

The Commercial-National Security Dilemma

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Global TechnoPolitics Forum

THE COMMERCIAL-NATIONAL SECURITY DILEMMA

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FOREWORD

Few tensions in national security policy are as persistent, or as consequential, as the one at the heart of this timely study: how to strike a balance between the imperatives of national security and the dynamism of commercial innovation. It is a question I have grappled with for decades as an analyst, a practitioner, and a teacher. And it is precisely the question that Lennart’s research addresses with clarity, rigor, and relevance.

At first glance, the so-called “Commercial–National Security Dilemma” might seem abstract—perhaps another policy paradox to be debated in think tank corridors. But as this paper shows, the dilemma is intensely real. From the satellites that peer down from orbit to the artificial intelligence tools that are reshaping our economies, the technologies that promise to drive prosperity are the same technologies that adversaries could exploit to challenge our interests. The stakes could not be higher: mismanaging this tension means either stifling the vitality of American industry or compromising our collective security.

What makes this research stand out is not just the lucidity with which it traces the history of the satellite remote sensing sector—a quintessential example of a dual-use arena—but the careful, evidence-based framework it offers for thinking ahead. Rather than repeating tired arguments about trade-offs, Lennart invites us to consider this dilemma as a **positive-sum challenge**: one that can be addressed through smart incentives, flexible governance, and an appreciation of the sector-specific context.

From my own vantage point in the intelligence community, I have seen firsthand how vital it is to avoid reflexively overclassifying or overcontrolling technology. Doing so too often alienates the very innovators whose breakthroughs we need. I have also seen how leveraging commercial capabilities—when done thoughtfully—can strengthen our security and economic position alike. The case study of the evolving U.S. licensing and export regime for satellite imagery is a testament to what can happen when policy starts to get that balance right.

Yet as this paper wisely reminds us, the path ahead is no simple blueprint. Each dual-use sector comes with its own history, its own political economy, and its own vulnerabilities. The recommendations offered here—grounded in evidence but alive to nuance—are a valuable guide for policymakers grappling with the next frontier, whether that be artificial intelligence, quantum computing, or technologies we can scarcely yet imagine.

This is an important, practical, and forward-looking piece of research. It deserves to be read not only by academics and industry leaders but by those making the difficult decisions that shape our future security and prosperity. I commend Lennart for an outstanding contribution to this vital debate.

Gregory F. Treverton
Chairman
Global TechnoPolitics Forum

EXECUTIVE SUMMARY

The integration of commercial capabilities in space intelligence gathering has become increasingly central to national security, spurred by technological advances and mounting geopolitical competition. The U.S. Space Force's Commercial Space Strategy emphasizes the importance of incorporating private sector assets into the Department of Defense (DoD) infrastructure to create a "hybrid space architecture." This structure, integrating government and commercial systems, aims to strengthen U.S. capabilities through resilient, diversified, and responsive satellite operations, particularly in response to escalating threats from China and Russia. In tandem, the U.S. Intelligence Community (IC) is fostering partnerships with commercial providers, such as Maxar and Amazon Web Services, to streamline data processing and enhance AI-driven analysis.

As part of this shift, programs like the Space Force's Commercial Augmentation Space Reserve (CASR) establish frameworks for private companies to support government missions in emergencies, similar to the Civil Reserve Air Fleet for air transport. CASR's framework includes heightened interoperability and risk management principles to support the complex, high-risk responsibilities that private sector partners would bear during conflicts, while simultaneously enhancing peacetime collaboration. This public-private collaboration also extends to data-sharing initiatives to provide real-time intelligence support for military and intelligence operations, as seen with the National Geospatial-Intelligence Agency's Luno A program, which contracts commercial analytic capabilities.

The Space Force's four Lines of Effort—Collaborative Transparency, Operational and Technical Integration, Risk Management, and Securing the Future—are designed to address the key challenges of integrating private sector assets. This framework is essential for an adaptable space strategy, where a mix of government and commercial solutions is required for speed, resilience, and sustainability. The government's transition from a "product-based" approach to a "service-based" model represents an effort to dynamically access and scale commercial innovation. The DoD's recent integration strategy categorizes mission areas

based on commercial involvement and recommends adaptable contract models, such as subscription services and pay-as-you-go frameworks, for efficient access to data.

Strategically, integrating commercial capabilities fosters resilience and accelerates innovation, but risks persist around foreign influence and data security. This is a concern as commercial capabilities increasingly mirror government assets in capability and criticality, with Chinese companies aggressively pursuing similar commercial capabilities under state-backed integration policies. Thus, while the U.S. government maintains a close collaboration with private space providers, oversight remains essential to prevent overreliance and protect against foreign manipulation.

Overall, the IC and DoD's efforts to streamline the delivery of commercial satellite imagery, as with the forthcoming Joint Mission Management Center by the NGA and Space Force, signify a move towards improved data transparency and efficiency. This also addresses the need for open-source intelligence (OSINT) capabilities, increasingly relevant as private satellite data becomes indispensable in conflicts like the Ukraine war. The success of this hybrid architecture rests on balancing innovation, interoperability, and oversight to secure American leadership in the competitive space domain.

Pari Esfandiari
President
Global TechnoPolitics Forum

INTRODUCTION

“Buy what we can, build what we must.”¹ This is how Chris Scolese, director of the National Reconnaissance Office (NRO), described the intelligence agency’s procurement strategy with respect to commercial capabilities. A growing reliance on the commercial sector to aid national security is not exclusive to the space sector, but also evident across the entire national security apparatus.² As a result, dual-use items, which consist of “a broad spectrum of products, services, and technologies capable of serving both civilian and military purposes,” rise in significance for both commercial and national security stakeholders.³ While stakeholders from both camps benefit from commercialization, the heightened focus on dual-use items also underscores a key point of contention among stakeholders that is particularly evident in the policy-making process.

Attempts at developing policies that regulate the commercial trade of dual-use items face an inherent dilemma. On one hand, the government has a vested interest in potential military and security applications of these items. This pertains not only to the incorporation of dual-use items into its own security infrastructure, but also to preventing adversaries from obtaining these capabilities. To address both concerns, the U.S. government has traditionally resorted to restrictive policies vis-à-vis commercial trade with dual-use items, such as rigorous licensing requirements or export controls.⁴

¹ C. Todd Lopez, “National Reconnaissance Office Looks for More Commercial Services,” *DOD News*, August 4, 2022, <https://www.defense.gov/News/News-Stories/Article/Article/3117445/national-reconnaissance-office-looks-for-more-commercial-services/>.

² “The Evolving Role of the Private Sector in Protecting Our National Security,” FTI Consulting, September 11, 2024, <https://www.fticonsulting.com/insights/articles/evolving-role-private-sector-protecting-our-national-security>; Jaspreet Gill, “DOD Releases New AI Adoption Strategy, Building on Industry Advancements,” *Breaking Defense*, November 1, 2023, <https://breakingdefense.com/2023/11/dod-releases-new-ai-adoption-strategy-building-on-industry-advancements/>.

³ Alexandr Svetlicinii and Xueji Su, “The Unsettled Governance of the Dual-Use Items under Article XXI(b)(ii) GATT: A New Battleground for WTO Security Exceptions,” *World Trade Review* (2024): 1. <https://doi.org/10.1017/S147474562400048X>.

⁴ Arvind Parkhe, “U.S. National Security Export Controls: Implications for Global Competitiveness of U.S. High-Tech Firms,” *Strategic Management Journal* 13, no. 1 (1992): 62, <https://www.jstor.org/stable/2486610>; Belay Seyoum, “Export Controls and International Business: A Study with Special Emphasis on Dual-Use Export Controls and Their Impact on Firms in the US,” *Journal of Economic Issues* 51, no. 1 (2017): 67, <https://doi.org/10.1080/00213624.2017.1287483>.

On the other hand, commercial stakeholders inherently seek to maximize profits through the commercial trade of dual-use items. The limitations imposed by the U.S. government obstruct a commercial provider's ability to compete with foreign firms that may not be subject to similar restrictions. Therefore, commercial stakeholders are deeply invested in minimizing restrictions on their potential to compete. Decision-makers, including policy-makers and public administrators, must balance the concerns of both commercial and national security stakeholders when regulating a dual-use sector. This fundamental conflict between commercial competitiveness and national security constitutes what can be referred to as the Commercial-National Security (Com-NatSec) Dilemma.

The satellite remote sensing (SRS) sector is a quintessential dual-use sector, where the growing commercialization has exacerbated the Com-NatSec Dilemma. The observation of earth from space has a multitude of applications in both the civilian and military realm. From monitoring agriculture and natural disasters to facilitating urban planning and mining, commercial SRS providers supply a wide variety of civilian consumers with valuable remote sensing data.⁵ Likewise, national security agencies have a tactical and strategic interest in SRS, with functions ranging from tracking troop movements to analyzing infrastructure and resource management of adversaries.⁶

The first remote sensing satellites were exclusively operated by the government, employing most of their capabilities for national security purposes. When lawmakers opened the SRS sector to private industry in 1984, national security was prioritized through strict regulations, destabilizing the balance of the Com-NatSec Dilemma. This aligns with broader trends identified by the academic literature, which is in agreement that U.S. decision-makers have favored national security across most dual-use sectors.⁷ Moreover,

⁵ Oleg Dubovik et al., "Grand Challenges in Satellite Remote Sensing," *Frontiers in Remote Sensing* 2 (2021): 1, <https://doi.org/10.3389/frsen.2021.619818>.

⁶ Todd Harrison and Matthew Strohmeier, *Commercial Space Remote Sensing and Its Role in National Security* (Washington, DC: Center for Strategic and International Studies, February 2, 2022), 2-3, <https://www.csis.org/analysis/commercial-space-remote-sensing-and-its-role-national-security>.

⁷ Parkhe, "U.S. National Security Export Controls," 62; Seyoum, "Export Controls and International Business," 67.

there is a consensus among scholars that disincentive-based policy measures, such as strict export controls, must be amended or repealed to restore a balance.⁸

Nonetheless, the literature does not provide a sustainable framework for crafting a policy regime that resolves the Com-NatSec Dilemma. Therefore, this paper will endeavor to formulate recommendations that allow decision-makers to navigate the Com-NatSec Dilemma with respect to any dual-use sector. Here, the governance of the SRS sector will serve as a case study. Despite the historical prioritization of national security over commercial competitiveness regarding SRS, a recent shift in policy-making and regulatory practice indicates a more balanced approach to the Com-NatSec Dilemma.

This paper argues that the current regulatory regime governing SRS in the U.S. provides a blueprint for an effective and sustainable management of the Com-NatSec Dilemma for other dual-use sectors. By applying a regulatory trade-offs framework and conducting a policy analysis, this paper will analyze three key policy measures incorporated into the SRS regulatory regime and scrutinize subsequent implications for commercial competitiveness and national security. The results reveal that an effective dual-use regulatory regime perceives the Com-NatSec Dilemma as a positive-sum game, where both commercial and national security interests can be promoted simultaneously. Moreover, the results demonstrate how the implementation of incentive-based policy measures is a key element of a robust dual-use regulatory regime.

To develop practical recommendations for other dual-use sectors, the paper is structured as follows. First, a literature review situates the paper in the wider academic discourse and ascertains the ideal characteristics of a dual-use regulatory regime. Second, the regulatory trade-offs framework is introduced, accompanied by a methodology section that discusses the details of the policy analysis as well as potential limitations. Third, a brief segment outlines the historical context of SRS legislation before the following section presents the results of the policy analysis. Fourth, the paper discusses the implications of the findings and poses three recommendations for the governance of other dual-use

⁸ Nathan E. Clark, "Blurred Lines: Multi-Use Dynamics for Satellite Remote Sensing," *Journal of International Humanitarian Legal Studies* 10, no. 1 (2019): 181-82, <https://doi.org/10.1163/18781527-01001003>; Parkhe, "U.S. National Security Export Controls," 62; Seyoum, "Export Controls and International Business," 67.

sectors. Subsequently, the artificial intelligence (AI) sector exemplifies how these recommendations may be applied in practice. Finally, a concluding section provides a brief summary of the paper and highlights avenues for future research.

LITERATURE REVIEW

Various scholars have explored different iterations of the Com-NatSec Dilemma. While each iteration has its own distinct nuances, they are fundamentally rooted in the foundational conflict between national security and commercial competitiveness. This core tension is observed by Todd Harrison & Matthew Strohmeyer, who highlight the significance of “balancing the need to protect national security interests with the desire to promote a more competitive commercial sector.”⁹ According to Harrison & Strohmeyer, a competitive advantage over adversarial countries in the commercial realm is vital since it gives the U.S. government regulatory control over cutting-edge commercial capabilities. However, corresponding policy measures should not compromise other national security interests.¹⁰ Additionally, Nathan Clark identifies a similar fundamental conflict, which he refers to as “the classic dual-use dilemma.”¹¹ Notably, Clark contends that increased lobbying efforts by commercial interests, brought about by a global trend to commercialize dual-use items, have amplified this dilemma.¹²

Building on this general notion, Belay Seyoum employs a “Bureaucratic Politics Model,” which highlights the diverging priorities of the numerous stakeholders that shape the policy efforts addressing the Com-NatSec Dilemma.¹³ In the case of SRS, such a perspective is particularly useful to illustrate the complexity of the policymaking process, attributable to the substantial number of stakeholders involved.¹⁴ In contrast to the majority of the literature examining the Com-NatSec Dilemma, John Goehring moves away from a polarized approach to the Dilemma by adding a third dimension. Goehring’s “rule of three” lays out three key goals that a commercial dual-use policy regime must address to be effective: the promotion of industry growth, the preservation of national security, and the satisfaction of

⁹ Harrison and Strohmeyer, *Commercial Space Remote Sensing*, 7.

¹⁰ Harrison and Strohmeyer, *Commercial Space Remote Sensing*, 7.

¹¹ Clark, “Blurred Lines,” 180.

¹² Clark, “Blurred Lines,” 181.

¹³ Seyoum, “Export Controls and International Business,” 53.

¹⁴ Kevin M. O’Connell et al., *U.S. Commercial Remote Sensing Satellite Industry: An Analysis of Risks* (Santa Monica, CA: RAND, 2001), 69-71, https://www.rand.org/pubs/monograph_reports/MR1469.html.

international obligations.¹⁵ What is significant about Goehring's approach is not the addition of a third dimension but rather the fundamental assumption that the interplay between the policy goals is not a zero-sum game. Notwithstanding this perspective that commercial competitiveness and national security can be advanced concurrently, Goehring recognizes the necessity of achieving an optimal balance between these two policy objectives.¹⁶

Irrespective of the diverging approaches to the Com-NatSec Dilemma, the central question of how to accomplish this optimal equilibrium persists throughout the academic discourse. The overwhelming majority of the literature proposes the prioritization of commercial competitiveness over national security concerns in order to establish an effective policy regime for dual-use items. Arvind Parkhe argues that a historically disproportionate emphasis on military security in the regulation of commercial dual-use items has harmed the "economic vigor" of the U.S.¹⁷ Although Seyoum asserts that national security should generally carry more weight than commercial competitiveness in policy discussions, he concurs with Parkhe, observing that export controls on dual-use items for national security purposes have been consistently too restrictive.¹⁸ Similarly, Yahya Dehqanzada and Ann Florini conclude that a more transparent, pro-commercial-freedom approach will yield greater long-term benefits for the U.S. than restrictive policies.¹⁹

Furthermore, various studies of the U.S. policy regime governing the commercial SRS sector imply that commercial competitiveness must be prioritized to effectively address the Com-NatSec Dilemma. In his article discussing the dual-use nature of commercial SRS, Clark crucially highlights how restrictions on commercial providers are progressively less effective in maintaining national security due to the ever-growing amount of data available to the global public.²⁰ In addition to this escalating ineffectiveness, Clinton Long draws attention to

¹⁵ John S. Goehring, "U.S. Commercial Space Regulation: The Rule of Three," *Journal of National Security Law & Policy* 13, no. 2 (2022): 337, <http://dx.doi.org/10.2139/ssrn.4206074>.

¹⁶ Goehring, "U.S. Commercial Space Regulation," 353.

¹⁷ Parkhe, "U.S. National Security Export Controls," 62.

¹⁸ Seyoum, "Export Controls and International Business," 67.

¹⁹ Yahya Dehqanzada and Ann Florini, *Secrets for Sale: How Commercial Satellite Imagery Will Change the World* (Washington, DC: Carnegie Endowment for International Peace, March 1, 2000), 33-34, <https://carnegieendowment.org/research/2000/03/secrets-for-sale-how-commercial-satellite-imagery-will-change-the-world?lang=en>.

²⁰ Clark, "Blurred Lines," 181-182.

the recent decline of American dominance in the space sector, which is rooted in a restrictive export control regime.²¹ Similar to scholars examining policies that govern commercial dual-use items in general, these more nuanced inquiries into the commercial SRS sector have also found a disproportionate emphasis on national security, which destabilizes the delicate balance required to manage the Com-NatSec Dilemma.

While the literature has reached a consensus that commercial competitiveness must be prioritized vis-à-vis national security, there is a more lively debate regarding the appropriate policy measures for this purpose. Parkhe proposes to streamline the export control regime by building “higher walls around fewer items.”²² This approach would maintain restrictions on the items most critical to national security while limiting the number of obstacles for a significant portion of commercial providers. Building on this, Kuttner advocates for a complete overhaul of the export control regime of dual-use items. In addition to enhanced restrictions on a reduced number of items, Kuttner underscores the necessity of a more centralized structure to improve the efficacy of export controls.²³ In the U.S., authority over export controls is split between various civilian and non-civilian agencies, which augments the complexity of the web of trade-offs decision-makers must navigate when contemplating export controls for dual-use items. According to Kuttner, besides this restructuring of the export control regime, the export restrictions that remain must be extended to “all prospective exporters” in order to achieve an equilibrium between commercial competitiveness and national security.²⁴

In fact, a substantial part of the literature perceives a multilateral harmonization of export controls as a viable solution to the Com-NatSec Dilemma. In their examination of the potential of the commercial SRS sector, Dehqanzada and Florini find that any unilateral export restriction becomes ineffective as soon as a provider from another country offers a similar product or service.²⁵ Correspondingly, Seyoum urges enhancing bi- and multilateral

²¹ Clinton Long, “An Imperfect Balance: ITAR Exemptions, National Security, and U.S. Competitiveness,” *National Security Law Journal* 2, no. 1 (2013): 52-53, https://www.nslj.org/pdfs/2_NatSecLJ_43-64_Long.pdf.

²² Parkhe, “U.S. National Security Export Controls,” 63.

²³ Robert Kuttner, “How ‘National Security’ Hurts National Competitiveness,” *Harvard Business Review*, January-February 1991, <https://hbr.org/1991/01/how-national-security-hurts-national-competitiveness>.

²⁴ Kuttner, “How ‘National Security’ Hurts National Competitiveness.”

²⁵ Dehqanzada and Ann Florini, *Secrets for Sale*, 28.

cooperation to ensure that export controls fulfill their intended national security purpose.²⁶ In addition, Harrison & Strohmeier claim that a harmonized multilateral export regime also aids commercial competitiveness, thereby accounting for both aspects of the Com-NatSec Dilemma. Since the current unilateral export controls constrain U.S. providers of dual-use items vis-à-vis their foreign counterparts, harmonized export controls would serve to equalize the competitive landscape.²⁷

However, while the assumption that harmonizing export controls can address the Com-NatSec Dilemma may seem viable in theory, a practical implementation is not feasible. Although Parkhe would also prefer a multilateral approach to export controls, he accurately asserts that the implementation of a robust multilateral export control regime is highly unlikely due to the diverging economic and security interests of different countries.²⁸ This is exemplified by the most notable existing multilateral export control regime, the Wassenaar Agreement. Given its non-binding nature, member states frequently implement their own export control regulations, effectively undermining the objective of a multilateral approach.²⁹ Moreover, Michael Noble argues that there is also a “domestic problem” that diminishes the possibility of export control harmonization. In line with Kuttner’s advocacy for centralization, Noble identifies the numerous government decision-makers involved in U.S. export policy as an additional obstacle to an effective multilateral approach.³⁰

A review of the academic literature exploring the Com-NatSec Dilemma reveals a predominant concern with reevaluating disincentive-based policy measures, such as the relaxation of restrictions, in order to balance commercial competitiveness and national security interests. Conversely, the benefits that emerge from the implementation of incentive-based policy measures, such as the expansion of public-private collaboration to promote commercial competitiveness, are generally overlooked. The governance of other

²⁶ Seyoum, “Export Controls and International Business,” 67.

²⁷ Harrison and Strohmeier, *Commercial Space Remote Sensing*, 7.

²⁸ Parkhe, “U.S. National Security Export Controls,” 59-62.

²⁹ Cindy Whang, “Trade and Emerging Technologies: A Comparative Analysis of the United States and the European Union Dual-Use Export Control Regulations,” *Security and Human Rights* 31 (2020): 15, <https://doi.org/10.1163/18750230-31010007>.

³⁰ Michael J. Noble, “Export Controls and United States Space Power,” *Astropolitics* 6, no. 3 (2008): 299-300, <https://doi.org/10.1080/14777620802469798>.

sectors, such as the semiconductor industry, has illustrated that the implementation of incentive-based policy measures is not a zero-sum game and that such measures may not only promote commercial competitiveness but also be in the interest of national security.³¹ This is in line with Goehring’s conceptualization of an effective dual-use policy regime, which, although not explicitly stated, would support the utilization of incentive-based policy measures to reconcile commercial competitiveness with national security.³²

In conclusion, despite partially diverging views on the specific elements that constitute the Com-NatSec Dilemma, the literature predominantly concurs that decision-makers have historically favored national security interests over the commercial competitiveness of dual-use providers. Furthermore, a strong consensus exists among scholars that restrictions on commercial dual-use providers must be relaxed. Whether in the form of export controls or confining licensing regulations, overly restrictive policy decisions have disrupted the delicate balance between commercial competitiveness and national security. While the literature mostly omits incentive-based policy measures, it also does not deny their effectiveness in managing the Com-NatSec Dilemma. In fact, some scholars implicitly acknowledge potential benefits of incentive-based policy measures in the effort to balance commercial competitiveness and national security.³³ Thus, a policy regime that adequately confronts the Com-NatSec Dilemma must not only modify existing restrictive policy measures, but also “find new flexible arrangements,” such as the incorporation of incentive-based policy measures.³⁴

³¹ “Commerce Department Outlines Proposed National Security Guardrails for CHIPS for America Incentives Program,” National Institute of Standards and Technology, March 13, 2025, <https://www.nist.gov/news-events/news/2023/03/commerce-department-outlines-proposed-national-security-guardrails-chips>.

³² Goehring, “U.S. Commercial Space Regulation,” 353-54.

³³ Clark, “Blurred Lines,” 183; Goehring, “U.S. Commercial Space Regulation,” 353-54.

³⁴ Clark, “Blurred Lines,” 183.

THEORETICAL FRAMEWORK

This paper will employ a regulatory trade-offs framework to determine the effectiveness of specific policy measures in addressing the Com-NatSec Dilemma in the context of the SRS sector. Generally, this framework allows for an identification of competing priorities and the assessment of the consequences of a given prioritization. Although a regulatory trade-offs framework has not been applied to the Com-NatSec Dilemma specifically, an evaluation of regulatory trade-offs has aided research in various other fields. For example, Kenny Robert employs a typology of regulatory trade-offs—including direct, long-term, and external trade-offs—to gain insights into communications policy.³⁵ Similarly, Keith Jin Deng Chan, Gleb Papyshv, and Masaru Yarime evaluate different approaches to the governance of artificial intelligence by analyzing regulatory trade-offs.³⁶

In the context of the Com-NatSec Dilemma, the regulatory trade-offs framework will facilitate a nuanced examination of the trade-offs between commercial competitiveness and national security. Furthermore, the effects of policy and regulatory practice changes on these competing interests will be scrutinized to determine their effectiveness towards achieving a balanced policy regime for commercial trade with dual-use items. Within the case study of the U.S. policy regime regarding SRS, three pivotal policy changes will be reviewed. By evaluating (1) the revision of the operational licensing framework, (2) recent export control rule changes, and (3) commercial integration programs by government agencies, the regulatory trade-offs framework will facilitate a deeper understanding of the current SRS policy landscape's effectiveness in engaging with the Com-NatSec Dilemma.

³⁵ Robert Kenny, *Mapping Trade-offs in Communications Policy and Regulation* (Geneva: World Economic Forum, April 2016), 7-8, https://www3.weforum.org/docs/WEF_Mapping_Trade_Offs_in_Communications_Policy_and_Regulations.pdf.

³⁶ Keith Jin Deng Chan, Gleb Papyshv, and Masaru Yarime, "Balancing the Tradeoff Between Regulation and Innovation for Artificial Intelligence: An Analysis of Top-Down Command and Control and Bottom-Up Self-Regulatory Approaches," *Technology in Society* 79 (2024): 1-10, <https://doi.org/10.1016/j.techsoc.2024.102747>.

METHODOLOGY

This paper will conduct qualitative research in the form of a single-case study, which will offer a valuable blueprint for regulating the commercial trade of dual-use items and for navigating the Com-NatSec Dilemma. In particular, a policy analysis will be utilized to scrutinize the current policy regime governing commercial SRS. Here, a regulatory trade-offs framework refines the focus of the policy analysis to the balance between commercial competitiveness and national security, as well as the subsequent consequences of inherent trade-offs. To assess the impact of the consequences of policy changes on this balance, the policy analysis will factor in various trade-off criteria that influence the global competitiveness of American commercial SRS providers and U.S. national security. These include innovation incentives, bureaucratic hurdles, market access, market share, or protection of sensitive technology, safeguarding space infrastructure, and strategic advantages vis-à-vis adversaries, respectively.

To determine whether or not a certain policy or regulatory tool, including their inherent trade-offs, can be considered effective, the normative recommendations of the literature vis-à-vis effective regulation of commercial providers of dual-use items will serve as a guiding foundation for this policy analysis. According to the literature, existing restrictions on the commercial providers of dual-use items must be reduced, given the historically disproportionate emphasis on national security interests. In addition, policy measures that benefit both the commercial competitiveness of dual-use providers and national security will also be considered effective.

To execute the policy analysis, this paper utilizes a combination of primary and secondary data sources. Primary sources consulted for the analysis include legislative texts, executive documents such as policy directives or agency-specific strategy outlines, and government-sponsored reports. These are supplemented by secondary sources, which primarily consist of academic literature as well as relevant newspaper articles. The latter are particularly crucial to this analysis, since they function as a valuable bridge between the government and the commercial realm, offering a platform to stakeholders from both domains to discuss a specific issue.

This leads to one of several limitations of the proposed methodology and its implementation. Although the publicly available data constitutes a sufficient data pool for a detailed analysis, certain relevant data remain classified. This is due to the national security significance of SRS, resulting in a limited availability of defense-related data, such as contracts with commercial partners or internal policy assessments. In addition, the policy-making process is inherently complex. A policy analysis that is constrained to commercial competitiveness and national security fails to consider the myriad of other interests and factors that influence policy. Nevertheless, focusing exclusively on specific drivers enables a more nuanced analysis, providing valuable insights for those seeking a comprehensive understanding of the policymaking process.

Furthermore, while a certain policy regime may effectively manage the Com-NatSec Dilemma for the SRS sector, the adoption of identical measures in other dual-use sectors may not yield similar outcomes. Thus, although an effective SRS policy regime can provide meaningful guidance, it is crucial to tailor policy measures to the respective sector. Finally, policy regimes are naturally dynamic and subject to change at any given moment. Despite examining the evolution of the SRS policy regime and highlighting trends that may extend into the future, this analysis cannot account for ongoing policy changes. Similarly, the implications of the most recent policy changes are more difficult to evaluate as empirical data may not yet be available.

HISTORICAL CONTEXT & LEGISLATIVE FOUNDATIONS

The first U.S. legislative action to regulate commercial SRS was the Land Remote Sensing Commercialization Act of 1984. By establishing a licensing framework, lawmakers introduced the first government regulation of the nascent private SRS sector. Since the sector had been dominated by the government prior to the enactment of the 1984 act, this was a major turning point, as it paved the way for a much more substantial private industry involvement.

Nonetheless, this initial attempt to encourage and regulate the private SRS sector was superseded by the Land Remote Sensing Policy Act of 1992, which continues to serve as the legal foundation for the current licensing system. In this early stage of commercial SRS regulation, lawmakers were already grappling with the Com-NatSec Dilemma. Despite riding the neoliberal wave of the 1980s and early 1990s, a deeply rooted Cold War realism among lawmakers led to the implementation of numerous provisions that demonstrated a clear tendency towards the preservation of national security, as opposed to the advancement of commercial competitiveness. For example, one provision of the act holds that the commercial provider must “operate the system in such manner as to preserve the national security of the United States.”³⁷ Furthermore, in anticipation of future export regulations, another provision mandates a commercial SRS provider to “notify the Secretary [of Commerce] of any agreement [...] with a foreign nation, entity or consortium [...]”³⁸ This focus on national security would set a guiding precedent for the strict interpretation of the Land Remote Sensing Policy Act during the next decade.

Most significantly, in 1994, President Clinton’s Presidential Directive 23 (PDD-23) built upon the “pro-national-security” sentiments by introducing the “shutter control” policy. In times of crisis, shutter control would allow the government to exclusively control access to commercial remote-sensing imagery. Due to potential economic and legal repercussions, however, shutter control has never been invoked by the U.S. government.³⁹ Nevertheless,

³⁷ Land Remote Sensing Act of 1992, Pub. L. No. 102-555, § 202(b)(1), 106 Stat. 4163 (1992).

³⁸ Land Remote Sensing Act of 1992, Pub. L. No. 102-555, § 202(b)(6), 106 Stat. 4163 (1992).

³⁹ Brad Townsend, “The Remote Sensing Revolution Threat,” *Strategic Studies Quarterly* 15, no. 3 (Fall 2021): 77, https://www.airuniversity.af.edu/Portals/10/SSQ/documents/Volume-15_Issue-3/Townsend.pdf.

the mere threat of potentially invoking shutter control can harm the competitiveness of commercial SRS providers.⁴⁰ In retrospect, despite opening up commercial SRS providers to international trade, PDD-23, through vague provisions such as “shutter control”, constrained the commercial competitiveness of U.S. providers more than strengthened it. In line with the 1992 Land Remote Sensing Policy Act, the Clinton administration further tipped the balance of the Com-NatSec Dilemma by reinforcing the government's commitments to a pro-national security stance.

In 2003, the Bush administration implemented the Commercial Remote Sensing Space Policy (CRSSP) which superseded the PDD-23. In contrast to the earlier-established regulatory framework, the CRSSP crucially elevated the significance of a globally competitive commercial SRS industry by intertwining it with national security goals.⁴¹ Correspondingly, the policy directive emphasized the value of leveraging commercial capabilities for national security demands, which would enhance both national security and the competitiveness of commercial providers. Through the lens of balancing the Com-NatSec Dilemma, the CRSSP marked a pivotal shift in the regulatory approach to commercial SRS, as subsequent regulatory changes increasingly centered on boosting commercial competitiveness.

⁴⁰ Dehqanzada and Ann Florini, *Secrets for Sale*, 19.

⁴¹ U.S. Department of Commerce, *U.S. Commercial Remote Sensing Space Policy Fact Sheet*, Office of Space Commerce, April 25, 2003, <https://www.space.commerce.gov/policy/u-s-commercial-remote-sensing-space-policy/>.

KEY POLICY IMPACTS AND SECTORAL DYNAMICS

Building on this historical context, the following findings examine how these legislative milestones and policy shifts have shaped the balance between commercial growth and national security imperatives in the U.S. SRS sector. Together, they illustrate how regulatory frameworks have evolved over time in response to shifting political priorities, technological advances, and market pressures—and reveal the persistent tension at the heart of the Com-NatSec Dilemma that continues to influence the industry today.

SPACE POLICY DIRECTIVE-2 (SPD-2)

The most illustrative example of this shift toward elevating the role of commercial competitiveness is the 2018 Space Policy Directive-2 (SPD-2). In an endeavor to “promote economic growth, minimize uncertainty for [...] private industry; protect national security, [...] and encourage American leadership in space commerce,” the directive called on the Secretary of Commerce to review the regulations adopted under the Land Remote Sensing Policy Act of 1992.⁴² The implicit acknowledgement that commercial competitiveness of U.S. commercial SRS providers and national security are not mutually exclusive, is in line with the CRSSP which initiated the larger policy shift in 2003.

In response to the SPD-2, the National Oceanic Atmospheric Administration (NOAA), which operates under the Department of Commerce (DOC), undertook a comprehensive overhaul of the regulations governing operational licenses for commercial SRS providers in 2020. The newly established licensing framework departs from the preceding risk-based approach by shifting the categorization basis from national security to the global commercial SRS market.⁴³ This is implemented in the form of a three-tiered licensing framework. A Tier 1 license, which merely subjects the licensed system to basic restrictions, is issued for

⁴² Executive Office of the President, *Space Policy Directive-2, Streamlining Regulations on Commercial Use of Space*, May 24, 2018, <https://trumpwhitehouse.archives.gov/presidential-actions/space-policy-directive-2-streamlining-regulations-commercial-use-space/>.

⁴³ Jeff Foust, “Commerce Department Releases Streamlined Commercial Remote Sensing Regulations,” *SpaceNews*, May 19, 2020, <https://spacenews.com/commerce-department-releases-streamlined-commercial-remote-sensing-regulations/>.

commercial SRS systems that are already available on the international market. If similar capabilities are exclusively available on the domestic market, a Tier 2 license is necessary, which includes additional restrictions such as shutter control. Finally, for commercial SRS capabilities that are not available anywhere else, a Tier 3 license is issued. Despite even stricter limitations, Tier 3 restrictions are limited to a period of one to three years, giving the U.S. government time to adapt to novel technologies while simultaneously unburdening the commercial provider.⁴⁴ The impacts of this revised licensing framework are best understood by examining its distinct implications for both commercial competitiveness and national security.

Impact on Commercial Competitiveness

Examining aspects of this novel licensing framework through the lens of several trade-off criteria reveals its profound impact on the commercial competitiveness of U.S. SRS providers. First, aligning the licensing process with the availability of similar capabilities on the commercial market elevates the global market access and market share of U.S. SRS providers. Given that the majority of providers under the current framework are holding Tier1 licenses, and thus merely face minor restrictions, the overall ability of the American commercial SRS industry to compete with foreign industries is notably enhanced.⁴⁵ Furthermore, the change to a market-based framework in itself avoids unnecessary restrictions. Even under the guidelines of the relatively pro-business SPD-2, a risk-based approach would have categorized “nearly all companies [...] as high risk,” limiting market access and share by imposing restrictions similar to the original licensing framework.⁴⁶

Second, the alignment with commercial markets allows for individual licenses to move between tiers, which enhances market access for U.S. providers. Prior to the 2020 changes to the licensing regulations, each commercial SRS system was considered on an individual basis—in perpetuity and irrespective of market shifts. Consequently, market access

⁴⁴ Goehring, “U.S. Commercial Space Regulation,” 348-49.

⁴⁵ U.S. Department of Commerce, *Remote Sensing License Tiering Q1 2024*, Office of Space Commerce, March 1, 2024, https://www.space.commerce.gov/wp-content/uploads/UQ1-2024_AvailabilityBenchmarks-03-01-2024.pdf.

⁴⁶ Foust, “Streamlined Commercial Remote Sensing Regulations.”

remained restricted even in cases where similar systems became available over time.⁴⁷ In contrast, the dynamic nature of the current three-tiered framework enables movement between tiers, which guarantees swift market access once national security is no longer a concern.⁴⁸

Third, the new framework ensures a greater predictability of its working procedures for commercial providers, which not only incentivizes innovation but also boosts market share in the long-run. For example, limiting the duration of severe national security restrictions for any SRS system to a maximum of three years reassures the providers regarding the possibility of realizing profits in the commercial market. Eventually, this certainty will incentivize larger investments in research and development (R&D), thereby boosting innovation across the industry. The example of commercial X-band synthetic aperture radar (SAR) systems illustrates how, in addition to encouraging innovation, the three-tiered framework also fosters an increase in global market share. Three years after the implementation of the new licensing framework, all Tier 3 restrictions on commercial X-band SAR systems were lifted.⁴⁹ As a direct consequence, in 2024, U.S. commercial X-band SAR systems have markedly outperformed Chinese capabilities in the same domain, despite China's overall advancement in commercial space technologies.⁵⁰

Impact on National Security

The changes to the operational licensing framework initiated by the SPD-2 have a considerable impact on the capacity of the commercial SRS industry to compete globally, yet their implications for national security are negligible. Although the academic literature would be amenable to certain negative trade-offs for national security in order to boost commercial competitiveness, the trade-off criteria for national security remain mostly

⁴⁷ U.S. Department of Commerce, *NOAA Eliminates Restrictive Operating Conditions From Commercial Remote Sensing Satellite Licenses*, Office of Space Commerce, August 7, 2023, <https://www.space.commerce.gov/noaa-eliminates-restrictive-operating-conditions-from-commercial-remote-sensing-satellite-licenses/>.

⁴⁸ Goehring, "U.S. Commercial Space Regulation," 353-54.

⁴⁹ Jeff Foust, "NOAA Lifts Many Commercial Remote Sensing License Conditions," *SpaceNews*, August 8, 2023, <https://spacenews.com/noaa-lifts-many-commercial-remote-sensing-license-conditions/>.

⁵⁰ Kari A. Bingen, David Gauthier, and Madeleine Chang, *Gold Rush: The 2024 Commercial Remote Sensing Global Rankings* (Washington, DC: Center for Strategic and International Studies, October 2024), 8-9, <https://www.csis.org/analysis/gold-rush-2024-commercial-remote-sensing-global-rankings>.

unimpaired. The protection of sensitive technologies is maintained, since the three-tiered framework merely allows for commercial distribution if comparable systems are already available. The sole exception to this is the easing of Tier 3 restrictions after a period of three years, which is implemented irrespective of market availability. Nonetheless, not only is there a sufficient time frame for the U.S. government to adjust to sensitive technologies entering the market, but a small number of Tier 3 restrictions may also be preserved to safeguard national security.⁵¹

With regard to the criterion of strategic advantages vis-à-vis adversaries, it can be argued that the novel licensing framework in fact exerts a marginally positive influence. The sweeping benefits to commercial competitiveness also translate to a strategic national security advantage over China, the primary adversary of the U.S. in the space realm. As the example of X-band SAR systems demonstrates, the relaxation of restrictions on U.S. commercial providers has an immediate impact on the preeminence in a specific SRS category.⁵² Dominating a specific category is a crucial national security goal of both China and the U.S., since it empowers the leading country to assert significant geopolitical authority as the global hegemon.⁵³

⁵¹ U.S. Department of Commerce, *NOAA Eliminates Restrictive Operating Conditions*.

⁵² Bingen, Gauthier, and Chang, *Gold Rush*, 8-9.

⁵³ Bingen, Gauthier, and Chang, *Gold Rush*, 16.

EXPORT CONTROL ADJUSTMENTS

Next to the revision of the operational licensing framework, regulations regarding export licenses for commercial SRS providers have also been adjusted. Since the majority of items supplied by the SRS industry have a dual-use application, they are traditionally included in the U.S. Munitions List, which means that their exports are regulated by the State Department's highly restrictive International Traffic in Arms Regulations (ITAR).⁵⁴ This is emblematic of the historical tendency of the U.S. to prioritize national security over commercial competitiveness. However, in line with the general shift towards decreasing restrictions on commercial providers, the DOC has introduced three major rule changes to space-related export controls in 2024, which have a substantial impact on the SRS export control regime.

First, all controls on certain items intended for export to Australia, Canada, and the UK have been removed. While the rule does not provide an exhaustive list of affected items, it does specify that items related to SRS are included.⁵⁵ In a second rule, license requirements on less sensitive items are reduced for exports to all U.S. allies and partners.⁵⁶ According to the Bureau of Industry & Security (BIS), an agency of the DOC that enforces export controls, the number of included allies and partners exceeds 40, thereby helping to "bolster America's global leadership in space technology."⁵⁷ Third, in cooperation with the State Department, the DOC plans to transfer space-related items that are no longer of national security interest from the U.S. Munitions List to the more lenient Commercial Control List.⁵⁸ While the rule remains in the proposal stage, commercial stakeholders regard this change as a positive

⁵⁴ Sandra Erwin, "U.S. Government Eases Export Controls on Space Technologies," *SpaceNews*, October 17, 2024, <https://spacenews.com/u-s-government-eases-export-controls-on-space-technologies/>.

⁵⁵ U.S. Department of Commerce, "Export Administration Regulations: Revisions to Space-Related Export Controls," *Federal Register* 89, no. 205 (October 23, 2024): 84770, <https://www.federalregister.gov/documents/2024/10/23/2024-23958/export-administration-regulations-revisions-to-space-related-export-controls>.

⁵⁶ U.S. Department of Commerce, "Export Administration Regulations," 84770.

⁵⁷ U.S. Bureau of Industry and Security, *Commerce Announces Series of Rules to Modernize Space-Related Export Controls*, Office of Congressional and Public Affairs, October 17, 2024, <https://www.bis.gov/press-release/commerce-announces-series-rules-modernize-space-related-export-controls>.

⁵⁸ U.S. Department of Commerce, "Export Administration Regulations: Revisions to Space-Related Export Controls, Including Addition of License Exception Commercial Space Activities (CSA)," *Federal Register* 89, no. 205 (October 23, 2024): 84784, <https://www.federalregister.gov/documents/2024/10/23/2024-23975/export-administration-regulations-revisions-to-space-related-export-controls-including-addition-of>.

step, though they believe it falls short of what is needed.⁵⁹ Again, the impacts are best understood by examining its distinct implications for both commercial competitiveness and national security.

Impact on Commercial Competitiveness

As declared by a BIS press release, the three regulatory changes to the export control regime will overwhelmingly have positive consequences for the commercial competitiveness of U.S. commercial SRS providers.⁶⁰ Most strikingly, access to foreign markets will be expanded for U.S. providers. The removal of some or all license requirements for exports to allied countries, as well as the relocation of items from the U.S. Munitions List to the Commerce Control List, enables U.S. commercial providers to expand their operations into significant markets, “particularly in Europe and Asia.”⁶¹

By gaining access to these new markets, U.S. commercial SRS providers can integrate their technology into supply chains, thereby establishing greater reliance on U.S. providers among foreign countries and companies. In the long term, this can increase the overall market share of U.S. providers in the global market. Moreover, the elimination or relaxation of export controls affords U.S. providers the opportunity to compete with foreign companies that have historically dominated certain markets due to their comparatively less restrictive regulatory environment.⁶² A more balanced competitive environment in foreign markets is also likely to have a positive effect on the market share of U.S. providers.

In addition to enhancing market access and share, the export rule changes also reduce bureaucratic hurdles and boost innovation incentives. Especially since the export licensing process under ITAR is notoriously complex, moving items to the less strict Commerce Control List drastically reduces compliance costs for export licenses.⁶³ Notably, some SRS systems, such as high resolution SAR systems will remain on the U.S. Munitions List, which requires

⁵⁹ Sandra Erwin, “U.S. Eases Export Rules for Space Tech, but High-Resolution Radar Satellites Remain Under Tight Control,” *SpaceNews*, October 23, 2024, <https://spacenews.com/u-s-eases-export-rules-for-space-tech-but-high-resolution-radar-satellites-remain-under-tight-control/>.

⁶⁰ U.S. Bureau of Industry and Security, *Commerce Announces*.

⁶¹ Erwin, “U.S. Government Eases Export Controls.”

⁶² Erwin, “U.S. Government Eases Export Controls.”

⁶³ Erwin, “U.S. Government Eases Export Controls.”

U.S. providers to comply with ITAR standards.⁶⁴ Despite not fully eliminating administrative constraints, the three changes to the export regulation result in a general reduction of bureaucratic hurdles.

As a consequence to this overall reduction, U.S. providers are free to reallocate resources previously dedicated to compliance toward R&D, thus accelerating the process of innovation. Furthermore, once the rule changes to the export control regime are fully implemented, U.S. providers will have the opportunity to expand the commercialization of mature technologies to foreign markets with fewer obstacles. The subsequent revenue increases may also be reinvested in innovation initiatives. Finally, the enhanced cooperation with foreign companies and allied countries resulting from the rule changes will further drive innovation in the U.S. commercial SRS sector.

Impact on National Security

In contrast to what the general notion of the Com-NatSec Dilemma might suggest, the adjustments made to the export controls of space-related products do not constitute an antagonistic trade-off situation between commercial competitiveness and national security. An examination of the impact of the recent export control rule changes on the national security criteria reveals that negative implications are sparse and inconsequential. To the contrary, various aspects of these changes even have a positive effect on national security. For example, with regard to safeguarding space infrastructure, the rule changes are in line with the Department of Defense's (DoD) goal of increasingly integrating commercial capabilities into its "Hybrid Space Architecture."⁶⁵ By cooperating with the commercial industries of allied countries, the DoD could further augment its resilience through a diversification of its capabilities.⁶⁶ Nonetheless, if the DoD increases the size of its space infrastructure, it creates new possibilities for malicious actors to disrupt and attack

⁶⁴ Erwin, "U.S. Eases Export Rules for Space Tech."

⁶⁵ Theresa Hitchens, "Commerce Department Eases Export Controls on Satellites, Including for Remote Sensing," *Breaking Defense*, October 17, 2024, <https://breakingdefense.com/2024/10/commerce-department-eases-export-controls-on-satellites-including-for-remote-sensing/>.

⁶⁶ U.S. Department of Defense, *2024 DOD Commercial Space Integration Strategy*, April 2, 2024, <https://media.defense.gov/2024/Apr/02/2003427610/-1/-1/1/2024-DOD-COMMERCIAL-SPACE-INTEGRATION-STRATEGY.PDF>.

capabilities that are vital to U.S. national security. To address this, the DoD has already developed a comprehensive approach to mitigate potential threats that could arise as a consequence of commercial integration.⁶⁷

The strategic advantages that the export control rule changes bring about vis-à-vis adversaries further demonstrate that they can benefit U.S. national security. The integration of U.S. commercial technology into the supply chains of foreign countries not only expands their dependence on the U.S. but also boosts American soft power by deepening economic ties. This is particularly vital to U.S. national security in light of China's ongoing efforts to exert global influence through economic dependency in the space sector.⁶⁸ While greater commercial integration primarily increases U.S. soft power, it also enhances military interoperability with strategic allies.⁶⁹ In a geopolitical landscape where the significance of commercial capabilities for militaries is progressively growing, interoperability with allied powers is evermore essential for national security.

With respect to the protection of sensitive technology, the implications of the export control rule changes are marginal, as exports of commercial SRS capabilities to adversarial countries remain highly restricted. Nonetheless, since a reduction of export controls on sensitive technologies to allied countries introduces additional vulnerabilities, the risk of unauthorized diversion to adversaries is amplified. In general, however, the notion of impeding the acquisition of sensitive technologies by adversaries through rigorous export controls is flawed. Prior to the recent rule changes, a report by the Center for Strategic & International Studies has found that export controls have not slowed the advancement of the commercial SRS industry in China, the primary competitor of the U.S. in the space sector.⁷⁰

⁶⁷ U.S. Department of Defense, *Integration Strategy*, 3-4.

⁶⁸ Kari A. Bingen, "2024: The Year That Launched China's Commercial Space Sector?," in *2024 Global Forecast: A World Dividing - The China Challenge*, ed. Craig Cohen and Alexander Kisling (Washington, DC: Center for Strategic and International Studies, 2024), 21, https://csis-website-prod.s3.amazonaws.com/s3fs-public/2024-01/240125_GlobalForecast_2024_ChinaChallenge.pdf.

⁶⁹ Hitchens, "Commerce Department Eases Export Controls."

⁷⁰ Bingen, Gauthier, and Chang, *Gold Rush*, 16.

COMMERCIAL INTEGRATION PROGRAMS

In addition to guiding legislative and regulatory changes, specific commercial integration programs by government agencies also have a profound effect on the balance between national security and commercial competitiveness. In line with what the CRSSP had envisioned in 2003, three core programs allow the government to harness commercial SRS capabilities while simultaneously aiding the economic well-being of the commercial SRS industry.

First, the NRO, which is responsible for procuring satellite imagery for the American Intelligence Community (IC), is conducting a program referred to as the Electro Optical Commercial Layer (EOCL). In 2022, the NRO awarded multi-billion dollar contracts to select commercial providers to secure access to commercial SRS capabilities for up to ten years.⁷¹ A shutter control mechanism built into the individual contracts has been widely criticized as outdated but is regarded by NRO officials as an essential assurance to preserve national security in a potential time of crisis. To mitigate this infringement on commercial flexibility, EOCL contracts also grant exclusive purchasing rights to commercial partners, generating a significant interest among industry stakeholders to join the program despite the shutter control mechanism.⁷²

Second, the National Geospatial-Intelligence Agency (NGA) runs a similar program under the name Luno. Originally limited to facilitating analysis on economic issues, Luno now employs the capabilities of the commercial SRS sector to also enhance the NGA's understanding of environmental and military issues. However, unlike NRO's EOCL, the NGA program is aimed at procuring solely unclassified data and services from the commercial sector, which exempts commercial providers from restrictions such as shutter control.⁷³ The

⁷¹ Sandra Erwin, "BlackSky, Maxar, Planet Win 10-year NRO Contracts for Satellite Imagery," *SpaceNews*, May 25, 2022, <https://spacenews.com/blacksky-maxar-planet-win-10-year-nro-contracts-for-satellite-imagery/>.

⁷² Theresa Hitchens, "EXCLUSIVE: NRO Space 'Civil Reserve' Includes Shutter Control Option," *Breaking Defense*, July 30, 2021, <https://breakingdefense.com/2021/07/exclusive-nro-space-civil-reserve-includes-shutter-control-option/>.

⁷³ Sandra Erwin, "NGA to Tap Commercial Satellite Data Under 'Luno' Program," *SpaceNews*, January 11, 2024, <https://spacenews.com/nga-to-tap-commercial-satellite-data-under-luno-program/>.

contracts are procured and disseminated through two subprograms, designated Luno A and Luno B, which collectively total nearly \$500 million in value.⁷⁴

Third, in an effort to secure vital surge capabilities from the commercial sector, the Space Force launched an initiative called Commercial Augmentation Space Reserve (CASR), which is currently in the implementation phase. Since the principal objective of CASR is to aid the Space Force in times of crisis, its framework will include so-called denial-of-service provisions, a more targeted approach to shutter control.⁷⁵ Resembling NRO's EOCL, the program offers substantial peacetime benefits to compensate for these constraints, such as longer funding periods, in-depth threat briefings, and opportunities to participate in the Pentagon's wargames.⁷⁶ Moreover, the Space Force is considering the industry suggestion of linking the denial-of-service provisions to the U.S. sanctions list, which would greatly reduce uncertainty among commercial providers, while maintaining the provisions' original intent.⁷⁷ Once more we examine the impacts on both Commercial Competitiveness and national security.

Impact on Commercial Competitiveness

Despite minor differences, these three agency-specific commercial integration programs predominantly have a similar impact on the trade-off criteria that offer insight into the Com-NatSec Dilemma. For example, all three programs substantially boost the incentive to innovate. Both the continuous government demand for cutting-edge technologies, as well as the prospect of securing lucrative government contracts, will spur investments into innovations in the commercial SRS sector. Moreover, the stable influx of funds generated by the programs can be reallocated to R&D. Even for those providers that were already

⁷⁴ Sandra Erwin, "U.S. Intelligence Agency Selects 13 Companies for Satellite Data Contract," *SpaceNews*, January 15, 2025, <https://spacenews.com/u-s-intelligence-agency-selects-13-companies-for-satellite-data-contract/>.

⁷⁵ Lauren Williams, "The Space Force's Plan for a Ready Fleet of Commercial Satellites Takes Shape," *Defense One*, September 16, 2024, <https://www.defenseone.com/defense-systems/2024/09/space-forces-plan-ready-fleet-commercial-satellites-takes-shape/399576/>.

⁷⁶ Theresa Hitchens, "Join the Commercial Space Reserve: Get Longer Contracts, In-Depth Threat Briefs; Play Wargames," *Breaking Defense*, October 25, 2024, <https://breakingdefense.com/2024/10/join-the-commercial-space-reserve-get-longer-contracts-in-depth-threat-briefs-play-wargames/>.

⁷⁷ Williams, "The Space Force's Plan."

selected to participate in one of these programs, the incentive to invest in innovation remains heightened, as they continue to compete for future contracts.

As it pertains to bureaucratic hurdles, the commercial integration programs initially lead to undesirable consequences for commercial providers. Due to increased security standards, providing services to the government's security apparatus comes with elevated compliance costs compared to the commercial sector. However, in the long term the continuous integration of commercial capabilities into government structures will streamline these hurdles. The Luno program is the exception since it does not aspire to fully integrate commercial capabilities. Due to the unclassified nature of the program, the initial compliance costs for participating providers are comparatively less significant than under EOCL or CASR.⁷⁸

Finally, regarding the criteria of market access and market share, the differences between the implications of the three programs become more evident. On one hand, the shutter control mechanisms in the contractual frameworks of EOCL and CASR result in separate barriers for participating providers, irrespective of the general relaxation of restrictions brought about by the 2020 operational licensing reforms and the recent changes to export control rules. Should these mechanisms be invoked, participating providers would lose access to commercial markets, which would negatively affect the provider's market share as well as the global market share of the U.S. commercial SRS industry as a whole. Additionally, EOCL in particular favors the major players in the industry, which may cause further consolidation as smaller companies are denied access to government contracts.

On the other hand, the NGA's Luno program exerts relatively low restrictions on participating providers due to its reliance on open-source data. Given that the commercial capabilities employed under the Luno program can also serve a civilian purpose, participating providers, such as BlackSky, may enhance their market share by leveraging government-funded resources on the commercial market.⁷⁹ Furthermore, in contrast to

⁷⁸ Erwin, "NGA to Tap Commercial Satellite Data."

⁷⁹ BlackSky Technology Inc., "BlackSky Wins Five-Year NGA Luno A Contract Valued Up to \$290 Million to Monitor Global Economic Activity and Military Capability," October 3, 2024, <https://ir.blacksky.com/news-events/press-releases/detail/148/blacksky-wins-five-year-nga-luno-a-contract-valued-up-to>.

EOCL and CASR, the Luno program engages with both established companies as well as recent start-ups, offering a more balanced access to the lucrative contracts.⁸⁰ Despite these differences, there is a common overarching consequence for market access and market share inherent to all three programs. Since the lucrative government contracts awarded through the programs are exclusively available to U.S.-based firms, and no other nation allocates a comparable amount of resources to SRS as the U.S. government, they constitute a substantial competitive advantage for the U.S. commercial SRS industry as a whole.⁸¹

Impact on National Security

Leveraging commercial capabilities through agency-specific programs also has a significant impact on national security. Most strikingly, these SRS programs provide the US government with a strategic advantage vis-à-vis adversaries in the space sector. Access to commercial capabilities allows the government to acquire innovative, cutting-edge technologies and services that can only be obtained in such a time- and resource-efficient manner from a market-driven enterprise. Although its leadership position is increasingly challenged by China, the U.S. is widely considered to be the global leader in the field of commercial SRS.⁸² Therefore, harnessing commercial capabilities through targeted initiatives holds substantial national security benefits, assuming that the commercial sector maintains its leadership position.

Additionally, the utilization of commercial capabilities, whether fully integrated or loosely coordinated, affects the protection of the U.S. government's space infrastructure in two key ways. First, an enlarged government space infrastructure offers new possibilities for malicious actors to disrupt or attack this infrastructure. To combat this, the programs include security regulations that must be met by the participating commercial providers, albeit to

⁸⁰ Calvin Biesecker, "NGA Selects 10 Vendors to Compete Under \$290M Luno A Global Monitoring Program," *Via Satellite*, September 16, 2024, <https://www.satellitetoday.com/imagery-and-sensing/2024/09/16/nga-selects-10-vendors-to-compete-under-290m-luno-a-global-monitoring-program/>.

⁸¹ Nova Space, "New Historic High for Government Space Spending Mostly Driven by Defense Expenditures," December 12, 2024, <https://nova.space/press-release/new-historic-high-for-government-space-spending-mostly-driven-by-defense-expenditures/>.

⁸² Michael O'Connor and Kathleen Curlee, *Eyes Wide Open* (Washington, DC: Center for Security and Emerging Technology, July 2024), 1, <https://cset.georgetown.edu/publication/eyes-wide-open-harnessing-the-remote-sensing-and-data-analysis-industries-to-enhance-national-security/>.

varying degrees depending on the program. Second, the sum of these programs diversifies the SRS capabilities to which the U.S. government has access, thus increasing its overall resilience. In combination with other elements, such as enhanced interoperability between public and private systems, this diversified access is a central component of a “Hybrid Space Architecture,” a major goal of the Pentagon’s national security strategy.⁸³

Finally, with respect to the protection of sensitive technology, the implications of the agency-specific commercial integration programs are minor. Both the denial-of-service clauses in CASR contracts and the shutter control mechanism included in EOCL would only provide a tangible contribution to the protection of sensitive technology against adversarial acquisition in rare conflict situations.⁸⁴ Since adequate protection of sensitive technology in the context of commercial SRS systems is already ensured as part of the mandatory operational licensing framework, there is no national security need to further restrict commercial providers who partake in specific government programs.

⁸³ U.S. Department of Defense, *Integration Strategy*; U.S. Space Force, *U.S. Space Force Commercial Space Strategy*, April 8, 2024, https://www.spaceforce.mil/Portals/2/Documents/Space%20Policy/USSF_Commercial_Space_Strategy.pdf.

⁸⁴ Sandra Erwin, “Space Force Refining Commercial Backup Plan for Military Satellites,” *SpaceNews*, October 22, 2024, <https://spacenews.com/space-force-refining-commercial-backup-plan-for-military-satellites/>; Theresa Hitchens, “Planned NRO Imagery Contracts to Ease Sharing, With One Big Exception,” *Breaking Defense*, November 3, 2021, <https://breakingdefense.com/2021/11/planned-nro-imagery-contracts-to-ease-sharing-with-one-big-exception/>.

RETHINKING THE BALANCE DILEMMA

Balancing national security and commercial competitiveness is often framed as a zero-sum struggle—but the findings of this research challenge that notion. This section unpacks how the U.S. remote sensing policy shifts illustrate a more nuanced reality: one where carefully designed policies can expand both goals at once. By analyzing how incentive-based and disincentive-based measures interact, and why a positive-sum mindset is crucial, this section shows why the so-called Com-NatSec Dilemma is not always a dilemma at all—and what that means for future governance of dual-use sectors.

INCENTIVE- AND DISINCENTIVE-BASED POLICY MEASURES

Contrary to what an oversimplified view of the Com-NatSec Dilemma may suggest, the findings indicate that, as a result of the recent policy shift, there is no definitive trade-off between exclusively positive outcomes for commercial competitiveness and exclusively negative outcomes for national security. In particular, the analysis of the incentive-based measures, i.e., the implementation of agency-specific commercial integration programs, reveals that both commercial competitiveness and national security are positively affected. Although the nuances of a given commercial integration program shape the exact proportions of these effects, the findings suggest that incentive-based measures can be a valuable tool for approaching the Com-NatSec Dilemma.

Interestingly, there is a similar dynamic in play with regard to the relaxation of disincentive-based policy measures. Originally implemented to safeguard national security, these measures may be lifted without significantly harming national security, as the example of the SRS sector illustrates. While the new operational licensing framework has no adverse impact on national security, the export control rule changes merely result in negligible adverse ramifications. At the same time, both measures provide comprehensive benefits to the commercial SRS industry. The findings pertaining to these two policy changes underscore that easing excessively restrictive disincentive-based policy measures can lead toward a more stable equilibrium between commercial competitiveness and national security.

This partially aligns with the majority of the academic literature, which asserts that disincentive-based policy measures must be loosened to harmonize the Com-NatSec Dilemma. A common argument for relaxing disincentive-based measures is that they impose a burden on commercial providers while simultaneously failing to bolster national security.⁸⁵ The findings reinforce this argument as they suggest that weakening pro-national-security policies does not inherently create a trade-off between national security and commercial competitiveness. Nevertheless, the findings also imply that the adoption of policies that promote commercial competitiveness without compromising national security may be even more effective. Despite the literature's excessive focus on restrictive policies, the SRS sector illustrates that a successful strategy to resolve the Com-NatSec Dilemma should ideally include a reduction of overly stringent regulations while concurrently introducing measures to actively support commercial competitiveness.

A POSITIVE-SUM PERSPECTIVE

Another fundamental implication of the findings is that the trade-offs between commercial competitiveness and national security are best understood as a positive-sum game. In other words, policy measures designed to encourage commercial competitiveness do not inevitably have a negative impact on national security, and vice versa. The analysis of all three SRS policy measures reveals that decision-makers were acutely aware of this dynamic, which allowed them to prioritize commercial interests without significantly compromising national security. For example, the revised operational licensing framework regulations were described as “forward-looking, in that they protect our national security but are flexible enough to allow industry to thrive” by Texas Senator Ted Cruz, who chairs the Senate Commerce Committee's space subcommittee.⁸⁶ Likewise, the adjustments to the SRS export controls were hailed by the BIS as “maintaining U.S. leadership in space, protecting our national security, and strengthening our foreign alliances.”⁸⁷ Lastly, and most strikingly,

⁸⁵ See, inter alia, Clark, “Blurred Lines”; Dehqanzada and Ann Florini, *Secrets for Sale*; Long, “An Imperfect Balance.”

⁸⁶ Jeff Foust, “Sausage Making in Space: The Quest to Reform Commercial Space Regulations,” *The Space Review*, June 29, 2020, <https://www.thespacereview.com/article/3977/1>.

⁸⁷ U.S. Bureau of Industry and Security, *Commerce Announces Series of Rules*.

both the DoD in general and the Space Force in particular have urged augmenting the integration of commercial capabilities to strengthen national security, which, in the case of the SRS sector, is done through agency-specific programs.⁸⁸

The Com-NatSec Dilemma should be understood as a positive-sum game primarily due to the intricate interrelationship of commercial competitiveness and national security. The literature often treats this interrelationship as a zero-sum game where one side can only be advanced at the expense of the other. However, the example of the SRS sector underscores that the reality is far more nuanced. In fact, assuming other factors remain unchanged, a globally competitive dual-use sector strengthens national security, as highlighted by two key dimensions of this interrelationship.

First, if a domestic dual-use sector of a country is globally competitive, leveraging its capabilities can be a major benefit for this country's national security. Commercial capabilities are especially vital for a government's security apparatus in a sector such as SRS, where costs are exceptionally high and there is a constant need for innovation.⁸⁹ Second, a globally competitive dual-use sector may constitute a crucial long-term strategic advantage depending on the geopolitical context. With respect to the SRS sector in the U.S., there is a substantial strategic interest in a dominant commercial sector. In light of the recent effort by the Chinese government to surpass the U.S. as global hegemon in the space realm, both commercial and national security interests are threatened.⁹⁰ Here, the ability to exert regulatory control over the majority of the global commercial SRS market not only elevates soft power but also creates strategic dependencies, both of which reinforce national security.

In sum, any policy measure that augments the commercial competitiveness of a domestic dual-use sector also has a positive effect on national security. Thus, if a specific measure has no direct adverse effects on national security, this interrelationship with commercial competitiveness will nevertheless bring about a net-positive outcome for

⁸⁸ U.S. Department of Defense, *Integration Strategy*; U.S. Space Force, *Commercial Space Strategy*.

⁸⁹ Jamie Morin and Robert S. Wilson, *Leveraging Commercial Space for National Security* (Arlington, VA: Center for Space Policy and Strategy, November 16, 2020), 2, https://csps.aerospace.org/sites/default/files/2021-08/Morin-Wilson_Leveraging_20201113.pdf.

⁹⁰ Bingen, "2024," 21.

national security. For example, the reform of the operational licensing framework did not directly weaken national security. Rather, since the new framework boosted commercial competitiveness, the reform's net impact on national security is positive. However, if the government is not interested in harnessing commercial capabilities for national security, this interrelationship—resulting in benefits for both sides of the Com-NatSec Dilemma—breaks apart. In the case of SRS, the findings demonstrate that the U.S. government aggressively pursues commercial integration, which is also evident in decision-makers' rhetoric.⁹¹ As a result, the positive-sum approach serves as a viable option for tackling the Com-NatSec Dilemma regarding the SRS sector.

Finally, the increased integration of the commercial sector into the national security architecture creates a positive feedback loop, which plays a stabilizing role in balancing the Com-NatSec Dilemma. With increased commercial integration comes a growing reliance on the commercial sector, and thus an elevated government interest in the economic well-being of the domestic firms within this sector. Therefore, legislators and government agencies will have a vested interest in allocating greater resources to the commercial sector, further driving the process of commercialization. While it is essential to factor in the downsides of commercialization, such as the heightened risk of regulatory capture, the feedback loop reinforces the interrelationship between commercial competitiveness and national security. The example of the SRS sector demonstrates how embracing this feedback loop through guiding legislation and administrative adjustments can create a regulatory environment that effectively mitigates the challenges posed by the Com-NatSec Dilemma.

⁹¹ See, for example, Sandra Erwin, "Geospatial Intelligence Gets Smart," *SpaceNews*, May 7, 2024, <https://spacenews.com/geospatial-intelligence-gets-smart/>; National Reconnaissance Office, *Innovation, Partnership, and Agility Key to Deterring Threats in Space*, NRO Director Says at IC Summit, August 29, 2024, <https://www.nro.gov/news-media-featured-stories/news-media-archive/News-Article/Article/3890394/innovation-partnership-and-agility-key-to-deterring-threats-in-space-nro-direct/>; Debra Werner, "NRO Expands Commercial Partnerships," *SpaceNews*, May 7, 2024, <https://spacenews.com/nro-expands-commercial-partnerships>.

CHARTING THE WAY FORWARD

The evidence from the SRS sector shows that a positive-sum approach is not only possible but essential for managing the Com-NatSec Dilemma. To translate these insights into practical guidance for other dual-use sectors, the following recommendations distill key lessons from the policy shifts, trade-offs, and incentive strategies analyzed above. Taken together, they offer a flexible roadmap for decision-makers seeking to balance commercial dynamism with national security in a rapidly evolving global landscape.

1) CONTEXT MATTERS: SECTOR-SPECIFIC APPROACHES

An essential stage of managing the Com-NatSec Dilemma is the evaluation of the context in which a given dual-use sector is regulated. Since there is a wide spectrum of dual-use items, a specific set of policy measures may suit the SRS sector but may worsen the dilemma if applied to a different sector. Therefore, a variety of elements must be taken into account. First, the makeup of the existing markets and governing regulations is often entirely different across dual-use sectors. Some sectors depend on civilian customers to a much larger degree, which requires more lenient export regulations for providers to stay globally competitive. In addition, certain dual-use sectors are of greater significance to national security than others and require more restrictive regulations. For example, commercial activities involving nuclear technology demand stricter oversight than commercial providers in the largely civilian 3D printing sector.

However, the most significant factor to consider is the state of the Com-NatSec Dilemma with respect to the specific dual-use sector. In other words, decision-makers must determine the extent to which existing policies and regulatory norms prioritize or neglect national security or commercial competitiveness. Only with a thorough understanding of the historical and current regulatory landscape of a given dual-use sector can decision-makers effectively determine the adequate policy measures that are necessary to mitigate the Com-NatSec Dilemma.

2) REFRAME THE DILEMMA: BEYOND ZERO-SUM THINKING

Approaching the relationship between commercial competitiveness and national security as mutually exclusive does not bring about a sustainable solution for the Com-NatSec Dilemma. Zero-Sum thinking cultivates a tendency to focus on implementing or rescinding disincentive-based policy measures, as they offer a straightforward response to an issue perceived in binary terms. Such reactive decision-making will inevitably lead to a prioritization of one side over the other, worsening the dilemma. Nonetheless, the example of the SRS sector demonstrates that it is in fact possible to mitigate the Com-NatSec Dilemma by repealing disincentive-based measures. However, this requires a recognition by decision-makers that the Dilemma is not a zero-sum game.

In contrast, a positive-sum view of the Com-NatSec Dilemma facilitates a more holistic approach to decision-making that will result in dynamic policies and regulatory norms. By appreciating the complex interrelationship between commercial and national security interests, decision-makers are able to design and implement policies that simultaneously account for both sides of the Com-NatSec Dilemma in a sustainable manner.

3) RETHINK CONTROLS, REWARD PROGRESS

The U.S. regulatory frameworks governing the commercial trade of dual-use items predominantly tend to overemphasize the needs of national security while neglecting those of commercial providers.⁹² In these cases, the decision-makers should follow a general two-step approach to address the Com-NatSec Dilemma. Notwithstanding the wide applicability of this general guideline, it is vital to assess the specific context of a dual-use sector prior to the implementation of any policy changes, as outlined in the first recommendation.

Initially, already existing disincentive-based policies must be amended if they unduly restrict the commercial competitiveness of domestic dual-use companies. Crucially, these adjustments should not be implemented in a manner that undermines the original objective

⁹² Parkhe, "U.S. National Security Export Controls," 62; Seyoum, "Export Controls and International Business," 67.

of safeguarding national security. As the academic literature suggests and the example of SRS underscores, disincentive-based policy measures, such as export controls, are often overly restrictive and can be eased without compromising national security.

In a second step, decision-makers should establish incentive-based policy measures—or strengthen existing ones—that simultaneously promote commercial competitiveness and national security. The exact nature of the incentive-based measures must be determined according to the specific dual-use sector that is subject to the regulation. For example, in the context of SRS, the expansion and reinforcement of public-private collaboration benefits both commercial and national security interests. For other dual-use sectors, different measures—such as investing in commercial R&D programs or rewarding compliance with tax breaks—may be more appropriate. Ultimately, a sustainable policy regime in response to the Com-NatSec Dilemma ideally involves both revisions of disincentive-based measures and the introduction of incentive-based measures.

OPERATIONALIZING THE WAY FORWARD

To illustrate how this proposed path can be put into practice for a specific dual-use sector, this section explores how decision-makers might operationalize the actions outlined above for regulating artificial intelligence.

1) CONTEXT

Before adopting policy measures to address the Com-NatSec Dilemma, the specific context of the AI sector and its dual-use nature must be considered. Compared to SRS, AI not only has much broader commercial and security applications but, more strikingly, is situated in a substantially different regulatory environment. Due to the novelty of AI as a regulatory concern, the corresponding legal framework in the U.S. is less sophisticated than that governing SRS. In fact, Congress is yet to pass significant AI legislation, which allows the executive branch to act as the key driver of regulation.

Furthermore, in contrast to the beginnings of SRS regulation in the U.S., there is a tendency to prioritize commercial competitiveness over national security concerns regarding the governance of AI. This inclination is evident in decision-maker's rhetoric as well as in their approaches to regulation. For example, discussing potential AI legislation, Senator Chuck Schumer declared that "innovation must be our North Star."⁹³ Moreover, California Governor Gavin Newsom vetoed a State bill that would have mandated various public security standards for AI providers, citing concerns about "curtailing [...] innovation."⁹⁴ Finally, and most significantly, the second Trump administration has revoked the Biden-era Executive Order 14110, the most comprehensive federal effort to date to regulate AI and address its national security risks.⁹⁵ As outlined in President Trump's new Executive Order

⁹³ Michael Frank, *Managing Existential Risk from AI without Undercutting Innovation* (Washington, DC: Center for Strategic and International Studies, July 10, 2023), <https://www.csis.org/analysis/managing-existential-risk-ai-without-undercutting-innovation>.

⁹⁴ Khari Johnson, "Newsom Vetoes Major California Artificial Intelligence Bill," *CalMatters*, September 29, 2024, <https://calmatters.org/economy/2024/09/california-artificial-intelligence-bill-veto>.

⁹⁵ David Shepardson, "Trump Revokes Biden Executive Order on Addressing AI Risks," *Reuters*, January 21, 2025, <https://www.reuters.com/technology/artificial-intelligence/trump-revokes-biden-executive-order-addressing-ai-risks-2025-01-21/>.

14179, the guidelines set by the Biden administration are perceived as harmful to commercial interests.⁹⁶

2) A POSITIVE-SUM APPROACH

The example of the AI sector demonstrates how merely determining whether the Com-NatSec Dilemma is treated as a zero-sum game can be challenging, as decision-makers' rhetoric may diverge from actual policies. In line with the recommendation of this paper, the policy goals of the second Trump administration vis-à-vis AI seem to embrace a positive-sum view of the Dilemma. For example, President Trump's Executive Order 14179 explicitly seeks to "promote [...] economic competitiveness, and national security."⁹⁷ Nevertheless, the Trump administration has not yet taken any tangible actions to facilitate this goal. Moreover, the original executive order issued under the Biden administration had already adopted a positive-sum approach, extensively addressing both national security risks and concerns of commercial providers.⁹⁸ Irrespective of potential political reasons for these executive shifts, an implementation of the second recommendation would include a strict adherence by the Trump administration to its own positive-sum commitments. This could be achieved, inter alia, by acting on the third recommendation.

3) IMPLEMENTING POLICY MEASURES

The third recommendation proposes a two-step approach, where disincentive-based policies are loosened and incentive-based policies are established or reinforced. In light of the prioritization of commercial competitiveness as opposed to national security in AI regulation, this approach must be slightly modified. Instead of relaxing disincentive-based policies to enhance commercial competitiveness, decision-makers should ensure stricter and more effective enforcement of existing measures to safeguard national security. Despite this

⁹⁶ Executive Office of the President, "Removing Barriers to American Leadership in Artificial Intelligence," *Federal Register* 90, no. 20 (January 31, 2025): 8741, sec. 1, <https://www.federalregister.gov/documents/2025/01/31/2025-02172/removing-barriers-to-american-leadership-in-artificial-intelligence>.

⁹⁷ Executive Office of the President, "Removing Barriers," 8741, sec. 2.

⁹⁸ Executive Office of the President, "Removing Barriers," 8741-8742, sec. 4-5.

focus on national security, they should avoid unduly obstructing commercial competitiveness in this process.

For example, existing export controls relating to AI face an even greater risk of ineffectiveness than those regulating the SRS sector, as AI models may also be trained by adversaries using computer chips from a distance.⁹⁹ Indeed, the Chinese government has already exploited this loophole, avoiding the US-imposed export restrictions on semiconductors to acquire advanced AI capabilities.¹⁰⁰ Legislative attempts at closing these loopholes have been widely criticized by experts. Not only could the broad language of these bills profoundly impair commercial competitiveness,¹⁰¹ but their unilateral nature does not take into account other crucial players in the semiconductor industry, such as the Netherlands, Taiwan, and Japan.¹⁰² While negative effects on commercial competitiveness should be reduced to a minimum, it is vital to revise these export controls to guarantee their effectiveness—in line with the notion of building “higher walls around fewer items.”¹⁰³

With respect to the introduction and expansion of incentive-based policies, the specific context of a dual-use sector continues to be of critical significance. Similar to commercial integration programs in the SRS sector, decision-makers should facilitate and further expand those incentive-based measures that have proven to boost both sides of the Com-NatSec Dilemma in the respective sector. In the case of AI, two incentive-based policies should be considered. First, a more targeted tax credit could promote both commercial competitiveness and national security. Under the current tax code, commercial providers

⁹⁹ John Villasenor, *The Tension Between AI Export Control and U.S. AI Innovation* (Washington, DC: Brookings Institution, September 24, 2024), <https://www.brookings.edu/articles/the-tension-between-ai-export-control-and-u-s-ai-innovation/>.

¹⁰⁰ Eduardo Baptista, Fanny Potkin, and Karen Freifeld, “Exclusive: Chinese Entities Turn to Amazon Cloud and Its Rivals to Access High-End US Chips, AI,” *Reuters*, August 23, 2024, <https://www.reuters.com/technology/chinese-entities-turn-amazon-cloud-its-rivals-access-high-end-us-chips-ai-2024-08-23/>.

¹⁰¹ Angela Luna, *AI Export Controls: Balancing National Security and AI Innovation* (Washington, DC: American Action Forum, November 5, 2024), <https://www.americanactionforum.org/insight/ai-export-controls-balancing-national-security-and-ai-innovation/>.

¹⁰² Gregory C. Allen and Isaac Goldston, *Understanding U.S. Allies’ Current Legal Authority to Implement AI and Semiconductor Export Controls* (Washington, DC: Center for Strategic and International Studies, March 14, 2025), <https://www.csis.org/analysis/understanding-us-allies-current-legal-authority-implement-ai-and-semiconductor-export>.

¹⁰³ Parkhe, “U.S. National Security Export Controls,” 63.

may leverage AI expenses to qualify for the R&D tax credit.¹⁰⁴ Combined with a lack of comprehensive security regulations, this existing incentive structure predominantly encourages research into the commercial applications of AI. In contrast, a tax credit specifically designed for AI could steer commercial providers to invest in aspects of AI that are also in the interest of national security.¹⁰⁵

Second, the ongoing public-private collaboration programs could be expanded by incorporating the national security apparatus to a greater extent. The U.S. National Science Foundation (NSF) is collaborating with various public and private stakeholders to fund National AI Research Institutes.¹⁰⁶ Although the U.S. Department of Homeland Security and the DoD are partially involved in this program, a majority of the institutes focus on civilian applications of AI.¹⁰⁷ Establishing additional institutes that conduct research on dual-use applications of AI, such as robotics, geospatial intelligence, or translation, would benefit national security and continuously drive commercial innovation and competitiveness. While the funding period for an institute under this program typically lasts for five years, the program faces uncertainty due to the recent reductions to the NSF budget and workforce under the Trump administration.¹⁰⁸ To balance the Com-NatSec Dilemma, decision-makers should not cut the resources of the NSF, but expand the agencies' capabilities to allow for an expansion of the National AI Research Institutes program.

¹⁰⁴ KBKG, "Qualifying AI for the R&D Tax Credit," accessed May 8, 2025, <https://www.kbkg.com/research-and-development/qualifying-ai-for-the-rd-tax-credit-kbkg>.

¹⁰⁵ Iskandar Haykel, *AI Security Tax Incentives* (Washington, DC: Americans for Responsible Innovation, March 27, 2025), <https://ari.us/policy-bytes/ai-security-tax-incentives/>.

¹⁰⁶ National Science Foundation, *AI Institutes Hill Day Booklet*, September, 2023, https://nsf-gov-resources.nsf.gov/2023-09/AI_Institutes_Hill_Day_Booklet.pdf?VersionId=TfZCveNVHYI6ULeq1XK37SYfEjq2KUZ.

¹⁰⁷ National Science Foundation, *AI Institutes*.

¹⁰⁸ Jackie Davalos, "Trump's Funding Cuts Threaten America's AI Competitiveness," *Bloomberg*, March 3, 2025, <https://www.bloomberg.com/news/articles/2025-03-03/trump-s-funding-cuts-threaten-america-s-ai-competitiveness>.

CONCLUSION

This paper aspires to examine the implications of the Com-NatSec Dilemma in the context of dual-use regulation and to provide actionable recommendations for decision-makers. Specifically, it argues that the regulatory regime governing the commercial SRS sector in the U.S. can be considered as a roadmap for a balanced and sustainable regulation of other dual-use sectors. Hence, a policy analysis aided by a regulatory trade-offs framework serves to scrutinize the consequences of recent policy measures regarding commercial competitiveness and national security. The findings reveal that most measures positively affect both commercial competitiveness and national security, thus mitigating the Com-NatSec Dilemma. Based on these findings from the SRS sector, this paper proposes three recommendations for the governance of other dual-use sectors:

- 1) Context Matters: Sector-Specific Approaches
- 2) Reframe the Dilemma: Beyond Zero-Sum Thinking
- 3) Rethink Controls, Reward Progress

By exploring how these recommendations can be relevant to the AI sector, this paper has presented a framework for their application to other dual-use sectors. Furthermore, this process allows for the exposure of certain policies as harmful when evaluated through the lens of the Com-NatSec Dilemma. While a given policy measure generally has wider implications beyond the commercial and national security spheres, applying the recommendations to a specific dual-use sector provides a valuable viewpoint from which the effectiveness of policy measures can be judged.

Despite the practical benefits of these recommendations, there are several limitations to consider. First, although AI serves as an insightful sample case, more research is necessary to fully examine the applicability of the proposed recommendations in this sector. Moreover, further research should assess the viability of the recommendations for additional dual-use sectors. By identifying how certain policy measures influence the Com-NatSec Dilemma in other sectors, subsequent studies can add to a more comprehensive understanding of how to address the Dilemma. Second, the notion of the relationship between commercial and

national security interests as a positive-sum game is based on a simplified regulatory trade-offs framework. Given the inherent complexity of this interrelationship—which is central to the Com-NatSec Dilemma—additional investigations may explore other dimensions of this interplay by moving beyond the confines of a regulatory trade-offs framework.

Finally, as the example of the shifting SRS regulatory regime illustrates, policy measures founded in a positive-sum view of the Com-NatSec Dilemma further boost the already entrenched commercialization of the U.S. national security apparatus. While this may resolve the dilemma in the short term, the long-term effects of commercialization could be detrimental if it spirals out of control. Driven by the aforementioned positive-feedback loop, increasing commercialization can incentivize decision-makers to prioritize commercial interests over the interests of the population at large.¹⁰⁹ Therefore, decision-makers must remain vigilant to the risks and challenges posed by unchecked commercialization when crafting or implementing policies to combat the Com-NatSec Dilemma.

¹⁰⁹ Sahar F. Aziz, “Security and Technology: Rethinking National Security,” *Texas A&M Law Review* 2 (2015): 791, <https://doi.org/10.37419/LR.V2.I4.7>.

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