can be done to mitigate risks associated with these uncertainty factors. To answer this question, a secondary emphasis was put on the policy responses of governments, as they were found to be increasingly influential in the current development of the semiconductor industry.

The theoretical framework of the study was built on three concepts: Resource dependence theory, which explains how firms adapt to external constraints and aim to regain control over critical dependencies, strategic resource management, which emphasizes the internal capabilities as buffers against external risks, and the concept of techno-nationalism, describing the trend of governments seeking to control strategic technologies through industrial policy. Together, these theories give insight into how firms, such as Intel, manage both external pressures and internal resource development in an increasingly techno-nationalistic business environment.

The study was carried out with a qualitative approach, based on a secondary data analysis of the broader semiconductor industry in combination with the case example. Data sources included company reports, news articles, academic literature and policy documents, providing diverse viewpoints on the topic. Through this exploratory data collection, the data was coded according to the main themes, and these themes were combined and mapped under the relevant research questions.

The findings to each research question were analysed in their respective chapters, connecting them to the relevant aspects of the theoretical framework. The study found that dependence on a limited

geographical area of East Asia for most of the advanced manufacturing capabilities is the key uncertainty factor for the industry to address, exacerbated by the geopolitical risks associated with the tightening relations between China, Taiwan and the US. These tensions have led to a rise in techno-nationalism, constraining firm decision-making. Government policy now plays a central role in shaping corporate strategy: the Chips Acts in the US and EU incentivise domestic chip production while limiting engagement with rival states. Trade alliances and export regulations shape firms' risk landscapes, requiring MNCs to integrate policy considerations into supply chain decisions, reducing autonomy.

Geographic diversification of production is a viable direction for the industry to reduce its one-sided dependency of companies such as TSMC, but due to the long-standing supply chain relationships, high levels of specialisation, and the costs of developing domestic capabilities, these initiatives take time to come into fruition. The findings of the case study of Intel Corporation echoed this sentiment, highlighting the difficulty of reaching true self-reliance in a deeply globally connected industry.

To manage the risks associated with pursuing a higher level of autonomy in an interconnected industry, the importance of public-private initiatives and governmental cooperation was found to be an important factor. Aligning with the government's geopolitical aims was found to be a way for companies to reduce dependence on foreign actors, while securing investments to further develop their in-house capabilities. This alignment, however, introduces the firms to a new uncertainty as this ties its decision-making firmly together with the government's geopolitical objectives. This loss of autonomy is at odds with the tenets of the strategic resource theory's pursuit of environmental control, but it highlights the shift in the role of the semiconductor manufacturers, from a commodity producer to an important strategic partner in the field of global geopolitics.

This thesis contributes to theory by applying the theoretical framework of resource dependence to a geopolitical context, additionally studying the internal capability emphasis connecting strategic resource management to techno-nationalism. In practice, the research offers companies and governments an overview of the risk that are present in the industry, with the analysis of strategies to anticipate and mitigate geopolitical risks being a valuable resource for decision-makers. The case example of Intel offers a grounded example of the challenges facing the industry, and how a company may navigate in this uncertain environment.

The focus on a single firm limits the generalisation of the study, which could be expanded on in future research. Similarly, the usage of only secondary data, while extensive, could be more

valuable with the support of primary data through interviews with experts or company insiders. The topic of semiconductors is a quickly evolving subject, with the introduction of geopolitics further reducing the long-term accuracy of this study. Still, it can be considered as a snapshot of the current business environment, examining the development of the industry.

References

- Aboagye, Aaron, Ondrej Burkacky, Abhijit Mahindroo, and Bill Wiseman. 2022. "Chip Shortage: How the Semiconductor Industry Is Dealing with This Worldwide Problem." World Economic Forum. February 9, 2022. <https://www.weforum.org/agenda/2022/02/semiconductor-chip-shortage-supply-chain/>.
- Allen, Gregory C., Emily Benson, and Margot Putnam. 2023. "Japan and the Netherlands Announce Plans for New Export Controls on Semiconductor Equipment." *Center for Strategic & International Studies*, April. <https://www.csis.org/analysis/japan-and-netherlands-announce-plans-new-export-controls-semiconductor-equipment>.
- Antonio Varas, Raj Varadarajan, Ramiro Palma, Jimmy Goodrich, and Falan Yinug. 2021. "Strengthening the Global Semiconductor Supply Chain in an Uncertain Era." BCG Global. March 28, 2021. <https://www.bcg.com/publications/2021/strengthening-the-global-semiconductor-supply-chain>.
- Arcuri, Gregory. 2022. "The CHIPS for America Act: Why It Is Necessary and What It Does | Perspectives on Innovation | CSIS." CSIS. January 31, 2022. <https://www.csis.org/blogs/perspectives-innovation/chips-america-act-why-it-necessary-and-what-it-does>.
- Arifin, Siti Roshaidai Mohd. 2018. "Ethical Considerations in Qualitative Study." *INTERNATIONAL JOURNAL OF CARE SCHOLARS* 1 (2): 30–33. <https://doi.org/10.31436/ijcs.v1i2.82>.
- Bairey, Steph. 2025. "Intel Foundry Adds New Customers to RAMP-C Project for US Defense." Newsroom. January 17, 2025. <https://newsroom.intel.com/intel-foundry/intel-foundry-adds-customers-ramp-c-project-us-defense>.
- Barney, Jay. 1991. "Firm Resources and Sustained Competitive Advantage." *Journal of Management* 17 (1): 99–120. <https://doi.org/10.1177/014920639101700108>.
- BBC. 2022. "US Bans Sale of Huawei, ZTE Tech amid Security Fears." *BBC*, November 26, 2022. <https://www.bbc.com/news/world-us-canada-63764450>.
- BCG. 2021. "Strengthening the Global Semiconductor Supply Chain in an Uncertain Era." BCG Global. March 28, 2021. <https://www.bcg.com/publications/2021/strengthening-the-global-semiconductor-supply-chain>.
- Bowen, Glenn A. 2009. "Document Analysis as a Qualitative Research Method." *Qualitative Research Journal* 9 (2): 27–40. <https://doi.org/10.3316/QRJ0902027>.

- Braun, Virginia, and Victoria Clarke. 2006. "Using Thematic Analysis in Psychology." *Qualitative Research in Psychology* 3 (2): 77–101. <https://doi.org/10.1191/1478088706qp063oa>.
- Breznitz, Dan. 2021. *Innovation in Real Places: Strategies for Prosperity in an Unforgiving World*. Oxford University Press.
- Casciaro, Tiziana, and Mikołaj Jan Piskorski. 2005. "Power Imbalance, Mutual Dependence, and Constraint Absorption: A Closer Look at Resource Dependence Theory." *Administrative Science Quarterly* 50 (2): 167–99.
- Chen, Caiwei. 2025. "How a Top Chinese AI Model Overcame US Sanctions." MIT Technology Review. January 24, 2025. <https://www.technologyreview.com/2025/01/24/1110526/china-deepseek-top-ai-despite-sanctions/>.
- Chi, Tailan. 1994. "Trading in Strategic Resources: Necessary Conditions, Transaction Cost Problems, and Choice of Exchange Structure." *Strategic Management Journal* 15 (4): 271–90.
- Clarke, Victoria, and Virginia Braun. 2017. "Thematic Analysis." *The Journal of Positive Psychology* 12 (3): 297–98. <https://doi.org/10.1080/17439760.2016.1262613>.
- Creswell, John W. 2013. *Qualitative Inquiry and Research Design: Choosing Among Five Approaches*. SAGE.
- Dannreuther, Roland. 2013. "Geopolitics and International Relations of Resources." In *Global Resources*, edited by Roland Dannreuther and Wojciech Ostrowski, 79–97. London: Palgrave Macmillan UK. https://doi.org/10.1057/9781137349149_5.
- Davis, Gerald F., and J. Adam Cobb. 2010. "Chapter 2 Resource Dependence Theory: Past and Future." In *Stanford's Organization Theory Renaissance, 1970–2000*, 28:21–42. Emerald Group Publishing Limited. [https://doi.org/10.1108/S0733-558X\(2010\)0000028006](https://doi.org/10.1108/S0733-558X(2010)0000028006).
- Denzin, Norman K., Yvonna S. Lincoln, Michael D. Giardina, and Gaile Sloan Cannella. 2024. *The SAGE Handbook of Qualitative Research*. SAGE.
- Dergaa, Ismail, Karim Chamari, Piotr Zmijewski, and Helmi Ben Saad. 2023. "From Human Writing to Artificial Intelligence Generated Text: Examining the Prospects and Potential Threats of ChatGPT in Academic Writing." *Biology of Sport* 40 (2): 615–22. <https://doi.org/10.5114/biolsport.2023.125623>.
- Drees, Johannes M., and Pursey P. M. A. R. Heugens. 2013. "Synthesizing and Extending Resource Dependence Theory: A Meta-Analysis." *Journal of Management* 39 (6): 1666–98. <https://doi.org/10.1177/0149206312471391>.

- Eisenhardt, Kathleen M., and Melissa E. Graebner. 2007. "Theory Building From Cases: Opportunities And Challenges." *Academy of Management Journal* 50 (1): 25–32. <https://doi.org/10.5465/amj.2007.24160888>.
- European Union. 2023. "Regulation - 2023/1781 - EN - EUR-Lex." eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.L_.2023.229.01.0001.01.ENG&toc=OJ%3AL%3A2023%3A229%3AFULL.
- Fang, Sheng, Mike W. Peng, L. Colin Xu, and Yuanyuan Yi. 2021. "The Interplay of Policy and Institutions during COVID-19." *The International Trade Journal* 35 (6): 493–522. <https://doi.org/10.1080/08853908.2021.1977201>.
- Farrell, Henry, and Abraham L. Newman. 2020. "Chained to Globalization: Why It's Too Late to Decouple." *Foreign Affairs* 99 (1): 70–80.
- Farrer, Martin. 2022. "'Just-in-Time to Just-in-Case': EU's \$49bn Chip Plan Shows Tectonic Shift in Global Economy." *The Guardian*, February 10, 2022, sec. Business. <https://www.theguardian.com/technology/2022/feb/09/eu-hopes-43bn-plan-will-fix-chip-shortages-as-supply-chain-crisis-bites>.
- Feingold, Spencer. 2023. "Industrial Policy's Comeback Is Official, Top Economists Say." World Economic Forum. May 2, 2023. <https://www.weforum.org/stories/2023/05/growth-summit-industrial-policy-officially-comeback-chief-economists/>.
- Friedman, George. 2009. *The Next 100 Years: A Forecast for the 21st Century*. Knopf Doubleday Publishing Group.
- Geertz, Clifford. 2008. "'Thick Description: Toward an Interpretive Theory of Culture.'" In *The Cultural Geography Reader*. Routledge.
- Gil, Dario. 2021. "Intel Teams with IBM for Advanced Semiconductor Research & Development." IBM Newsroom. March 23, 2021. <https://newsroom.ibm.com/Intel-Teams-with-IBM-for-Advanced-Semiconductor-Research-and-Development>.
- Goodrich, Jimmy. 2024. "China's Evolving Semiconductor Strategy - IGCC." <https://ucigcc.org/>. May 29, 2024. <https://ucigcc.org/blog/chinas-evolving-semiconductor-strategy/>.
- Gulati, Ranjay, and Martin Gargiulo. 1999. "Where Do Interorganizational Networks Come From?" *American Journal of Sociology* 104 (5): 1439–93. <https://doi.org/10.1086/210179>.
- Gulati, Ranjay, and Maxim Sytch. 2007. "Dependence Asymmetry and Joint Dependence in Interorganizational Relationships: Effects of Embeddedness on a Manufacturer's Performance in Procurement Relationships." *Administrative Science Quarterly* 52 (1): 32–69. <https://doi.org/10.2189/asqu.52.1.32>.

- Gupta, Manya, and Arnav Sharma. 2024. "Article: Friendshoring and Reshoring Semiconductor Supply Chains: US CHIPS Act and the Multilateral Trading System." *Global Trade and Customs Journal* 19 (3).
<https://kluwerlawonline.com/api/Product/CitationPDFURL?file=Journals\GTCJ\GTCJ2024029.pdf>.
- Henshall, Will. 2024. "Intel's CEO on Turning Skeptics Into Believers." TIME. May 30, 2024.
<https://time.com/6980426/intel/>.
- Huang, Yiping. 2016. "Understanding China's Belt & Road Initiative: Motivation, Framework and Assessment." *China Economic Review* 40 (September):314–21.
<https://doi.org/10.1016/j.chieco.2016.07.007>.
- Huld, Arendse. 2023. "Exploring Friendshoring: Shifting Operations in Asia and China+1." ASEAN Business News. September 27, 2023.
<https://www.aseanbriefing.com/news/exploring-friendshoring-shifting-operations-in-asia-and-china1/>.
- Hurtarte, George S., Evert A. Wolsheimer, and Lisa M. Tafoya. 2011. *Understanding Fabless IC Technology*. Elsevier.
- Intel Corporation. 2021. "Intel CEO Announces 'IDM 2.0' Strategy for Manufacturing, Innovation,..." Intel. March 23, 2021.
<https://www.intel.com/content/www/us/en/newsroom/news/idm-manufacturing-innovation-product-leadership.html>.
- . 2022. "2022 Annual Report."
- . 2024a. "2024 Annual Report."
- . 2024b. "Intel Opens Fab 9 in New Mexico." Intel Corporation. January 24, 2024.
<https://www.intc.com/news-events/press-releases/detail/1670/intel-opens-fab-9-in-new-mexico>.
- Ip, Greg. 2021. "'Industrial Policy' Is Back: The West Dusts Off Old Idea to Counter China." *Wall Street Journal*, July 29, 2021, sec. Politics. <https://www.wsj.com/articles/subsidies-chips-china-state-aid-biden-11627565906>.
- Jash, Amrita. 2024. "China's Military Exercises Around Taiwan: Trends and Patterns." Global Taiwan Institute. October 2, 2024. <https://globaltaiwan.org/2024/10/chinas-military-exercises-around-taiwan-trends-and-patterns/>.
- Jiarui Zhang. 2024. "Intel says 3nm will be contracted to TSMC." Commercial Times. September 9, 2024. <https://www.ctee.com.tw/news/20240909700056-439901>.

- Johnston, Melissa P. 2014. "Secondary Data Analysis: A Method of Which the Time Has Come." *Qualitative and Quantitative Methods in Libraries* 3 (3): 619–26.
- Jung, Eric. 2023. "The 'Chip 4 Alliance' and Taiwan–South Korea Relations." *Global Taiwan Brief* 8 (18): 6–9.
- Khalifa, Mohamed, and Mona Albadawy. 2024. "Using Artificial Intelligence in Academic Writing and Research: An Essential Productivity Tool." *Computer Methods and Programs in Biomedicine Update* 5 (January):100145. <https://doi.org/10.1016/j.cmpbup.2024.100145>.
- Lamsal, Ritu Raj, Anurodh Devkota, and Madhu Sudhan Bhusal. 2023. "Navigating Global Challenges: The Crucial Role of Semiconductors in Advancing Globalization." *Journal of The Institution of Engineers (India): Series B* 104 (6): 1389–99. <https://doi.org/10.1007/s40031-023-00938-4>.
- Lee, Chun-Yi, and Leo Shaw. 2024. "Securing the Semiconductor Supply Chain in an Era of Geopolitical Uncertainty." China Strategic Risks Institute. May 4, 2024. <https://www.csri.global/launch-report/7-how-can6-securing-the-semiconductor-supply-chain-in-an-era-of-geopolitical-uncertainty-governments-help-investors-manage-esg-risks-in-china>.
- Lincoln, Yvonna S., and Egon G. Guba. 1985. *Naturalistic Inquiry*. SAGE.
- Luo, Yadong. 2022. "Illusions of Techno-Nationalism." *Journal of International Business Studies* 53 (3): 550–67. <https://doi.org/10.1057/s41267-021-00468-5>.
- Luo, Yadong, and Ari Van Assche. 2023. "The Rise of Techno-Geopolitical Uncertainty: Implications of the United States CHIPS and Science Act." *Journal of International Business Studies*, April, 1–18. <https://doi.org/10.1057/s41267-023-00620-3>.
- Martin, Dylan. 2022. "Intel Boss Presses Congress for Manufacturing Subsidies." April 24, 2022. https://www.theregister.com/2022/03/24/intel_chips_subsidy/.
- Martin, Joel, A R Suhas, and Niti Jhunjunwala. 2024. "Semiconductors—the next Frontier of Geopolitics." HFS Research. March 22, 2024. <https://www.hfsresearch.com/research/semiconductor-supply-chain-diversification/>.
- McGregor, Jim. 2024. "It Is Time To Take Intel Seriously As A Chip Foundry." Forbes. April 5, 2024. <https://www.forbes.com/sites/tiriasresearch/2024/04/05/it-is-time-to-take-intel-seriously-as-a-chip-foundry/>.
- Merriam, Sharan B., and Elizabeth J. Tisdell. 2015. *Qualitative Research: A Guide to Design and Implementation*. John Wiley & Sons.

- Meyer, Klaus E., and Chengguang Li. 2022. "The MNE and Its Subsidiaries at Times of Global Disruptions: An International Relations Perspective." *Global Strategy Journal* 12 (3): 555–77. <https://doi.org/10.1002/gsj.1436>.
- Miner, John B. 2006. *Organizational Behavior 2: Essential Theories of Process and Structure*. London New York: Routledge.
- Mondal, Himel, and Shaikat Mondal. 2023. "ChatGPT in Academic Writing: Maximizing Its Benefits and Minimizing the Risks." *Indian Journal of Ophthalmology* 71 (12): 3600–3606. https://doi.org/10.4103/IJO.IJO_718_23.
- Naderifar, Mahin, Hamideh Goli, and Fereshteh Ghaljaie. 2017. "Snowball Sampling: A Purposeful Method of Sampling in Qualitative Research." *Strides in Development of Medical Education* 14 (3). <https://doi.org/10.5812/sdme.67670>.
- Nellis, Stephen. 2021. "Intel to Spend \$20 Billion on U.S. Chip Plants as CEO Challenges Asia Dominance." *Reuters*, March 24, 2021, sec. Asia Pacific. <https://www.reuters.com/world/asia-pacific/intel-doubles-down-chip-manufacturing-plans-20-billion-new-arizona-sites-2021-03-23/>.
- Orb, A., L. Eisenhauer, and D. Wynaden. 2001. "Ethics in Qualitative Research." *Journal of Nursing Scholarship: An Official Publication of Sigma Theta Tau International Honor Society of Nursing* 33 (1): 93–96. <https://doi.org/10.1111/j.1547-5069.2001.00093.x>.
- Overland, Indra. 2019. "The Geopolitics of Renewable Energy: Debunking Four Emerging Myths." *Energy Research & Social Science* 49 (March):36–40. <https://doi.org/10.1016/j.erss.2018.10.018>.
- Park, Seohee. 2023. "Semiconductors at the Intersection of Geoeconomics, Technonationalism, and Global Value Chains." *Social Sciences* 12 (8): 466. <https://doi.org/10.3390/socsci12080466>.
- Pfeffer, Jeffrey. 1987. "A Resource Dependence Perspective on Intercorporate Relations." In *Intercorporate Relations: The Structural Analysis of Business*, 22–55. Cambridge University Press.
- Pfeffer, Jeffrey, and Gerald Salancik. 2003. *The External Control of Organizations: A Resource Dependence Perspective 2003*.
- Pfeffer, Jeffrey, and Gerald R. Salancik. 1978. *The External Control of Organizations: A Resource Dependence Perspective*. Harper & Row.
- Portugal-Perez, Alberto, José-Daniel Reyes, and John S. Wilson. 2010. "Beyond the Information Technology Agreement: Harmonisation of Standards and Trade in Electronics." *The World Economy* 33 (12): 1870–97. <https://doi.org/10.1111/j.1467-9701.2010.01300.x>.

- Priem, Richard L., and John E. Butler. 2001. "Is the Resource-Based 'View' a Useful Perspective for Strategic Management Research?" *The Academy of Management Review* 26 (1): 22–40. <https://doi.org/10.2307/259392>.
- Ramahandry, Tiana, Vincent Bonneau, Emarildo Bani, Nikita Vlasov, Michael Flickenschild, Olga Batura, Nikolay Tcholtchev, Philipp Lämmel, and Michell Boerger. 2021. *Key Enabling Technologies for Europe's Technological Sovereignty*. LU: EPRS | European Parliamentary Research Service. <https://data.europa.eu/doi/10.2861/24482>.
- Ramani, Vinay, Debabrata Ghosh, and ManMohan S. Sodhi. 2022. "Understanding Systemic Disruption from the Covid-19-Induced Semiconductor Shortage for the Auto Industry." *Omega* 113 (December):102720. <https://doi.org/10.1016/j.omega.2022.102720>.
- Reuters*. 2021. "Intel Apologises in China over Xinjiang Supplier Statement," December 23, 2021, sec. Technology. <https://www.reuters.com/technology/intel-china-apologises-over-xinjiang-supplier-statement-2021-12-23/>.
- . 2024. "China Sets up Third Fund with \$47.5 Bln to Boost Semiconductor Sector." *Reuters*, May 27, 2024, sec. Technology. <https://www.reuters.com/technology/china-sets-up-475-bln-state-fund-boost-semiconductor-industry-2024-05-27/>.
- Sarma, Sumita, and Sunny Li Sun. 2017. "The Genesis of Fabless Business Model: Institutional Entrepreneurs in an Adaptive Ecosystem." *Asia Pacific Journal of Management* 34 (3): 587–617. <https://doi.org/10.1007/s10490-016-9488-6>.
- Schuh, Christian, Wolfgang Schnellbacher, Alenka Triplat, and Daniel Weise. 2022. "The Semiconductor Crisis Should Change Your Long-Term Supply Chain Strategy." *Harvard Business Review*. May 18, 2022. <https://hbr.org/2022/05/the-semiconductor-crisis-should-change-your-long-term-supply-chain-strategy>.
- Sen, Anirban. 2023. "Intel Scraps \$5.4 Bln Tower Deal after China Review Delay." *Reuters*, August 16, 2023, sec. Technology. <https://www.reuters.com/technology/intel-walk-away-54-bln-acquisition-tower-semiconductor-sources-2023-08-16/>.
- Sevastopulo, Demetri, Claire Jones, and Sam Fleming. 2024. "How National Security Has Transformed Economic Policy." *Financial Times*, September 4, 2024, sec. The Big Read. <https://www.ft.com/content/6068310d-4e01-42df-8b10-ef6952804604>.
- Sevastopulo, Demetri, and Qianer Liu. 2023. "US Tightens Rules on AI Chip Sales to China in Blow to Nvidia." *Financial Times*, October 17, 2023, sec. Semiconductors. <https://www.ft.com/content/be680102-5543-4867-9996-6fc071cb9212>.
- Shih, Willy C. 2020. "Global Supply Chains in a Post-Pandemic World." *Harvard Business Review* 98 (5): 82–89.

- Shivakumar, Sujai, Gregory Arcuri, and Charles Wessner. 2022. "The Great Rewiring: How Global Supply Chains Are Reacting to Today's Geopolitics," July.
<https://www.csis.org/analysis/great-rewiring-how-global-supply-chains-are-reacting-todays-geopolitics>.
- Shivakumar, Sujai, Charles Wessner, and Thomas Howell. 2024a. "A World of Chips Acts: The Future of U.S.-EU Semiconductor Collaboration," August.
<https://www.csis.org/analysis/world-chips-acts-future-us-eu-semiconductor-collaboration>.
- . 2024b. "Too Good to Lose: America's Stake in Intel," November.
<https://www.csis.org/analysis/too-good-lose-americas-stake-intel>.
- Singer, Pete. 2021. "Intel Launches 'IDM 2.0' Strategy, Including Two New U.S. Fabs and Foundry Services." *Semiconductor Digest* (blog). March 24, 2021.
<https://www.semiconductor-digest.com/intel-launches-idm-2-0-strategy-including-two-new-20b-fabs-and-foundry-services/>.
- Smit, See Sven, Martin Hirt, Kevin Buehler, Susan Lund, Ezra Greenberg, and Arvind Govindarajan. 2020. "Coronavirus: Implications for the Semiconductor Industry."
- Statista. 2024a. "Distribution of Rare Earths Production Worldwide as of 2023, by Country." Statista. August 19, 2024. <https://www.statista.com/statistics/270277/mining-of-rare-earths-by-country/>.
- . 2024b. "Semiconductor Foundries Revenue Share Worldwide 2019-2024, by Quarter." Statista. July 2, 2024. <https://www.statista.com/statistics/867223/worldwide-semiconductor-foundries-by-market-share/>.
- . 2025. "Intel/AMD X86 Computer CPU Market Share 2024." Statista. 2025.
<https://www.statista.com/statistics/735904/worldwide-x86-intel-amd-market-share/>.
- Stavis-Gridneff, Matina. 2025. "How Trump's '51st State' Canada Talk Came to Be Seen as Deadly Serious." *The New York Times*, March 7, 2025, sec. World.
<https://www.nytimes.com/2025/03/07/world/canada/trump-trudeau-canada-51st-state.html>.
- Stowsky, Jay. 1996. "The Dual-Use Dilemma." *Issues in Science and Technology* 13 (2): 56–64.
- Strumpf, Dan. 2023. "Rebalancing Chip-Supply Chains Will Take Decades, Intel CEO Says." *WSJ*. January 19, 2023. <https://www.wsj.com/livecoverage/davos2023/card/rebalancing-chip-supply-chains-will-take-decades-intel-ceo-says-tAD8xp7CwcdOEBMZdXO>.
- Thornhill, Adrian. 2023. *Research Methods for Business Students*. Harlow.
- Tracy, Sarah J. 2010. "Qualitative Quality: Eight 'Big-Tent' Criteria for Excellent Qualitative Research." *Qualitative Inquiry* 16 (10): 837–51. <https://doi.org/10.1177/1077800410383121>.

- TSMC. 2020. "TSMC Arizona - Taiwan Semiconductor Manufacturing Company Limited." March 2020. <https://www.tsmc.com/static/abouttsmcaz/index.htm>.
- US Congress. 2022. "H.R.4346 - 117th Congress (2021-2022): CHIPS and Science Act." Legislation. 2021-07-01. August 9, 2022. <https://www.congress.gov/bill/117th-congress/house-bill/4346>.
- Varadarajan, Raj, Chris Richard Jacob Koch-Weser, Joseph Fitzgerald, Jaskaran Singh, Mary Thornton, Robert Casanova, and David Isaacs. 2024. "Emerging Resilience in the Semiconductor Supply Chain." *Boston Consulting Group and Semiconductor Industry Association*, May.
- Wang, Chia-Nan, Nhat-Luong Nhieu, Chen-Te Chiang, and Yen-Hui Wang. 2024. "Assessing Southeast Asia Countries' Potential in the Semiconductor Supply Chain: An Objectively Weighting Multi-Criteria Decision-Making Approach." *Humanities & Social Sciences Communications* 11 (1): 1260. <https://doi.org/10.1057/s41599-024-03768-x>.
- Wong, Chan-Yuan, Henry Wai-chung Yeung, Shaopeng Huang, Jaeyong Song, and Keun Lee. 2024. "Geopolitics and the Changing Landscape of Global Value Chains and Competition in the Global Semiconductor Industry: Rivalry and Catch-up in Chip Manufacturing in East Asia." *Technological Forecasting and Social Change* 209 (December):123749. <https://doi.org/10.1016/j.techfore.2024.123749>.
- Xiong, Wei, David D. Wu, and Jeff H. Y. Yeung. 2024. "Semiconductor Supply Chain Resilience and Disruption: Insights, Mitigation, and Future Directions." *International Journal of Production Research* 0 (0): 1–24. <https://doi.org/10.1080/00207543.2024.2387074>.
- Yang, Chang-Gyu. 2023. "A Study on the Changes in the ICT Industry after the COVID-19 Pandemic." *Industrial Management & Data Systems* 123 (1): 64–78. <https://doi.org/10.1108/IMDS-03-2022-0165>.
- Yin, Robert K. 2017. *Case Study Research and Applications: Design and Methods*. SAGE Publications.
- Zurich. 2024. "What Lies Ahead for the Geopolitics of Semiconductors." December 12, 2024. <https://www.zurich.com/commercial-insurance/sustainability-and-insights/commercial-insurance-risk-insights/what-lies-ahead-for-the-geopolitics-of-semiconductors>.