Market Efficiency and Geopolitical Policies:
An Event Study of the Semiconductor Industry
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ABSTRACT
The semiconductor industry, a cornerstone of modern technology, is vital for advancements across various sectors. In response to intensifying global competition, the United States has implemented key regulatory measures to strengthen its semiconductor capabilities, including the Advanced Computing/Supercomputing Interim Final Rule. Using an event study methodology, this article examines the impact of these export controls on the stock prices of publicly traded semiconductor companies. The findings reveal that the Advanced Computing/Supercomputing Interim Final Rule negatively impacted stock prices in the short term, highlighting the market's sensitivity to geopolitical policies. Understanding these market reactions is crucial for gauging investor confidence, informing policymakers, and guiding future research on the broader economic and strategic impacts of such regulations.

Keywords: semiconductor industry, event study methodology, the Advanced Computing/Supercomputing Interim Final Rule, geoeconomics

JEL Classification Codes: K10, K22, G10, G14, G30, F51, F52, H56

Highlights:

- The study employs an event study approach to evaluate how the U.S. Advanced Computing/Supercomputing Interim Final Rule affected semiconductor firm valuations.
- Results show a short-term decline in semiconductor stock prices following the regulation's announcement, indicating negative investor reactions.
- Findings underscore how export controls and geopolitical policies can significantly influence market confidence and valuations in the semiconductor industry.

1. INTRODUCTION

"Technological change is only one of the engines of prosperity, but it is perhaps the most critical one."
D. Acemoglu & J. Robinson, *Why Nations Fail*

The semiconductor industry is a cornerstone of modern technology, driving advancements in various fields from consumer electronics to defense systems (Zhang 2024). As global competition intensifies, national policies aimed at bolstering domestic semiconductor capabilities have become increasingly prominent. In this context, the United States has implemented significant legislative measures, notably the CHIPS and Science Act and the Advanced Computing/Supercomputing Interim Final Rule, to enhance its competitive edge in semiconductor manufacturing and technology innovation (Bureau of Industry and Security 2023; Qureshi 2022a; Chi 2022). Employing an event study methodology, this study examines the impact of these measures on the stock prices of publicly traded semiconductor companies.

In determining the best methodological set up, it becomes evident that the CHIPS and Science Act is less suitable for an event study analysis due to challenges in identifying a specific event date. For starters, the Act, enacted in 2022 and which allocates approximately $52.7 billion to revitalize the domestic semiconductor industry, is the by-product of a lengthy legislative process, beginning with the introduction of the Endless Frontier Act in 2019. Over the next several years, this initiative evolved into the U.S. Innovation and Competition Act (USICA) and later the America COMPETES Act before ultimately being reconciled into the CHIPS and Science Act (Luo and Van Assche 2023). Given its extensive development, bipartisan negotiations, and public discourse, much of its anticipated effects were likely priced into the market well before its formal enactment.

By contrast, the Advanced Computing/Supercomputing Interim Final Rule, with its immediate and restrictive policy changes, presents a clearer event for empirical analysis. The U.S. Department of Commerce, through its Bureau of Industry and Security (BIS), promulgated the Advanced Computing/Supercomputing Interim Final Rule, which introduced new export controls on October 7, 2022 (Squire Patton Boggs 2022). The rule targeted advanced computing and semiconductor manufacturing items to mitigate threats from foreign adversaries, particularly China (Bureau of Industry and Security 2022; Swanson 2022). The regulation was further tightened on October 25, 2023, to close existing loopholes and enhance the effectiveness of the controls. As stated in the Federal Register, "these revisions protect U.S. national security interests by further restricting China's ability to obtain critical technologies to modernize its military capabilities in ways that threaten the national security interests of the United States and its allies" (2023). Accordingly, this study focuses on the market reaction to the Interim Final Rule, allowing for a more precise examination of how regulatory constraints on semiconductor exports influence investor sentiment and stock prices.

Our results indicate that the implementation of export controls under the Advanced Computing/Supercomputing Interim Final Rule had a predominantly negative impact on the stock prices of semiconductor companies. Following the initial announcement of these export controls, there was a noticeable dip in the market, illustrated by a significant decline in Cumulative Abnormal Returns (CAR) values for semiconductor companies, with average CAR values dropping roughly 7 percent within the event window. The announcement of the updated export controls in 2023 had also a roughly 2 percent negative effect on stock prices, with the downward

trend diminishing a few weeks post-announcement. Lastly, we notice a divergence of reaction after these regulatory changes between various sectors of the semiconductor industry.

These results align with existing literature on the strategic implications of policy changes on export controls and trade restrictions (Kane 1983; Clayton et al. 2023; Chen 2024). The controls often lead to financial and productivity losses, as highlighted by Mendoza and Yue (2011), and have significant economic repercussions (Fajgelbaum et al. 2020). Furthermore, the observed negative market reactions to the export controls align with the findings of Smales (2021), who emphasizes the influence of economic dynamics on stock returns. These findings support the Efficient Market Hypothesis, which posits that the prices of publicly traded securities fully reflect all available information (Fama 1970; Fama 1991). The volatile and often partially mixed reactions to these regulations reflect the complexities and uncertainties associated with legislative measures when it comes to trade policy in general (Dick 1991; Krueger 1996), or underscoring the nuanced impacts on different segments of the semiconductor industry (Luo and Van Assche 2023). In the light of rising geopolitical tensions, these results demonstrate how regulatory interventions can exacerbate market volatility and investor uncertainty (Salisu et al. 2022; Guo and Shi 2024; Miller 1992), further complicating the strategic landscape for semiconductor companies. Lastly, this study contributes to the broader literature on techno-nationalism and the role of government intervention in shaping the competitive dynamics of high-tech industries (Luo and Van Assche 2023; Weiss 2021; Luo 2021; Li et al. 2024).

Our paper is organized in the following way. Section 2 provides the necessary theoretical framework; section 3 breaks down the data and the methodology. Section 4 presents the results, whereas Section 5 elaborates such results and concludes.

2. THEORETICAL FRAMEWORK

2.1. Legislations

On October 7, 2022, the United States Department of Commerce, through its Bureau of Industry and Security (BIS), announced a series of new export controls on advanced computing and semiconductor manufacturing items (Bureau of Industry and Security 2022). The intent behind these controls was to mitigate potential threats posed by foreign adversaries, particularly countries of concern such as China. Subsequently, on October 17, 2023, the BIS released three rules to update the controls established in 2022 (Bureau of Industry and Security 2023). The updated rules included the Advanced Computing Chips Interim Final Rule, the Semiconductor Manufacturing Items Interim Final Rule, and the Additions to the Entity List Final Rule.

The strategic implications of these rules are significant. The Advanced Computing/Supercomputing Interim Final Rule plays a crucial role in preventing potential adversaries from acquiring advanced computing capabilities that could threaten U.S. interests (Cui and Yang 2023; Wiley 2023). The rules align with broader efforts to maintain U.S. strategic superiority in critical technologies. The updated rules strengthen U.S. export controls, enhancing the country's ability to protect sensitive technologies and maintain its technological edge in high-stakes domains such as artificial intelligence, quantum computing, and advanced manufacturing.

Additionally, the rules have broader implications for international trade and geopolitics. By restricting access to critical technologies, the U.S. seeks to mitigate risks associated with the

use of advanced computing for military or strategic purposes by potential adversaries (Hyun 2024). The rules also highlight the importance of technological sovereignty and the need for strategic control over key industries, which are increasingly relevant in the context of rising global competition and technological arms races (Zaloilo 2024; Wriston 1988). Put differently, the regulatory changes underscore the U.S. government's commitment to maintaining technological superiority and securing its national interests (Donohue 2014).

2.2. Techno-Nationalism

These legislative measures, both supportive and restrictive in nature, highlight the U.S. government's strategic focus on maintaining technological supremacy. This dual approach is deeply rooted in the broader concept of techno-nationalism, which underscores the intersection of national security and technological innovation (Kadtke and Wharton 2018). By prioritizing technological self-sufficiency, techno-nationalism serves as a guiding principle for these policies. Techno-nationalism has emerged as a critical response to the intertwined challenges posed by globalization and rapid technological advancements (Montresor 2001). Historically, nations that have achieved technological leadership have consequently experienced significant boosts in both economic and military prowess, as documented by Reich (1991), Prestowitz (1988), and Pascali (2017). This pattern underscores a strategic imperative: technology not only drives economic growth but also fortifies national interests and security.

In recent years, the resurgence of techno-nationalism has become particularly evident as nations address the imperatives of digital sovereignty and cybersecurity (Luo 2021; Lee et al. 2024). The strategic role of key sectors such as artificial intelligence, quantum computing, semiconductors, and biotechnology is pivotal in both economic and national security domains, as argued by Luo and Van Assche (2023) and Segal (2018). The revival of techno-nationalism is also noticeable against the backdrop of escalating trade wars and economic competition (Bai et al. 2025; Alessandria et al. 2025). Nations increasingly adopt protective measures, including subsidies, trade barriers, and significant investments in research and development, to shield and foster their high-tech industries. While these measures aim to consolidate national technological capacities, they often clash with the principles of free trade, thereby straining international relations (McGuire and Lindeque 2010).

Techno-nationalism also plays a strategic role in the geopolitical dynamics of great powers vying for technological supremacy. This strategic orientation is evident in the actions of nations like the United States (Luo and Van Assche 2023), China (Kennedy 2005), and Japan (Govella 2021), which align their national interests closely with technological advancements (Chen and Shimomura 1998). Such alignment frequently results in a form of techno-nationalism that prioritizes domestic innovation and sector-specific developments. This approach is exemplified by China’s handset industry's adoption of a neo-techno-nationalist strategy (Shim and Shin 2016). However, an excessive focus on domestic capabilities may lead to inefficiencies and dampen innovation by limiting international collaboration and competition. Breznitz (2007) cautions against the potential fragmentation of the global technology landscape, which could undermine interoperability and global standards.

Moreover, the strategic importance of state intervention and legislation in cultivating technology sectors is essential. Such intervention not only bolsters national power but also ensures

a competitive edge vital for national security (Borrás and Edler 2020). This significance is further amplified in strategic sectors like space technology, where national capabilities reflect broader ambitions on the global stage. The ongoing tension between techno-nationalism and techno-globalism, particularly in the context of the China-U.S. technology rivalry, highlights the complex balance nations must strike. They grapple with safeguarding national interests while engaging in necessary international collaborations, illustrating the intricate dance between securing domestic technological fortitude and integrating into the global technology marketplace (Weiss 2021; Sachs 2019). This dichotomy adds a layer of complexity to the global technological landscape, posing unique challenges and opportunities for policymakers and industry leaders alike.

2.3. Legislations as Protectionism Mechanism

In the global technological landscape, semiconductors have become pivotal, aligning perfectly with Barney's (1986; 1991) VRIN framework — meaning that a resource is valuable, rare, inimitable, and non-substitutable. Semiconductors are immensely valuable, given their critical role across various technological platforms, from consumer electronics to advanced industrial systems. Their rarity stems not from scarcity but from the highly specialized knowledge and cutting-edge technology required for their production, domains controlled by a limited number of entities. The intricate and proprietary nature of their manufacturing processes renders them difficult to imitate, while their non-substitutability is highlighted by the absence of alternative technologies that can perform comparably. This distinctive combination of characteristics underlines their strategic significance, resonating with Peteraf's (1993) insights on how such resources underpin a firm's long-term competitive edge and an analysis of their role in industrial competitiveness, particularly in technology-driven sectors.

The strategic value attributed to the chips has catalyzed a notable shift towards protectionist measures in several countries, most prominently in technologically advanced ones (Fajgelbaum et al. 2020). This trend is evident in legislative actions like the U.S. CHIPS Act and the Advanced Computing/Supercomputing Interim Final Rule. These initiatives are reflective of Krugman's (1987) strategic trade policy theory, which advocates for government intervention to support domestic industries in high-technology fields. Baldwin's (1989) and Irwin's (2017) expanded analysis of economic policies aimed at protecting domestic industries remains pivotal for understanding these legislative measures (Ramondo et al. 2016). By implementing such policies, governments aim to bolster their domestic semiconductor capabilities, thereby ensuring economic security and technological sovereignty (Bown et al. 2021). These measures not only protect but also potentially enhance a nation's position in the global semiconductor market.

Furthermore, this trend towards protectionism is not just a matter of economic strategy but also of national security and geopolitical positioning (Bown 2023; Malawer 2024). As semiconductors are integral to a wide array of critical technologies, their production and supply have become focal points in international relations and trade negotiations. They embody a critical junction where the need to foster innovation intersects with the imperative to protect and advance national interests in an increasingly competitive and interconnected global arena.

In this context, the strategic importance of semiconductors is not only a matter of technological prowess but also a focal point of modern governance and emerging market dynamics. The U.S. CHIPS Act and the Advanced Computing/Supercomputing Interim Final Rule

represent key examples of how governmental decisions in technology sectors can ripple through global markets. These legislative measures, while primarily aimed at bolstering national technological infrastructure and securing supply chains, could potentially have far-reaching implications for financial markets (Kutlina-Dimitrova and Lakatos 2017; Kane 1983). In an increasingly competitive and interconnected world, semiconductors have become a critical intersection where governmental policy, technological advancement, and economic market responses converge.

2.4. Efficient Market Hypothesis

The Efficient Market Hypothesis (EMH), a foundational concept in finance developed by Eugene Fama and others in the 1970s, significantly advanced the understanding of how stock prices are determined in financial markets. According to EMH, stock prices at any given moment fully reflect all available information (Fama 1970).

Despite its foundational role in finance, EMH has faced significant criticism and debate (Malkiel 2003). Critics argue that market anomalies and behavioral biases can lead to inefficiencies. For instance, periods of irrational exuberance or panic can cause stock prices to deviate from their true values (Shiller 2003). Additionally, behavioral finance researchers have highlighted that psychological factors and cognitive biases often lead to irrational investment decisions, challenging the notion of fully efficient markets (Baker and Ricciardi 2014; Thaler 1993; Kahneman and Tversky 1979). Moreover, empirical evidence has sometimes contradicted the predictions of EMH. For example, various studies have documented anomalies such as the January effect (Thaler 1987), momentum effects (Johnson 2002), and long-term reversals (George and Hwang 2007), which suggest that markets are not always perfectly efficient (Daniel and Hirshleifer 2015; Jegadeesh and Titman 1993; De Bondt and Thaler 1985). The role of insider information and the practical limitations of market participants' access to information have also been points of contention (Grossman and Stiglitz 1980; Yadav 2015). Nonetheless these criticisms, EMH remains a cornerstone of financial theory, particularly in the context of event studies.

2.5. EMH in Light of Geopolitical Tensions

Recent research has increasingly focused on the interaction between the EMH and geopolitical events, emphasizing how geopolitical risks introduce significant uncertainty into global markets. These risks challenge the assumptions of EMH by potentially disrupting the flow of information and investor behavior, leading to market inefficiencies. Hoque and Zaidi (2020) investigated the inverse correlation between geopolitical risk and stock returns, highlighting how political uncertainties influence market behavior and investor sentiment, thus questioning the validity of EMH under such conditions (Hoque and Zaidi 2020).

Further complicating this issue, Clayton, Maggiori, and Schreger (2023) argue that export controls and other trade restrictions serve strategic purposes in geopolitical conflicts, introducing additional layers of complexity into market dynamics. These strategic policies can create information imbalances and lead to inefficiencies, as markets struggle to process and reflect the implications of such geopolitical maneuvers. The research by Fajgelbaum et al. (2020) on protectionism’s impact further reveals the short-run economic repercussions of these policies,

including real income losses and market adjustments, which challenge the market's ability to efficiently incorporate and reflect such information (Clayton et al. 2023; Fajgelbaum et al. 2020).

There is a notable research gap in understanding how specific geopolitical events and policy shifts impact the efficiency of financial markets, particularly in specialized sectors like semiconductors. While general studies have established a connection between geopolitical risk and market performance, there is a lack of focused research on how targeted policy measures, such as the CHIPS Act and export controls, influence stock prices in high-tech industries. Existing literature on this topic primarily examines Chinese companies (Park and Liu 2023; Horng 2024) leaving a gap regarding U.S. firms and beyond. This gap is particularly relevant because the semiconductor industry is crucial for technological advancements and economic security in the United States. Understanding how these policy measures impact the overall semiconductor firms is essential for investors, policymakers, and stakeholders.

3. DATA AND METHODS

This study utilizes daily stock return data sourced from Wharton's Center for Research in Security Prices (CRSP), Eikon Refinitiv, and Yahoo Finance. The selection of the companies was done under the NAICS identifiers (333242; 334413; 334515), targeting companies within the semiconductor industry (respectively, Semiconductor Machinery Manufacturing; Semiconductor and Related Device Manufacturing; Instrument Manufacturing for Measuring and Testing Electricity and Electrical Signals). In general, semiconductor companies are involved in the design, production, and marketing of an array of components including integrated circuits, microprocessors, logic devices, chipsets, and memory chips, serving a broad spectrum of applications. A total of 1044 companies were identified.

After attaining the list of companies from CRSP, some data cleaning was necessary. For the 2022 event date (as described further below), companies with missing values in the estimation window or event window were dropped, leading to a total of 928 companies. For the 2023 event date (as described further below), our sample consists of 996 companies. These companies are headquartered in 30 countries and are traded on 43 stock exchanges. Figure 1 shows a histogram of the top five countries being represented in the sample.

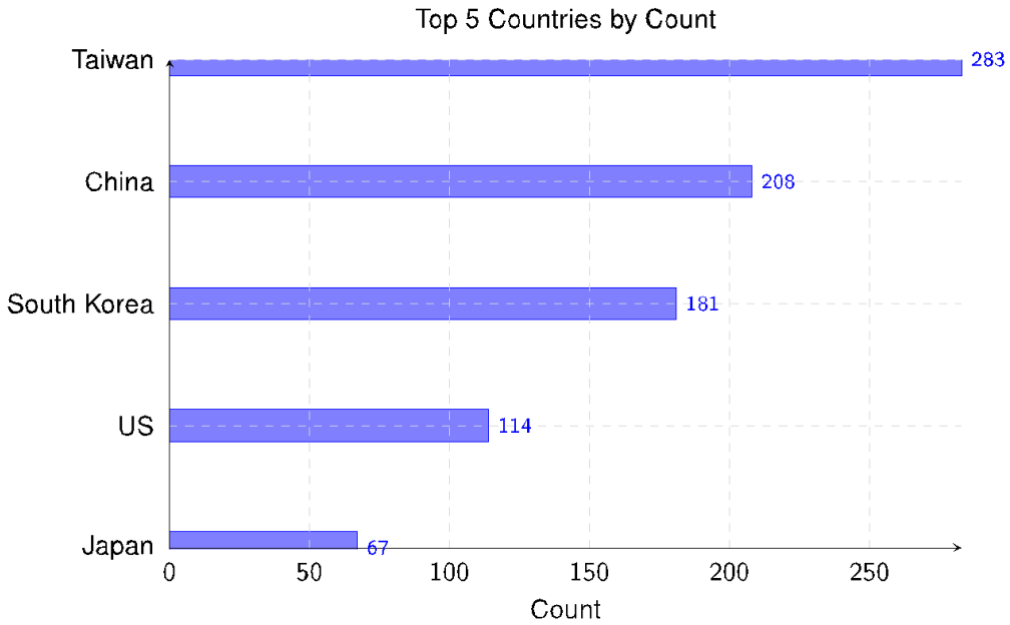

Exhibit 1. Top five countries represented in the sample

A quick glimpse at Exhibit 1 reveals a heavy concentration in Asian countries, which partially explains why the United States government is so keen in enacting legislative measures that affect the industry.

Besides the sample, the event study methodology requires three other key components: event date, event window, and estimation period (Kothari and Warner 2007; Ghoul et al. 2023; Kaja and Foster 2024). The selection of the specific dates is based on key announcements and implementation milestones of the Advanced Computing/Supercomputing Interim Final Rule that are likely to have influenced market reactions.

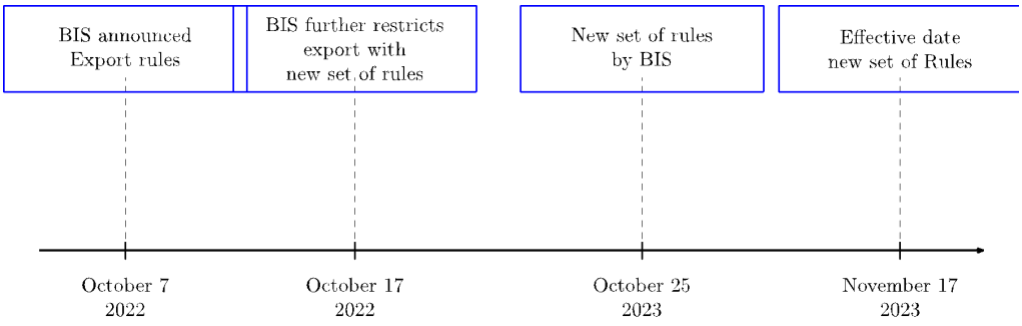

Exhibit 2. Timeline of the Advanced Computing/Supercomputing Interim Final Rule

Based on the timeline shown in Exhibit 2, we selected as our event dates the announcement dates, October 7th, 2022, and October 25, 2023.

This study adopts the market model methodology of event studies, as it is the most adequate tool for analyzing the impact of specific events on stock price performance due to its ability to measure abnormal returns, consider market efficiency, and provide insights into the effects of new information on stock prices (Fama 1970; Brown and Warner 1985). In particular, we apply a Fama-

French three-factor model. Based on the academic scholarship (Khotari and Warner 2006; El Ghoul et al. 2022)[1] in order to construct the abnormal returns we would first estimate the expected returns and find the difference.

$$AR_{t,k} = R_{t,k} - E(R)_{t,k} \quad (1)$$

To estimate expected return of the kth stock, $E(R)_{t,k}$, we use the three Fama-French factors, MR_t, SMB_t and HML_t, the excess market return, the small-minus-big factor, and the high—minus-low factor. We estimate coefficients for each stock.

$$E(R)_t = \alpha + \beta_1 MR_t + \beta_2 SMB_t + \beta_3 HML_t \quad (2)$$

Each stock's cumulative abnormal return from the time of the event, w, during the event window, is then

$$CAR_{t,k,w} = \sum_{i=1}^{w} AR_{t,k} \quad (3)$$

As robustness checks, we use the SP500 index, the NASDAQ index, and the MSCI Global index. The former is a proxy for US market performance; the NASDAQ can serve as a proxy for the entire technology sector — making it particularly relevant for analyzing companies within the semiconductor industry — and the MSCI Global index offers a more global perspective.

ESTIMATION PERIOD

In determining the selected estimation period, we apply a one-year estimation period, which is within the standard range (100-250 days) for market model parameters (MacKinlay 1997; Ghoul et al. 2023; Kaja and Foster 2024). This shorter span minimizes the residual effects of the ongoing COVID-19 crisis on the data. The estimation window excludes the day of the event and the two weeks leading up to it to avoid overlap with the relevant event windows.

EVENT WINDOWS

The event window is four weeks. The rationale behind a four-week period is to account for potential market overshooting in response to other unrelated announcements or overall market trends. Initial market reactions can be exaggerated, thereby distorting the true impact on CARs.

4. FINDINGS

4.1 Export Controls

Event Date 1: October 7 2022

On October 7, 2022, the Bureau of Industry and Security (BIS) announced new export rules impacting the semiconductor industry.

[1] Both Kothari and Warner (2007) and Ghoul et al. (2023) offer generous overviews of the status of event studies in the field of international finance research. With over 500 event studies published, these overviews are providing a reliable aggregate view of how event studies should be conducted.

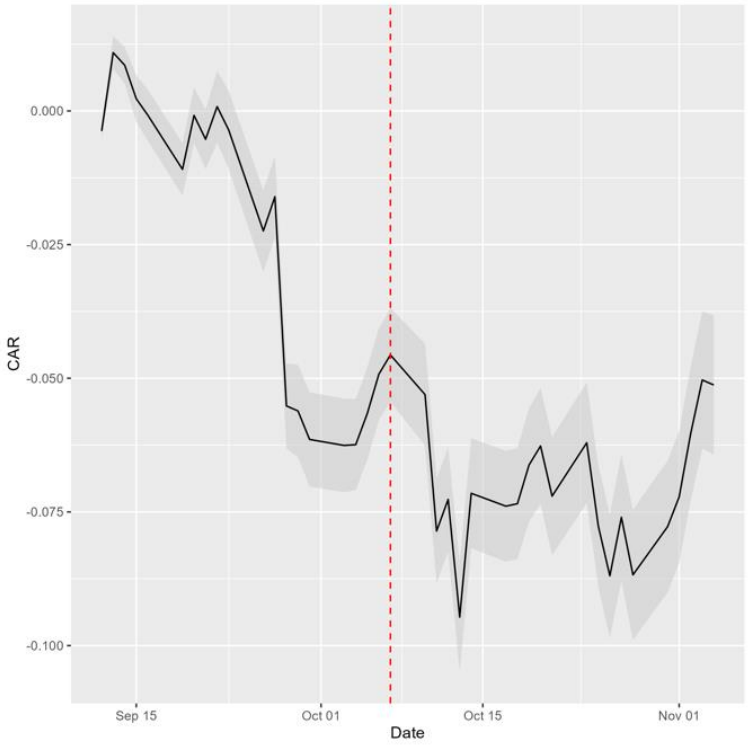

Exhibit 3. Fama-French three-factor model for the October 7th, 2022, event date

Exhibit 3 is the graphical representation of the results for the October 7th, 2022, event date. As seen in the graph, the CAR began to fall even before the event date but increased prior to the announcement of the new rules. Immediately following the event date, the CAR exhibits a pronounced decline, indicating a sharp negative reassessment of firm value. Within the event window, the CAR has dropped more than 8.5%, highlighting a consistent drop of more than 2.5% after the event date, as documented in Exhibit 4. This result is statistically significant, reflecting a strong negative adjustment that the market is seeking.

Exhibit 4: October 7th, 2022, CAR results

Date	Average	t stat	p value (Significance)	Trimmed Avg (10%)	Median	Std Error
07/10/2022	−0.0456	−10.4000	1.48e-11 (***)	−0.0434	−0.0412	0.0044
14/10/2022	−0.0715	−13.9000	9.79e-15 (***)	−0.0672	−0.0645	0.0051
21/10/2022	−0.0720	−13.1000	5.18e-14 (***)	−0.0693	−0.0687	0.0055
28/10/2022	−0.0868	−14.3000	5.02e-15 (***)	−0.0864	−0.0854	0.0060
04/11/2022	−0.0513	−7.8900	7.44e-09 (***)	−0.0496	−0.0456	0.0065

Event Date 2: October 25, 2023

On October 25, 2023, the Bureau of Industry and Security (BIS) announced a new set of rules impacting the semiconductor industry.

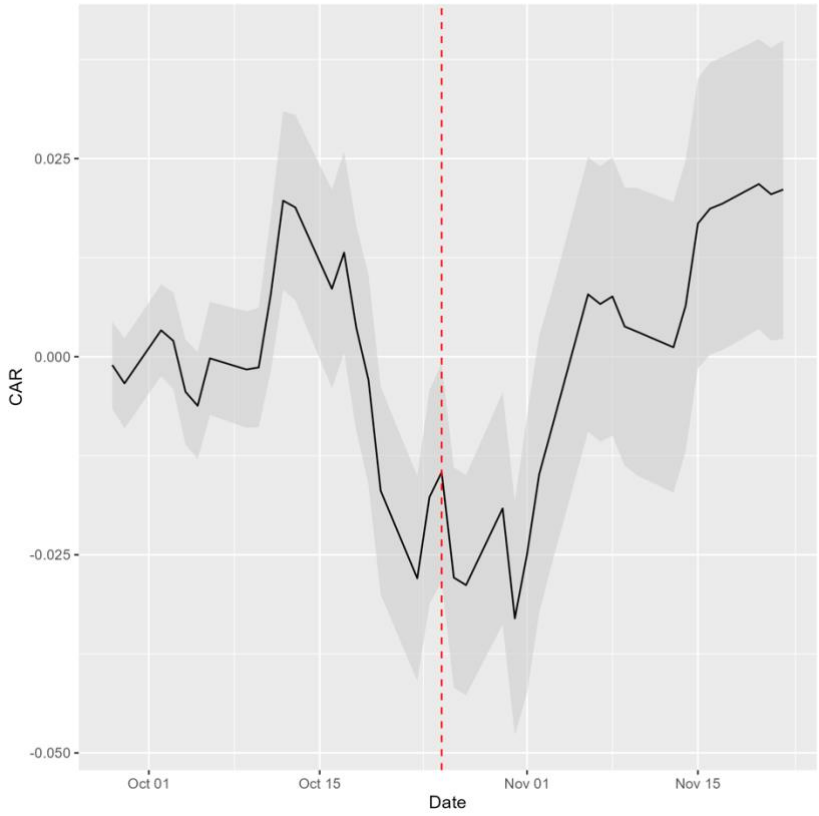

Exhibit 5. Fama-French three-factor model for the October 25th, 2023, event date

The observed trend in the CAR in Exhibit 5 presents a much more complex situation; it suggests a gradual decline leading up to the event date, with returns becoming increasingly negative over time. A deeper analysis shows that there was a drop of about 5 percentage points from about a week prior to a week after the event date. Indeed, according to Exhibit 6, the CAR drops roughly 1 % after the event date, but it seems that the companies rebuked such trend quickly. The fact that the error bands get wider in Exhibit 5 than in Exhibit 3 is a safe indication that there were firms in the sample that reacted vastly differently to the second event date.

Exhibit 6: October 25th, 2023, CAR results

Date	Average	t stat	p value (Significance)	Trimmed Avg (10%)	Median	Std Error
25/10/2023	−0.0146	−2.1100	0.0426 (**)	−0.0114	−0.0172	0.0069
01/11/2023	−0.0249	−2.8500	0.00762 (***)	−0.0248	−0.0240	0.0088
08/11/2023	0.0076	0.8660	0.393	0.0074	0.0073	0.0088
15/11/2023	0.0168	1.8400	0.0756 (*)	0.0173	−0.0193	0.0091
22/11/2023	0.0211	2.2400	0.0323 (**)	0.0233	−0.0214	0.0094

A more detailed breakdown of companies by category reveals a complex picture as well. For the 2022 event, there is a bifurcation on how companies in different NAICS categories reacted.

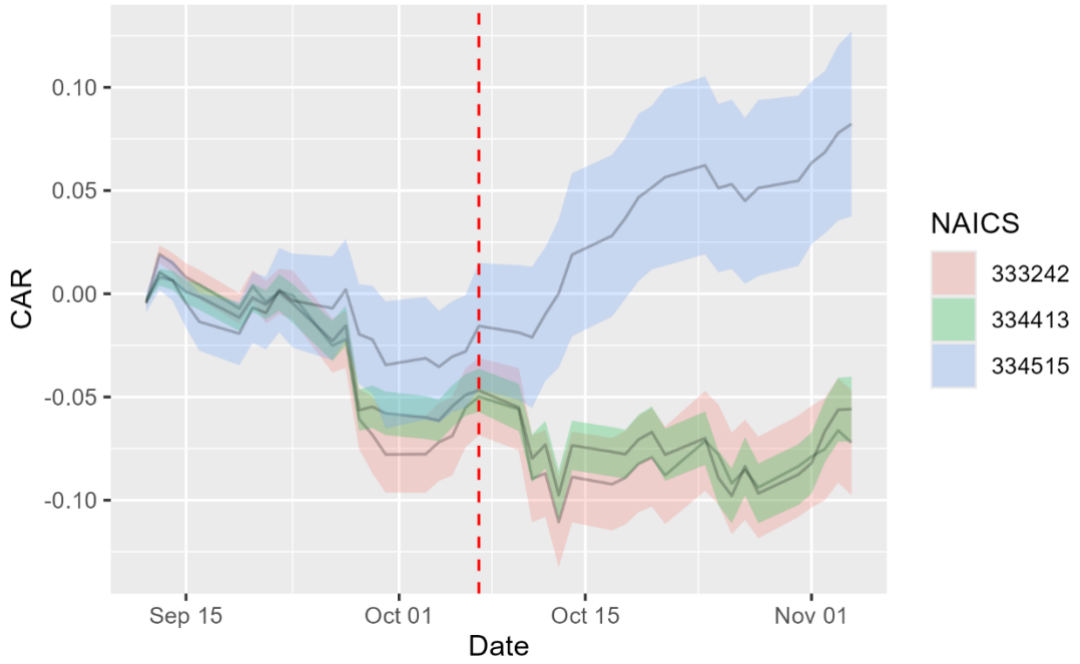

Exhibit 7. CAR results for the October 7, 2022, event date based on NAICS

As seen in Exhibit 7, NAICS 334515 (Instrument Manufacturing for Measuring and Testing Electricity and Electrical Signals) reflects a different trend than NAICS 333242 (Semiconductor Machinery Manufacturing) or NAICS 334413 (Semiconductor and Related Device Manufacturing).

One possibility could be differences in country. This table shows that NAICS 334515 has the most Chinese companies (34%) while the other NAICS have fewer (11% Chinese for 333242 and 18% for 334413).

Exhibit 8: Company Distribution by Country and NAICS Code

NAICS	Country/Region	N Companies	% Companies
333242	South Korea	93	39
	Taiwan	41	17
	Japan	31	13
	China	26	11
	Other Asia	24	10
	Europe	13	5
	United States	10	4
	ROW	2	1
334413	Taiwan	236	35
	China	120	18
	United States	92	14
	South Korea	82	12
	Europe	54	8
	Other Asia	52	8
	Japan	25	4
	ROW	12	2
334515	China	21	34
	Japan	11	18
	United States	10	16
	Other Asia	7	11
	Taiwan	5	8
	Europe	5	8
	ROW	2	3
	South Korea	1	2

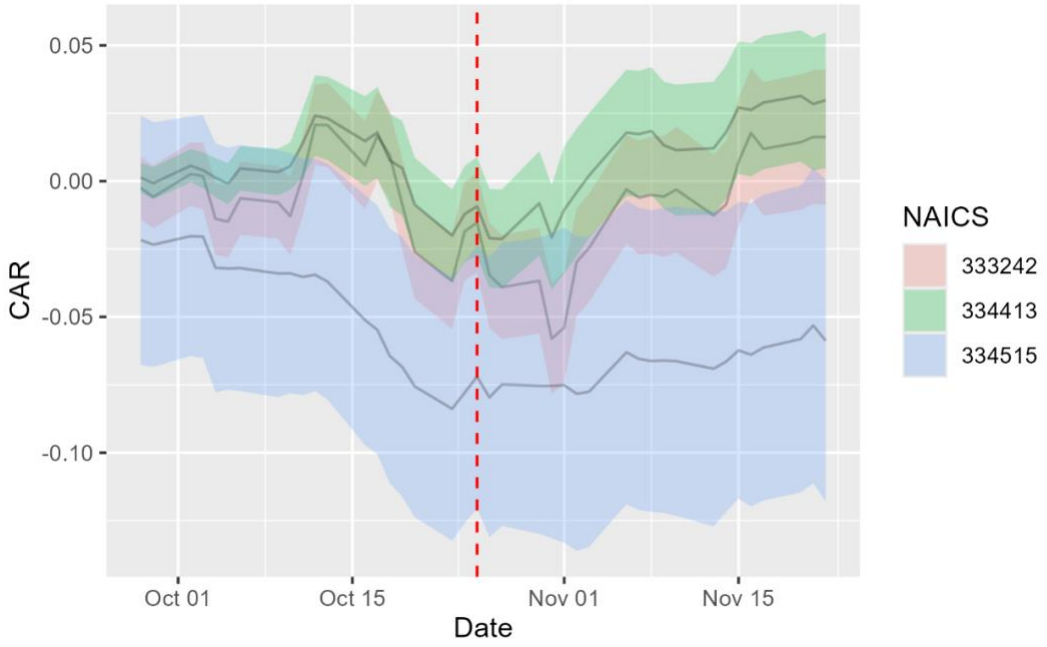

Exhibit 9. CAR results for the October 25, 2023, event date based on NAICS

After the 2023 event, again NAICS 334515 (Instruments) diverges from the others, although this time moving lower (and with larger error bands since there is more spread even within that grouping), as evidenced in Exhibit 9. One week after the 2022 event, the CAR for

Instruments firms was not statistically different from zero, as seen in Exhibit 10, while in 2023 (in Exhibit 11), the CAR was 7.8 percentage points lower. Four weeks after the 2022 event, the CAR for Instruments firms was 8.2 percentage points higher, while in 2023 it was 6 percentage points lower.

Exhibit 10: CAR after 2022 event based on NAICS

Week	NAICS	Mean	N	Std Err	t-stat
1	333242	−0.089	230	0.011	−8.100
	334413	−0.073	640	0.006	−12.310
	334515	0.019	58	0.020	0.960
2	333242	−0.088	230	0.012	−7.470
	334413	−0.078	640	0.006	−12.330
	334515	0.056	58	0.021	2.630
3	333242	−0.094	230	0.012	−7.650
	334413	−0.097	640	0.007	−13.430
	334515	0.051	58	0.021	2.400
4	333242	−0.072	230	0.013	−5.710
	334413	−0.056	640	0.008	−7.130
	334515	0.082	58	0.022	3.670

For the other NAICS, 333242 (Semiconductor Machinery Manufacturing) and 333413 (Semiconductor and Related Device Manufacturing), one week after the 2022 event, CAR had fallen from 7 to 9 percentage points. After the 2023 event, one week CAR was down 5.4 percentage points for machinery but device manufacturing themselves were not significantly different from zero. Four weeks past the 2022 event, the CAR was down roughly 6 to 7 points, but after the 2023 event, CAR was up by 1 to 3 points.

Exhibit 11: CAR after 2023 event based on NAICS

Week	NAICS	Mean	N	Std Err	t-stat
1	333242	−0.054	237	0.010	−5.230
	334413	−0.011	683	0.012	−0.900
	334515	−0.078	60	0.029	−2.640
2	333242	−0.005	237	0.011	−0.490
	334413	0.018	683	0.012	1.500
	334515	−0.068	60	0.028	−2.430
3	333242	0.007	237	0.012	0.600
	334413	0.027	683	0.012	2.180
	334515	−0.064	60	0.028	−2.320
4	333242	0.017	237	0.013	1.340
	334413	0.030	683	0.013	2.340
	334515	−0.060	60	0.030	−2.010

4.3. Robustness

We implemented a series of robustness tests to ensure that the results hold. First, the results hold with a shorter or longer estimation period (-/+ six months). Second, the raw returns can be observed for both events can be observed in Exhibit 12 and Exhibit 13 respectively.

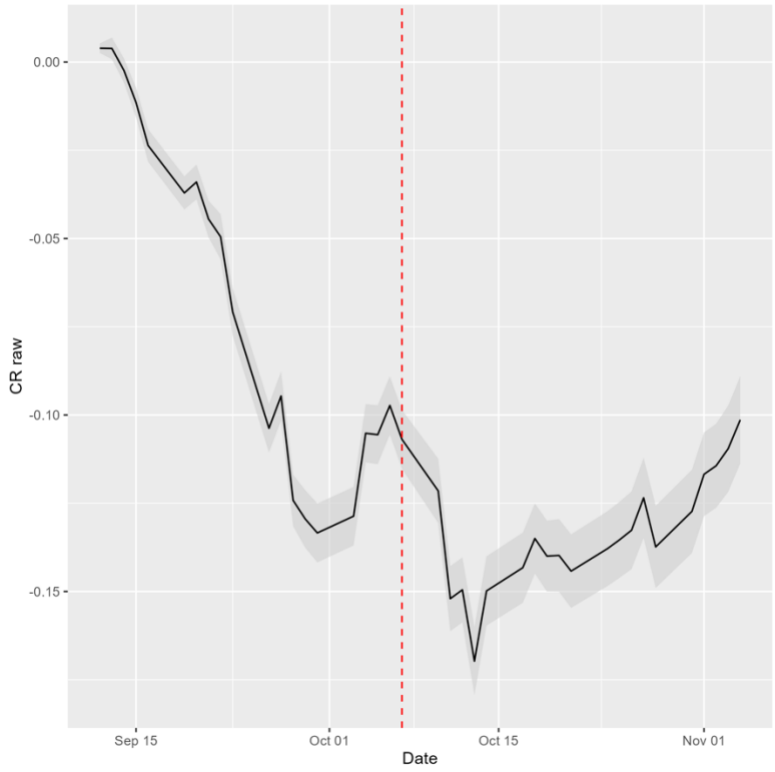

Exhibit 12. Raw returns for the October 7th, 2022, event date

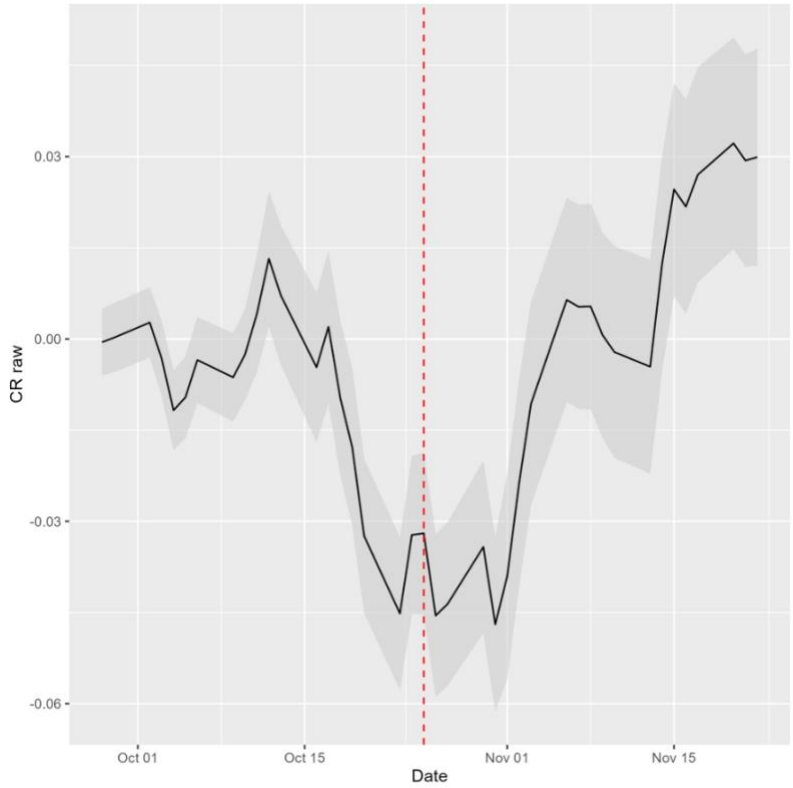

Exhibit 13. Raw returns for the October 25th, 2023, event date

From our perspective, such figures provide a straightforward view of the impact of the events without adjusting for market or sector influences. In Exhibit 12, the results of the raw returns are quite profound. Within the event window, one notices the drop in CAR go to above 15 percent within the event window. In Exhibit 13, one can notice a similar trend: the raw stock returns experienced a bigger drop than under the French Fama 3-Factor model.

Given the criticism that is often given to the French Fama 3-Factor model, we also implement robustness checks with a change in the market model implemented. Specifically, we use as a control the NASDAQ index (Exhibit 14, Exhibit 15), the SP500 (Exhibit 16, Exhibit 17), MSCI Global (Exhibit 18, Exhibit 19). The results hold.

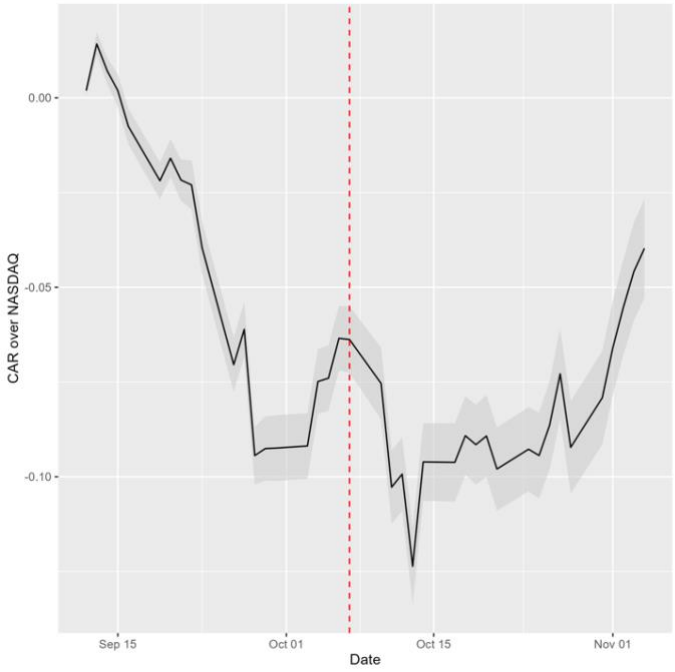

Exhibit 14. CAR returns for the October 7th, 2022, event date using NASDAQ

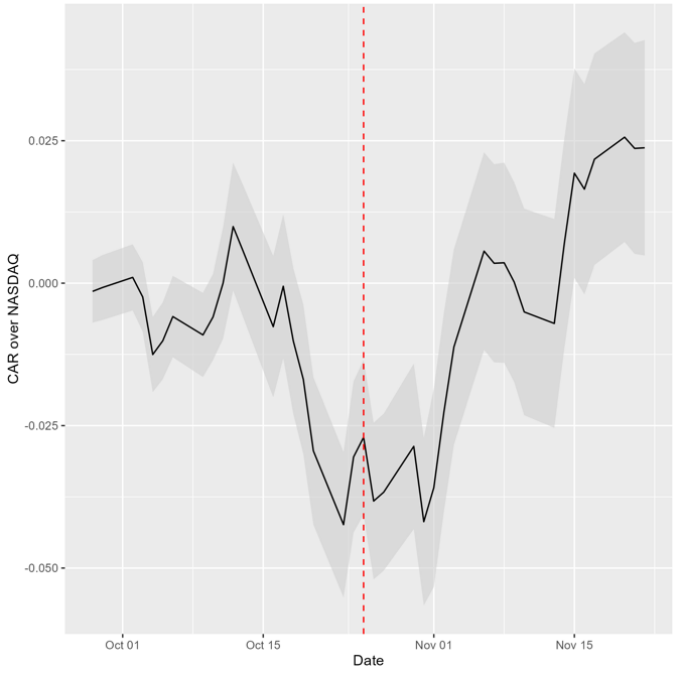

Exhibit 15. CAR returns for the October 7th, 2022, event date using NASDAQ

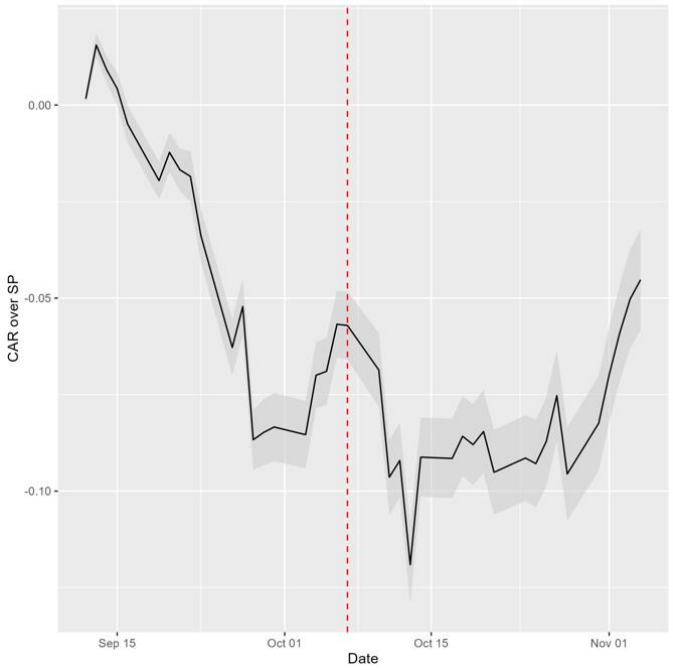

Exhibit 16. CAR returns for the October 7th, 2022, event date using SP500

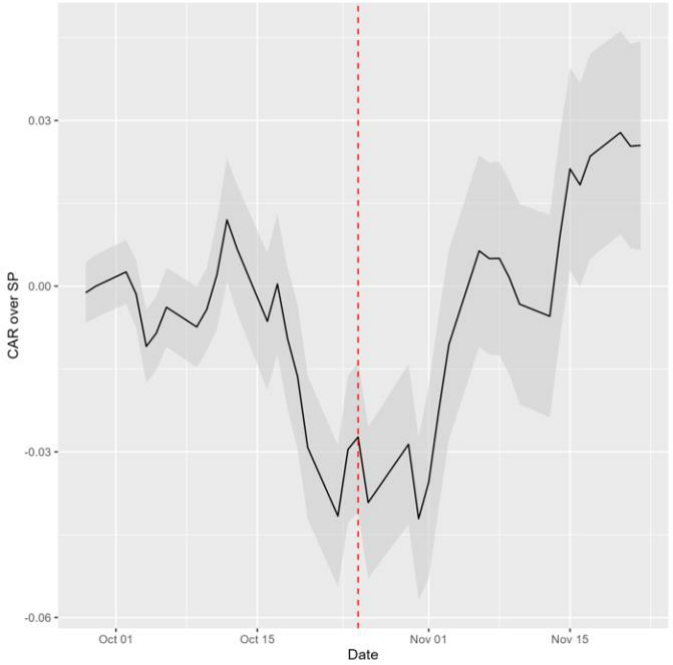

Exhibit 17. CAR returns for the October 25th, 2023, event date using SP500

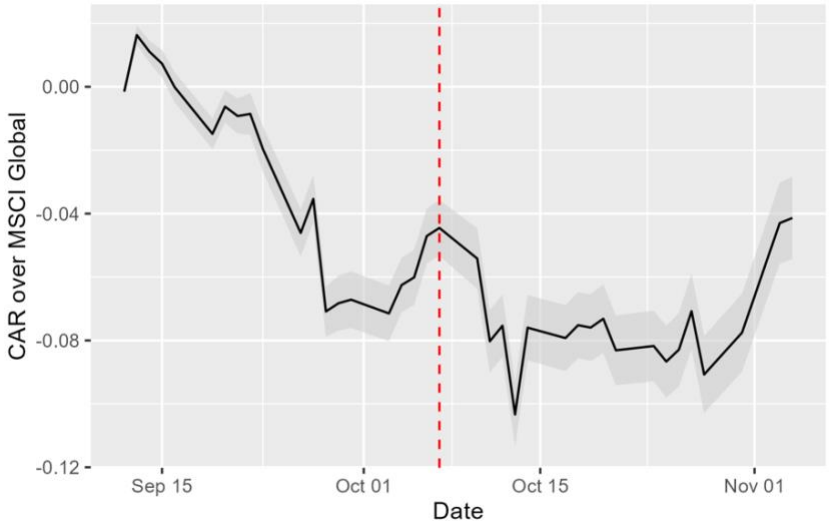

Exhibit 18. CAR returns for the October 7th, 2022, event date using MSCI Global

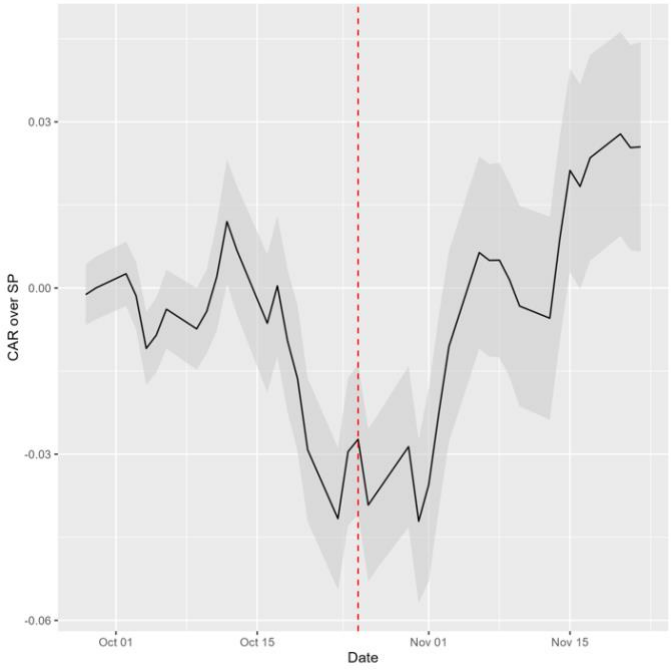

Exhibit 19. CAR returns for the October 7th, 2022, event date using MSCI Global

As a final robustness check, Exhibit 20 and Exhibit 21 show the respective raw returns of the indexes during the event windows.

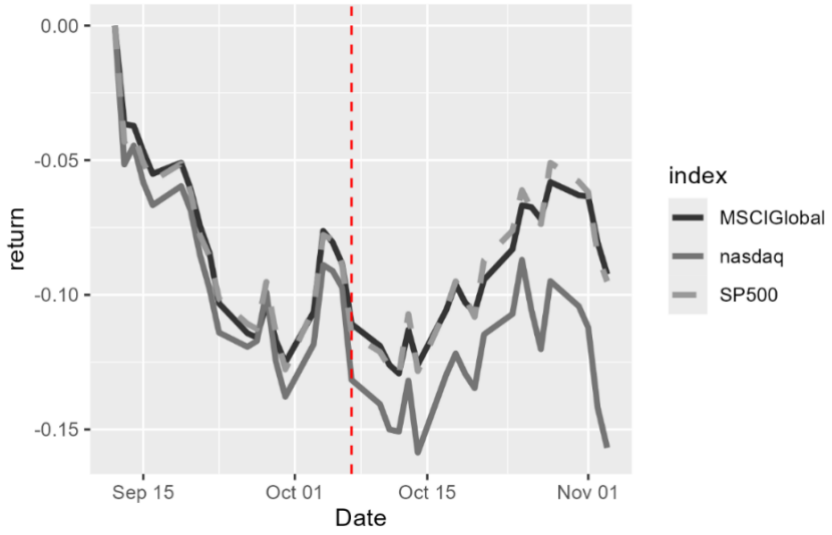

Exhibit 20. Indexes raw returns for the October 7th, 2022, event date

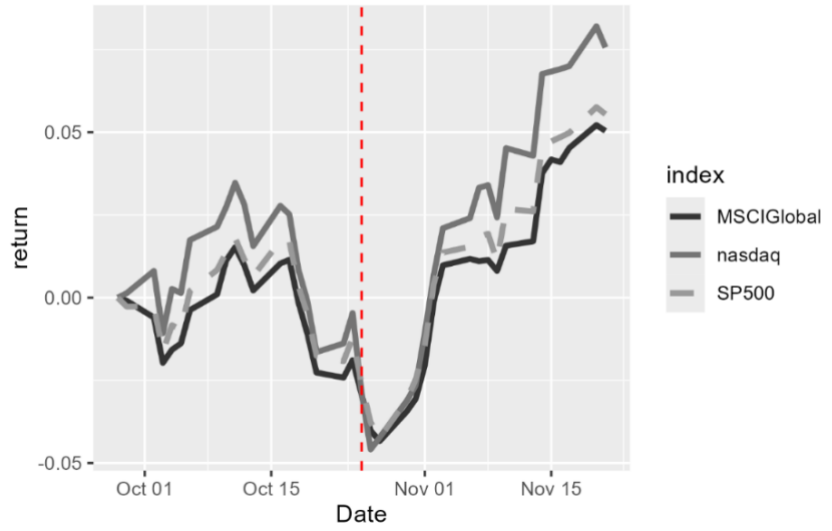

Exhibit 21. Indexes raw returns for the October 25th, 2023, event date

5. DISCUSSION

5.1. Export controls:

The strategic implications of policy changes are critically analyzed by Clayton, Maggiori, and Schreger (2023), who argue that export controls and other trade restrictions can serve strategic purposes in geopolitical conflicts. These measures can result in financial and productivity losses, as highlighted by Mendoza and Yue (2011). Adding to this economic narrative, research by Fajgelbaum et al. (2020) on protectionism's impact reveals short-run economic repercussions, including real income losses across various sectors of the U.S. economy. Their use of general-equilibrium models offers quantifiable insights into the costs of tariffs, enriching the understanding

of policy impacts on economic dynamics. Furthermore, these insights also help in understanding how such economic dynamics influence stock returns (Smales 2021).

After the announcement of new export controls on October 7, 2022, there was a noticeable dip in the market, illustrated by a significant decline in CAR values in the semiconductor industry, with CAR values dropping between -2.5% and -4% (Exhibit 4). These controls aimed to restrict the export of advanced computing and supercomputing technologies, particularly targeting China's semiconductor industry to curb its technological advancements and ensure national security (Ernst 2021; Bown 2020). The potential loss of significant market share in key regions like China and the anticipated disruptions in the global supply chain led to this negative market reaction.

The initial decline and subsequent trend break in the short and medium term align with the Efficient Market Hypothesis (EMH), which posits that stock prices quickly incorporate all available information (Fama 1970). As investors became aware of the impending regulations, the market started to price in the anticipated effects of the export controls, explaining why there was a brief, observable effect on stock prices following the actual implementation. This observed negative impact during these periods confirms that the market reacts immediately to new public information, supporting the hypothesis that the Advanced Computing/Supercomputing Interim Final Rule had a statistically significant negative impact on the stock prices of U.S. semiconductor and semiconductor equipment companies.

Overall, the analysis indicates that semiconductor companies were negatively impacted by the export controls. This is in line with contemporary research that scrutinizes the influence of geopolitical risk on stock market performance, with studies by Hoque and Zaidi (2020), Salisu et al. (2021), and Smales (2021) indicating an inverse correlation. These investigations reveal that heightened geopolitical tensions tend to erode stock returns, suggesting that periods of political uncertainty are often accompanied by a decline in market confidence and investor sentiment.

Techno-geopolitical uncertainty arises from the disruptions caused by major policy shifts by dominant countries aiming to achieve interconnected technological and geopolitical advantages over their rivals (Farrell and Newman 2020; Luo 2022; Luo and Van Assche 2023; Montresor 2001). The findings highlight the difficult interplay between technological capabilities and national security concerns as countries pursue techno-nationalist policies to enhance their geopolitical power (Witt 2019; Witt et al. 2023; McCarthy 2021; Clopton 2016). On one hand, these policies aim to protect domestic sectors and national interests; on the other hand, they can erode company worth due to the global integration of these industries.

5.6. Conclusion

This study critically examines the impact of the Advanced Computing/Supercomputing Interim Final Rule on the stock prices of companies in the semiconductor industry. The findings reveal a complex interplay between technological capabilities and national security concerns as countries adopt techno-nationalist policies to enhance geopolitical power. The implementation of new export controls resulted in a significant negative impact on stock prices, consistent with the Efficient Market Hypothesis, as markets quickly incorporated the anticipated effects of these regulations.

Future research could explore the evolving dynamics of the semiconductor industry in light of techno-nationalist policies, particularly the intersection of technological advancement and national security concerns. One critical avenue for investigation would be to figure out the impact of export controls within the semiconductor industry, particularly on the differences on whether a company handles the actual semiconductor chip production or just general designs.

Another important area for future studies is the role of investor behavior in response to geopolitical risk and regulatory uncertainty in other high-tech sectors. The semiconductor industry is particularly sensitive to shifts in trade policies, and understanding how market participants price in national security risks and political instability can shed light on the broader economic consequences of techno-nationalism. Comparative research across other VRIN resources could provide a deeper understanding of how similar policies affect different sectors, potentially revealing patterns in market reactions and investor decision-making.

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Footnotes

1. Both Kothari and Warner (2007) and Ghoul et al. (2023) offer generous overviews of the status of event studies in the field of international finance research. With over 500 event studies published, these overviews are providing a reliable aggregate view of how event studies should be conducted.