Technological Interdependence and National Security-Related Investment Restrictions: Evidence from CFIUS Reviews

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Abstract What explains the rise in national security-related investment restrictions and why are high-tech firms disproportionally targeted? I argue that national security-based investment restrictions serve two goals of governments: (1) to prevent technology diffusion to their geopolitical rivals, and (2) to enhance their regulatory influence over high-tech firms that are not effectively regulated by traditional industrial policies. I hypothesize that governments are more likely to invoke national security when their domestic firms control chokepoints, i.e., key technologies, in global innovation networks (GINs), and when governments lack regulatory control of these firms. I test this hypothesis by compiling an original dataset of 700 CFIUS cases and conducting network analysis of US firms' positions in GINs using 188k patent license and assignment agreements between Chinese and US firms from 2000 to 2021. The results show that compared to peripheral firms in GINs, those controlling key technologies are 48% more likely to receive CFIUS notices. Furthermore, firms weakly regulated by the government are 8% more likely to be reviewed by CFIUS compared to those with median exposure to government regulations. Firms' central positions in global innovation networks paradoxically incentivize governments to restrict their access to foreign capital, contrary to the conventional wisdom that technological interdependence leads to investment liberalization.

Keywords: Investment restrictions, the Committee on Foreign Investment in the United States, FDI, national security, US-China relations.

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1 Introduction

What are the determinants of national security-based investment restrictions? Free flows of goods and capital across borders are important pillars of the liberal world order (Kant, 1957; Keohane and Nye Jr, 1973; Lake et al., 2021; Ruggie, 1982). However, in recent years, we have witnessed a substantial increase in restrictions on cross-border investment, especially in high-tech sectors. Between 2014 and 2021, the number of inward foreign investments screened by the Committee on Foreign Investment in the United States (CFIUS) increased from 64 to 272 each year. 64% of the reviewed transactions involved high-tech companies (The Committee on Foreign Investment in the United States, 2014, 2018, 2021). The rise in investment screenings is not unique to the United States. According to Bauerle Danzman and Meunier (2023a), the number of new regulations and amendments related to investment screenings has increased from 2 in 2000 to 18 in 2020 in OECD countries. These developments pose three challenges to the conventional wisdom that is fundamental to our understanding of investment policies and governments' role in shaping them.

First, conventional wisdom believes that the growing economic exchange between countries will lead to widespread economic liberalization by empowering producers deeply involved in global trade and supply chains. Collectively, these producers will lobby to remove barriers to free trade and investment. (Gartzke et al., 2001; Keohane and Nye Jr, 1973; Kim et al., 2019; Lee et al., 2021; Meckling and Hughes, 2017; Oneal et al., 1996; Oneal and Russet, 1997; Osgood, 2018). However, the growing investment restrictions in developed economies reveal that governments may still choose to tighten barriers to cross-border investment even with the presence of powerful pro-globalization groups.

Second, studies on interest group politics often build around the premise that governments' role is to aggregate the preferences of domestic groups. Additionally, to maximize their political support, governments tend to assign higher weights to interest groups with strong collective action capabilities (Bombardini, 2008; Grossman and Helpman, 1994; Kim and Osgood, 2019). However, to curb CFIUS reviews, tech companies such as IBM have been engaged in intensive lobbying efforts to secure their access to foreign capital and overseas supply chains (Mohsin and Brody, 2018). Between 2017 and 2020, General Electric on average lobbied 11 times each year and spent $32.94 million in total to monitor the decision-making process of CFIUS and prevent the Congress from excessively expanding the agency's power (Kim, 2018; Mohsin and Brody, 2018). Despite the strong opposition, the US government still chose to strengthen the restrictions, leading people to wonder why the lobbying efforts of influential tech companies failed to bear fruit.

Third, these events challenge our traditional definition of national security and its relationship with the economic sphere. Conventionally, national security is narrowly related to military defense where government involvement is necessary. Outside the security domain, government intervention is expected to be limited to allow for efficient allocation of resources by the free market (Smith, 1937). However, in recent years, governments in advanced economies have been expanding the scope of national security to cover concerns of economic competition, leading to expanded government power over cross-border investment that traditionally honored limited government intervention (Connell and Huang, 2014; Groves, 1988).

To explain the increasing securitization of investment policies, I argue that instead of viewing governments as aggregators of private interests, we should treat them as relative power maximizers in geopolitical competition, capable of deriving national interests independently from domestic

firms (Grieco, 1988; Krasner, 1978; Lobell et al., 2009; Ripsman et al., 2016; Skocpol et al., 1985; Waltz, 1979). Governments can build a competitive edge against rivals by restricting investments that may result in outflows of key technologies. This consideration often conflicts with domestic tech firms' quest for foreign capital, leading to strong opposition from globally minded firms that are less susceptible to traditional policy tools. This government-business divergence necessitates a national security justification that allows governments to coerce domestic firms into compliance. Accordingly, I contend that governments' invocation of national security serves two purposes: (1) to enhance their countries' relative power against geopolitical rivals by retaining key technologies, and (2) to tighten their control over high-tech firms to facilitate the implementation of geopolitical strategies. The former makes governments less responsive to the demand of high-tech firms, and the latter explains why invocation of national security is necessary as governments need justifications to curb the strong opposition from the private sector.

Accordingly, I hypothesize that governments are more likely to impose investment restrictions on domestic firms if the latter possess key technologies and are weakly regulated by governments. I introduce a novel dataset that includes 188k patent license and assignment agreements between Chinese and American firms from 2000 and 2021 and apply network analysis to measure whether a firm controls chokepoints, i.e., key technologies, in global innovation networks. Furthermore, I create a novel dataset with 700 national security reviews made by CFIUS using firms' annual reports with the US Securities and Exchange Commission, news reports, and law firm briefs. I discover that American firms controlling chokepoints are 48% more likely to be targeted by CFIUS compared to those that do not. Using the firm-level political risk data provided by Hassan et al. (2019), I find that firms weakly regulated by the government are 8% more likely to be reviewed

by CFIUS compared to those with median exposure to government regulations. These findings are corroborated by a comparative case study of Lattice Semiconductor Corporation (Lattice) and Kopin Corporation (Kopin). They are two US semiconductor producers that are similar in firm size and relationship with the US government. However, Lattice's central position in GINs resulted in intensive CFIUS scrutiny in its merger and acquisition deal with a Chinese firm. In contrast, CFIUS adopted a relatively laissez-faire attitude toward Kopin's deal with another Chinese firm as Kopin did not control technological chokepoints.

This paper makes three contributions. First, it contributes to the study of anti-globalism by developing and testing the mechanism through which technological interdependence leads to increasing investment restrictions. Technological interdependence differs from other types of economic ties as producers tend to make investments that are relationship specific to their technology providers, making it prohibitively costly to find alternative providers (Klein, 2000; Klein et al., 1978; Williamson, 1975, 1985). This feature incentivizes governments to weaponize technological interdependence between firms by cutting off, rather than promoting, trade and investment between domestic tech firms and their foreign business partners.

Second, this paper contributes to studies of investment and trade policymaking by theorizing governments as autonomous actors who seek to enhance their control of domestic firms to further geopolitical goals. Studies on anti-globalization trends usually follow a bottom-up approach, often referred to as Open Economy Politics, where winners and losers have different preferences for economic openness and governments passively respond to the demand of these actors (Bates, 1999; Lake, 2009; Rickard, 2021).This project contributes to the literature by proposing a top-down mechanism in which governments resort to a national security rationale to enhance their

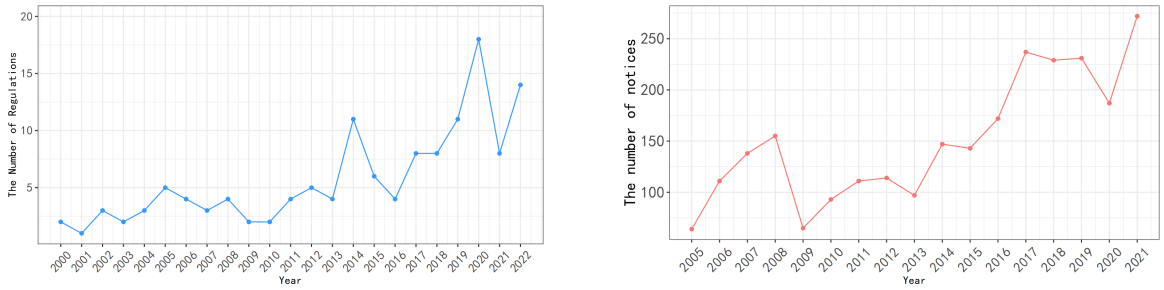
regulatory influence over cross-border investment. Specifically, I will demonstrate how governments are incentivized to weaponize the central positions of their domestic firms in GINs to gain the upper hand in geopolitical competition, and how this incentive prompts governments to find policy tools to improve their regulatory control of domestic firms.

Third, the project makes two empirical contributions by designing a novel measurement of technological interdependence between firms and compiling a new dataset of 700 CFIUS reviews. First, due to the lack of firm-level data, the existing literature mainly studies economic interdependence by examining trade and investment volumes between countries (Haim, 2016). Such measurement cannot capture firms' positions in global production networks and their relationships with each other. Furthermore, trade and investment volumes are insufficient to capture strong and unbalanced interdependence that is prone to weaponization by governments. To fill this gap, I designed a novel network-based measurement of technological interdependence between firms using two datasets of cross-border patent license and assignment agreements provided by PatSnap and the US Trademark and Patent Office (USTPO). Second, to study how technological interdependence between firms affects their likelihood of facing investment restrictions, I collected firm-level CFIUS review data between 2000 and 2023. Such data are not publicly available as CFIUS does not disclose individual cases it reviewed.

2 The Puzzle: the Rise in National Security-Based Investment Restrictions

Many countries have laws that authorize governments to intervene in inward foreign investments when relevant deals threaten to impair national security. For example, the EU adopts a two-level investment screening mechanism where the European Commission provides advice on whether to block a deal and individual member states reserve the right to make the final decision (Bauerle Danz-

man and Meunier, 2023b). In Australia, the Foreign Investment Review Board is responsible for reviewing foreign investments and evaluating their implications for national security (Bauerle Danzman and Couloubaritsis, 2023). Although such investment screening mechanisms are prevalent, the increasing invocation of them is a relatively recent phenomenon. As shown in Figure 1(a), according to the data provided by Bauerle Danzman and Meunier (2023a), since 2013, we have seen a rapid and lasting increase in the number of new laws and regulations on investment screenings among OECD countries. Between 2000 and 2012, OECD countries only issued around 3 new regulations or significant amendments on investment screenings each year. After 2013, the number increased to 9.2 per year. Among these investment screening mechanisms, the national security reviews conducted by CFIUS are no doubt the most salient.



(a) Investment Screening Mechanisms

(b) CFIUS Notices

Fig 1: The Rise in National Security-Related Investment Screening Mechanisms

Notes: The data about investment screening mechanisms come from the Politics and Regulation of Investment Screening Mechanisms (PRISM) project (Bauerle Danzman and Meunier, 2023a). The CFIUS notice data are provided by CFIUS' Annual Report to Congress.

CFIUS is an inter-agency committee that is in charge of screening merger and acquisition (M&A) deals between American firms and their foreign buyers. It consists of nine Cabinet members: Secretaries of Defense, State, Commerce, Homeland Security, the Treasury, Energy, as well as the United States Trade Representative, the Attorney General, and the Director of the Office of Science and Technology Policy (Jackson, 2020). It also hires lawyers specializing in M&A deals

and national security issues to review relevant cases and provide policy recommendations. The backbone of CFIUS' power comes from the Defense and Production Act which authorizes the President to impose investment restrictions if he/she believes a deal of interest threatens national security. Based on this authorization, President Gerald Ford established CFIUS in 1975 by Executive Order 11858. In 1988, amid the US-Japan trade conflicts, CFIUS obtained its power to provide recommendations to the President on whether to block an investment deal (Jackson, 2020).

As shown in Figure 1(b), between 2000 and 2012, CFIUS was relatively inactive and on average reviewed around 100 deals each year. However, since the second term of Obama's presidency, we have witnessed a sharp increase in the number of CFIUS notices. If we take a closer look at the sectoral breakdown, we will observe that high-tech firms were disproportionally targeted by these CFIUS reviews. Specifically, 56% of the CFIUS notices targeted high-tech firms manufacturing semiconductors and pharmaceuticals. 8% of the cases involved medium-tech firms such as chemicals producers. The rest of the CFIUS notices mainly involved low-tech firms such as those from financial service sectors. Together, the high-tech industries account for 64% of the observations (The Committee on Foreign Investment in the United States, 2014, 2018, 2021).

To understand this phenomenon, conventional wisdom, often referred to as Open Economy Politics (OEP), suggests that we should direct our attention to the distributional effects of cross-border investment, find the winners and losers, and check whether the losers have a stronger political influence due to their collective action capabilities (see Bates (1999), Lake (2009), and Rickard (2021) for detailed discussion of OEP, and Rodrik (1995), Milner (1997), Mayda and Rodrik (2005), Pandya (2010), Nelson and Yackee (2012), Walter (2017), Lorenz (2020), Lee et al. (2021), and Dwidar (2022) for application of the analytical framework). For the final step of the policy fun-

nel, governments either play the role of social planners that maximize the sum of the welfare of domestic groups or political support maximizers that aggregate the preferences of different interest groups while assigning higher weights to those with stronger collective action capabilities (see Bailey et al. (1997) and Jensen (2008) for the former and Findlay and Wellisz (1982), Magee et al. (1989), Grossman and Helpman (1994), and Hillman (2013) for the latter).

However, an examination of the distributional effect and collective action capabilities does not provide a clear explanation of the puzzle. As receivers of foreign investment, US tech firms are strongly against these investment restrictions as these measures limit the pool of foreign capital that is available to them. Furthermore, if the US government blocks a deal, relevant US firms will face significant decreases in their stock prices and immediately lose the premium on their stake that could have been obtained from the deal (Connell and Huang, 2014). Therefore, as victims of concentrated loss, US firms have been engaging in intensive lobbying activities against CFIUS reviews (Olson Jr, 1971). For example, in 2018, Google, Facebook Inc, IBM Corp, Intel Corp, and Qualcomm Inc all chose to lobby against a congressional bill that would broaden the reach of CFIUS (Bartz, 2018; Mohsin and Brody, 2018). However, as shown in Figure 1(b), their lobbying efforts did not succeed in curbing the rising trend of CFIUS activities. In addition, given that the benefits of investment screenings are diffusely distributed among competitors of these foreign capital recipients, it is unlikely that lobbying efforts of the pro-globalization firms can be easily offset by their domestic competitors. Analysis of the distributional effects and collective action capabilities of firms will lead us to expect fewer, rather than more, investment restrictions.

I argue that to better explain the phenomenon, we need to turn the spotlight on governments. The rise in investment screenings shows that governments can set investment policy objectives that go

against those of the most profitable and successful firms, rather than passively responding to the demand of them. Multinationals can make significant profits by selling their assets to the highest bidders in the international market, regardless of whether the bidders are from a rival country or not. Whether such activities threaten to impair one country's great power position in technology ladder is external to firms' cost-benefit analysis. However, from the perspective of home governments, letting their rivals benefit from cross-border investment and the resulting diffusion in cutting-edge technologies is detrimental to their countries' position in geopolitical competition.

President Biden explicitly expressed this concern in his executive order and instructed CFIUS to ramp up its reviews of investment deals that will "accelerate and increase the success of the development of sensitive technologies and products in countries that develop them to counter United States and allied capabilities." In referring to "countries," he specifically meant China (Biden, 2023). With the rising technological competition between major economies, governments' geopolitical considerations are playing an increasingly important role in investment policymaking. This underscores the need for a theoretical framework that brings in governments as central actors.

3 Theory: A New Statist Approach in the Era of Technological Interdependence

Governments' ability to derive national interests independently from interest groups comes from their special position that lies at the intersection of international and domestic politics (Lake, 1988; Lobell et al., 2009; Mastanduno et al., 1989; Ripsman et al., 2016; Skocpol et al., 1985). First, in inter-state interactions, governments represent their countries as a whole, making them naturally susceptible to stimuli from the international system instead of just domestic desires (Ripsman et al., 2016). Among these stimuli, relative power distribution is the most important (Waltz, 1979). Due to the self-help nature of the international system, states always have the incentive to keep

themselves relatively strong compared to their rivals to guarantee their survival and enhance their bargaining power (Grieco, 1988; Waltz, 1979). Second, in the domestic arena, governments are either elected by the general public or reliant on public support for their political survival. This selection mechanism promotes governments to respond to what they define as the public will, or rather, national interests, instead of the summation of private interests (Bailey et al., 1997; Krasner, 1978). The key difference between the two concepts is that formulation of national interests requires governments to have high agency. They need to decide what public goods the society as a whole needs while making the hard decision on whether certain groups' interests should be sacrificed to achieve the common goal of the society (Krasner, 1978; Pareto, 1935).

In what follows, I will illustrate my model that treats governments as relative power maximizers and explain how relative power concerns induced by technology diffusion and constraints from globally minded firms promote governments to resort to national security justifications. The model consists of three steps. In the first step, governments independently derive investment policy objectives based on their own definition of national interests. For the second step, firms determine their policy preferences based on the distributional effects of different investment policies. Finally, governments choose the appropriate policy tool that helps them promote national interests and overcome domestic opposition. In this paper, the term 'government' refers to government branch(es) with the power to decide investment policies. In the US context, it mainly refers to the President, Cabinet, and Congress.

3.1 Relative Power Maximization and Government Preferences in Investment Policymaking

Governments' incentive to maximize their relative power compared to geopolitical rivals has important implications on how they formulate their preference regarding cross-border investment. In-

ward foreign investments, especially mergers and acquisitions, are one of the most important tools for firms to acquire technologies. From governments' perspective, allowing firms to make investments freely will result in technology diffusion to their rivals. The process entails strong negative security externalities as it reduces the home countries' relative power against other geopolitical competitors (Gowa and Mansfield, 1993). As a result, to curb such technology diffusion, governments are incentivized to weaponize the interdependence between firms by restricting foreign investment targeting domestic owners of key technologies (Baldwin, 2020; Drezner et al., 1999, 2021; Farrell and Newman, 2019).

Theoretically, all economic exchange with rivals should trigger the relative power concern as trade and investment will improve the welfare of both trading parties. However, one distinctive feature that makes high-tech sectors particularly suitable for weaponization is that investments in tech industries are highly relationship specific (Klein, 2000; Klein et al., 1978; Williamson, 1975, 1985). For example, to use Qualcomm's chips on its cellphones, Huawei needs to design specialized motherboards and source radio frequency (RF) chips that are compatible with Qualcomm's chips. Huawei's investment in these components is only valuable within its relationship with Qualcomm as these motherboards and RF chips cannot be easily adapted for other uses (McNamara, 2020). The high relationship specificity means that governments can easily choke off the development of technology buyers by forbidding domestic technology providers from making investment deals with the former. This incentive is strongest when governments are in geopolitical competition with foreign rivals, making concerns about relative power dominate the investment policymaking process.

3.2 Network Centrality and Firms' Policy Preferences

Controlling key technologies, or "chokepoints" as termed in the weaponized interdependence literature, gives firms exactly the opposite incentive to that of their home government (Drezner et al., 2021; Plouffe, 2017). Chokepoint firms are usually against trade and investment restrictions as central positions in global innovation networks give them strong bargaining power against their trading partners. The high relationship specificity of investment allows firms that control chokepoints to generate substantial profits by charging a high price when selling products and assets, licensing their patents, and making joint investments with foreign collaborators. Furthermore, many productive firms are deeply involved in global value chains to source cheap intermediate products from foreign countries. For example, between 2014 and 2016, Qualcomm on average made 25 billion dollars each year. But only around 2% of its revenue was created in the United States. Most of its production activities were organized in China and South Korea (Lapedus, 2017). Taking these factors into account, investment restrictions will only negatively affect Qualcomm's profits (Leswing, 2020). Based on the analysis of distributional effects, we should expect chokepoint firms similar to Qualcomm to oppose government restrictions on its trade and investment decisions.

3.3 Government-Business Divergence and the Rise of National Security-Based Investment Restrictions

Given the collision of the logic of free market and geopolitical competition, governments can no longer expect high-tech firms to voluntarily comply with investment restrictions. Some policy instruments are needed to compel firms' compliance. To restrict foreign investment, governments can resort to traditional policy tools such as taxation, subsidies, and antitrust reviews. For example, to encourage domestic electronic vehicle producers to shift their production activities back to

the United States, the Biden administration signed the Inflation Reduction Act (IRA) that denies automakers $3,750 tax credits if more than 60% of the value of their battery components is manufactured outside of North America, and another $3,750 if more than 60% of the value of critical minerals is created outside the United States and its free trade partners (Shepardson and Lawder, 2023; The 117th Congress, 2022).

National security screenings are a costly tool compared to these traditional policy instruments in that the former are a coercive tool through which governments forcibly intervene in market exchanges to stop investment deals. Traditional tools such as tax breaks and subsidies only create moderate distortions in economic competition. Productive foreign firms can cope with these adversities by improving their production capabilities. In contrast, national security screenings forcibly deny foreign firms' access to the host market with limited room left for market adjustment. Frequent usage of this tool will make foreign investors doubt the host government's commitment to free market and discourage future investments (Connell and Huang, 2014). So the question becomes why governments resort to national security-based regulations instead of other policy means.

This paper answers this question by examining the domestic constraints faced by governments. I argue that governments will invoke national security when they lack regulatory influence on domestic firms. When domestic firms are highly exposed to regulations, their home government can influence their investment decisions through the aforementioned traditional leverages. However, such measures tend to be ineffective on productive tech firms as they are relatively self-reliant and do not depend on subsidies. In addition, they are able to push back against unwanted policies by lobbying independently and filing lawsuits (Kim and Osgood, 2019). Governments will face strong

opposition when implementing restrictions in high-tech sectors. In this situation, invoking national security exceptions becomes an ideal choice that allows governments to insulate themselves from the influence of interest groups and coerce them into complying with geopolitical strategies (Heath, 2019).

The national security-based regulations allow governments great leeway as national security is usually intentionally broadly phrased in laws to allow governments enough flexibility when making policies related to national defense. For example, in the US, the laws governing the operations of CFIUS mainly include Section 721(f) of the Defense Production Act and its amendments. The Defense Production Act only states a list of factors to consider when making relevant policies without providing a rigorous definition of national security (U.S. Department of Homeland Security, 2018).[2] This ambiguity is inherited by the amendments to the Act. Apart from the strategically designed ambiguity, the scope of national security has been expanded over the years. Traditionally, only industries related to national defense are considered subjects of national security reviews. With the series of amendments to the Act, whether a deal involves critical technologies gradually becomes a factor of consideration for CFIUS reviews.

In summary, the "securitization" of investment policy in high-tech sectors represents governments' efforts to both win geopolitical competition and control weakly regulated high-tech firms.

H1: Governments are more likely to impose national security-related investment restrictions when their domestic high-tech firms control the chokepoints in GINs and when they lack regulatory influence on these firms.

[2]The original wording is "The term 'national security' shall be construed so as to include those issues relating to 'homeland security', including its application to critical infrastructure."

4 Research Design

The unit of analysis is individual M&A deals and the time coverage is between 2000 and 2021. The universe of cases includes all M&A deals between US public firms and their Chinese buyers. The M&A data are provided by EMIS (2022), Thomson One (2022), and Zephyr (2022). In total, 337 M&A deals targeting public firms in the US are detected. However, due to data attrition caused by missing values in covariates, only 81 observations are retained in regression models with all control variables added. Logit regressions are used for the following analysis and standard errors are clustered within firms. Time fixed effects are added to control for time shocks caused by changes in CFIUS regulations. The regression model is specified as follows.

$$H1 : R_c = \beta_1 Centrality_f + \beta_2 Regulation_f + \gamma S_c + \alpha E_c + \epsilon_c$$

CFIUS Reviews

The dependent variable, R_c, is an indicator that takes the value of 1 if a M&A deal is subject to CFIUS review in a given year. CFIUS reviews can be roughly divided into three stages. For the first stage, US firms involved in M&As with foreign buyers file notices with CFIUS if they believe their deals to have national security implications. Relevant government agencies can also ask CFIUS to issue notices to firms or start a review without a notice. Therefore, although firms are not required to file notices, they usually lean toward doing it to avoid future interventions by CFIUS. A notice will be followed by a CFIUS review. Before the enactment of the Foreign Investment Risk Review Modernization Act of 2018 (FIRRMA), CFIUS is required to finish reviewing a case 30 days after being notified. After FIRRMA's enactment, the time limit is extended to 45 days (The Committee on Foreign Investment in the United States, 2018).[3] The second stage begins if CFIUS believes

[3] After FIRRMA's enactment, firms can choose between filing a notice and a declaration. The latter will enable them to expedite the review process. The current dataset does not distinguish between declarations and notices and

that the deal of interest poses a national security threat and further investigations are needed. The national security investigation needs to be completed within 45 days. For the third stage, if the investigation has an affirmative result, CFIUS will advise the president whether to order the firms to revise their agreement or force them to terminate the deal. The President needs to make the decision within 15 days after the conclusion of national security investigation (Jackson, 2020). I choose CFIUS reviews instead of the mitigation/termination orders as the dependent variable because CFIUS is able to induce firms' behavior change at all stages of reviews. Firms may choose to revise an investment deal or terminate the deal at any stage of the screening process if they believe that CFIUS is unlikely to grant them approval.

The major empirical challenge is that CFIUS does not provide data on individual cases to the public. However, many firms choose to disclose such information in their 10-K files. Law firms and the media also occasionally report on CFIUS reviews. I make an empirical contribution by building a novel dataset of CFIUS reviews utilizing the three information sources (See Appendix 1 for the detailed data collection process). In total, 700 CFIUS reviews were identified between 2000 and 2023, of which 220 cases involve Chinese buyers (The Trade Practitioner, 2023; U.S. Securities and Exchange Commission, 2023). For the following analysis, I will only use China-related CFIUS reviews as the dependent variable as the main independent variable is constructed using patent agreements between Chinese and US firms.

codes both cases as notices as firms/news reports/lawyers often use vague language when discussing a CFIUS case without specifying whether a notice or a declaration is filed.

Centrality of Firms

The first independent variable, $Centrality_f$, measures the extent to which a US company is located in the center of the patent license and assignment network between China and the United States, or rather, whether it controls a key technology indispensable for Chinese companies. The existing literature tends to use monadic measures such as the number of patents invented by firms in a given year. However, numbers are not an ideal proxy for how reliant other producers are on certain technology owners. A firm that invents 100 patents but has no customers willing to use those patents is less influential than a firm with just one patent assigned/licensed to many technology-intensive producers. Therefore, whether a firm controls key technology is determined by its connection with other producers, making network-based analysis necessary.

To measure firms' locations in the network, I take advantage of two datasets. The first is a novel data set of cross-border patent license agreements provided by PatSnap (2022). PatSnap is a proprietary database that provides data on patent license agreements filed with patent offices of major economies. It obtains data from patent offices such as the United States Patent and Trademark Office (USPTO) and the China National Intellectual Property Administration. The second dataset is provided by Graham et al. (2018) through the USPTO. It offers data on cross-border patent assignment agreements between the US and China. Together, the two datasets provide a comprehensive picture of how technology is shared and transferred between Chinese and American firms. The United States and China are chosen here due to the availability of high-quality data. The relevant findings should be generalized mainly to technologically advanced countries.

Links in the network are directed and indicate the existence of patent license/assignment agree-

ments between two firms. Licensors/assignors are the targets of incoming links.[4] The centrality measure is constructed in three steps. First, to get a snapshot of a network at the time point t, I gather all patent license/assignment records between t-9 and t. Second, I focus on agreements between Chinese firms and identify the most innovative Chinese firms by measuring their eigenvector centrality scores within the Chinese market. Eigenvector centrality is usually used in the literature to measure the extent to which a node is connected to influential nodes in the network (Banerjee et al., 2013). This measurement is suitable here as it captures the degree to which a firm's patent is licensed/assigned to the most innovative firms in the network. If Firm A's patent has a low technological content and is cheap to obtain, it may get many licensees/assignees. But it does not mean that it controls key technologies. In contrast, if the most innovative firms, those that license/assign many patents to others, need to use patents invented by Firm A, then we can more confidently conclude that Firm A controls key technologies. Third, after obtaining Chinese firms' centrality scores, the second step is to calculate the degree centrality of US firms with their incoming links weighted by the eigenvector centrality scores of their Chinese licensees/assignees. The higher a US firm's weighted degree centrality is, the more influential it is over its Chinese clients, and the more likely that the US government can choke off technological exchanges by prohibiting the US firm from making investments with foreign firms. I lag firms' centrality scores by one year in the regression models as decision-makers should mainly rely on firms' past innovation activities when making decisions about CFIUS reviews.

[4]Some tech firms such as HP Inc. and General Electric have more than one branch/subsidiary that work on R&D. In this case, I code the branches/subsidiaries of the same firm as one node.

The Government's Regulatory Influence on Firms

Another explanatory variable, $Regulation_f$, is the government's regulatory control of companies. I follow the method of Hassan et al. (2020a, 2019, 2020b) and measure the level of government control over domestic businesses by looking at the proportion of conversations that were used to discuss political risks when firms held their conference calls. Publicly listed firms in the United States usually hold quarterly conference calls right after their earnings releases. Such calls usually consist of presentations by executives followed by Q&A sessions. Financial analysts and investors are the main audience for these conference calls. The conference calls are a suitable measurement of governments' regulatory influence for two reasons. First, firms may face lawsuits from investors if they fail to discuss risk factors that may affect their stock price in their official statements. This fact differentiates conference calls from other information sources such as media interviews where firm executives have more room to selectively present the information. Second, the portion of conversation devoted to political risks reveals firms' self-perceived exposure to government regulations. Governments' regulatory influence over firms may be determined by various factors such as state capacity and restrictiveness of regulations. But eventually, all these factors need to go through the perception of firm executives. The amount of conversation that firm executives choose to spend on political risks captures the degree to which they believe that their profits and losses are determined by political factors.

The operationalization of firm-level political risks is divided into three steps. First, Hassan et al. (2019) compile transcripts of these conference calls that are provided by Thomson Reuters' StreetEvents. Second, they find training texts that consist of an undergraduate textbook on US politics and political sections of newspaper articles. Then, they use a pattern-based sequence-classification method

to identify two-word combinations (bigrams) that are political in nature (Mogotsi, 2010; Song and Brook Wu, 2008). Third, they divide the transcripts of conference calls into bigrams and count the number of political bigrams that are less than 10 words away from the words "risk" and "uncertainty" or their synonyms. The final measurement is a weighted sum of the number of bigrams associated with political risks divided by the total number of bigrams in a transcript. Like the centrality measure, I lag the variable by one year to allow for some time lag for political risks to take effect.

Control Variables

I control for covariates that may affect the onset of CFIUS reviews. These variables can be divided into two groups: variables related to national security threats (S_c) and those related to the economic characteristics of the firms involved (E_c). If CFIUS closely follows its mandate to review national security-related cases, we should expect E_c to have moderate to no effects.

I capture the national security threat posed by a US firm's investment deal by creating a dummy variable that is 1 if a US firm worked as a contractor with the US government in a given year and 0 otherwise. The idea is that government contractors may have access to confidential information with national security implications. Allowing such firms to make M&A deals with foreign firms may result in information leaks to the latter and their home governments. The relevant data are provided by the Award/IDV Information Report database of the System for Award Management (SAM.gov) (2023).

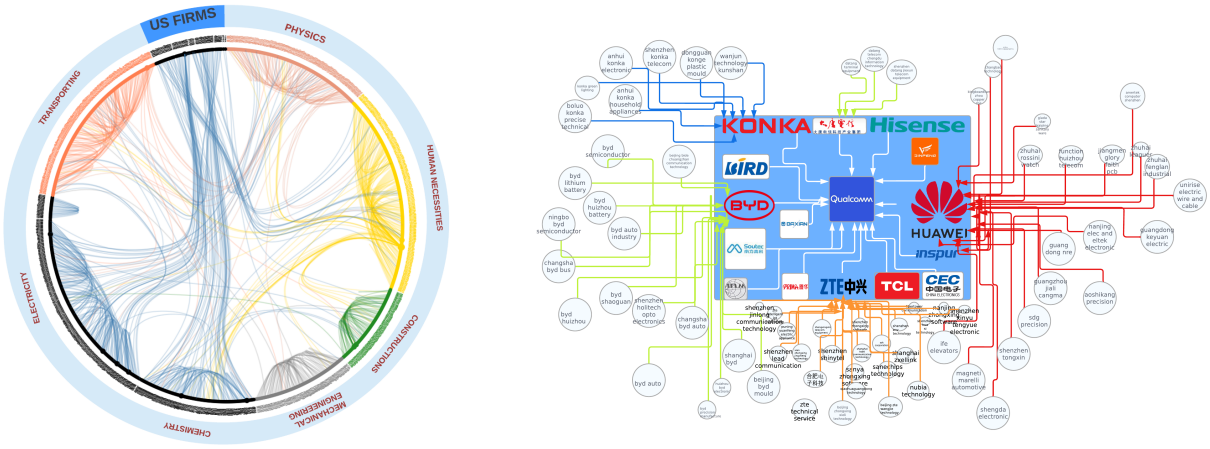
For variables related to economic competition, I control for firms' sizes which are operationalized by their total assets. Studies of interest group politics predict that large firms should be in an

advantageous position to obtain their desired policy (Kim and Osgood, 2019). Accordingly, we expect that large firms are less likely to be reviewed by CFIUS. The opposite correlation is possible if we consider the implications of relevant deals on economic competition. Firms of larger sizes are usually more competitive. Allowing such firms to be acquired by foreign buyers may create entry barriers for newcomers to the market (Goldstein, 2010). Since such competition concerns should be taken care of by the Department of Justice's antitrust division and the Federal Trade Commission, the variable should not play a big role in decisions made by CFIUS. I also control for the R&D investment made by firms as a share of their total assets. This variable captures the competitiveness of US firms and the level of economic threat that their investment deals may pose to other US firms in the market.

Another covariate, the number of employees of a US firm, captures the labor market implications of a foreign takeover. Foreign takeovers have mixed implications for the labor market. On the one hand, foreign firms are usually productive so M&As made by them may increase the demand for and wage premium of high-skilled labor in the market (Bandick and Karpaty, 2011; Setzler and Tintelnot, 2021). On the other hand, foreign firms from countries less economically advanced than the host country may introduce employees from their home country or change the target firm's policies regarding labor welfare and unionization. All of these factors may introduce uncertainties in the local labor market. Although CFIUS is not required by law to consider these factors, it may choose to incorporate such factors into its decision-making process.

5 Results

5.1 Descriptive Results



(a) (b)

Fig 2: Cross-Border Patent Licensing Network between China and the US

Notes: The patent license agreement data come from PatSnap.

The USPTO does not provide sectoral classification codes for the patent assignment data. Therefore, I will focus on the patent license agreements provided by PatSnap for this section. These agreements are classified into different sectors using the International Patent Classification (IPC) scheme (World Intellectual Property Organization, 2022). Figure 2(a) shows the patent licensing network between Chinese and US firms. The dots under the light blue arc indicate Chinese firms and those under the dark blue arc are American firms. A link indicates the existence of a patent license agreement between two firms. Links with the same one-digit IPC code share the same color. To simplify the figure, I only keep cross-border ties where US firms are licensors and ignore agreements where Chinese firms are patent owners. Cross-border ties are colored in dark blue. As shown in the figure, most patent license requests made by Chinese firms come from the electricity sector, which mainly involves the production of electronics. Specifically, patents related to semiconductor manufacturing and wireless communication technology account for the major-

ity of the links. This pattern captures Chinese firms' dependence on US firms in semiconductors and information and communication technology (ICT) sectors. The second sector of China that is technologically reliant on US firms is the chemistry sector. US licensors in this sector are mainly innovative pharmaceutical firms such as Pfizer Inc. and Eli Lilly and Company. Chinese firms in other sectors apply for much fewer patent licenses from US firms, indicating a weaker technological dependence.

Figure 2(b) shows a subsection of the network with Qualcomm Incorporated in the center. Qualcomm has one of the highest weighted degree centrality in the ICT industry and is thus considered as controlling chokepoints. Qualcomm's high centrality is mainly driven by the fact that it has a large group of Chinese licensees, and most of them are innovative firms such as Huawei, ZTE, and BYD. The latter are defined as innovative firms as they own many patents on which many other Chinese firms are dependent. The fact that firms like BYD need to apply for patent licenses from Qualcomm reveals the existence of technological gaps that these Chinese firms are unable to fill by themselves or through dealing with other Chinese firms. Qualcomm's links with these firms thus indicate its control of key technologies that are indispensable for the most innovative Chinese firms.

5.2 Regression Results

Table 1: The Effect of Centrality on CFIUS Reviews

	CFIUS Reviews		
	(1)	(2)	(3)
Centrality	2.185***		2.288***
	(0.311)		(0.390)
Political Risk		−0.008*	−0.008*
		(0.004)	(0.004)
Government Procurement	−0.225	−0.685	−0.609
	(0.720)	(0.715)	(0.745)
Employee	−0.004	−0.006	−0.009
	(0.006)	(0.004)	(0.009)
Total Assets	0.020	0.020*	0.021*
	(0.011)	(0.009)	(0.010)
R&D	0.038**	0.030	0.027
	(0.014)	(0.016)	(0.014)
Observations	121	81	81
Log Likelihood	−59.773	−37.853	−37.540
Akaike Inf. Crit.	167.545	117.706	119.079

Notes: Standard errors clustered within firms are shown in the table. Time fixed effects are added in all models. *p<0.05; **p<0.01; ***p<0.001.

Model 1 in Table 1 examines the correlation between US firms' centrality in the patent license and assignment network and their likelihood of being reviewed by CFIUS. One unit increase in firms' centrality score will lead to a 6.76 increase in the odds ratio of observing CFIUS cases. The correlation is statistically significant. Once targeted by Chinese buyers, a US firm with no cross-border patent license/assignment record (centrality=0) has a 51% likelihood of facing a CFIUS review. In contrast, firms with the highest centrality score have a 99% probability of experiencing CFIUS reviews. Substantively, a central position in the patent network makes a firm 48% more likely to be

targeted by CFIUS. This finding offers strong evidence that CFIUS has been strategically targeting firms that control key technologies so as to prevent technological diffusion to China. As shown in Figure 3, firms that go through CFIUS reviews have a higher average centrality score compared to that of all firms that are targets of M&A efforts by Chinese firms.

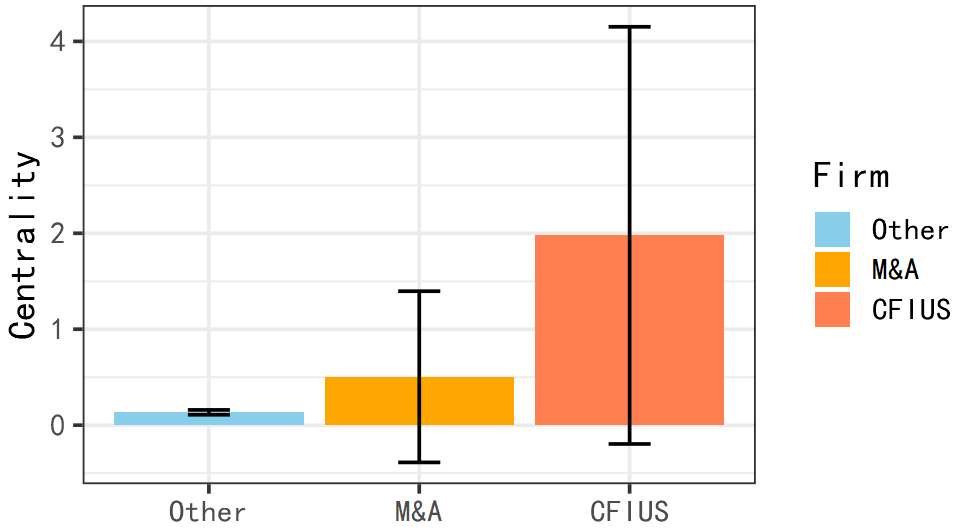


Fig 3: Average Centrality Scores of Firms with CFIUS Reviews, Targets of Chinese M&As, and All US Public Firms

Notes: This Figure shows the average centrality score of three groups of firms: firms that are reviewed by CFIUS, those that are targets of M&A deals of Chinese buyers, and all other US public firms listed with the SEC. I remove firms whose centrality scores are always zero from 2000 and 2021. 95% confidence intervals are shown in the figure.

It should be noted that Chinese firms have also been strategically selecting firms to invest in. The blue bar in the graph indicates the average centrality score of all public firms listed with the SEC in the United States. It is clear that US firms that strike M&A deals with Chinese buyers tend to have higher centrality scores compared to other public firms that are not selected.

Model 2 examines the correlation between firms' self-perceived political risk and their likelihood of getting CFIUS reviews. The political risk scores of firms range from 0 to 1086 in the sample. Compared to firms with a median political risk score, those with the lowest score is 8% more likely

to be targeted by CFIUS. For firms that are highly exposed to political risks, their probability of being targeted by CFIUS is only 1%. This finding corroborates my theory that the government does not need to resort to CFIUS reviews if it has other leverage over domestic firms. Firms with the lowest 10% political risk scores are mainly those from the pharmaceutical, semi-conductor, and ICT industries. Examples of those firms include Cellular Biomedicine Group, Inc., MEMSIC Semiconductor Co., Ltd., and 8x8 Inc..

Model 3 shows the regression result with both political risk and centrality added in the model. Centrality retains its statistical significance after political risk is added in the model. After regressing political risk on centrality, I discover a negative correlation between the two. It is consistent with my expectation that productive firms will feel less reliant on government regulations and less exposed to political risks. However, the correlation is not statistically significant. Mediation analysis with political risk as the mediator and centrality as the independent variable does not reveal a significant mediation effect, either. However, given that the sample size is 81 due to data attrition caused by missing values, statistical insignificance does not rule out the possibility that political risk can serve as a mediator of the effect.

As for the control variables, contracting experience with the US government makes firms less likely to go through CFIUS reviews. One interpretation is that firms with government contracts can also utilize their connections with the government to persuade the latter into approving a deal. The correlation is not significant, though. The number of employees does not have a strong effect on firms' likelihood of being reviewed. The implications of a deal on domestic job opportunities may not be a major concern of the CFIUS reviews. In Models 2 and 3, the amount of total assets increases the likelihood of CFIUS intervention. One possible explanation is that deals involving

big firms are more likely to catch CFIUS' attention. The increase in research and development expenditure by firms is associated with an increased likelihood of CFIUS reviews. The finding is consistent with the expectation that the government is more likely to intervene in deals that threaten the competitiveness of domestic firms. The effect is not statistically significant for all models, though.

6 Comparative Case Studies

To further test my theory, I conduct a comparative study of two M&A deals: one between Lattice Semiconductor Corporation (Lattice) and the Canyon Bridge Capital Partners, Inc. (Canyon Bridge), and another one between Kopin Corporation (Kopin) and Goertek Inc. (Goertek). The two deals are chosen here because the first one went through all stages of CFIUS reviews, providing readers with a good illustration of how CFIUS works. The second deal serves as a good comparison as the target US firm is relatively similar to Lattice on dimensions such as industry (semiconductor), participation in government procurement programs, and timing of deal announcement (see the table below). But Lattice and Kopin differ in terms of their positions in the global innovation network, explaining why the two deals were treated differently by CFIUS.

Table 2: Comparison between Lattice and Kopin

Firm name	Lattice Semiconductor Corporation	Kopin Corporation
Location in GINs	Central	Non-central
Business	Field programmable gate arrays	Voice chips and display devices for mobile electronics
Total asset in 2016	$794 million	$101 million
The number of employees in 2016	986	174
Government procurement experience	Yes	Yes
Announcement year of the M&A deal	2016	2016
CFIUS review	Yes	No

In order for my theory to hold, the following four pieces of evidence need to be present. First, Lattice should own some key technologies that are indispensable to relevant Chinese producers.

Second, Lattice and the US government should hold divergent opinions over the deal, with the former being supportive. Third, the US government should have some difficulty in affecting Lattice's investment decisions, promoting it to resort to national security justifications. Finally, the US government, represented by CFIUS, should take some measures to intervene in the deal. Such measures may take the form of mitigation orders, emails aiming to dissuade Lattice from proceeding with the deal, or a presidential order that blocks the deal. In comparison, CFIUS should be relatively inactive when dealing with the Kopin-Goertek deal.

6.1 The Lattice-Canyon Bridge Deal

Lattice's Position in GINs

Lattice Semiconductor Corporation is a leading producer of Field Programmable Gate Arrays (FPGAs) in the United States. FPGAs are programmable integrated circuits that are widely used to develop artificial intelligence, consumer automotive, edge computing, and industrial appliances (Lattice Semiconductor, 2023). Lattice distinguishes itself from other producers by focusing on low-power FPGAs that allow computing to be made in a low-cost way. Between 2015 and 2017, Lattice Semiconductor filed on average 96 patents each year. According to the PatSnap-USPTO dataset, between 2000 and 2021, Lattice has licensed/assigned 37 patents to producers such as Qualcomm, making it one of the most innovative firms in the industry (GlobalData, 2023).

LG, Lenovo, and ASUS are among the main customers of Lattice (Krewell, 2023). These customers' dependence on Lattice mainly stems from the latter's ownership of key patents and costly process of switching to alternative FPGA providers. For example, to use FPGAs on their own products, computer producers need to reprogram FPGAs so that they are compatible with the operating system and software installed on the computers. In addition, the reprogramming effort usually re-

quires patent licenses from Lattice. An indirect evidence of how expensive the licenses are is that Lattice made approximately 20 million dollars between 2018 and 2021 by licensing its patents and providing patent-related services, accounting for 5% of its total revenue (Lattice Semiconductor Corporation, 2022). These two factors make it costly for customers to switch to alternative FPGA providers.

Government-Business Divergence over the Lattice-Canyon Bridge Deal

In 2016, Lattice and Canyon Bridge, a Chinese private equity fund, reached a definitive agreement where Canyon Bridge was scheduled to acquire Lattice with 1.3 billion dollars in early 2017, bringing an immediate 30% premium to the stakes of Lattice. In addition, Lattice would maintain considerable autonomy after the deal by operating as a standalone subsidiary of Canyon Bridge. Not surprisingly, the generous offer was unanimously approved by Lattice's board of directors. Darin G. Billerbeck, the then President and CEO of Lattice, was an avid advocate of the deal. He commented that this transaction "delivers certain and immediate cash value to shareholders while reducing our execution risk. We are excited to leverage Canyon Bridge's resources and market connections as we enhance our focus on executing our long-term strategic plan of continued innovation." (Lattice Semiconductor, 2016). It is not hard to see that the executives of Lattice viewed this deal as a win-win, bringing them both immediate increase in their income and access to Chinese markets. This explains their strong opposition when CFIUS ordered them to discontinue the deal.

In 2017, CFIUS determined that the deal had negative security implications. According to Steven Mnuchin, the then Secretary of the Treasury, the national security concerns mainly referred to "the potential transfer of intellectual property to the foreign acquirer, the Chinese government's role

in supporting this transaction, the importance of semiconductor supply chain integrity to the US government, and the use of Lattice products by the US government." (Mnuchin, 2017).

Lattice strongly disagreed with the statement, arguing that it did not have any active contract with the US military. To save the deal, Lattice proposed a comprehensive plan to mitigate the negative national security implications of the deal, including promising to double the number of job positions if the deal was closed (Baker, 2017). Meanwhile, Lattice also engaged in intensive lobbying efforts to persuade CFIUS into approving the deal. In 2017, Lattice lobbied 4 times and spent more than 120,000 dollars on issues regarding the CFIUS investigation (Office of the Clerk, U.S. House of Representatives, 2023). This frequency is high compared to its inactive lobbying record between 2014 and 2016. However, in 2017, then-president Trump still chose to issue a presidential order that blocked the deal.

Economic and Policy Environment of the US Semiconductor Industry

CFIUS' intervention in the acquisition deal can be better interpreted by situating it in the policy environment of the semiconductor industry. The semiconductor industry in the US is deeply involved in global value chains. The technology intensiveness of chips requires heavy R&D investment and collaboration between researchers from around the world. The complexity in the production process also makes the fragmentation of productions imperative. To produce FPGAs, companies need to first source raw materials. Second, factories refine these raw materials to create wafers that can be reshaped into different types of chips. Third, the assembly and testing of FPGAs are usually outsourced to countries with cheap skilled labor. Fourth, FPGA producers will program their FPGAs to meet customers' demand. As a result, semiconductor producers in the US tend to organize their production activities across different countries, utilizing mine resources from countries

such as China, professional technicians in developed economies such as Taiwan, and intellectuals who specialize in designing chips in the United States and abroad. Economists call it the fabless-foundry model, as it usually does not require manufacturing activities in the home country of chip designers (Bown, 2020).

Lattice's production process is a typical example of the fabless-foundry model. Its research team is mainly responsible for designing and programming FPGAs. The manufacturing of silicon wafers and chips is outsourced to Fujitsu Limited ("Fujitsu"), United Microelectronics Corporation ("UMC"), Taiwan Semiconductor Manufacturing Company Ltd. ("TSMC"), and Seiko Epson ("Epson"). The testing and assembly of its products are outsourced to Asian factories of Advanced Semiconductor Engineering ("ASE") and Amkor Technology ("Amkor") (Lattice Semiconductor Corporation, 2022).

The heavy reliance of US producers on oversea supply chains and market makes them strong opponents of any trade and investment restrictions. After being notified that the deal was blocked, Lattice wrote in an email to the press that "We are obviously disappointed in today's decision by the President of the United States to forgo what we believe to be an excellent deal for Lattice's shareholders and its employees by expanding the opportunity to keep jobs in America." (BBC News, 2017). The opposition to trade and investment restrictions is also prevalent among other US chip makers. For the past ten years, the chip manufacturing industry in the US barely initiated any anti-dumping and countervailing investigations against foreign countries (Bown, 2010; Bown et al., 2020). When the Trump administration decided to impose export control on Huawei, the Semiconductor Industry Association was unequivocally against it, worrying that this restriction might disrupt relevant firms' overseas supply chains (Semiconductor Industry Association, 2018).

If the US government wants to impose any trade and investment restrictions over these US chip makers, it would be hard to imagine that the latter will support it.

Limitations in the government's regulatory influence over the firms are also determined by the lack of policy tools to restrict inbound investment. Up until the second term of the Obama administration, the United States was largely an advocate of open investment. The existing policy tools that can be used to restrict inbound investments mainly include antitrust reviews, national security screenings, and some indirect tools such as taxation and subsidies. The antitrust reviews do not allow the government enough flexibility as they are not applicable to cases where firms' sizes are not large enough to threaten competition. Moreover, innovative firms such as Lattice are not reliant on subsidies. Most of Lattice's profits came from its product sales and patent licenses to American and foreign markets. 88% of Lattice's revenue in 2022 is attributed to foreign markets (Lattice Semiconductor Corporation, 2022).

In sum, the US government faces significant domestic constraints when it comes to restricting inbound investment due to firms' uncooperativeness and lack of policy tools. This fact makes national security reviews a relatively ideal tool as it allows the government to interpret its applicability without relying on firms' cooperation. Even though Lattice responded to the US government's accusation regarding supply chain security by arguing that it did not produce chips for the military at that time, the power to define supply chain integrity and national security largely resides with the government, making Lattice's claim unlikely to make a difference (Baker, 2017; Cooley Alert, 2017). In general, private firms like Lattice do not have the institutional authority to determine whether critical technologies should be considered as having national security implications. Neither do they have classified information that enables them to challenge the government's claim.

This power disparity makes national security reviews a highly effective policy tool when the government is determined to insulate itself from the influence of domestic groups to pursue certain geopolitical interests.

6.2 The Kopin-Goertek Deal

In December, Kopin Corporation, an American producer of voice chip and consumer virtual reality (VR) products, announced its deal with Goertek Inc., a Chinese producer of electro-acoustic components. According to the deal, Goertek agreed to buy 9.8% of Kopin's stake with 23.9 million dollars. In December 2017, Goertek increased the stake to 10.1%. After the completion of the deal, the two parties planned to jointly develop and commercialize wearable products (Kopin Corporation, 2017a,b).

Georgtek is a producer of optical components and virtual and augmented reality (VR and AR) headsets. It is a long-time supplier to Apple and the main manufacturer of AirPods (Patently Apple, 2023). According to its official website, Goertek also maintains close business relations with Qualcomm, Microsoft, and Infineon Technologies (Goertek, 2023a,b). The strategic relationship between Kopin and Goertek allows Kopin to utilize the latter's manufacturing capabilities and expand its market in China, making the deal strongly welcomed by the board of directors of Kopin. Dr. John C.C. Fan, Kopin's President and CEO, commented that "Our partnership with Goertek will enable Kopin to leverage their world class capabilities to commercialize our innovative components and further improve our system products." (Kopin Corporation, 2017a).

Kopin's Position in GINs

Kopin was an innovative firm in that it owned around 200 patents as of 2016 (Kopin Corporation,

2023a). However, it was not central in the patent license and assignment network. In total, it had 4 license and assignment records between 2000 and 2021 in the PatSnap-USPTO dataset. 3 of them were signed with Solos Technology Limited, its subsidiary in Hongkong. The remaining record was between Kopin and Lenovo New Vision. Overall, Kopin did not have strong technological dominance over Chinese firms, and neither were the VR and AR technologies exclusive to Kopin. Oculus VR, Unity, Meta, and Apple are widely considered the most innovative companies in the VR and AR market (Gossett, 2023; Hicks, 2023). Chinese companies such as HTC and Huawei are also considered competitive players in the industry (Gentlemen Marketing Agency, 2023).

It is worth noting that according to Kopin's official website, the company is "the largest supplier of microdisplays for the US military." Its technologies have been applied to thermal weapon sights and enhanced night vision goggles that are widely used in the US military (Kopin Corporation, 2023b). Theoretically, Kopin's close tie with the US military should make it a likely target of CFIUS scrutiny as Goertek might be able to obtain some insiders' information about the US military through its joint investment with Kopin. However, surprisingly, the two parties managed to close the deal without much interference from the US government.

Inaction of CFIUS

In the 8-K form filed in January 2017, Kopin reported the strategic agreement with Goertek in December 2016. Therefore, relevant US government agencies should be notified of the deal. But Kopin did not mention whether it filed a CFIUS notice in either 10-K or 8-K forms. No newspaper reports were made on the involvement of CFIUS. Considering that Kopin is a public firm and it may be sued by investors for failing to disclose events with negative implications on its profits, no mention of CFIUS in these forms should indicate the inactivity of CFIUS. Furthermore, the two

parties successfully closed the deal only two months after Geortek announced its plan to buy the 10.1% stake. Given that CFIUS reviews can take as long as 90 days before 2018, it is safe to infer that CFIUS' involvement, if any, was not substantial in the deal.

One potential explanation is that Goertek's share in Kopin is relatively low compared to the Lattice case. However, it should be noted that the CFIUS regulations give the agency considerable flexibility to the extent that a low stake change cannot be used to stop the agency from intervening in a case. In 2016 and 2017, the Foreign Investment and National Security Act of 2007 (FINSA) was the latest law governing CFIUS investigations. It authorized CFIUS to investigate any mergers, acquisitions, and takeovers that may result in foreign control of US firms, without providing a reference point on what level of stake change should be considered "control." In Section 721, FINSA stipulates that deals that involve critical technologies should be considered transactions covered by the jurisdiction of CFIUS. But similar to the definition of "control", critical technologies are loosely defined as "critical technology, critical components, or critical technology items essential to national defense." Considering that Kopin happened to supply products to the US military, if CFIUS wanted to investigate the deal, it was legally feasible for it to do so, thanks to the broadly phrased act.

One plausible reason why CFIUS did not intervene is that it did not think that Kopin possessed critical technologies considering that Kopin was not the dominant player in the VR and AR industry and that such technologies were widely available through other firms. This decision is consistent with the "small yard and high fence" principle that was originally proposed by former Secretary of Defense Robert Gates and often reiterated by the Biden administration. The idea is that the US should be selective in defining critical technologies that should be walled off from Chinese acqui-

sition but aggressive in protecting these critical technologies (Edgerton, 2023; Laskai and Sacks, 2018). The fact that Kopin comes from a burgeoning high-tech industry does not automatically make it subject to CFIUS scrutiny. Instead, the existence of competitive Chinese VR and AR firms and the availability of a large number of VR and AR technology providers made Kopin an unlikely target that the US government could utilize to build a chokepoint against China.

In sum, the comparative studies of Lattice and Kopin reveal that whether a US firm controls cutting-edge technologies that are not widely available is an important determinant of CFIUS involvement. Such consideration even outweighs the firms' ties with the US military and potential information leakage risks. When leading semiconductor producers are involved, CFIUS can be aggressive in interpreting regulations and cutting business ties. In contrast, when a technology cannot be used as a chokepoint, CFIUS tends to defer to the free market.

7 Conclusions

This paper explains the political and economic origins of national security-based investment restrictions through the perspective of geopolitical competition and government-business interactions. In sum, the paper generates two takeaways.

First, with the rise in geopolitical competition between the major economies in the world, cross-border technological interdependence is increasingly weaponized by governments to slow down the technological advancement of their rivals. Instead of being a cypher that passively aggregates domestic firms' preferences, governments in developed economies are increasingly taking the initiative in shaping investment policies and promoting the evolution of national security concept. By doing this, governments are able to strengthen their control over cross-border technological

exchange so as to further their countries' relative power against geopolitical rivals.

Second, governments' regulatory influence over their domestic firms explains the type of policy tool that they will choose to regulate cross-border investment. National security provides governments with a strong leverage when they need to implement geopolitical strategies that may trigger strong opposition from domestic firms. Governments' invocation of national security essentially expands their power over private sectors. This phenomenon calls for more academic discussions on the appropriate boundaries of state involvement in cross-border investment.

The project generates several directions for future research. First, the current project mainly focuses on the United States. But the CFIUS might be a special case in that policymaking in the US is often dominated by interest groups and the government used to intentionally limit its intervention in the market to encourage foreign investment. However, in economies where interest groups are less powerful, governments' choice of investment policy tools might take a highly different form. For example, in China, the central government enjoys considerable leeway in making trade and investment policies. Therefore, it may not be necessary for it to use national security as a fallback plan (Goldstein, 2010). Second, although this paper refrains from making normative judgement so that readers can focus on the empirical findings, it does acknowledge the importance of normative discussions over the appropriate demarcation between national security and economic competition and how it relates to governments' commitment to the liberal world order. Restricting investment when it has strong security externality is necessary as no country wants its military to be vulnerable to its enemies in the event of war. But the unrestricted expansion of the boundary of national security will lead to inefficient economic outcomes and be detrimental to one country's innovative capability in the long run as it restricts the pool of foreign capital available to domestic producers.

The rapidly evolving national security concept creates challenges but also offers good opportunities for academic debate over the appropriate boundaries of national security and the resulting change in state power.

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Appendices

Appendix 1. Coding Rules for CFIUS Cases

The time coverage of the data is 2000 to 2023. The dataset consists of two parts: a dataset of CFIUS reviews that consists of 700 observations, and a dataset of high-risk deals/firms that consists of 186 observations. If relevant sources provide convincing evidence that an investment deal went through a CFIUS review, the relevant case goes to the first dataset. If relevant sources only hint that a deal/firm is likely to go through a CFIUS review but do not provide direct evidence of the review, then the case goes to the second dataset. Overall, the data coverage is better between 2000 and 2021. Observations in 2022 and 2023 were collected mainly using newspaper reports.

To identify a CFIUS case, I mainly utilized three sources: 10-K and 10-Q files that public firms filed with the Securities and Exchange Commission of the United States (SEC), law firms' briefings, and newspaper reports. For what follows, I will discuss the features and potential bias of different information sources, coding rules, data cleaning process, and the codebook that I used to code the data.

Features and Biases of Different Information Resources

10-K and 10-Q files: 10-K and 10-Q files are documents that public firms in the US need to file with the SEC to explain their financial status. 10-K files are filed on a yearly basis and 10-Q files on a quarterly basis. Both foreign and US firms are required to file the forms as long as they are listed with the SEC. The major issues covered by these documents are risk factors faced by firms, legal proceedings, balance sheets, and investment deals made by firms in a given year. The files are designed to give investors a good understanding of firms listed in the stock market so as to reduce investor uncertainty and prevent frauds. The strength of the data source is that it is legally costly for firms to misreport relevant cases. Investors can hold firms accountable for what they reported by filing law suits, and the SEC can punish firms for misreporting relevant information.

The US government and investors are the two target audiences of the document. One potential problem this fact may induce is the under-report of CFIUS reviews. Some firms may choose not to report CFIUS reviews as government intervention in a firm may be considered bad news for investors. Another issue is that CFIUS may require firms to hide certain cases that are militarily sensitive. I do not have a good measurement of how widespread the phenomenon is. But an assuring fact is that firms will face legal consequences if they fail to disclose information that investors or stakeholders deem crucial for their investment decisions. One unavoidable bias of the data source is the absence of private firms. Researchers may want to limit their sample to public firms if they want to only use the data provided by the SEC.

Law firm reports: Law firm briefings complement the 10-K and 10-Q files by extending the data coverage to private firms. Many law firms in the US have divisions that specialize in dealing with international investment. They are hired by firms to draft contracts for merger and acquisition deals and represent the firms in front of CFIUS if a review takes place. To attract future clients, some law firms chose to list the CFIUS cases that they handled on their websites. In addition, some firms published briefings of cases that were not necessarily delegated by them in order to signal their professional knowledge to potential clients. Theoretically, some firms may require the law firms to

keep their deals secrete. If this is the case, law firm reports may under-report CFIUS cases related to sensitive issues.

Newspaper reports: Data on news reports are provided by the Trade Practitioner and the National Law Review. Overall, they provide an impressive track of CFIUS cases after 2016. One common issue with the media is that they tend to cover high-profile cases that boost their circulation. If that is true, CFIUS reviews on small firms may be under-reported. In total, I identified 236 news reports about CFIUS reviews.

Data Cleaning and Coding Process

I hired human coders to identify relevant cases. First, I hired three undergraduate research assistants to code all 10-K and 10-Q files that mentioned CFIUS. The coding rules are shown below. Second, I compiled a list of law firms that made briefings/reports on CFIUS reviews. Third, a list of CFIUS cases mentioned in newspaper reports was compiled.

Coding rules for research assistants: You are provided with 10-K and 10-Q documents of firms from 2000 and 2022. The documents were downloaded from the Securities and Exchange Commission's official website. A document was included in the dataset if "CFIUS" or "Committee on Foreign Investment in the United States" was mentioned in it. Please code relevant variables according to the following instructions.

(1) Input 1 under the "CFIUS notices" column if the target firm (filing entity/person) filed/received a CFIUS notice and 0 otherwise.

(2) Input 1 under the "CFIUS reviews" column if the target firm (filing entity/person) went through a CFIUS review and 0 otherwise.

(3) Input 1 under the "National security investigations" column if the target firm (filing entity/person) went through a CFIUS national security investigation and 0 otherwise. Firms often do not distinguish between CFIUS reviews and national security investigations. So this variable will contain many missing values.

(4) Input 1 under the "Deal revised" column if CFIUS asked the target firm to revise its deal with a foreign entity. Such revision is usually called mitigation agreements.

(5) Input 1 under the "Deal blocked" column if CFIUS blocked a firm's deal.

(6) Input 1 under the "withdraw" column if a foreign/US firm decided to withdraw from the deal as a result of CFIUS reviews.

(7) Input 1 under the "clear" column if a deal was cleared by CFIUS.

(8) Input 1 under the "high_risk" column if a firm mentioned that it was highly likely to be investigated by CFIUS but did not specify whether a notice was filed or not. Cases that are reviewed by CFIUS are automatically coded as "high risk."

(9) Input all US firms who are the targets of a deal under the column "us_target_group". Please separate firms by ";". US firms are usually targets of foreign investments. If the target includes some foreign firm, please paste the firm's name there and note its nationality within a parenthesis. For example, "qualcomm; huawei (china)".

(10) Indicate all the foreign buyer(s) under the column "buyer_group." Please separate firms by ";".

(11) If all buyers are US firms, they are usually US subsidiaries of a foreign firm. In this case, please indicate under the "buyer_foreign_parent" column who the parent firm is. Online searching will be needed. If you have multiple buyers whose foreign parent firms are from different countries, please input "buyer $\sim$ foreign parent (foreign parent's nationality)" under the "buyer_foreign_parent" column. "$\sim$" is used to connect buyers with their parent firms. For example, "HNA group $\sim$ Wiseroad(China); STE $\sim$ STE government fund (Singapore)"

(12) Please type the buyer's nationality under the "foreign_firm_nationality" column. In rare cases where you have multiple buyers from different countries, please list all relevant countries under the "foreign_firm_nationality" column and separate them by ";". In addition, indicate each buyer's nationality in parentheses and append it to the name of relevant buyers under the "buyer_foreign_parent" or "buyer_group" columns to avoid confusion. For example, "Buyer A(Singapore); Buyer B(China); Buyer C(Italy)."

(13) The year when a review was made is usually the year when the 10-K/Q file was filed. But if the two are different, please indicate the year when the review starts under "year_review."

(14) If you are uncertain, please type "NA" under the relevant column(s).

(15) If a case is ongoing in 2022, please type "ongoing" for the corresponding variables.

(16) For the "duplicates" column, if you believe that two lines of observations refer to the same CFIUS case. Assign the first line a unique identifier, such as "2022-01-01-dupliate001", and type the same identifier for the second of the duplicates.