2023

The CHIPS and Science Act: The United States' Race for Semiconductor Sovereignty

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Graduate Program in Political Science

An MA Literature Review submitted in partial fulfillment of the requirements for the degree of Master of Arts

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The School of Graduate and Postdoctoral Studies
The University of Western Ontario
July 24, 2023

Abstract

This paper explores the CHIPS and Science Act in the United States. The microchip is extremely crucial to the function of technology as a whole, and its global supply chain is monopolized by countries such as the US, China, Taiwan, the Netherlands, South Korea, and Japan. The industry is fierce in competition, and holds many implications within political science, and international relations. The CHIPS Act is an Act that allocates funding toward the re-shoring efforts to manufacture and research the microchip on US territory. This paper explores the history leading up to the CHIPS Act, as well as the reasoning behind the sudden re-shoring efforts. It argues that national security concerns are the main reason behind the Act, compared to the economy. Furthermore, the paper looks at the existing literature, and identifies the areas in need for future research. Ultimately, this paper explores the CHIPS Act, and its implications in the microchip industry.

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Introduction

Microchips, also referred to as semiconductors, are "a set of electronic circuits printed onto a small flat piece of silicon".[1] Although on a technical level, semiconductors and microchips do differ, the terms are often used interchangeably.[2] Microchips play a crucial role in the production of all electronic devices. Essentially, "microchips serve as the neurons of a computer, essentially telling the device what to do by sending on and off signals to different parts of the device".[3] Without microchips, almost all of the electronics and technology as we know it would cease to exist.[4] Microchips are also a crucial aspect in regard to the exponential increase in computing power over time. This phenomena is referred to as Moore's law, "which states that the speed of computers, as measured by the number of transistors that can be placed on a single chip, will double every year or two".[5] Computing power is essential in the realm of technology, and in many fields, it can account for "49%-94% of the performance improvements in [certain] domains".[6] When the processing speed of a microchip increases, its computation power increases, and the technology becomes more efficient.[7] In summary, microchips are necessary for the overall function of technology, and the exponential growth in computing power.

The microchip industry is one that is volatile and complex in nature. It has many implications in political science, specifically international relations. The production of microchips occurs on a global level with a global supply chain, and is home to many monopolies as well. That is to say, Taiwan, The United States, Japan, China, the Netherlands and South Korea are all prominent actors in this industry.[8] The way this industry is set up creates fierce competition and has the potential for large hegemonies. The two main competing actors are the United States and China. The United States recently determined it has been over reliant on foreign countries for production, and this can prove detrimental to national security and the economy.[9] Thus, in August

of 2022, the CHIPS Act was passed in an effort to re-shore and domesticate microchip production.[10] The goals of the Act are to "1) reduce the likelihood that shocks abroad might disrupt the supply of chips, 2) boost American international economic competitiveness and create domestic jobs, and 3) protect semiconductors from being sabotaged in the manufacturing process".[11]

This act, and its provisions, are novel in nature. That is to say, the decision to re-shore seemed very sudden with a strong sense of urgency. The Act was seemingly passed for two main reasons: national security concerns and economic concerns. This literature review will seek to answer the question of whether national security or economics serve as the main explanation behind the CHIPS and Science act. Then, it will explore the current literature regarding this industry, ultimately shining light on where this literature is headed, and what needs further research. This literature review will conclude that national security considerations are the most prominent factor in terms of the timing and content of the CHIPS Act. The literature review will begin with a history of the industry, as well as the current events and discussions. Then, it will explore national security as the main reason behind the Act. Next, it will explore the economy and its prominence within the Act. Finally, an analysis of the current literature within this industry, and it will conclude with areas of future research.

History & Current Discussion

The history of the semiconductor is rich. From its invention, to its advancements, to its global implications. For the sake of this paper, it is imperative to understand it from the perspective of the United States and its production. Its journey through domestic production, to international expansion lays the foundation as to why the US is looking to re-shore and re-domesticate their

production today. The semiconductor industry stems from humble beginnings in the late 1950s.[12] During this time, scientists were working to simplify transistors and the amount of wires that were required to string them together.[13] Scientists were looking into semiconductor material, such as silicon and germanium, and experimenting with the idea of placing multiple transistors on a single piece of the semiconductor material.[14] This revelation was known as the "integrated circuit", or a "chip", since "each integrated circuit was made from a piece of silicon 'chipped' off a circular silicon wafer".[15] This is, ultimately, the beginning of the streamlining of this technology. These 'chips' were more reliable, smaller, more efficient, and more powerful than the previous technology. Now, they needed to establish its market.

Around this time, the Soviet Union had launched the world's first satellite, Sputnik, into space.[16] This began to instill fear into Americans, implicating that the Russians now had a strategic advantage to the United States.[17] These fears increased immensely when the Soviet Union sent the first person, Yuri Gagarin, to space.[18] Ultimately, "the Soviet space program caused a crisis of confidence. Control of the cosmos would have serious military ramifications".[19] The US now felt as though they were falling behind when it came to world power, and needed to catch up swiftly. This led to the decision to have the US send a person to the moon. This gave Robert Noyce, a pioneer in this field, his first market: rockets. NASA procured a large order of chips from Noyce and his company for their space travel endeavours.[20] The early demand at the time for this new technology is rooted in competition and has implications in geopolitics. The US began using chip technology as a means to undermine their Russian counterparts and catch up to them in their scientific advancements. This was done to combat the potential military ramifications and global control that space travel would bring.[21] This competition and fear is a stark foreshadowing to the future of this technology.

Robert Noyce's efforts within NASA and the Apollo guidance computer resulted in great success. Ultimately, "NASA's trust in integrated circuits to guide astronauts to the moon was an important stamp of approval".[22] Noyce's company, Fairchild Semiconductor, had jumped from a $500,000 small start-up company, to a $21 million established company over the span of only two years.[23] This was the beginning of a booming industry within the United States. Over the next few years, technological improvements were being made and different industries began utilizing chip technology. The US was in the early stages of establishing a strong, domestic supply chain. These actors knew how important this technology would be in the future. They knew it had potential to revolutionize the world and continue its exponential growth in accordance with Moore's Law.[24] Mass production, however, did prove to be a challenge. In the 1960s, the assembly process contained many steps that could only be completed by hand.[25] As the demand for this technology increased, the labour was difficult to procure and keep funded.

This commences the offshoring efforts to outsource labour to Hong Kong due to their significantly cheaper labour wages. They were able to hire more people for less cost and increase their supply. During their first year of operation in 1963, "the Hong Kong facility assembled 120 million devices".[26] This success garnered the attention of many other companies, who decided to follow suit. By the 1970s, "almost all US chipmakers had foreign assembly facilities".[27] From there, these companies further outsourced their labour to other parts of Asia, where they could take advantage of the labour costs that were even cheaper than Hong Kong's wages. This leads their efforts to Taiwan. Taiwan was the next best spot for the US to create chipmaking facilities for a number of reasons. Although America was allied with Taiwan, the defeat from Vietnam left many countries uneased. Chris Miller states that "from South Korea to Taiwan, Malaysia to Singapore, anti-communist governments were seeking assurance that America's retreat from Vietnam

wouldn't leave them standing alone".[28] In addition, Taiwan was in search of developments and jobs that would help address economic struggle (pg 64). Collaboration with the US was ultimately the best strategy to address these problems.

Within the next decade, "American semiconductor firms employed tens of thousands of workers internationally, mostly in Korea, Taiwan, and Southeast Asia".[29] Business was being conducted as planned, gaining immense success. Facilities were also actively improving semiconductor technology and diversifying their use. These chips were now used not only in governmental affairs, but were also being refined to be sold to everyday consumers for personal products. The US was seemingly on top, dominating the world's technology industry.[30] However, competition started to rise. Japan was now catching up to the forefront of this technology race. They were producing chips that were ultimately superior to America's. Japan was producing chips with failure rates around 0.02 percent.[31] In comparison, "the lowest failure rate of the three American firms was 0.09 percent- which meant four-and-a-half times as many US-made chips were malfunctioning".[32] There was no difference in terms of cost or function, so why would anyone willingly choose to purchase this technology from the US? Japanese company, Sony, was now becoming a leader not only in terms of technology, but also innovation.[33]

This competition, along with Japan's newfound success had many negative implications on the United States. To begin, the economic loss would be disastrous. They were now second in the technology race that brought them extensive revenue. They were losing precious money to their competitors in a way that they could not keep up. They feared that "if the trends of the mid-1980s continued, Japan would dominate the DRAM industry and drive major US producers out of business. The US might find itself even more reliant on foreign chips and semiconductor manufacturing equipment than it was on oil".[34] The economic loss was not even the only issue

they were now faced with. The potential reliance on overseas manufacturing meant that the US would just have to trust these international companies with incredibly sensitive material.[35] The US was now looking at a potentially detrimental national security problem.

The United States now had to explore potential solutions. They needed to figure out a way to stay competitive in the technology race with Japan and address issues of national security. There were threats of tariffs, attempted deals, and formal complaints.[36] However, in 1986, Washington and Tokyo ended up deliberating and reaching a deal.[37] Japan would now have to place quotas on their exports of DRAM chips, ultimately decreasing supply and increasing price.[38] Despite these agreements, the US was still looking to exit the market of DRAM chip production because although "the trade restrictions redistributed profits within the tech industry… they couldn't save most of America's memory chip firms".[39] This agreement was seemingly not sufficient for the United States. Their next step was to attempt to implement policy moves similar to Japan's to help with research and development (R&D). Ultimately, Japan's government acted as a mediator to help coordinate R&D efforts for firms, and also fund these efforts.[40] If the US could implement this tactic into their work, it might allow them to regain their competitive edge. Ultimately, despite all of these efforts, America still found themselves lacking compared to Japan.

That is, until new names entered the race. Business billionaire Jack Simplot was a key factor in the revival of Silicon Valley.[41] It was Simplot's efforts, as well as tech start-ups and corporate transformations that put America back into the competition. Soon enough, "the US overtook Japan's DRAM behemoths not by replicating them but by innovating around them. Rather than cutting itself off from trade, Silicon Valley offshored even more production to Taiwan and South Korea to regain its competitive advantage".[42] The US ultimately made a comeback in the early 2000s because of its "dominance in computer chips, [which were] the core technology of

the era".[43] While the emphasis was still on the importance of offshoring, this new US resurgence also began to highlight the need for domestic production, as evident through the success of the American tech start-ups. This entrepreneurial innovation, the success of government programs, new progress with R&D, and the hit of Japan's financial crisis in the 1990s led the US back to first place in 1993.[44] Japan's inexplainable low costs and lack of innovation led to their demise, even being taken over in DRAM production by South Korea.[45]

Everything was seemingly looking up for the United States. They were back in the race and back on top. This success was only short-lived, however, as new competition and problems swiftly arose. At the same time that the US was navigating their race with Japan, Taiwan was looking to enter the competition. After not receiving a CEO position at his current company, Texas Instruments, Morris Chang took his business to Taiwan, with the intention of putting Taiwan on the map as a strong actor within the chip industry.[46] The creation of the Taiwan Semiconductor Manufacturing Company (TSMC) was just the beginning of Taiwan's imminent success, and they were well on their way to becoming a dominating force, producing some of the "world's most advanced chips".[47] Taiwan, the US, and other actors will spend the next couple of decades continuing this fight in the technology race. Being at the forefront of technology not only means ruling the economy, but also gaining an incredible advantage in terms of the military and security.[48] This competition has ultimately turned into a war, a 'Chip War', the term coined by Chris Miller.

The current factors in this war are broad. Since microchips are quintessential to essentially every piece of technology there is, this war expands to technology as a whole, and the race to be on top. To begin, there are predictions of China potentially beating the US in terms of AI technology.[49] The improvement of computing power and the easy acquisition of US microchips from Taiwan, places China at an extreme military advantage.[50] An AI-forward China means the

potential for autonomous weapons, autonomous vehicles, and overall stronger military systems.[51] China is able to continue these endeavours because they are currently able to acquire US-designed microchips from Taiwan. It was discovered that "less than 20 percent of the contracts involved companies that are subject to US export controls".[52] Ultimately, this places the US at an extreme disadvantage in terms of military and technology. With this competition in general, the future will be heavily reliant on chip technology. That is to say, "powerful processors to run AI algorithms, big memory chips to crunch data, [and] perfectly tuned analog chips to sense and produce radio waves".[53] Essentially, this chip war has everything to do with global power, military power, and economic power.

In terms of the US military, they are no longer a leading buyer of chips, being replaced by everyday consumers and consumer companies such as Apple.[54] Since the production of chips is so expensive, it is not something the Pentagon, or the National Security Agency, can do in-house.[55] In addition, producing a cutting edge chip that competes technologically with the rest of the world's production, while maintaining the upgrading abilities in accordance with Moore's Law, is much too expensive for domestic production on a military front.[56] The US military, and government intelligence agencies, currently purchase their chips from outsourced "trusted foundries".[57] This does, however, create potential vulnerabilities. No matter how trusted the source, there is always risk of tampering.[58] This alludes to a bigger picture, of every country in this chip war looking to further their technology and maintain their dominant status. Many of these actors share a common denominator of relying on Taiwan for the fabrication of their chips.

China has currently "identified their reliance on foreign chipmakers as a critical vulnerability".[59] They are seeking to "rework the world's chip industry by buying foreign chipmakers, stealing their technology, and providing billions of dollars of subsidies to Chinese

chip farms".[60] This will allow China to domesticate fabrication, as well as avoid many US restrictions. Although the US noticed these advancements, they still had the notion of globalization in their minds. They believed it was what was best for the world, until the potential impending doom of China's advancements began to become reality. Toward the end of the Obama administration in 2016, Commerce Secretary Penny Pritzker publicly "declaring it 'imperative that semiconductor technology remains a central feature of American ingenuity and a driver of economic growth. [The US] cannot afford to cede our leadership".[61] The US began to gain an understanding of their heavy reliance on Taiwan and the deepening threat of China. Attempts to impose sanctions and restrictions, reach agreements, and collaborate were all simply not enough.

Now, each country involved is seeking to achieve very specific goals in this war. The US hopes to increase its chip fabrication and continue to be a dominating force in the semiconductor industry.[62] Some countries in Asia and Europe are looking to dive further into the chip market and expand their shares.[63] Taiwan and South Korea want to remain as leaders of chip fabrication.[64] China, similar to the US is looking to increase its chip fabrication.[65] This leaves the United States, Europe, and Asia as the three main actors in this war. Ultimately, "if the US wants to increase its market share, some other country's market share must decrease… yet outside China, all the world's advanced chip fabs are in countries that are US allies or close friends".[66] This leads into the United States' efforts to domesticate chip production.

The first factor that led to the push for US domestication efforts is the global semiconductor chip shortage.[67] The beginning of the COVID-19 pandemic also marked the beginning of the chip shortage. While the pandemic did play a large role in this crisis, it is not the sole cause. The pandemic merely exacerbated already existing vulnerabilities within the chip industry.[68] COVID-19 played a role in this shortage through its impact on supply and demand.[69] The new working

conditions brought on by the pandemic meant the increased demand for technology to enable working from home, and the decreased demand for consumer electronics due to economic struggles.[70] The disruptions within chip supply led to "the forced closure of chip manufacturing plants due to global lockdowns, resulting in the depletion of semiconductors production and inventory".[71] The pandemic was not the only reason for the shortage, however.

The Semiconductor Supply Chain (SSC), as previously depicted, has an incredibly long, expensive, and complex production process. Furthermore, the supply chain is spread across many different countries, which means having to navigate between "different tax laws, import controls, and diverse regulations".[72] The pandemic exacerbated issues within the SSC pertaining to "large scale disruptions [that] can occur because of single points of failure, [and] global access to suppliers or customers can be impaired due to geopolitical tensions".[73] The pandemic, and the economic and production issues that came with it, led to bottlenecks in many areas, choking out areas in the supply chain. Furthermore, there are heightened geopolitical issues. With the US and China 'trade war' looking to "make semiconductor manufacturing in China difficult",[74] it only furthered and worsened the semiconductor shortage as a result of the restrictions.[75] The chip shortage, as well as increased tensions within the 'tech war', led the US to begin re-evaluating their policies.[76]

These factors furthered America's understanding that they were now heavily reliant on other countries in a way that could prove detrimental. The only way around this would be to develop new strategy. Enter the Chips and Science Act.[77] The Act "provides funds to support the domestic production of semiconductors and authorizes various programs and activities of the federal science agencies".[78] That is to say, the US is seeking to domesticate their production to combat the heavy reliance on international production. The Act also emphasizes the fact that the

funding allocated within this program must only be used for US efforts, and cannot be used to "construct, modify, or improve a facility outside of the United States".[79] It is a bipartisan legislation that allocates $52.7 billion for chip production.[80] For the first five years, $39 billion will be "earmarked for the construction of semiconductor fabrication plants, or 'fabs', including $2 billion specifically designated for mature semiconductors essential to the military as well as the automotive and manufacturing industries".[81] The leftover funding then "will foster a more robust domestic ecosystem for semiconductor production, including research and development and workforce cultivation".[82] This act highlights the overarching belief that working toward domesticating production is the most viable option for the US to maintain its status as a dominating force.

The Obama administration began to lay down the foundation to addressing the issues within the semiconductor industry. The Trump administration sought to impose restrictions on China to address the economic and security issues that the industry.[83] The Biden administration then understood that they needed to incorporate the domestication efforts to further address the economic and security problems. This act ultimately addresses the "global shortage that has been exacerbated by the COVID-19 pandemic and the US-China trade war".[84] The administration also hopes to create jobs through these efforts.[85] Through this developed understanding of the United States' unique position in this industry, it can be concluded that they are looking to domesticate for a multitude of reasons. The US is utilizing the CHIP act to address national security concerns, increase supply chain resilience, increase their economic competitiveness, reinstate their technological leadership, and bring business back to the United States. Secretary of Commerce Gina Raimondo states that "CHIPS for America is fundamentally a national security initiative",[86] and the hope is that it "advances our shared goals, strengthens global supply chains, and enhances

our collective security".[87] While all of these reasons are important and play a role in their decision, could there be one reason in particular that was most important in their sudden efforts to re-shore?

National Security

The CHIPs act is intended to aid national security. The main goal has been to "re-establish and sustain US leadership across the semiconductor supply chain".[88] However, hegemonic efforts also need to be supplemented with strategies to prevent competitors from catching up. These strategies also work to protect national security, thus making national security an important factor in this Act. Therefore, national security will be the first factor explored in this paper. To begin, the Act includes guardrail provisions specifically intended to advance technological and national security within America. The guardrails pertaining to national security "are intended to ensure technology and innovation funded by the CHIPS and Science Act is not used for malign purposes by adversarial countries against the United States or its allies and partners".[89] Specifically, there are specific provisions that entail the following:

1. Expansion Clawback section of the Act (15 U.S.C. 4652(a)(6)) states that funding recipients may not engage in any significant transaction involving the material expansion of semiconductor manufacturing capacity in a foreign country of concern

2. The Technology Clawback section of the Act (15 U.S.C. 4652(a)(5)(C)) bans funding recipients from engaging in joint research or technology licensing efforts with foreign entities of concern that relate to a technology or product that raises national security concerns

3. For both the prohibition on certain expansion transactions and the prohibition on certain joint research or licensing transactions, the applicable term shall be the 10 years following the date of the award of Federal financial assistance, unless otherwise specified in the required agreement (15 CFR § 231.202(a))

(Federal Register 88 FR 17439)[90]

These guardrails are intended to contain production and expansion solely to the US, and ensure other countries of concern (i.e. North Korea, People's Republic of China, Iran, Russia) do not reap any benefits from America's efforts and funding. This will ultimately be an immense help as the US will be able to advance without risk of interference.

These provisions also play a large role in protecting America's national security. Another large aspect of the guardrails seeks to "classify semiconductors as critical to national security".[91] Currently, the US recognizes there is still production of 'legacy chips' in other countries, as well as the countries of concern. The statute would ultimately allow expanded production of these types of chips; however, the new proposed guardrails would classify and distinguish a list of semiconductors as being a crucial aspect to America's national security.[92] Ultimately, these chips would not fall under the 'legacy chip' classification and thus, would be able to hold much tighter restrictions.[93] Ultimately, the US Department of Commerce states that "this measure will cover chips that are critical to US national security needs, including current-generation and mature-node chips used for quantum computing, in radiation-intensive environments, and for other specialized military capabilities".[94] Not only are the US seeking to protect these new chips for the sake of security, the guardrails also work to control exports.

In October 2022, the Bureau of Industry and Security (BIS) "implemented export controls to prevent the PRC from purchasing and manufacturing advanced chips that would enhance their military capabilities".[95] Since there has been recent progress pertaining to technology advancements and production, the new guardrails work to reinforce these previous controls "by aligning prohibited technology thresholds for memory chips between export controls and CHIPS national security guardrails. [The] proposed rule applies a more restrictive threshold for logic chips than is used for export controls".[96] Essentially, the US is utilizing microchip technology to advance

their military. These chips are undoubtedly crucial to the military system and therefore, cannot be at risk of infiltration. The CHIPS act and its proposed guardrails ultimately work to protect this important sector. With the understanding that the CHIPS act was enacted rather suddenly, there is implications regarding the urgent need for change. It is important to explore and understand how the industry has reached this point in order to understand why the sudden change is necessary.

In the early 2000s, it was understood that the United States had a large lead in the science and technology industry. The military dominance and hegemony was attributed to the 'scientific prowess' of the US.[97] That is to say, the technologies they were utilizing were only available from US weapons laboratories. They were domestically produced and the technological advancements were unique to the United States. However, the early 2000s also brought about increased globalization and free trade, which meant that 'scientific and technical' (S&T) knowledge was now being disseminated at faster rates, to further areas. This meant imminent threat to US military hegemony.[98] This ultimately identifies free trade as a threat to the military system and the United States' hegemony. In addition to free trade, other major powers were making advancements of their own.

During this time, China was working diligently to close the technology gap within the military sector, but it was evident that their capacities were lacking in comparison to the US.[99] In terms of microchip technology, "China's most advanced facilities have been six to eight years behind the state of the art and continue to be critically dependent on imports".[100] It was ultimately predicted that by 2020, their military technology "will still be significantly inferior to that of the United States".[101] However, the current case is that China "by far remains the biggest threat to America's technological innovation and economic security".[102] China has developed robust strategies in an effort to take lead and gain hegemonic power in the military sector. These strategies

work to combat their 'technological inferiority'. They have developed the 'Military-Civil Fusion' (MCF) in an effort to cut back the lead of the United States.[103] An important factor in the MCF is "the elimination of barriers between China's civilian research and commercial sectors, and its military and defence industrial sectors".[104] China is ultimately "implementing this strategy, not just through its own research and development efforts, but also by acquiring and diverting the world's cutting-edge technologies - including through theft - in order to achieve military dominance".[105]

Despite the Department of Commerce imposing export controls on semiconductor components, and working to address national security cases, China still allegedly enacted "efforts to steal intellectual property [and] other American data".[106] Deputy Attorney General Lisa O. Monaco delivered a speech on February 16, 2023 addressing the national security threats. She states that there are countries posing a threat to national security "through foreign investment designed to access sensitive data and key technologies".[107] Furthermore, she discussed how these countries' leaders' are working to "seek technical advantage through the acquisition, use, and abuse of disruptive technology: innovations fueling the next generation of military and national security capabilities".[108] She continues by discussing the fact that these countries "want to acquire technology by any means possible – not only to fuel surveillance and repression at home and abroad, but to gain strategic dominance".[109] That is to say, even despite technological inferiority, countries of concern still pose a very real threat to US hegemony in terms of national security.

Attorney General Monaco also discussed the CHIPS Act in this speech and how it works to tackle national security concerns. It seeks to maintain US leadership in this sector through its investment in domestic R&D and restricting transfers to countries of concern to mitigate the national security risks. Domestic investment allows for technological innovation that the US will

have complete control over. They will be working with microchip technology that will be utilized in the military industry, as well as other high-stake industries. If they want to maintain their military hegemony, these innovations must be unique to the US and not shared with others, especially countries of concern. Therefore, the CHIPS Act serves to protect these new, sensitive microchips from having their technology stolen by enforcing strict, domestic control over them. In addition, the restriction of transfers and exports further protects against national security threats by preventing the procurement of these chips from countries of concern. Ultimately, this act works to prevent theft and potentially dangerous procurement, and protect technological innovations. Other countries gaining a technological lead is a very dangerous threat to the US and its hegemonic power. These countries can gain vital information on the US, which the CHIPS Act works to circumvent. However, information and exports are not the only potential security threats.

Another aspect the CHIPS Act addresses is the over-reliance on foreign countries for the production of these chips. The semiconductor supply chain is global in nature. It is an industry that spans over the entire world; however, there is intense concentrations within aspects of the industry. That is to say, certain countries have monopolies on areas, resulting in interdependence. Ultimately, this can create "chokepoints that can result in interruptions and opportunities for foreign adversaries to impair US access to trusted semiconductors".[110] Firstly, the US "is heavily dependent on a single company in Taiwan for producing its leading-edge chips and has significant dependence on China for mature node logic chips".[111] Due to the nature of the supply chain, it is extremely fragile and volatile. Countries could very well impair access to product, and exploit the supply chain.[112] This can ultimately result in scenarios where "counterfeit and compromised microchips appear in US commercial and defense systems".[113] In addition, "adversaries can and have targeted critical technology, intellectual property, and human talent from the US

semiconductor industry, resulting in substantial losses".[114] To summarize, the US faces potential extreme security threats as a result of their acquired chips.

In 2018, there was an article released discussing a conspiracy that Chinese intelligence agencies were able to infiltrate companies in the US by "embedding malicious microchips in Supermicro motherboards".[115] These motherboards were allegedly used in US data centers, which could ultimately supply China with sensitive information pertaining to the United States. However, this claim was vehemently denied by the companies the article stated were affected.[116] Whether this case was true, or not, it still has serious implications regarding microchip infiltration. If the US continues acquiring microchips to deal with sensitive information from their competitors, they open themselves up to numerous security risks. The example discussed above, whether true or false, provides a stark warning that microchips can greatly compromise hardware. The technology behind it is that "somewhere in the Linux operating system, which runs in many servers, is code that authorizes a used by verifying a typed password against a stored encrypted one. An implanted chip can alter part of that code so the server wont check for a password… [resulting in] a secure machine [that] is open to any and all users".[117] This isn't the only potential weak point, though. There is potential for microchips to "steal encryption keys for secure communications, block security updates, and open new pathways to the internet".[118] It can also be done in a way that network administrators wouldn't even recognize it as suspicious activity.[119]

This highlights the fact that there are very real security risks with importing microchips. When a country has the technological ability, along with the desire to knock out the US as a hegemonic power, who knows what lengths they will go in order to achieve their goals. It is evident that there are already efforts to gather US information. Recently, Microsoft stated that "Chinese state-sponsored hackers had compromised 'critical' US cyber infrastructure across numerous

industries with a focus on gathering intelligence.[120] China is actively engaging on attacks in the cyber sphere, it is only a matter of time before . This also leaves room for potential future research pertaining to China's infiltration of microchips. Although the instance with Supermicro has not been proven true, there is still high risk with acquiring technology that deals with such sensitive information from countries that are actively working against you. Is this something they're already doing without us knowing?

The only way to circumvent this issue is through domestic production, at least for areas with sensitive, confidential information. The CHIPS Act seeks to mitigate these problems through the increase of domestic production and guardrails to protect national security. It is apparent that the geopolitical climate calls for immediate change in this industry due to national security threats. While noted during the Obama and Trump administrations respectively, the severity was truly understood once Biden took office. That is when the reshoring efforts began. The bipartisan legislation called for the sudden and immediate plan to begin domestic production. The US began to realize the true security threats that came with such a volatile supply chain. To begin, there is high risk when producing chips for things like military and security affairs. Since the supply chain is globally interdependent, areas of the supply chain in the US are actively collaborating with other countries, even countries of concern. Thus, production in the US is still at risk to security breaches when dealing with other countries. This is where the mitigation efforts of the CHIPS Act work. It works to keep production and the sharing of new production exclusively domestic. Protecting new innovations will ultimately reduce security risks by keeping America's progress exclusive to America, giving them the lead in the technology race.

Another way the CHIPS Act works to mitigate national security threats is by reducing the reliance on acquired chips from countries of concern. Procuring chips from countries, such as

China, implicates security risks since the US is in direct competition with them. China has displayed that they are actively working on gathering information on the United States, and working diligently to gain a lead in the competition. This means the US is at risk of potentially receiving compromised microchips, or becoming victim to critical information theft. This is especially concerning in areas surrounding national security, such as the military industry. By increasing domestic production of microchips, there is far less risk of receiving a microchip that has been tampered with. Furthermore, there will be more control over the assembly of the chip itself, allowing for a more secure chip. It is understood, however, that microchips are extremely expensive and difficult to produce. This raises concern regarding the feasibility and sustainability of the sudden re-shoring efforts.

It was discussed earlier that free trade, while a crucial part of this industry, has also led to its downfalls. Free trade is ultimately a key cause to the issues faced within the microchip industry and technology war due to the security threats brought about. The outsourcing of labour, and increase in globalization in the early 2000s paved the way for the industry we see today. With free trade so engrained in our world, especially in this industry, it is impossible to imagine this industry without it. Although free trade is a key cause of the issues pertaining to national security, it is not something that can be eliminated. Despite the re-shoring efforts and the CHIPS Act, the supply chain is vast and too interdependent to ever eliminate free trade. With that being said, how can the efforts of the United States work to domesticate production while also accounting for free trade in a way that further protects national security?

It has been established that the protection of national security is a predominant and crucial aspect behind the reshoring efforts of the CHIPS act. From the rise in globalization and the global supply chain, to the risks that come with importing and exporting such sensitive technology, the

semiconductor industry holds many implications within national security. Events such as the trade war, chip shortage, and China's push for global hegemony have raised the stakes even higher in the United States' push to domesticate. With that being said, the economy is another reason to explore to further understand the re-shoring efforts. Mainly, whether it is the more predominant reason, or not.

Economy

The economy is an important factor within the CHIPS Act, and its goal to bolster the economy will be evaluated and discussed below. To commence this section, however, there will be an exploration of partisan opinions pertaining to the passing of this act with regard to economic concerns. That is to say, although the CHIPS Act was passed in the senate in a bipartisan vote, the Republican party leadership voiced strong concerns about the Act.[121] Specifically, "House Republican leadership is urging members of its conference to vote against [the CHIPS Act]… a reversal from its position earlier in the day that comes hours after Senate Democrats struck a deal on a multibillion-dollar reconciliation package".[122] The announcement of an agreement that looked at a "$369 billion deal on a climate, taxes, and health care package"[123] was seemingly the reason behind the Republican Party's opposition to the CHIPS Act. A memo from the office of House Minority Whip Steve Scalise stated that "this legislation comes to the House precisely as Senate Democrats have allegedly struck a deal on their partisan reconciliation bill, pairing up a tone-deaf agenda that on one hand gives billions away in corporate handouts, and on the other hand undoes historic tax cuts implemented by Republicans".[124] In this instance, the Republicans believed that the Democrat agenda has provided increased inflation, and was on track to cause a severe recession.[125] The CHIPS Act ultimately received negative feedback from many Republicans

because, in tandem with the reconciliation package, there could be detrimental ramifications regarding America's economy.

Republicans ultimately had vast concerns regarding the CHIPS Act and its potential implications. Republican Representative Kevin Hern stated via Twitter, that "in light of this deal, whether Republican Members support CHIPS or not (I don't), we must ALL vote no. Passing CHIPS will pave the way for the radical Build Back Broke plan. The time to fight is now".[126] Rep. Hern, and many other Republicans, were referring to President Joe Biden's 'Build Back Better Framework, as the 'Build Back Broke plan'. Stating that instead of bolstering the middle class, fulfilling climate goals, and growing the economy,[127] it would actually "cause even more inflation, supply chain issues, and hurt the American people and the economy".[128] This framework, as well as the CHIPS Act, proved to be quite opposed by Republicans. In a press release, Rep. Barry Moore stated that "in the midst of our highest inflation rate in more than 40 years, this legislation spends $250 billion on crony capitalist handouts with no guardrails to prevent that money from strengthening China's economy instead of our own".[129] Rep. Moore continues, saying that "we all share the goal of revitalizing the critical semiconductor industry, but I cannot vote for a legislation that adds $79 billion to the deficit without proper oversight or assurances of accomplishing its stated purpose".[130] Essentially, in the eyes of Rep. Moore, and other Republicans, the only way to properly bolster the economy in the United States is to cut down on taxes, and reduce regulations "for all American industries and families, not crony capitalism".[131]

Ultimately, according to many Republicans, the CHIPS Act is just another way to damage the economy. Furthermore, considering that the legislation went to the House while the Democrats were also allegedly making a deal pertaining to their reconciliation bill, it is believed that they were "pairing up a tone-deaf agenda that on one hand gives billions away in corporate handouts,

and on the other hand undoes historic tax cuts implemented by Republicans".[132] Although the idea of protecting and bolstering the microchip industry in the United States is bipartisan in nature,[133] many Republicans believed the CHIPS Act was less than ideal. Rep. Barry Moore proposed that "instead of industry specific subsidies, broad based tax incentives would do more to increase the US's global competitiveness. For about the same cost as CHIPS subsidies, Congress could enact a powerful set of incentives to allow all American companies to compete and win in the global economy".[134] Prior to the Act becoming bipartisan, the conflict along partisan lines pertained to the allocation of funds, and how the Act would seemingly worsen America's economy, rather than bolster it.

On the other hand, many other Republicans that were "on the House Homeland Security, Intelligence, and Foreign Affairs committees were urging their colleagues to get behind the legislation, arguing that the shortage of semiconductor chips presents a national security threat".[135] Republican Congressman Michael McCaul stated that, despite being unhappy with the political issues surrounding the bill, he was supporting in in order to uphold America's national security.[136] Republican Congressman Tom Cole stated via a press release, that the bill "is a step in the right direction toward keeping Communist China at bay and protecting our nation's economic and security interests".[137] Ultimately, "the House passed the CHIPS and Science Act in a 243-187-1 vote, with 24 Republicans joining most Democrats in supporting the measure".[138] This exploration of partisan conflict surrounding the CHIPS Act illuminates the fact that protecting America's national security is the main explanation for the Act, as this is what allowed it to become bipartisan. Many Republicans did not prefer the economic aspect of it. Even though the Act seeks to bolster the economy, many Republicans still viewed it as something that could prove detrimental to America's economy. Thus, many Republicans attempted to urge their colleagues to vote against

the Act. However, it was ultimately due to national security concerns that certain Republicans ended up voting in favour of the CHIPS Act. Ultimately, national security was the cause of the bipartisanship for this act.

While it is important to understand the partisan conflict pertaining to the economy during the passing of the CHIPS Act, it is also important to explore and evaluate the economic implications of the Act itself and what it seeks to achieve. As previously established, there is an overall global reliance on Taiwan within the microchip industry. Specifically, "Taiwan makes 65% of the world's semiconductors and almost 90% of the advanced chips".[139] Taiwan's monopoly in this field holds implications in a few areas regarding economy. To begin, the United States was essentially 'behind' in the economic potential this industry could bring. That is to say, the microchip industry generates just under $600 billion in global revenue annually, and is projected to surpass $600 billion in 2024.[140] To compare, the US generates approximately $73 billion in annual revenue,[141] whereas Taiwan generates approximately $175 billion in annual revenue.[142] This represents a vast discrepancy in revenue between the United States and the countries they are so reliant on. One might question why the US is a leader in economy yet doesn't have larger stakes in an industry that plays a very large role in global economy.[143] This is one reason that the US is seeking to re-shore their efforts, that being their potential to increase their economic hegemony.

Another reason for re-shoring pertaining to the economy emphasizes the overreliance on foreign countries, such as Taiwan. The monopoly Taiwan holds on such a crucial part of the global supply chain implicates disaster in the event of any disruption. Kannan & Feldgoise state that "the effects of a disruption in Taiwan would be catastrophic for the global economy and would affect more than 50 percent of the world's most advanced chips and the trillions of dollars of commercial activity that depend upon them".[144] Ultimately, the shockwaves from a disruption in Taiwan would

be felt globally, especially in the US. This was evident during the chip shortage that began in 2020. The COVID-19 pandemic, along with various structural factors, led to a microchip shortage that impacted countless industries. One industry that felt this shortage heavily was the automotive industry. The automotive industry is one of the United States' largest exports.[145] The disruptions within the microchip industry had a detrimental impact on the United States' automotive industry, as microchips are crucial to automobile production. Although the industry is slowly recovering from these events, it highlights the over-reliance on foreign countries for production. If disruptions of a similar nature were to occur in the future, the US would once again experience major economic shortcomings in industries as important as the automotive industry. The US simply cannot risk a repetition of these past events for the sake of their economy, ultimately highlighting the need to begin re-shoring efforts. Increased production in the US increases independence, and in the case of disruptions in other countries, they would still have production abilities and would not be left out completely.

The way the CHIPS act accounts for economic development is through allocation of funding for production and development. Specifically, "the bill authorizes $10 billion for a new grant program at the Department of Commerce (DOC) to build as many as 20 new regional technology hubs to accelerate important technology development… funds can be used for accelerating commercialization of key competitive technologies, workforce development, and entrepreneurial training".[146] The bill also seeks to help foster long-term economic development and success, as well as create jobs.[147] Ultimately, it is understood that there are many concerns regarding the economy. This act seeks to address and protect the economy through re-shoring and protecting microchip production. This act will fundamentally address economic problems pertaining to this industry, but there are still some questions about the true level of effectiveness.

That is to say, “some Members of Congress have expressed concerns about the economic and military implications of a loss of US leadership in parts of the semiconductor supply chain and, relatedly, the adequacy of US-based semiconductor fabrication capacity to meet US commercial and defence needs”.[148] That is to say, although the US is the leader when it comes to technology and innovation, the question still stands as to whether a domestic semiconductor ecosystem would garner success on an equal or higher level than it is currently. To summarize, would the US truly be able to domesticate production and re-shore completely?

There are a few areas to explore within this inquiry. To begin, the logistics of re-shoring and domestication efforts. Within the CHIPS Act, $39 billion is allocated to manufacturing incentives.[149] However, it is not easy to create and expand a domestic chip industry. A semiconductor fabrication plant (fab) is a facility that is incredibly difficult to create due to the high costs and time needed for production.[150] Analyst Bob Johnson stated that “a modern fab is something like half a million square feet… and requires monstrous clean rooms that have massive air handling capabilities”.[151] In addition, the buildings themselves require “exceptionally strong foundations… you cannot have any vibration in the fab because it can wreck the manufacturing process”.[152] All of this is to say, even the creation of the facilities will be complex. This only means the process will be expensive, and very lengthy in time. Furthermore, the machines in the fabs are also extremely costly. The ultraviolet lithography machine, for example, is used to “map out the circuitry of chips, [and] costs about $150 million”.[153] A fab requires 9-18 ultraviolet lithography machines, ultimately costing anywhere between $1.3 billion to $2.7 billion.[154] The creation of fabs alone is costly and time-consuming.

Furthermore, the production of semiconductors is very complex. It requires things such as a myriad of pure chemicals, chip etching machines, and more.[155] In Asia, more localized supply

chains have evolved "where the providers of these products are located close to the semiconductor factories. There are also one or two companies that produce vital inputs and that have been trustworthy suppliers to companies in Asia for a long time. This is not yet the case in places like Arizona and Ohio".[156] That is to say, fabs in Asia have evolved over time to optimize the manufacturing process in a way that streamlines production. Another argument is the notion that re-shoring will bring new jobs to the US. Aside from labour being significantly less expensive than it is in the US, there is a lack of people that can work in this industry. To elaborate, "there is both a shortage of new graduates and experienced workers with the technical and engineering knowledge necessary to manufacture semiconductors".[157] Furthermore, Scott Kennedy, a senior advisor at the Center for Strategic and International Studies, states that "if we were to today, snap our fingers and have ten new fabs with the world's leading chips, we probably wouldn't have enough people to staff them, that's the biggest bottleneck to the expansion of America's fab capacity".[158] Although the CHIPS Act does allocate funding to training, it still requires time and willing people. Despite the urgency of America's reshoring efforts, all of these efforts will only garner results in the long-term when it comes to America's economy.

Another aspect worth noting is the allocation of the funds itself. If the CHIPS Act emphasizes the economy as an important factor behind the reshoring, the funds from the bill itself need to be properly dispersed. This highlights an inherent flaw in the Act, which can lead us to believe that the economy is not as crucial of a reason for the bill as protecting national security is. The President's Export Council ultimately "serves as the principal national advisory committee on international trade".[159] This committee "will undoubtedly have influence over how the CHIPS Act is implemented".[160] Members of this committee range from national security experts to executives of companies. Some of the executive members, for example, are Cristiano R. Amon, CEO of

Qualcomm; Patrick E. Murphy, CEO of Togal.ai; Mike Roman, CEO of 3M; and more. Essentially, some of the members of this committee are leaders in the technology and science world; however, they fail to represent one group that is vital to America's economy: small and medium businesses (SMBs). There is no SMB representative on this board, despite accounting for "99.9% of all US businesses".[161] In addition, SMBs also create 64% of new jobs yearly in the US.[162] It appears, thus, that the CHIPS Act needs to specifically account for small businesses if the economy is truly at the forefront of this bill.

Robert Morcos, CEO of Social Mobile, states that "the majority of the CHIPS funding will go to some of the world's largest companies. The government should, however, stipulate a percentage of the awarded funds be spent engaging SMBs to accelerate innovation in materials science, packaging, mechanical design, and the plethora of ancillary industries needed to create a downstream supply of business".[163] Failure to represent SMBs within the CHIPS Act can prove detrimental. For example, Erdal Arikan, an academic studying in the US, discovered 'polar code', which is "a coding theory that helped the Chinese telecommunications giant (Huawei) develop its 5G technology".[164] Arikan had pitched his polar codes to Qualcomm and Seagate, both US-based companies, and was ultimately turned down only to be picked up by Huawei in China.[165] This example is not an anomaly. As Morcos states, even the most successful companies, such as Qualcomm, started off as SMBs. This implicates the fact that many technological innovations could easily have not been uncovered had these small business not had the opportunities they were given. Innovation thrives on the small business level. Morcos continues to state that "the CHIPS Act could incentivize America's large corporations to invest in the country's most promising SMBs while creating a sustainable pipeline for recruiting and retaining top talent from around the world".[166] Ultimately, the CHIPS Act does have potential to bolster America's economy

exponentially. However, there are provisions that need to be carried out in order to achieve success, namely accounting for SMBs.

There are many gaps and obstacles that come with re-shoring and domesticating the microchip industry. There is high potential to bolster the economy, such as preventing economic chokeholds from disruptions in the areas the US is heavily reliant on, and creating jobs. However, the creation of the chip fabs, and the technology in the facilities that produce the chips, are incredibly time-consuming and costly. It is a lengthy, expensive process that simply isn't logistical in terms of a short-term solution. The fabs themselves take about 3-5 years just to build.[167] The urgency of the United States Administration to re-shore indicates that they need results in the short-term, as well as the long-term. From an economic lens, although there is clear indication that the CHIPS Act can bolster the economy, it is evident that it is not the most prominent reason for the re-shoring efforts. This is also evident through the lack of accounting for SMBs. While the economy is a very important aspect in the grand scheme of things, it is not as prominent of a factor within the CHIPS Act compared to national security. National security is at the forefront of this bill, and ultimately the most important reason for the United States' re-shoring efforts. Arriving at this conclusion, we can now analyze it from a theoretical standpoint, as well as attempt to explain developments in the policy from an academic perspective.

Current Literature and Future Research

The CHIPS Act holds incredibly broad implications in the grand scheme of international relations and political science as a whole. The Act itself is representative of a vast industry impacting the entirety of the world. With that being said, the majority of academic literature appears in journals pertaining to economics, business, technology, and other areas. To begin, various economic journals analyze and discuss the CHIPS Act from a financial lens. To begin, the Peterson Institute

for International Economics posted a policy brief analyzing the Act and its overall claims. Among many, one key point stated that "US semiconductor agreements with allied and friendly countries should do more than control exports. As well, they should ensure free trade in chips between participating countries and shine a spotlight on subsidies".[168] They also recommend that the US "should not pursue self-sufficiency but should instead continue to follow the logic of comparative advantage, exporting advanced, high-value chips and importing basic, lower-value chips".[169] The article also analyses national security aspects and other various economic implications.[170] The authors continue to state that the CHIPS Act "will not make a material difference to US chip supplies in the next two or three years".[171] This emphasizes the previously mentioned point that the Act is more of a long-term solution rather than a short-term solution, and the desire for short-term results may not have fruitful results. The article, overall, analyses the CHIPS Act on its effectiveness and potential results, but from a more economic lens. Furthermore, it provides recommendations for the US to garner the most success in their endeavours.

The Journal of International Business Studies published an article looking at how the "growing techno-geopolitical uncertainty affects international business in many ways".[172] They discuss how the CHIPS Act feeds into, and contributes to techno-geopolitical uncertainty.[173] That is to say, the Act is representative of technological policy shifts within the US. To begin, the authors state that "the US administration increasingly considers it necessary to abandon traditional free-market rules for aggressive industrial policy actions in their intensifying geopolitical and geo-technological rivalry with China, shaking the longstanding consensus in the US on defending and preserving the open and rules-based multilateral system".[174] In addition, it also "underscores the policy shift to pro-subsidy industrial interventions in high technology industries".[175] Finally, it "highlights the US government's attempt to weaponize global value chains in strategic industries

for geopolitical purposes".[176] This article looks at the CHIPS Act through an international business lens and explores how the Act contributes to techno-geopolitical uncertainty.

The Asian Economic Policy Review published an article exploring the US-China trade war, and how the "escalation of the trade war into a tech war could lead to a decoupling between the US and Chinese economies".[177] The trade war and tech war are broader topics that encompass the microchip industry and the chip war. It is an important topic to explore as it provides a lot of foundation and deeper understanding within the microchip industry. An article published in the China Economic Journal also explores the tech war, but states that US-China trade is incredibly resilient and despite sanctions and tariffs, will most likely continue as is. Even though the relationship is volatile, trade is inevitable.[178] There are also articles looking at the tech war within political science, and international relations journals. The China Quarterly of International Strategic Studies discusses the tech war from a geopolitical lens. The author states that the tech war has the potential to greatly hinder US-China relations.[179] This is because of the claim that the US is "exaggerating China's progress in cutting-edge technologies and seeing China as a 'hypothetical enemy', the Trump administration has justified increasing investment in national defense and arms building".[180] That is to say, the tech war holds serious implications in international relations between the US and China. This is important because microchips are a part of the overall tech war.

Ultimately, most of the academic literature pertaining to the CHIPS Act is published by journals related to business, economics, and technology. There is also academic literature looking at broader topics such as the trade war and tech war. There is a lack of academic literature pertaining to the CHIPS Act specifically related to political science and international relations. The existing literature commences with an analysis of "the decoupling of US-China semiconductor

value chains".[181] The article states that "even if the two super-powers are able to repair ongoing trade tensions and hammer out a series of 'trade deals', there will be no turning back from the pervasive effects of techno-nationalist policies and the salient connection between semiconductors and national security".[182] The article continues by discussing the logistics of trade between the two great powers amongst the tensions caused by the semiconductor industry.[183] This sentiment is furthered in an article from the National Institute of Defense Studies, stating that China and the US are deeply connected in the digital realm.[184] China, despite being "seen as an electronic powerhouse…is still very dependent on key US and other Western technologies, from high-performance chips and up to semiconductor manufacturing equipment".[185] This article concludes that the future of geopolitics lies within the digital realm and it is on track to become much more high-tech.[186] This highlights the importance of successfully navigating the tech war and easing the geopolitical tensions.

A lot of the academic literature exploring the tech war discusses similar ideas. In an article exploring the Biden administration's response to China and its technological advancements, it is understood that there are implications in international relations and geopolitics.[187] The overall understanding is that the competition fueled by the tech war can provide motivation for progress and innovation. On the other hand, there is also grave implications in the potential for decoupling and conflict, because both countries are seeking to protect themselves and place themselves above their competitor.[188] The idea that competition can fuel innovation, but also conflict, is corroborated in an article that predicts that China has the potential to 'catch up' to the US in regard to microchip fabrication and design.[189] It also highlights geopolitical tensions, wherein China is seeking to overpower the US in the tech war. It concludes by stating that the US will need to "re-strategize

and fasten their tech development efforts".[190] This is an overall general conclusion to many discussions surrounding the tech war, and the tensions between China and the US.

Moving to a more specific exploration of the CHIPS Act itself, there is some (albeit very few) pieces of literature discussing it. The first article looks at the CHIPS Act as a whole and outlines everything it entails. From the intentions of the Act, to the importance of semiconductors within the economy and national security, the article analyzes the Act itself.[191] It concludes that "The CHIPS and Science Act is significant for both education and philosophy in that the material base for the advanced semiconductor industry and global supply chain among a small select group of countries mostly located in East Asia, has the potential to change the orientation of US science and engineering technology".[192] Furthermore, it also has the potential to "reinforce a move away from the neoliberal global free-market in the US based on contracting out toward a science and technology strategy that is master-minded, directed and supported at the federal level".[193] Lastly, it is highlighted that there are immense changes within the economic and national security sectors.[194] Essentially, this article explores the CHIPS Act and its implications with regard to China-US relations. Similarly, another article seeks to explain the CHIPS Act, and how it can bolster the US in terms of crisis management, and preventing further disruptions within the supply chain.[195]

In summary, there is a vast lack of literature pertaining to the CHIPS Act specifically within the political science sector. Other fields explore the Act, as well as the broader trade war and tech war in detail; however, under the political science umbrella, most of the literature lies within the broader trade war and tech war. There is not sufficient literature exploring the CHIPS Act in and of itself, other than to explain its function and examine its implications. This poses immense potential for further research within the political science field as a whole, and more specifically

within international relations. Understanding the microchip industry from a political science perspective is crucial as the industry holds many implications within the field. Everything from international relations, to global economy, and even domestic politics, is impacted by the microchip industry. Thus, highlighting the need for extensive research in this field. While there is a broad, overall need for further research, it would be beneficial to start by exploring international relations theories to explain phenomena behind the CHIPS Act and semiconductors as a whole. Utilizing theory to understand and explain concepts is crucial in this field as it allows for a richer understanding of the topic, and can even allow for some stability in an otherwise unpredictable field. That is to say, it can provide such a thorough understanding that can allow researchers to better predict events, which is important in a field as volatile as this one. From there, further research pertaining to semiconductors and the CHIPS Act within the broader field of political science would be the logical next step. All in all, this field needs extensive research and further literature.

Conclusion

To summarize, the microchip industry has been sensitive and volatile ever since the beginning of globalization, and the establishment of the global supply chain. From there, countries sought to create monopolies and gain a lead in the global competition. The United States and China are at the forefront of this race. Taiwan is the leader of production, but the US is the leader of innovation and creation. However, the US has determined they are over relying on foreign countries for their microchips, and this was especially felt during the trade war and chip shortage. The US deemed it necessary to begin re-shoring efforts and domesticate the production. This is because of the national security risks of navigating this industry and having to collaborate with adversaries, and

the economic fright of losing out on crucial revenue. Through this, the CHIPS Act was created to allocate funding for the creation, and research and development efforts, and bolster chip production in the US.

The intention of this literature review was to highlight national security as the most prominent reason behind the CHIPS Act. The economy, while also important, is less so than national security due to the timing and context of the Act. With regard to the current literature, there is rich research exploring the semiconductor industry in journals dealing with economics, business, and technology. There is also thorough research on the tech war and trade war, which encompasses the microchip industry. There is a great lack of literature looking at the microchip industry and the CHIPS Act from journals pertaining to political science, and international relations. This highlights the overall need for further research within the political science field, specifically within international relations. It would be useful to explore international relations theories to explain the Act, conducting comparative research on the explanatory power of different theories. There also is a need for further research specific to the CHIPS Act, exploring the best potential method for maximizing national security, perhaps shifting the focus of domestic production strictly for microchips dealing with sensitive information that is crucial to the security of the United States. In addition, would this shift in focus also address the issues regarding the price and production of the chips? Essentially, would a narrowing of efforts bolster the CHIPS Act and allow it to fulfill its intended purposes? Another potential area of explanation is the further analysis of partisan ideologies with respect to the CHIPS Act and the microchip industry. There are many unanswered questions within this industry under the lens of political science. Following an understanding of international relations theories to explain the CHIPS Act, it paves the way for future research in all aspects of the microchip industry.

The microchip industry holds implications in many different aspects, and impacts the entire world. It is volatile, and disruptions can lead to detrimental results. It is so important, that being a world leader within this industry inherently influences total hegemony. Although this industry is business in nature, it holds many implications in political science, and has an extensive role in international relations. Since there is such little academic literature on the topic, specifically the CHIPS Act, there is a dire need to increase academic research in this field. All facets of this industry could benefit from future research. This can prove helpful when determining strategies and future policies. Ultimately, further research will allow for a deeper understanding of our ever-growing technological world.

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