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Fiona Paine
Richard R. Townsend
Ting Xu

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ABSTRACT

This paper examines the evolving policy landscape surrounding foreign investment restrictions in innovative startups. Drawing on recent research, we analyze both the security benefits and economic costs of policies like the Foreign Investment Risk Review Modernization Act (FIRRMA). The evidence suggests that foreign investments do facilitate measurable cross-border knowledge spillovers that may raise legitimate security concerns. However, restricting these investments imposes significant costs on domestic innovation ecosystems, including reduced capital availability, disrupted investor networks, and potentially diminished innovation outcomes. These effects extend well beyond directly targeted foreign investors to affect domestic venture firms and startups. We explore design considerations for more effective investment screening policies, including industry targeting, investor heterogeneity, and implementation approaches, as well as complementary policies that might address security concerns while minimizing costs to innovation. We conclude by outlining promising directions for future research on this increasingly important intersection of innovation policy and national security.

Fiona Paine
Massachusetts Institute of Technology
paine.f@gmail.com

Richard R. Townsend
University of California, San Diego
Rady School of Management
and NBER
rrtownsend@ucsd.edu

Ting Xu
University of Toronto
Rotman School of Management
and NBER
tingxu.xu@rotman.utoronto.ca

1 Introduction

In recent decades, innovation ecosystems around the world have benefited from global capital flows that transcend national borders. Venture capital investments across international boundaries have accelerated the commercialization of transformative technologies, from semiconductors to synthetic biology. These cross-border investments have traditionally served multiple purposes: providing risk capital to early-stage firms, facilitating international partnerships, enabling market access, and supporting the transfer of complementary capabilities.

However, the past decade has also witnessed a significant global shift in how countries approach foreign investment in critical technology sectors. Nations worldwide have grown increasingly concerned about the security implications of certain capital flows, particularly those originating from strategic competitors. This growing wariness reflects a fundamental reassessment of the risks associated with technology transfer, as innovations in fields such as artificial intelligence, quantum computing, and advanced biotechnology present dual-use potential—technologies developed for commercial purposes that could be repurposed for military applications.

In response to these concerns, the U.S. passed the Foreign Investment Risk Review Modernization Act (FIRRMA) in 2018, significantly expanding the authority of the Committee on Foreign Investment in the United States (CFIUS). CFIUS is an executive branch committee of the U.S. government that reviews transactions involving foreign investors on national security grounds. Prior to FIRRMA, only majority stakes (mergers and acquisitions) in US companies by foreign investors could be reviewed and blocked by CFIUS. After FIRRMA, CFIUS’s purview newly included non-controlling venture capital investments, particularly those involving access to board rights, material nonpublic technical information, or governance influence in sensitive sectors. It also introduced a mandatory filing requirement for deals involving a subset of industries deemed critical to national security.

This shift represents a substantial reconfiguration of U.S. innovation policy. Unlike traditional industrial policies, which aim to stimulate innovation by expanding capital access or subsidizing R&D, FIRRMA is fundamentally restrictive. Its objective is not to encourage more innovation but to manage the geopolitical risks that innovation may create or exacerbate. As such, it reflects a broader reorientation of economic policy tools toward strategic competition.¹

¹These cross-border venture capital restriction policies exemplify a growing area within the broader literature on industrial policy where interventions may be driven primarily by non-economic motives, such as national security or foreign policy concerns, rather than purely economic efficiency or growth goals. A burgeoning body of research is studying the complex dynamics and trade-offs inherent when industrial policy operates under such non-economic rationales. For instance, Clayton et al. (2024) explore the trade-offs, explicitly including national security externalities, when countries undertake costly actions to achieve geopolitical or specific economic aims. Similarly, Goldberg et al. (2024) analyze industrial policies within the semiconductor sector, documenting the critical role of subsidies while

Following this policy shift by the U.S., other countries have also adopted similar policies. For example, the European Union implemented a framework for screening foreign direct investments in 2019, while individual member states like Germany have enhanced their national regimes. The United Kingdom introduced its comprehensive National Security and Investment Act in 2021, creating mandatory notification requirements for investments in sensitive sectors. Similarly, Japan, Australia, and Canada have all reformed their foreign investment review processes to address emerging national security concerns.

What remains unclear, however, is the relative costs and benefits of these new restrictions. How much innovation do countries sacrifice by curtailing foreign venture capital? Are the national security benefits commensurate with the potential reduction in startup formation, risk-taking, or technological progress? In addition, are there more effective ways that investment screening policies could be implemented that would reduce the costs? And is there a role for policies beyond investment screening?

This paper seeks to explore these questions by drawing on recent theoretical and empirical research focused on the U.S. experience. Overall, the evidence suggests that, absent restrictions, there are indeed measurable knowledge spillovers from startups to foreign investors. At the same time, the costs of blocking such investment are also significant, with recent evidence suggesting impacts not only on targeted investors but also on domestic capital supply, syndication networks, and innovation outcomes.

2 Illustrative case study

The dynamics of foreign capital, knowledge transfer, and innovation risk are particularly vivid when examined in the context of individual firms. To fix ideas, we begin with an illustrative case study of the startup Kateeva, drawn from Akcigit et al. (2024). Kateeva epitomizes both the promise and peril of cross-border venture investment in strategic technology sectors. Its trajectory underscores how foreign capital can fill gaps left by domestic investors, but also how this reliance can lead to the diffusion of core technologies to strategic competitors in the absence of effective safeguards.

Founded in 2008 by a group of MIT-trained scientists, Kateeva emerged from academic research in organic electronics and quickly developed a proprietary inkjet printing technology to manufacture organic light-emitting diode (OLED) displays. These displays, increasingly used in high-end televisions and smartphones, offered superior contrast, flexibility, and energy efficiency compared to traditional liquid crystal display (LCD) technologies. Kateeva’s innovation—the YIELDjet printer—

also quantifying the extent of learning-by-doing effects and significant international knowledge spillovers, highlighting the complexities of managing technology diffusion in strategic industries.

enabled high-precision, high-throughput deposition of OLED materials, addressing one of the most costly and technically challenging aspects of OLED manufacturing. The technology represented a potential leap forward not only in display performance but also in manufacturing efficiency.

In its early stages, Kateeva attracted funding from top-tier U.S. venture capital firms, including Spark Capital and Sigma Partners. The firm garnered awards, industry attention, and support from the U.S. Department of Energy and other public research entities. But like many hardware-intensive, capital-hungry startups, Kateeva faced significant hurdles in scaling its manufacturing capacity and fulfilling large commercial orders from display panel makers. The venture capital community, which had already begun shifting heavily toward software and platform business models by the mid-2010s, proved less willing to continue underwriting Kateeva’s capital-intensive growth.

In 2016, Kateeva raised \$88 million in a round led by several major Chinese investors, including BOE Technology Group and TCL Capital—two large display manufacturers with deep connections to China’s industrial policy ecosystem. Redview Capital, a private equity firm with links to China’s political leadership, also participated. These investors were not passive backers; they were deeply interested in integrating Kateeva’s technology into China’s domestic display manufacturing pipeline. For Kateeva, this foreign capital was not only welcome—it was likely necessary. Domestic alternatives were limited, and public financing mechanisms were not designed to fill the scale-up gap for frontier manufacturing technologies.

Shortly after this financing round, Kateeva’s plans to go public in the United States quietly stalled. As geopolitical tensions escalated and concerns over Chinese technological acquisition intensified, the firm became financially vulnerable. In 2019, Kateeva entered into a convertible debt agreement with a Chinese finance group that further consolidated control among its Chinese investors. The company’s founding team and senior engineers began to depart, and key manufacturing operations and intellectual property appeared to shift toward China. The firm, once heralded as a breakthrough U.S. manufacturing innovator, largely faded from the domestic technology landscape. The Kateeva case encapsulates several of the core tensions at the heart of the investment screening debate. On one hand, foreign capital clearly enabled continued innovation and scale-up at a moment when U.S. financial and strategic support systems had fallen short. On the other, the outcome—a shift of strategic manufacturing capabilities, know-how, and perhaps core IP to China—aligned closely with the very risks that FIRREA was designed to mitigate. The case thus illustrates the double bind that investment screening policies confront: protecting strategic technologies from being transferred abroad may, if implemented too rigidly, also prevent them from succeeding at home.

3 Policy Background

3.1 Foreign Investment Restrictions in the U.S.

The history of the U.S. government’s approach to screening foreign investment dates back to 1975, when President Gerald Ford established the Committee on Foreign Investment in the United States (CFIUS) by executive order. At the time, concerns were mounting about Japanese purchases of American technology firms, reflecting a pattern that would repeat itself in subsequent decades with different nations as the focus of anxiety. Initially, CFIUS operated as an inter-agency working group with a mandate to review the national security implications of foreign investments in U.S. companies or operations, but it possessed limited authority to block transactions.

Over time, CFIUS’s powers were strengthened through a series of legislative actions. The Exon-Florio Amendment in 1988 expanded the committee’s authority, followed by the Foreign Investment and National Security Act of 2007, which further codified and enhanced CFIUS’s role. Throughout this evolution, CFIUS maintained its focus on transactions where foreign entities would gain control of U.S. businesses, with particular attention to critical infrastructure and technologies with military applications.

The Foreign Investment Risk Review Modernization Act (FIRRMA), signed into law in August 2018, represented a significant expansion of CFIUS’s jurisdiction and powers, but would later prove to be just one step in an escalating series of policies aimed at restricting technology transfers through investment channels. FIRRMA was explicitly motivated by increasing concerns about Chinese investment in American technology firms and potential appropriation of sensitive intellectual property. The legislation fundamentally altered the scope of CFIUS review by expanding its reach beyond transactions resulting in foreign control to include minority investments that provided foreign investors with certain rights or access.

Specifically, FIRRMA empowered CFIUS to review transactions where a foreign investor gained: non-controlling equity interest; access to material nonpublic technical information; membership on a board of directors; or involvement in substantive decision-making regarding critical technology, critical infrastructure, or sensitive personal data of U.S. citizens. This expansion effectively brought venture capital investments by foreign entities within CFIUS’s purview, creating new considerations for the startup ecosystem.

A particularly significant aspect of FIRRMA was the introduction of a mandatory filing requirement for certain transactions. Under the mandatory filing program, transactions involving "critical technologies" in 27 specifically enumerated industries identified by their 6-digit NAICS codes required pre-closing permission from CFIUS. These industries were explicitly designated as

having national security importance and included sectors such as biotechnology, semiconductor manufacturing, telecommunications, and various defense-related manufacturing categories.

While FIRREA initially marked a watershed moment in U.S. investment screening policy, subsequent administrations have further expanded the scope and reach of these restrictions through additional policy initiatives. In August 2023, President Biden issued Executive Order 14105, establishing what has been colloquially termed "reverse CFIUS" or "outbound CFIUS" - a framework to screen not just inbound foreign investments into the U.S., but also outbound U.S. investments into countries of concern, particularly China, Hong Kong, and Macau. This executive order created notification requirements and prohibitions for U.S. persons investing in entities involved in semiconductors, quantum technologies, and certain AI systems in these countries, extending investment controls to the outflows of U.S. venture capital.

In March 2024, the U.S. Treasury Department finalized rules for implementing this outbound investment program, which officially took effect in January 2025. These regulations required U.S. investors, including venture capital funds, to notify the government of certain investments and prohibited others entirely, particularly those that might contribute to the advancement of sensitive technologies in countries of concern.

The second Trump administration has further built upon these restrictions with the announcement of an "America First Investment Policy", which has signaled an even more comprehensive approach to aligning capital flows with national security objectives. This initiative has established a broader range of "strategic" industries and has introduced additional compliance requirements for venture capital firms with both foreign investments and foreign limited partners.

These successive policy developments reflect an evolving treatment of investment as a key vector for technology transfer and a progressively more comprehensive approach to managing the national security implications of cross-border capital flows. What began with FIRREA, as primarily a focus on inbound minority investments, has expanded to a bidirectional framework that scrutinizes both inbound and outbound technology-related investments, significantly reshaping the landscape for venture capital in strategic sectors.

3.2 Foreign Investment Restrictions in Other Countries

The trend toward increased scrutiny of foreign investment for national security reasons reflects a global shift in regulatory approaches. Since 1995, more than 37 countries have adopted regulations centered on investment screening, including the US, Germany, Italy, Japan, and Canada (United Nations Conference on Trade and Development, 2023). In recent years, the pace of adoption has accelerated dramatically, with many regimes modeled after or influenced by the U.S. approach. In

particular, the set of potentially qualifying transactions has also expanded in scope, as seen with FIRMA and venture capital transactions.

The European Union enacted its framework for screening foreign direct investments in March 2019, shortly after FIRMA. While the EU framework does not replace national screening mechanisms, it establishes minimum standards, enables coordination across member states, and allows the European Commission to issue non-binding opinions on investments affecting multiple member states or EU interests. Unlike FIRMA, the EU framework is primarily a coordination mechanism, leaving implementation to individual member states.

Germany has significantly strengthened its foreign investment screening regime through amendments to the Foreign Trade and Payments Act. In May 2021, Germany expanded FDI screening to potentially include VC investment in high tech industries by lowering ownership threshold to 20%. "The thresholds for high tech industries and agriculture was lowered to 20%, with the obligation to notify the Federal Ministry for Economic Affairs and Energy also when 25, 40, 50 and 75% of voting rights are exceeded."² Similarly, the United Kingdom introduced a comprehensive National Security and Investment Act in 2021, creating mandatory notification requirements for investments in 17 sensitive sectors. Furthermore, the UK authorities can review transactions up to five years after completion, creating retroactive uncertainty similar to CFIUS's ability to review non-notified transactions.

Australia has progressively strengthened its Foreign Investment Review Board powers, with significant reforms in 2020 that created a national security test for investments in sensitive businesses or assets regardless of value. The Australian system now includes mandatory notification requirements and the power to "call in" non-notified transactions for review.

Canada has enhanced its Investment Canada Act to include national security provisions allowing for the review of investments of any size, including minority investments. In 2021, Canada announced a policy of enhanced scrutiny for investments by state-owned enterprises, particularly in critical minerals and supply chains.

This expansion of investment screening stands in contrast to most other venture capital policies and programs worldwide, which have historically focused on expanding investment and increasing the number of startups. The tension between these competing policy objectives-protecting sensitive technologies from foreign access while maintaining the dynamism of the venture capital ecosystem-provides the central analytical question for understanding the economic impact of these regimes.

²<https://investmentpolicy.unctad.org/investment-policy-monitor/asures/3699/germany-fdi-screening-expanded-over-high-tech>

4 Stylized Model

To analyze the economic implications of restrictions on foreign investment in innovative startups, we begin with a theoretical framework developed by Akcigit et al. (2024). Their model captures the key tensions between capital access and technology spillovers in an open economy setting where financing decisions play a crucial role.

The authors develop a step-by-step innovation model embedded in a dynamic, open-economy competition between two countries. In their framework, each country hosts incumbent firms and potential startup entrants across a continuum of industries. Incumbents from different countries differ in their labor productivity and engage in Bertrand competition. Potential startup entrants require financing to implement their ideas and replace domestic incumbents with more productive firms. When faced with financing constraints in their domestic markets, these startups may seek investment from foreign corporate investors.

Akcigit et al. (2024) identify both opportunities and challenges in cross-border venture financing. For startups, foreign investment provides necessary capital to implement innovative ideas that might otherwise remain unrealized. However, for the startup’s home country, this financing may lead to knowledge spillovers benefiting the foreign investor and potentially the foreign nation more broadly.

Their model incorporates several key mechanisms influencing equilibrium outcomes. When a foreign corporate investor finances a domestic startup, the investor gains both a share of future profits and knowledge benefits that help close technological gaps with the home country’s firms. The likelihood of such investment increases when technological gaps are wider, as foreign firms have stronger incentives to invest to catch up to the frontier. Additionally, the baseline rate of knowledge spillovers (occurring regardless of investment) affects the incremental benefit of investment-driven spillovers.

The authors’ framework allows policymakers in a technologically leading country to raise the cost of foreign corporate investments through regulatory barriers or taxes. If these costs are sufficiently high, they may eliminate venture investments by foreign corporations, potentially causing some innovative startups to remain unfunded. Importantly, the model recognizes that policymakers may consider both economic impacts on domestic firms and broader national security implications.

Akcigit et al. (2024) analyze several relevant scenarios through this framework. In industries where following incumbents lag far behind leaders, foreign corporations have stronger incentives to engage in cross-border investments, particularly benefiting from higher spillovers that help close technology gaps. As firms become more technologically similar, the probability of cross-border

investment approaches zero due to diminishing returns from spillovers.

The framework highlights important policy trade-offs. When evaluating optimal policy responses, the government in the technologically leading country must weigh several factors: benefits to domestic startups from increased capital access, potential knowledge spillovers eroding domestic technological advantages, and national security implications of technology transfer.

This theoretical model provides a structured way to think about empirical patterns observed in response to policies like FIRMA. It predicts that investment restrictions will have heterogeneous impacts across industries based on technological gaps, baseline spillover rates, and security implications. It can also help quantify the costs and benefits of restricting foreign investments (See Section 7). It is important to note that the model focuses on corporate venture capital (CVC). However, many restrictions, like FIRMA, apply more broadly to all VC investors. Knowledge spillovers are likely stronger for CVC investors than independent VC (IVC) investors, as the former are closer to product market and can more readily apply acquired knowledge. Moreover, the stylized model cannot capture all of the complex and dynamic considerations associated with cross border venture capital restrictions. In the next section we will walk through these other considerations and discuss the associated empirical evidence.

5 Benefits of Restricting Foreign VC Investments

5.1 Potential Benefits

Understanding the potential benefits of restricting foreign venture capital requires first examining why foreign investors engage in cross-border VC investing despite the relationship and location-based nature of venture capital.

Foreign VCs may invest abroad for several benign reasons: to diversify their portfolios against country-specific shocks, to access specialized talent or expertise, or to expand their investment opportunities beyond limited domestic options. However, two other motivations raise significant national security concerns. First, foreign investors may seek access to intellectual property that can benefit startups in their home country. Second, investors connected to state actors may pursue non-economic objectives driven by foreign policy goals rather than profit maximization. Critically, the startups receiving foreign investment often do not internalize these broader security externalities (Bian and Meier, 2020).

Foreign venture capital can create several specific national security risks. Most directly, foreign VC investors may facilitate intellectual property diffusion back to their home countries, enabling

technological leapfrogging in strategically important areas. These technologies could later be deployed directly in warfare or used as bargaining chips to extract military concessions. Other risks include foreign access to critical infrastructure or citizen data, creating vulnerabilities in essential systems; foreign influence over domestic technology development priorities; and potential manipulation of domestic populations through control of media or sensitive data. While these scenarios might seem far-fetched, U.S. government reports treat these possibilities as credible national security threats (Brown and Singh, 2018; U.S. House, Permanent Select Committee on Intelligence, 2018; U.S. Senate, Committee on Banking, Housing, and Urban Affairs, 2018).

5.2 Empirical Evidence on Benefits

Quantifying these security benefits is challenging, but a first step is examining whether foreign investments actually facilitate cross-border knowledge transfer. Akcigit et al. (2024) address this question by analyzing foreign corporate venture capital investments in U.S. startups between 1976 and 2015. Their findings reveal clear patterns of knowledge spillovers following these investments. After a foreign corporate investment in a U.S. startup, patenting activity in the same technology class increases significantly in the investor’s home country. These effects appear both in aggregate national patenting trends and in the investing firms themselves, which become more likely to cite the U.S. startup’s patents and to patent in related technological areas.

These spillovers are most pronounced when the investing country is technologically lagging in the startup’s domain, suggesting that countries strategically use foreign investment to catch up in areas where they lack expertise. The spillovers are also stronger when the startup’s innovations are general-purpose or foundational rather than narrowly applied. Notably, investments from Chinese entities were associated with particularly large post-investment increases in home-country patenting compared to investors from other nations.

Bian et al. (2024) use Bilateral Investment Treaties (BITs) as shocks to cross-border investments, particularly R&D-related investments such as venture capital, acquisitions in R&D-active sectors, and joint ventures and strategic alliances with a technology transfer purpose. They show that reducing frictions in these investments through BITs enhances innovation spillovers between the signatory countries. Following the signing of a BIT, the investor country becomes more likely to adopt the technology from the investee country, as measured by increased patenting of the same invention from the investee country in the investor country.³ The investor country is also more likely to source technology from the investee country, as evidenced by increased patent citations and

³Sequential patenting within a patent family represents a series of patents filed in different countries to protect the same invention. These patents share the same priority right and can be used to trace out the adoption of the same underlying invention in different countries (Eaton and Kortum, 1999; Lanjouw and Mody, 1996)

patent transfers originating from the investee country.

Paine (2025) provides complementary evidence in the biotechnology sector, one of the industries most affected by FIRRMA. By examining the correlation in development progress between U.S. and Chinese biotech startups working on similar therapies and funded by the same Chinese investors, she identifies measurable changes after FIRRMA’s implementation. Before FIRRMA, progress by U.S. startups was positively correlated with the development stage of Chinese startups in the same therapeutic areas with shared investors. After FIRRMA, this correlation declined, and Chinese startups showed increased lag behind their U.S. counterparts in the same drug category with the same Chinese investor.

The evidence suggests that tacit knowledge transfer occurs through board access, technical collaboration, and close observation of innovation processes. While these studies cannot definitively prove that foreign investment restrictions prevented technology transfer that would have harmed national security, they confirm that foreign investments serve as a channel for cross-border knowledge flows. These findings validate the potential security benefits of investment screening by establishing that the mechanisms these policies aim to regulate do indeed facilitate knowledge transfer across borders.

This evidence provides empirical grounding for the national security rationale behind foreign investment restrictions, demonstrating that concerns about technology transfer through foreign investment are supported by observable patterns in innovation and knowledge diffusion. Restricting certain foreign investments may therefore yield significant security benefits by preserving technological advantages in strategically important sectors, protecting sensitive data and infrastructure, and maintaining autonomy in technology development priorities.

6 Costs of Restricting Foreign VC Investments

6.1 Potential Costs

Restricting foreign venture capital may impose several potential costs on domestic innovation ecosystems. These potential costs stem from the specialized roles that foreign investors play in venture capital markets, which may become evident when their participation is constrained.

Capital shortfalls represent a primary potential cost of foreign investment restrictions. When foreign investors are excluded from venture markets, startups may face financial constraints if domestic sources cannot fully substitute the lost capital. This problem could be particularly acute if foreign investors fund different types of projects than domestic investors. Foreign investors may

have different risk preferences, potentially allowing them to finance higher-risk projects that might otherwise go unfunded. They may also have longer investment horizons, enabling support for technologies that require extended development timelines. Foreign VCs could also have lower cost of capital (due to, for example, different LP base), allowing them to finance projects that would be otherwise passed by domestic investors. Additionally, foreign investors often participate at specific stages in a startup’s lifecycle, such as providing seed capital that subsequently attracts domestic funding. In these cases, restricting foreign capital might create funding gaps that domestic capital cannot fully address (Kerr et al., 2014).

The loss of value-added services constitutes another potential significant cost. Venture capitalists provide more than just capital to their portfolio companies, offering advice, networks, monitoring, and professionalization services (Hellmann and Puri, 2002; Bottazzi et al., 2008; Bernstein et al., 2016). Foreign investors often contribute unique value through their international connections, which can be critical for startups seeking to expand globally. This is particularly evident in sectors like biotechnology, where access to international markets is crucial for growth. As noted in a 2019 Financial Times article, the chair of the Biotechnology Innovation Organization warned that investment slowdowns from FIRREA could hurt U.S. biotech companies’ ability to access the rapidly growing Chinese market (Hancock and Kuchler, 2019). Some U.S. venture capital firms explicitly advertise their international networks as a competitive advantage, highlighting the value these connections might bring to startups.

Syndication disruption represents a third major potential cost. Venture capital markets operate through complex networks of co-investment, with firms regularly partnering to share risk and pool expertise (Nanda and Rhodes-Kropf, 2019). When specific investors are excluded, these networks could be significantly disrupted. Cross-border investment partnerships often involve complementary capabilities, with foreign and domestic investors providing different expertise and market access (Hellmann et al., 2019). Their collaboration may create synergies that benefit portfolio companies beyond what either investor could provide independently. Restricting foreign investment might break these partnerships, potentially reducing both the quantity and quality of venture funding.

Potential declines in innovation represent a fourth potential cost. Investment restrictions could create increased financing risk—uncertainty about whether startups can secure follow-on funding rounds. When venture capitalists anticipate difficulty in raising subsequent capital for their portfolio companies, they often respond by becoming more conservative in their investment decisions, favoring safer projects with more predictable returns over highly innovative but uncertain ones (Nanda and Rhodes-Kropf, 2017). This shift in risk preferences could lead to systematic underinvestment in the most innovative startups and projects, particularly those pursuing novel or breakthrough technologies. Moreover, startups that lose funding might be forced to abandon promising research

projects, out-license their technologies at unfavorable terms, or sell to larger incumbents, potentially shifting innovation from entrepreneurial firms to more established companies with different innovation priorities.

Declines in innovation may also result from diminished knowledge spillovers from foreign investors, particularly when the investor’s country is technologically more advanced than that of the investee. This effect is especially pronounced for corporate venture capital (CVC) investors, who often possess valuable technological know-how that could benefit the startups they fund. More broadly, it is important to recognize that knowledge spillovers can be bidirectional—while limiting the transfer of knowledge from startups to investors may yield national security benefits, it can also reduce the learning opportunities available to startups from their investors.

6.2 Empirical Evidence on Costs

Paine (2025) provides empirical evidence on these potential costs by examining FIRMA’s implementation and its differential impact across industries. She documents that following FIRMA, Chinese venture capital firms funded approximately 39% fewer startups in U.S. treated industries compared to control industries. More importantly, this reduction in Chinese investment coincided with a broader 10% decrease in the total number of startups receiving venture funding in affected industries. This aggregate decline is particularly striking given that Chinese investors participated in only about 10% of investment rounds in these industries before FIRMA.

The magnitude of this effect reveals that the impact of FIRMA extended well beyond the direct loss of Chinese capital. Paine (2025) shows that reduced participation of Chinese investors was not offset by increased investment from other sources, challenging the conventional view that U.S. venture capital markets are sufficiently liquid that the loss of specific investors would have minimal aggregate effects. Instead, the findings indicate that the supply of capital in venture markets is not perfectly elastic, and policy-induced constraints can significantly reduce funding availability.

FIRMA’s effects rippled through domestic venture firms via disruption of syndication networks. U.S. domestic venture capital firms that had previously co-invested with Chinese investors reduced their investment in U.S. startups by approximately 29% compared to their investment outside the U.S. This effect was stronger for venture firms with more frequent Chinese co-investments, indicating that the strength of network ties influenced the magnitude of the spillover.

Paine (2025) identifies several mechanisms driving this syndication disruption. First, Chinese investors provided specific value-added services that were difficult to replace, particularly access to the Chinese market. U.S. biotech startups with Chinese investors were 22% more likely to register drug trials in China compared to startups without Chinese investment. The loss of this market

access capability reduced the attractiveness of certain investments to remaining U.S. investors.

Second, information asymmetry impeded startups' ability to find replacement investors. Startups that had previously raised funding from Chinese investors faced greater challenges in raising follow-on rounds after FIRRMA, particularly those that had gone longer since their last funding round. This suggests that the loss of previous investors created a negative signaling effect that was difficult to overcome (Ewens et al., 2016).

Following from the theoretical concerns about financing risk, Paine (2025) also finds empirical evidence of FIRRMA's negative impact on innovation outcomes. She documents that the average innovativeness of startups receiving first-round funding in treated industries declined after FIRRMA. Importantly, this decline cannot be attributed to the compositional effect of losing Chinese investment, as startups funded by Chinese investors were not systematically more or less innovative than those funded by other investors prior to FIRRMA.

The biotechnology industry case study in Paine (2025) illustrates these effects vividly. After FIRRMA, U.S. biotech startups that had previously raised funding from Chinese investors were more likely to suspend drug development projects or out-license them to other firms. This effect was strongest when the Chinese investor was the lead investor and more pronounced for riskier drug candidates (those in therapeutic categories with lower historical approval rates) and for startups that had not yet achieved any drug approvals.

In sum, while investment screening policies may yield security benefits, they impose substantial economic costs through reduced capital availability, disrupted syndication networks, and diminished innovation. These costs extend far beyond the direct impact on foreign investors to affect domestic venture firms, startups, and ultimately innovation outcomes in strategically important sectors.

7 Quantifying Benefits and Costs

A fundamental challenge in evaluating the overall welfare effects of foreign investment screening policies is the difficulty in quantifying national security benefits.

Unlike economic costs, which can be measured through changes in investment flows or innovation outputs, national security benefits are inherently difficult to observe and quantify. The prevention of technology transfer that could have military applications or compromise critical infrastructure creates value that is not easily captured in standard economic metrics. It is important to recognize that national security benefits may still be substantial even if they are difficult to quantify. Preventing the transfer of sensitive technologies that could be used for military purposes or surveillance capabilities may have significant value to national security that exceeds readily ob-

servable economic costs. Moreover, the deterrent effect of an investment screening regime may prevent problematic investment attempts that are never observed in the data. This creates an inherent asymmetry in our ability to measure costs versus benefits-economic costs are more readily observable than security benefits.

The analysis in Akcigit et al. (2024) suggests that investment screening policies like FIRMA could be welfare-enhancing if the security costs of knowledge spillovers are sufficiently high. Their calibration exercise indicates that optimal policy depends critically on the assumed magnitude of security externalities. When modeling a security cost equivalent to 2.3% of GDP (based on historical U.S. nuclear deterrence spending), their model suggests that raising barriers to foreign corporate investment could be optimal. However, with more modest security cost assumptions, the model recommends lowering barriers to allow more foreign investment, highlighting the sensitivity of policy recommendations to assumptions about difficult-to-measure security costs.

8 Design Considerations and Implementation Challenges

This section explores how different policy design choices affect the impact of cross-border venture capital restrictions. Understanding these nuances is crucial for creating investment screening frameworks that achieve security objectives while minimizing economic costs.

The "small yard, high fence" metaphor, popularized by former U.S. National Security Advisor Jake Sullivan, describes one conceptual framework for technology protection: applying stringent controls (the "high fence") to a limited set of technologies deemed critical (the "small yard"). This conceptual framework raises two fundamental implementation questions: How effectively can restrictions prevent intellectual property flows? And how precisely can policymakers target only the most security-sensitive sectors?

The first question acknowledges that investment restrictions represent just one potential channel for knowledge transfer. Technology can flow through multiple pathways—including talent migration, cyber espionage, academic collaboration, and legitimate business partnerships. Investment screening therefore works best as part of a comprehensive strategy that addresses multiple transfer vectors simultaneously, such as when combined with export controls on physical technologies.

The second question—defining the "yard"—presents even greater challenges in the current technological landscape. The traditional approach of focusing on technologies with clear military applications increasingly breaks down as innovations blur the boundaries between civilian and military domains. Technologies like artificial intelligence, quantum computing, advanced semiconductors, and autonomous systems fundamentally differ from historical military technologies like nuclear

weapons or specialized radar systems that remained relatively isolated from civilian applications.

Today's most strategically important technologies are deeply integrated throughout the civilian economy. The same AI algorithms powering consumer applications simultaneously enable next-generation weapons systems. Drone technologies transforming agriculture and logistics also revolutionize battlefield surveillance. When the underlying research methodologies, talent pools, and development approaches are identical across domains, attempting to isolate only "military applications" may prove futile.

This dual-use characteristic creates a profound policy dilemma: comprehensive restrictions across entire technological categories risk significantly impeding innovation in critical sectors of the broader economy, while narrower approaches may miss crucial security vulnerabilities. Akcigit et al. (2024) find that knowledge spillover effects are typically stronger in more fundamental and general-purpose technologies—precisely those with the broadest economic benefits and the greatest potential for dual-use applications.

The unpredictable nature of innovation further complicates boundary-setting. Breakthroughs often emerge from unexpected directions and through recombination of seemingly unrelated technologies. Computer vision systems developed for retail applications might later prove crucial for missile guidance. This unpredictability means that attempts to create a "small yard" risk either being too narrow (missing emerging threats) or too broad (unnecessarily constraining innovation).

These complexities explain why cost-benefit analysis in this domain is inherently challenging. In critical sectors, both the security costs of allowing foreign investment and the innovation benefits of international capital and knowledge flows may be substantial. The optimal approach likely requires moving beyond static definitions of restricted technologies toward more dynamic frameworks that consider specific applications, end-users, and potential for rapid repurposing.

The political economy of designating protected industries further complicates implementation. The inherent difficulty in quantifying national security benefits creates an environment susceptible to special interest influence. Industries may lobby for inclusion under the "national security" umbrella to shield themselves from foreign competition rather than address legitimate security concerns. Conversely, sectors with genuine security implications but powerful globalized firms may resist restrictions that limit their access to international capital or markets. The opacity of security justifications makes distinguishing between legitimate protection and regulatory capture particularly challenging for outside observers, potentially undermining the legitimacy of the entire framework. This dynamic may lead to overextension of restrictions beyond what security considerations alone would warrant, increasing economic costs without commensurate security benefits.

Beyond sector selection, effective policy design must also consider investor heterogeneity. Ide-

ally, restrictions would target only investors with technology appropriation motives while allowing beneficial investment to continue. Akcigit et al. (2024) find that investments by Chinese firms are associated with two-to-three times more spillovers than the average corporate venture capital investment in their sample, suggesting meaningful variation in investor behavior and/or intent. As Paine (2025) discusses, policymakers must also consider the roles that specific foreign investors play in the venture ecosystem and whether domestic capital can readily substitute for restricted foreign investment.

The structure of venture capital raises additional implementation questions. Current policies primarily target general partners (GPs) rather than limited partners (LPs), reflecting the direct access to technical information that GPs typically receive. This approach recognizes the different roles of capital providers in the venture ecosystem, though it also creates potential circumvention paths that require monitoring.

Timing considerations also matter significantly. Akcigit et al. (2024) demonstrate that restrictions are most beneficial when implemented when technological gaps between countries are moderate—large enough that spillovers would meaningfully accelerate catch-up, but not so large that leapfrogging is impossible. When countries are technological peers, restrictions provide limited security benefits while still imposing innovation costs.

Finally, restricting foreign investments may not impede the technological advancement of foreign adversaries if they can redirect those investments to other technologically advanced countries or reinvest them domestically to promote innovation at home. As such, coordination with allied countries and a multilateral approach may be important for the effectiveness of investment screening policies.

The effectiveness of investment screening ultimately depends on implementation within a comprehensive framework addressing multiple knowledge transfer vectors. Beyond venture capital, knowledge flows through human capital mobility, research collaboration, and various forms of corporate partnership. A coherent approach requires complementary policies addressing these parallel channels, which we discuss in the next section.

9 Alternative and Complementary Policies

Investment screening policies like FIRREA represent one approach within a broader set of tools addressing national security concerns related to foreign investments in startups. As the previous sections have demonstrated, these restrictions are associated with certain costs to innovation ecosystems. This raises an important question: What alternative or complementary approaches exist, and

how do they interact with investment screening? This section explores several such approaches and their relationship to investment screening frameworks.

The effectiveness of investment screening depends on addressing knowledge flows through multiple channels. If foreign actors can access sensitive technologies through alternative means, the benefits of investment restrictions may be undermined. Conversely, well-designed complementary policies could potentially allow for a more targeted investment screening approach—the "small yard, high fence" metaphor discussed above—by addressing security concerns through other mechanisms.

Allowing foreign investments with mitigation measures. In some cases, rather than blocking foreign investment entirely, countries could implement measures that allow beneficial capital flows while mitigating national security risks. These "middle path" approaches would represent a more nuanced alternative to binary permit-or-prohibit decisions on foreign investment. Mitigation measures might include limitations on access to certain technologies or information, governance provisions, third-party monitoring, or reporting requirements.⁴ However, implementing these measures effectively requires sophisticated regulatory frameworks, technical expertise, and enforcement capabilities that many countries may lack, and the compliance burden could deter both startups and investors, potentially undermining the intended balance between security and economic benefits.

Subsidizing affected industries. Complementary policies to ensure adequate capital for sensitive industries could offset the funding gaps created by foreign investment screening. These might include expanded public funding for early-stage research, incentives for domestic investors, or public-private investment vehicles with appropriate security safeguards. However, as the Kateeva example illustrates, these approaches face significant implementation challenges that limit their effectiveness as substitutes for private foreign investment.

Based on an extensive review of government interventions in entrepreneurial finance across countries and decades, Lerner (2009) concludes that "for each effective government intervention, there have been dozens, even hundreds, of failures, where substantial public expenditure bore no fruit." His historical assessment attributes these persistent failures to three primary causes: fundamental misunderstandings of entrepreneurial dynamics by policymakers, bureaucratic constraints that impede nimble decision-making, and political capture that diverts resources toward well-connected firms rather than the most innovative ones.

The Defense Innovation Unit (DIU) experience, documented by Shah and Kirchhoff (2024), exemplifies these challenges within the national security context. Despite its mission to function

⁴Part of CFIUS's role in the U.S. is negotiating mitigation terms for potential transactions (Paine, 2025). Country-level treaties such as Bilateral Investment Treaties (BITs) and Trade-Related Aspects of Intellectual Property Rights (TRIPS) can also stipulate conditions regarding intellectual property rights (Bian et al., 2024; Boie, 2010; Andrenelli et al., 2019).

like a venture capital firm for defense innovation, DIU encountered persistent obstacles including institutional resistance to commercial technologies, the "valley of death" between prototypes and procurement, and budgeting processes misaligned with the rapid pace of technological change.

These institutional barriers are particularly problematic because domestic funding programs typically cannot replicate the specialized knowledge and market access that foreign investors provide—particularly in sectors like biotechnology where international clinical trials and market entry strategies are vital. As mentioned in our discussion of the costs of restricting foreign investment, Paine (2025) showed that Chinese investors significantly increased U.S. biotech startups' likelihood of conducting clinical trials in China, providing value that domestic capital sources could not easily replace.

Simply expanding general innovation funding without addressing the structural obstacles to its effective deployment may fail to counterbalance the effects of foreign investment screening. Effective subsidization requires not just capital but fundamental reforms to governance structures that preserve the benefits of private market discipline while addressing legitimate security concerns—a challenge that has proven stubbornly resistant to policy solutions.

Screening outbound investments. Building on the outbound investment screening framework introduced in our discussion of recent policy developments, these "reverse CFIUS" mechanisms represent another complementary approach to managing technology transfer concerns. While the inbound screening policies like FIRRMA focus on preventing foreign access to domestic innovation, outbound investment controls address the parallel risk of domestic capital facilitating technological advancement in countries of concern.

The implementation of Executive Order 14105 offers both opportunities and challenges as a complement to inbound investment screening. By targeting specific technology categories—semiconductors, quantum computing, and artificial intelligence—this approach demonstrates greater precision than some broader inbound restrictions. This targeted structure may better approximate the "small yard, high fence" ideal discussed earlier, focusing only on technologies with the clearest national security implications while allowing continued capital flows in other sectors.

However, outbound investment screening faces its own implementation challenges. First, effective enforcement requires complex determinations about whether investments contribute to the development of restricted technologies. Second, unilateral restrictions may simply shift capital flows through third countries or alternative investment structures unless coordinated with allies. Third, limiting outbound investment reduces opportunities for domestic investors to diversify portfolios and may diminish returns for U.S. pension funds and other institutional investors with technology exposure.

Limiting knowledge flows through human capital mobility. The movement of skilled personnel represents one of the most significant channels for knowledge transfer across national boundaries. If knowledge flows freely across borders through human capital mobility, restricting foreign capital investment will have little benefit. Unlike codified information in patents or technical documents, tacit knowledge carried by employees is difficult to monitor and control through traditional intellectual property protections.

Foreign talent screening has emerged as a key approach to managing knowledge flows through employee and researcher movement. These programs involve enhanced vetting processes for individuals working in strategic technology sectors, particularly when they have connections to countries identified as competitors or security concerns.

The United States has been particularly active in developing these mechanisms. In 2019, the Department of Energy prohibited employees and grantees from participating in foreign talent recruitment programs sponsored by designated "countries of concern." This policy directly targeted programs like China's Thousand Talents Plan, which had successfully recruited leading scientists to share expertise with Chinese institutions while maintaining their positions at American research organizations.

Academic institutions have implemented complementary measures. Major research universities have established review processes for international research collaborations, especially in fields like artificial intelligence, quantum computing, and biotechnology. These reviews typically assess knowledge transfer risks and may impose conditions on collaborative activities or deny particularly sensitive collaborations entirely.

These screening programs face significant challenges: differentiating between legitimate collaboration and concerning technology transfer; ensuring consistent enforcement across diverse organizations; and avoiding discrimination based solely on nationality while focusing on specific behaviors and affiliations that pose actual risks. Despite these difficulties, as geopolitical competition for technological advantage intensifies, foreign talent screening will likely remain a crucial component of national security strategies.

Limiting ability to use knowledge flows. Finally, rather than solely focusing on preventing knowledge transfer, policymakers can implement strategies that target the crucial inputs needed to operationalize such knowledge. This approach—exemplified by nuclear non-proliferation treaties that restrict access to enrichment technology rather than nuclear physics knowledge—acknowledges that information often flows despite barriers. Recent semiconductor export controls represent a modern application of this principle, as they aim to constrain China's AI advancement not by limiting AI research knowledge but by restricting access to the advanced chips necessary to implement

cutting-edge AI systems at scale.

However, the effectiveness of these types of policies is frequently limited by design loopholes or undermined by unintended consequences. For example, the unilateral nature of the semiconductor controls—implemented without coordination with allied countries—allowed those allies to supply similar goods to China in record quantities (Schleich and Denamiel, 2024).⁵ Studying the same policy, Crosignani et al. (2024) show that chip export controls impose significant costs on domestic firms, which struggled to establish new relationships with alternative customers after halting sales to Chinese buyers. As a result, these firms experienced declines in profitability, employment, and market value.

Moreover, restricting innovation inputs to adversarial countries can backfire by motivating them to re-innovate, potentially resulting in superior technologies. Prior research has shown that resource scarcity can foster innovation (Acemoglu, 2010; Hoegl et al., 2008; Almeida et al., 2013). A notable example is DeepSeek, a GPT-4-level model developed in China at a significantly lower cost. DeepSeek exploited regulatory loopholes, including importing chips that matched U.S. performance thresholds, chip smuggling, and stockpiling during periods of delayed regulatory updates (Tucker and Franke, 2025). Limited access to cutting-edge chips also compelled the startup to innovate around these constraints, leading to the development of more efficient and customized solutions from the ground up (Villasenor, 2024; Mercer et al., 2025).

Supporting this view, Liu et al. (2024) study an earlier U.S. policy—commonly referred to as the “China Rule” of 2007—which restricted Chinese imports of products with military end-uses. While they find a significant and lasting decrease in such imports, indicating the policy’s effectiveness, affected firms also exhibited signs of adaptation: they were more likely to invest in R&D and more likely to hold patents.

10 Directions for Future Research

Our analysis highlights several promising avenues for future research on foreign investment restrictions in innovative startups.

Perhaps most urgent is the need for longitudinal studies examining how the innovation ecosystem adapts to these restrictions over time. While initial evidence suggests significant disruption to capital flows and syndication networks, these effects may evolve as markets adjust, alternative financing sources emerge, or new circumvention strategies develop. Understanding these dynamic

⁵Some of these loopholes were addressed in early 2025 through new restrictions on third-country purchases of advanced U.S. chips.

responses would provide crucial insights for policymakers seeking to balance security and innovation.

Comparative analysis across different national contexts represents another vital research direction. As countries beyond the U.S. implement similar policies, natural experiments will emerge allowing researchers to evaluate how these restrictions function in environments with different venture capital market depths, innovation capabilities, and geopolitical positions. The consequences of investment restrictions may vary dramatically between established innovation hubs and emerging ecosystems dependent on foreign capital.

Research should also explore the global spillover effects of these policies. How do restrictions in one country affect global innovation networks? Do they create competitive advantages for "neutral" third countries not subject to restrictions? Does entrepreneurial talent relocate to avoid restrictive environments? These questions address the broader implications for global innovation rather than just effects within implementing countries.

A methodological priority remains developing better approaches to quantify knowledge spillovers and national security externalities. Current research relies heavily on patent citations and documented technological progress, but these metrics capture only a fraction of potential knowledge transfers. More sophisticated measurement approaches would enable more precise cost-benefit analyses of investment screening policies.

Finally, future research should examine the interaction between different policy tools aimed at controlling knowledge flows. Investment restrictions represent just one mechanism among many, including export controls, talent mobility restrictions, and research collaboration guidelines. Understanding how these different policy levers act as complements or substitutes would help policymakers develop more coherent and effective technology security frameworks.

These research directions would substantially enhance our understanding of how countries can protect legitimate security interests while preserving the benefits of global capital flows and knowledge sharing that have historically accelerated innovation.

11 Conclusion

The global shift toward restricting foreign investments in startups represents a significant recalibration of the traditional relationship between innovation policy and national security considerations. The latest research reveals that while these restrictions may yield important security benefits by limiting knowledge spillovers to strategic competitors, they also impose substantial costs on domestic innovation ecosystems through reduced capital availability, disrupted syndication networks, and potentially diminished innovation.

The empirical evidence indicates that foreign venture capital investments—particularly those from corporate investors—do facilitate measurable knowledge transfers across borders. These spillovers are especially pronounced when the investing country is technologically lagging in the relevant domain, suggesting strategic motivations behind certain cross-border investments. At the same time, the implementation of policies like FIRREA has led to significant decreases in overall startup funding in affected industries, extending well beyond the direct loss of foreign capital.

These findings highlight the complex tradeoffs involved in investment screening frameworks. The “small yard, high fence” concept discussed by some policymakers involves considerations regarding which technologies might warrant closer scrutiny, the extent of potential restrictions, and the relationship between investment screening and other policy frameworks. Alternatives such as mitigation measures, domestic funding subsidies, and coordinated approaches to limiting knowledge flows through other channels all merit further research and analysis.

As geopolitical competition for technological leadership intensifies, investment screening policies have become an increasingly common element in national security frameworks worldwide. The relationship between protecting security interests and maintaining the benefits of global capital flows that have historically accelerated innovation involves complex tradeoffs. Future research examining these tradeoffs and enhancing our understanding of how cross-border investment shapes technological development will continue to be valuable in an increasingly interconnected yet competitive global economy.

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