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Mario Daniels and John Krige, *Knowledge Regulation and National Security in Postwar America*. Chicago: University of Chicago Press, 2022.
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Introduction by Katherine Epstein, Rutgers University-Camden

It is a pleasure and a privilege to introduce this roundtable, which features six scholars from whom I have learned a great deal.

I have been awaiting John Krige's and Mario Daniels's book about export controls with excitement—so much so that I broke one of the cardinal rules of academia (always wait to be voluntold) and volunteered to organize this roundtable. "Export controls, huh," you may be thinking. "Is someone who wrote a book about torpedoes really the best judge of what's 'exciting'?" Normally, of course, the answer is no. But in this case, the excitement is on-point.

Krige and Daniels have produced a work with striking contemporary relevance, though they did not come to this project chasing it. They did not know that Donald Trump would be elected in 2016 and his administration would make export controls a central part of its hardline policy against China, or that Russia would invade Ukraine and export controls would play a major role in the US response against Russia. What more than one reviewer in this roundtable calls the "timeliness" of their book was an unexpected benefit. Their principal reasons for undertaking their study were of the best scholarly sort: the project emerged organically from long-standing twin interests in the history of science and technology, on the one hand, and US foreign relations, on the other. Krige and Daniels saw that export controls, for all their "arcaneness" (another word used, aptly, by multiple reviewers), represent an important but under-studied intersection between the domestic US political economy and the global political economy: a site where the public and private sectors interact in ways that confound clear distinctions between "public" and "private," and where nations compete against each other for power and resources.

Krige and Daniels bring an unusual array of qualifications to the project. A past president of the Society for the History of Technology (SHOT), Krige is also a long-time participant in the Society for Historians of American Foreign Relations (SHAFR) and has probably done more than anyone else to try to build intellectual bridges between these two fields of historical inquiry.[1] Like Krige, Daniels has brushed aside artificial disciplinary boundaries and been an active participant in both SHOT and SHAFR, a dual scholarly citizenship that remains surprisingly rare in view of the overlap in subject matter between the two fields.[2]

One of the key moves that Krige and Daniels make in the book, which all of the reviewers highlight, is to establish that export controls are not only, or even primarily, about the control of physical goods. Rather, they are mainly about the control of *knowledge* (hence the book's title—and hence the value of Krige's and Daniels's backgrounds in the history of science and technology). Export controls touch everything from computers to conversations between colleagues at academic conferences. Indeed, one of the revelations of the book is the existence and extent of export-control bureaucracies on university campuses. Most of us working in the humanities have no contact with these bureaucracies, because, for historical reasons that Krige and Daniels explain, their officials treat our knowledge as existing within a zone excepted from export controls. But they can loom large in the day-to-day lives of our colleagues in STEM disciplines, and they raise important questions about academic freedom. No less importantly, the conceptual turn from exports-as-goods to exports-as-knowledge enables Krige and Daniels to situate export controls much more robustly in many of the debates that preoccupy H-Diplo readers—for instance, about US empire.

The contributors to this roundtable reflect the diversity of methodological approaches needed to tackle so complex a subject as export controls. Mark Wilson, a business historian and the author of two important books on US defense contracting

[1] See, for example, John Krige, *American Hegemony and the Postwar Reconstruction of Science in Europe* (Cambridge, MA: MIT Press, 2006); Krige, ed., *How Knowledge Moves: Writing the Transnational History of Science and Technology* (Chicago: University of Chicago Press, 2019); and Krige ed., *Knowledge Flows in a Global Age: A Transnational Approach* (Chicago: University of Chicago Press, 2022).

[2] See, for example, Mario Daniels, "Controlling Knowledge, Controlling People: Travel Restrictions of U.S. Scientists and National Security," *Diplomatic History* 43, no. 1 (January 2019): 57–82; and Daniels and Krige, "Beyond the Reach of Regulation? 'Basic' and 'Applied' Research in Early Cold War America," *Technology and Culture* 59, no. 2 (April 2018): 226–50.

and military procurement, brings unsurpassed authority on the history of the US military-industrial complex.[3] Alex Wellerstein, a historian of science and technology whose outstanding *Restricted Data: The History of Nuclear Secrecy in the United States* is the topic of a forthcoming H-Diplo roundtable, has thought as deeply as anyone about the US government's regulation of knowledge.[4] Stefan Link, whose outstanding *Forging Global Fordism: Nazi Germany, Soviet Russia, and the Contest over the Industrial Order* won SHAFR's 2021 Stuart Bernath Book Prize and was the topic of a recent H-Diplo roundtable, brings expertise in the history of science and technology, the history of US foreign relations, and economic history.[5] Jessica Wang, in her distinguished career, has done more than anyone besides Krige himself to build bridges between the study of US foreign relations—especially the study of US empire—and the study of science and technology.[6]

Of the four reviews, Wilson's is the most critical, although it finds elements of the book to admire. He singles out for praise Krige's and Daniels's emphasis on export controls as regulations of knowledge, not just physical goods, as a valuable contribution to the existing literature on export controls; he similarly lauds their discussion of how export controls have impacted universities. But he also offers several criticisms. "Daniels and Krige rarely make strong interpretive arguments about which approaches were more effective at different points in time," he writes, "or about the lessons the history may suggest for new policies in the mid-twenty-first century." Furthermore, he judges that "the book does not do enough to sustain [its] broader claim about the amplification of regulation since the 1940s," that it offers "incomplete, disjointed narratives… for different parts of the story," that it relies "mainly on low-hanging fruit" in the way of published primary sources like Congressional hearings, and that it provides "inadequate consideration of flows of goods and knowledge running in directions other than from the US to its rivals." Notwithstanding these criticisms, Wilson welcomes the book as a potential launching pad for additional research on a highly contemporary topic, "[a]s many nations try to coordinate economic warfare against Russia, and as the US continues to try to impose stricter export controls against China."

While Wellerstein echoes some of Wilson's concerns, overall he is enthusiastic about Krige's and Daniels's book, calling it "a valuable and important work that requires the attention of historians of many stripes, as well as policymakers today." He agrees with Wilson that the book's "main deficit" relates to its primary-source base, especially in the later chapters, which "feel somewhat less focused and archival than the earlier chapters." The absence of archival material effectively forces Krige and Daniels to take the final written products of bureaucratic processes at face value. But Wellerstein also notes that the primary-source materials they did use are demanding (not least of a tolerance for tedium), recognizes that the authors are "quite up front about their intention that this book be a contribution that will stimulate further research inquires," and judges the book to be a work of "detailed historical scholarship." Moreover, while a part of him shares Wilson's wish for the authors to have engaged the question of whether export controls have accomplished their objectives, he acknowledges that the question is a counterfactual one "and, as such, is obviously not something anyone, much less principled historians, can answer with any confidence." Similarly, though Wellerstein would have welcomed some reflection from the authors on the contemporary policy lessons of their work, he "would defend the right of historians to avoid such activity if they wish, because it is hard enough to understand the past on its own terms, much less make arguments about potential futures."

For Wellerstein, the book is ultimately so valuable because of its "political-epistemological" insights. As he puts it, "Export controls present a fascinating study in categorization for anyone who is epistemologically inclined." Even though the book's narrative has "extremely familiar broad outlines"—in which export controls ebb and flow with the two world wars, the start

[3] Mark Wilson, *The Business of Civil War: Military Mobilization and the State, 1861–1865* (Baltimore, MD: Johns Hopkins University Press, 2006); and Wilson, *Destructive Creation: American Business and the Winning of World War II* (Philadelphia: University of Pennsylvania Press, 2016).

[4] Alex Wellerstein, *Restricted Data: The History of Nuclear Secrecy in the United States* (Chicago: University of Chicago Press, 2021).

[5] Stefan Link, *Forging Global Fordism: Nazi Germany, Soviet Russia, and the Contest over the Industrial Order* (Princeton: Princeton University Press, 2020).

[6] See, for example, Jessica Wang, *American Science in an Age of Anxiety: Scientists, Anticommunism, and the Cold War* (Chapel Hill, NC: University of North Carolina Press, 1999); and "Introduction," co-authored with Axel Jansen and Krige, special issue on "Empires of Knowledge: Constructing Global Order in the Twentieth Century," ed., Jansen, Krige, and Wang, *History and Technology* 35, no. 3 (2019): 195–202.

of the Cold War, détente, the end of the Cold War, and the rise of China—it contains a great deal of originality when it comes to conceptualizing export controls vis-à-vis other regimes for controlling knowledge. Export controls do not operate according to the logic of secrecy, which divides knowledge into "public" and "secret," but rather according to a logic suited to the gray zone between "public" and "secret" within which they operate. In Wellerstein's words, export controls "rely on questions about what technology is, how technology spreads, what knowledge is, how knowledge spreads, how nationality is applied to categories of knowledge regulation, definitions of what it means for something to be 'published' or not, questions about basic, applied, and fundamental research, and so on." Krige's and Daniels's book matters because it illuminates "an immensely complex political-epistemological site for thinking about knowledge and its role in the world during the Cold War and beyond."

Where Wellerstein dwells on epistemology, Link's highly favorable review emphasizes the contributions of Krige's and Daniels's book to our understanding of domestic and global political economy. Dubbing the book "terrific and important," Link focuses on how the concept of "economic security," which Krige and Daniels unpack in a section that Link calls "a real gem" (and which Wellerstein also discusses in his review), complicates the binary between the "public" and "private" sectors and compels a rethinking of neoliberal governance. In the 1970s, many Americans, both inside and outside government, perceived Japan's growing strength in automobiles and electronics as a combined economic and military threat. Weaving in his own work on comparative economic development (which includes not only his book but a splendid essay with Noam Maggor), Link situates American concerns over relative decline vis-à-vis Japan within a long multi-national history of less developed powers trying to catch up with more developed powers.[7] When Americans began worrying about relative decline in the 1970s, in Link's words, "they simply rediscovered what catcher-uppers knew all along—that military strength grows from a diversified, technologically capable civilian economy." That rediscovery prompted them to do what all developmental states have done, which was to institute "a major shift in the state-business relationships that characterize the American innovation system."

In the 1980s, the Reagan administration transposed the discourse of "economic security" that had cohered around Japan to the Soviet Union. The developmental measures undertaken by the Reagan administration—such as new controls on Foreign Direct Investment, which also fell within the domain of export controls—conformed as much to the "mercantilist" paradigm of activist states, to use Link's term, as to the neoliberal paradigm of hands-off states. Like its restrictions on capital movements (!), the Reagan administration's support for the technologically high-end export sector does not comfortably fit the neoliberal paradigm. One reading would be that the ostensibly ur-neoliberal Reagan administration was not actually neoliberal. But in an arresting passage that questions Krige's and Daniels's framing of tensions between those who wished to relax and those who wished to strengthen export controls, Link proposes an alternative reading, which is that neoliberalism has a distinctive national-security mode:

> One might say that the national security state outsourced the policing of global access to American technology to the intellectual property lawyers of US corporations. Seen in this light, the recalibrations of export controls appear less as a "tug of war" between liberalizers and hawks ([Krige and Daniels,]197) than as part of the multipronged effort to transform the global position of the American political economy since the crisis of the 1970s. (10-11)

In effect, without disputing Wilson's and Wellerstein's assessment that Krige's and Daniels's story in some ways is very familiar, Link suggests that in other ways it is quite unfamiliar.

Like that of Link, Wang's review brings Krige's and Daniels's book into conversation with her own work on global political economy. She seeks to situate export controls in "the conundrums of trade itself and the logics by which it operates," as well as those of property. An anarchist logic might imagine export controls, like the concept of property itself, as illegitimate attempts to regulate and enclose what ought to move freely. A liberal logic might accept the notion of property as legitimate

[7] Link and Noah Maggor, "The United States as a Developing Nation: Revisiting the Peculiarities of American History," *Past and Present* 246, no. 1 (February 2020): 269–303.

but reject export controls as illegitimate—because non-contractual—attempts to regulate property. At the same time, Wang notes that export controls also exist within paradigms, or "fields of power," other than trade: "the legal regimes that legitimate intellectual property, the apparatus of rights that governs freedom of speech and other components of democratic citizenship, and the American state's assertions of authority over movements of knowledge that it has defined as sensitive and in need of regulation."

To this list she also adds empire, which is an important analytical lens for Krige and Daniels. For them, empire is useful and necessary as a way to explain the power differentials between the United States and those nations—including US allies—whose use of "American" goods and knowledge the United States asserted a right to control. As Krige and Daniels note, these US assertions of right were ambitiously, indeed breath-takingly, extra-territorial; for instance, if a single component of a complex technology relied on US research and development, that was enough for the United States to claim the right to regulate trade between two foreign parties. Wang places these US claims against less powerful nations within "a long history of [imperial] expropriation, from the early modern era of exploration to the developmental imperatives of the twentieth century." To justify their expropriation, she observes, imperial powers moved between evidently inconsistent universalist claims about goods and knowledge belonging to everyone and nationalist claims of a prerogative to control them. Moreover, while nationalist claims frequently buttressed imperial claims, they also buttressed decolonizers who sought to push back against western environmentalist claims in the twentieth century. In short, she suggests that we should think about export controls as technologies for intervening in the global political economy.

In their detailed reply, Krige and Daniels respond to these questions and criticisms.

While there is consensus among the reviewers that Krige's and Daniels's book is something other than a light-hearted romp through the federal bureaucracy, they nevertheless agree that it merits widespread attention. I share that assessment and thank the authors and the reviewers for producing such intellectually stimulating contributions to this roundtable.

Participants:

Katherine Epstein is an associate professor of history at Rutgers University-Camden and the author of *Torpedo: Inventing the Military-Industrial Complex in the United States and Great Britain* (Harvard University Press, 2014). Her research focuses on the intersection of government secrecy, defense contracting, and intellectual property.

Mario Daniels is the DAAD-Fachlektor des Duitsland Instituut Amsterdam. He holds a PhD from the University of Tübingen, taught at the Universities of Tübingen and Hannover, and was twice a research fellow at the German Historical Institute in Washington, D.C. From 2015 to 2020 he was the DAAD Visiting Professor at the BMW Center for German and European Studies at Georgetown University.

John Krige is the Kranzberg Professor Emeritus at the Georgia Institute of Technology. His research lies at the intersection of the history of science and technology with US foreign policy. His most recent volume is an edited collection, entitled *Knowledge Flows in a Global Age. A Transnational Approach* (University of Chicago Press, August, 2022).

Stefan Link is Associate Professor of History at Dartmouth College. He is the author of *Forging Global Fordism: Nazi Germany, Soviet Russia, and the Contest over the Industrial Order* (Princeton: Princeton University Press, 2020).

Jessica Wang recently transitioned to a joint appointment, and she is now Professor of Geography in the Department of Geography and Professor of US History in the Department of History at the University of British Columbia. Her publications include *American Science in an Age of Anxiety: Scientists, Anticommunism, and the Cold War* (University of North Carolina Press, 1999) and *Mad Dogs and Other New Yorkers: Rabies, Medicine, and Society in an American*

Metropolis, 1840-1920 (Johns Hopkins University Press, 2019). Wang's current research focuses on tropical agriculture and the US insular empire in the early twentieth century.

Alex Wellerstein is an associate professor and the director of the Science and Technology Studies program at the Stevens Institute of Technology. His most recent book is *Restricted Data: The History of Nuclear Secrecy in the United States* (University of Chicago, 2022).

Mark Wilson is a professor of history at the University of North Carolina at Charlotte. He is the author of the books *The Business of Civil War* (Johns Hopkins University Press, 2006) and *Destructive Creation: American Business and the Winning of World War II* (University of Pennsylvania Press, 2016); he is co-editor, with Jennifer Mittelstadt, of *The Military and the Market* (University of Pennsylvania Press, forthcoming 2022).

Review by Stefan Link, Dartmouth College

In this eye-opening book, Mario Daniels and John Krige train their sights on the US export control system – the pervasive mechanisms by which Washington has sought to regulate by whom, and for what purposes, technology and know-how generated in America may be used. Export controls seem arcane, but the authors succeed handsomely at demonstrating that they have been a central tool of American statecraft. The export control bureaucracy involves the Pentagon, the Departments of State and Commerce, and various interagency committees; for the most part it churns along, as bureaucracies will, in a humdrum fashion, reviewing license applications from American firms, approving most, amending many, and rejecting some. Occasionally, however, export controls provoke controversies that rise to public attention.

For example, in 2019 the Trump administration barred American tech firms from dealing with the Chinese smart phone giant Huawei. As we learn from the authors, the mechanism to do so was the Bureau of Industry and Security at the Commerce Department, an agency of the export control system. To the alarm of the academic community, the Justice Department has recently targeted several American STEM researchers with contacts to China, charging them with intellectual property espionage.[8] The authors dedicate much of their epilogue to these cases. One might add that American sanctions on Russia in response to the 2022 invasion of Ukraine were promulgated by the Commerce Department's Export Administration Regulation, another organ of the export control system.[9]

An earlier controversy furnishes Daniels and Krige with a key case study that illuminates how export controls work, and their sensitive political nature. In 1996, the Palo Alto-based satellite maker Loral prepared to launch one of its designs on a Chinese Long March rocket in Xichang in Sichuan Province. To abide by export controls, Loral had to apply for, and was granted, a waiver of sanctions that the United States had declared on China after the Tiananmen crackdown. When the launch failed – the rocket carrying the satellite crashed after liftoff – Loral's engineers investigated extensively and in close consultation with the Chinese. US authorities now had second thoughts. They charged that the joint investigation amounted to an illegal "defense service" that could help improve Chinese ballistic missile capabilities. Loral's was a commercial satellite, not a military one. But in the aftermath, Congress reclassified all satellites as munitions and subjected them to non-proliferation protocols. Loral settled for a $20 million fine and suffered a brush with bankruptcy.

The Loral case captures the central dilemma of American export controls: the tension between a foreign economic policy that is supportive of US interests, on the one hand, and a pervasive commitment to technology restriction for national security considerations, on the other. In an emblematic case of 1990s-style globalization, China offered satellite launching services at substantially lower prices than could be found in the United States. Committed to trade liberalization, the Clinton administration encouraged such outsourcing, until the Loral mishap (and other cases like it) provoked deep-seated hawkish instincts in Congress. The Loral case also showcases that policing the distinction between civilian and military applications – a central preoccupation of export controllers – may just be an elusive goal. The issue has become particularly awkward in an age when innovation-intensive sectors – computing, telecommunications, biotech – serve both military and civilian uses (or, to invoke an example, when GPS directs both Uber drivers and high precision missiles to their destinations). Since the 1970s, Congress and administrations have found themselves conflicted over whether exports in such 'dual-use' technologies should be encouraged (to strengthen American businesses) or restricted (to prevent those deemed adversaries from obtaining them).

The book's emphasis is on the 1970s-1990s, though the authors provide deeper historical context. They pinpoint precedents such as the Trading with the Enemy Act of 1917. Substantially, however, American export controls are a spawn of World War II. The Control Act of 1940 established federal oversight over American firms' exports of arms, raw materials, machine tools, and technical knowledge (specs and blueprints); it was from this system that privileged Allied access under Lend-Lease

[8] "Have Chinese spies infiltrated American campuses?" *The New Yorker*, March 14, 2022.

[9] https://www.commerce.gov/news/press-releases/2022/04/commerce-department-expands-restrictions-exports-russia-and-belarus

was carved. During the first decades of the Cold War, the principal target of export controls was the Soviet bloc. American-Soviet détente since the late 1960s involved a relaxation of controls, and trade and scientific exchanges between East and West expanded. The Soviet Union took energetic advantage of the new opportunities to acquire American technology. This, as we learn, is the period when "technology transfer" became a term and a topic for social scientists.[10]

Technology transfer also posed a renewed problem for American national security. By the late 1970s the military establishment fretted about an American innovation deficit: Japanese firms were eroding American leadership in telecommunications and electronics, and the Soviets appeared to have achieved strategic parity. According to Daniels and Krige, this led to two shifts. On the one hand, export controllers began focusing on intangible know-how that could impart the capacity to innovate independently. Person-to-person technical assistance and engineering services now raised more concern than, say, the sale of a machine. Another consequence was that international scientific exchanges hosted at US universities moved into the eye of the national security apparatus. On the other hand, the goal conflict encapsulated by the Loral affair raised its head. American businesses clamored for a relaxation of export controls lest European and Japanese competitors snatch up global markets. The revamped 1979 Export Administration Act, which strengthened control over technologies with clear military application while liberating much else, reflected this compromise.

The book shines in its treatment of the 1980s and 1990s. In a nutshell, Japanese competition, which was deeply unsettling to Americans, ensured that export controls survived the Soviet collapse and received an economic reformulation. A new consensus congealed around the notion of "economic security" – the idea, that is, that military primacy required economic competitiveness (chapter 7). As the authors show, concern for American "economic security" could point to rather different courses of action. It came to justify the oft-forgotten mercantilist measures of the Reagan administration, such as strengthened oversight over foreign direct investment (implemented in 1988, targeting Japan) and industrial policy in semiconductors (via the public-private hybrid Sematech). But the neoliberal dogmatists that dominated the Clinton years invoked "economic security" with equal conviction. As their argument went, military supremacy required a thriving domestic industrial-technological base, and this in turn required a multilateral trade policy that would allow US corporations to dominate world markets. Hence, in the 1990s, "in the name of economic security, export controls were increasingly removed" (229). In a revealing phrase, the Clinton administration approved Loral's Xichang launch by citing "the national interest" (270).

This is a rich and compelling account, which yields a wealth of insights. To pick a few: the authors emphasize that for most of the interwar period, Washington exercised no oversight over firms dealing with other countries. This serves to contextualize the ease with which the Soviet Union was able to acquire technology from America during the First Five-Year Plan (1928-32).[11] The same finding also underscores how deeply World War II reshaped the American state and its relationship to the world.[12] A real gem is the authors' discussion of the origins of "economic security" thinking in the realist school of International Relations during the 1980s. It was the realists, the authors remind us, who coined and popularized terms – *geoeconomics, industrial policy, competitiveness* – that are regaining currency today. Finally, in a strange turn, Civil-Rights-era arch-segregationist Strom Thurmond resurfaces as nonagenarian Senate sponsor of the Defense Act that reclassified satellites as munitions in the aftermath of the Loral crash.

If one were to gripe, one could demand more consistent attention to numbers. For example, we learn that "in 1966, an estimated 12 percent of all US exports needed a 'validated license'" (96) and that "in the mid-1980s" 40 percent of exports required government approval (223) – a substantial increase, it would seem! A time series could be helpful. Also,

[10] See, for example, George Holliday, *Technology Transfer to the USSR: 1928-1937 and 1966-1975* (Boulder, CO.: Westview, 1974).

[11] See Stefan Link, *Forging Global Fordism: Nazi Germany, Soviet Russia, and the Contest over the Industrial Order* (Princeton: Princeton University Press, 2020), chapter 3.

[12] See Stephen Wertheim, *Tomorrow, the World: The Birth of U.S. Global Supremacy* (Cambridge: Harvard University Press, 2020).

occasionally the authors keep their noses awfully close to the technical ground. It turns out that "solid-state devices," a subject of much discussion in the 1970s (102, 106, 118), are a type of computer chip. But these are quibbles.

The full measure of this book is how sharply it improves our view of American economic statecraft. [13] It does so, first, in an international-comparative perspective. State control over technology – acquiring and denying technology – becomes visible as an intrinsic feature of the political architecture of global economic relations. We know that catch-up developers from Meiji Japan to present-day China have prioritized importing and indigenizing advanced technology from abroad. As Alice Amsden has demonstrated, there is simply no other way to catch up than through extensive technological learning. Learners, in Amsden's words, "visit international expositions, attend conferences and lectures, read technical journals, hire experienced workers, visit overseas plants, engage foreign technical assistants, consult machinery suppliers, and buy, borrow, beg, and steal foreign designs."[14] These are precisely the kinds of activities to which the US export control system has applied its vigilant scrutiny. In other words, Daniels and Krige suggest that the counterpoint to the sustained and pervasive efforts of catch-up industrializers to acquire technology have been the equally assertive efforts of technological leaders to withhold and deny it, or at least to protract and complicate its diffusion abroad. In this light, what explains American export controls since the 1940s is not only the Cold War but also the sheer fact of US technological dominance in the second half of the twentieth century. Certainly, World War II and the Cold War created the American national security state, and export controls along with it. But, as Michael Falcone has shown, it was only after 1940 that the United States in fact became dominant across a broad spectrum of high-end technologies.[15]

Another comparative observation: when Americans began agonizing over "economic security" in the 1980s they simply rediscovered what catcher-uppers knew all along – that military strength grows from a diversified, technologically capable civilian economy. This, after all, was the very point of the Meiji development mantra "rich nation, strong army."[16] As Arisawa Hiromi, one of the intellectual standard bearers of Japanese developmentalism, put it: "without heavy-mechanical, automobile, tractor and modern chemical industries, without the advanced technology of metal production and training in precision manufacturing, a country's economy simply will not have the foundation to produce advanced weapons." This statement concerned the technological context of the 1930s, but it encapsulates the basic insight of "economic security" thinking.[17]

Denying technology, however, presumes the capacity to develop and wield it. This is the second aspect of American economic statecraft which this book illuminates. Since World War II it has been an article of faith for Washington's national security elites that military-political primacy requires an unmatched capacity for techno-scientific innovation. National security therefore spawned, in the authors' apt words, "a massive state-driven innovation system" (30) that has joined government with businesses and universities in the pursuit of scientific-technological advances. It is revealing to read this book alongside accounts of the national-security sponsorship of American innovation.[18] Just like export controls, the American innovation system experienced a major refashioning in the 1970s and 1980s. By the mid-1970s, consumer

[13] For a useful restatement of the concept of economic statecraft, see Linda Weiss and Elizabeth Thurbon, "Developmental State or Economic Statecraft? Where, Why and How the Difference Matters," *New Political Economy* 26, no. 3 (2021): 472-489.

[14] Alice Amsden, *Asia's Next Giant: South Korea and Late Industrialization* (New York: Oxford University Press, 1989), 20.

[15] Michael Falcone, "The Rocket's Red Glare: Global Power and the Rise of American State Technology, 1940-1960," Ph.D. Dissertation, Northwestern University, 2019.

[16] Richard Samuels, *"Rich Nation, Strong Army": National Security and the Technological Transformation of Japan* (Ithaca: Cornell University Press, 1994).

[17] Quoted in Bai Gao, *Economic Ideology and Japanese Industrial Policy: Developmentalism from 1931 to 1965* (Cambridge/ New York: Cambridge University Press, 1997), 50. American "economic security" thinking in the 1980s clearly draws from efforts to scrutinize the Japanese developmental state – a reception history that deserves reconstruction. See for example Chalmers Johnson, *MITI and the Japanese Miracle: The Growth of Industrial Policy, 1925-1975* (Stanford: Stanford University Press, 1982).

[18] Fred Block, "Swimming Against the Current: The Rise of a Hidden Developmental State in the United States," *Politics & Society* 36, no. 2 (2008); Linda Weiss, *America Inc.? Innovation and Enterprise in the National Security State* (Ithaca/ London: Cornell University Press, 2014); Mariana Mazzucato*, The Entrepreneurial State: Debunking Public vs Private Sector Myths* (New York: Public Affairs, 2013).

markets lured the most innovative firms away from government contracts, throwing sand into the well-oiled gears of the military-industrial complex. In response, the national security state began to sponsor commercially oriented innovation for the purposes of military-technological advance. Contractors were allowed, indeed encouraged, to patent and commercialize innovations that had military applications – and this is how we ended up with GPS on our phones. In effect, widespread consumer use began to double as the large-scale field-testing of potential military technology even as, with scale, government procurement costs have come down.

In other words, the late 1970s and 1980s marked a major shift in the state-business relationships that characterize the American innovation system. Here the authors' account raises intriguing questions. For example, they give much attention to a 1976 Pentagon paper (the "Bucy Report") that criticized détente for giving away crucial American technology to the Soviets and adopted a hawkish stance on export controls. Bringing together national-secrecy bureaucrats with leading government contractors (the likes of Boeing, Lockheed, Xerox, and Hewlett Packard), the Bucy Report seems to represent a degree of government-industry alignment that soon crumbled. Fred J. Bucy was a semiconductor executive and embraced "a DoD [Department of Defense] perspective" (117); yet by 1983 his colleagues in the semiconductor industry inveighed strongly against the entire edifice of export controls (131-32). Is this telling of a split between the dinosaurs of the military-industrial complex and the new generation of smallish innovators that came to benefit from the Pentagon's turn to commercialization?

From a broad political-economy perspective, these shifts have been remarkably successful. The high-tech industries fostered by the innovation system since the 1970s helped revive and restructure the American economy in the 1980s and 1990s. Finance has received all the attention,[19] but the move towards high-end exportable products and services (telecommunications, engineering, computing) was equally momentous (and triggered a resurgence of American manufacturing, *sans* the jobs). As Leo Panitch and Sam Gindin document, by century's end, "the US accounted for 77 percent of the world's aerospace sales, 75 percent of all sales of computers and office equipment, 91 percent of computer software sales, and 62 percent of pharmaceuticals" – dual-use technologies that have been aggressively targeted by what Fred Block has called the "hidden" American developmental state since the late 1970s.[20]

On this background, third, export controls throw a revealing light on American economic statecraft in the neoliberal era. Daniels and Krige describe the clashes over export controls in the 1980s and 1990s as pitting American businesses and free-market liberals against "a politically powerful hardline faction" (197) that was ensconced in government and academia and committed to defending American technological leadership by fiat. But the authors' findings on the consistency with which free trade was justified in the name of "economic security" during the 1990s suggest that more is at play here: US strategic economic policy did not disappear, it simply shifted gears as American businesses regained the technological frontier and resoundingly reversed the dreaded innovation deficit of the late 1970s. The Clinton administration watered down export controls; it also signed NAFTA into law and finalized the World Trade Organization. The new multilateral architecture expanded American capital's room for maneuver; among other things it locked in property rights "on a vast array of trademarks, patents, semiconductor and industrial designs, trade secrets, satellite signals, and so on."[21] One might say that the national security state outsourced the policing of global access to American technology to the intellectual property lawyers of US corporations. Seen in this light, the recalibrations of export controls appear less as a "tug of war" between liberalizers and hawks (197) than as part of the multipronged effort to transform the global position of the American political economy since the crisis of the 1970s.

The analytical payoff of is substantial. For the longest time the social sciences have taught, and American culture has embraced, a dichotomy between liberal market systems and state-driven economic steering. The history of export controls, instead, reveals pervasive patterns of state-market interpenetration in postwar America. But state-society dichotomies are

[19] See, for example, Greta Krippner, "The Financialization of the American Economy," *Socio-Economic Review* 3 (2005): 173-208; Judith Stein, *Pivotal Decade: How the U.S. Traded Factories for Finance in the Seventies* (New Haven: Yale University Press, 2010).

[20] Leo Panitch and Sam Gindin, *The Making of Global Capitalism: The Political Economy of American Empire* (New York: Verso, 2012), 190; Block, "Swimming Against the Current."

[21] Panitch and Gindin, *Making of Global Capitalism*, 227.

tenacious; even Daniels and Krige occasionally invoke them. "Export regulations demarcate the borderline where the reach of 'free-market' ideology and liberal democratic freedoms ends and the realm of national security begins," they write (6). Absent American export controls, they propose, "the global movement of goods, information, and people would be much less regulated today" (18). Perhaps, though it seems to me that the authors' own account suggests something rather different. Technology never moves freely, since states aggressively manage innovation and shape the markets by which it spreads. The national security state does not sit on top or aloof of an otherwise "free" economy and society, it is embedded in them and formative of their very structures.

All told, this is a terrific and important book. To make sense of our current moment of post-neoliberal *revirement*, we need new, engaged, and detailed political histories of state institutions. Daniels and Krige show us what that might look like.

Review by Jessica Wang, University of British Columbia

Knowledge Regulation and National Security in Postwar America adeptly brings to light the arcane and convoluted world of export controls and their histories. Export controls, like financial regulation, administrative procedure, and other highly technical areas of legal and bureaucratic oversight, attract little everyday notice, yet possess extraordinary power in a global order of large organizations and the formalized institutional structures of the modern nation-state.[22] Mario Daniels and John Krige's study provides yet another post-2008 cautionary tale about how citizens and societies ignore such seemingly mundane, specialized areas of public policy and regulatory practice at their peril.

The book sheds light on the myriad ways in which export controls shape science, international affairs, and the politics of national security in the United States. In particular, Daniels and Krige's analysis highlights the slippery nature of exports themselves, and the real-world consequences of their liminality. Export controls operate between what laypersons otherwise assume are clear-cut and well-differentiated categories. The familiar post-World War II binary of secret vs. unclassified information, for example, actually encompasses a far less well-recognized "vast gray zone…between total restriction and unimpeded circulation" (7), in which clumsy yet powerful official distinctions, such as "sensitive but unclassified" or "controlled unclassified information" (13) have extended the state's reach over movements of knowledge. Over the decades, this bureaucratic invention of categories forged new spaces of regulation that have increasingly blurred the boundaries between open and secret, public and private, civilian and military, and even allies and enemies.

As Daniels and Krige show, export controls are undergirded by an exceedingly complex bureaucratic apparatus of overlapping, interlocking information control regimes, which grant the Departments of Commerce, State, and Defense authority over different parts of an intertwined regulatory apparatus. The net effect of these bureaucratic entanglements produced growing attention to exports as know-how, which widened the field of government regulation to include ideas, people, and the social interactions by which knowledge moves. As the authors emphasize, the idea of exports as non-tangible information and not simply material objects has a long history that dates back to the World War I and the Espionage Act of 1917. At the same time, the more recent period since the 1970s has constituted a political watershed, in which the explicit reorientation of export controls towards know-how, combined with the US political context of growing anxiety about American economic competitiveness, directed ever-increasing attention to face-to-face scientific exchanges both within the United States and abroad. In the process, the definition of national security itself has metastasized to include technology transfers that might weaken US economic power, in a post-cold war geopolitics that places maintenance of American economic prowess on the same plane as military power.

Daniels and Krige provide an extensive and incisive analysis of these transformations and how they have reshaped academe, intellectual property regimes, trade policy, and the politics of national security in the post-World War II and post-cold war eras. Here I wish to build outward from their analysis, by using the history of knowledge exchange and export controls as a jumping off point to puzzle over some of the conundrums of trade itself and the logics by which it operates. At one extreme, the old anarchist adage that all property is theft would seem to suggest that goods and ideas should flow freely, without export controls or any other restrictions at all, and without a sense of transactionalism beyond the human desire to do good. Another theoretical abstraction, liberalism, would suggest that export controls intrude upon the contractual relations by private parties that constitute the basis of fair exchange, if not liberty more generally. Meanwhile, exchange itself is replete

[22] For some early twenty-first century examples of such complex systems at work and their exploitation by those in the know, see David Cay Johnston, *Perfectly Legal: The Covert Campaign to Rig Our Tax System to Benefit the Super Rich—and Cheat Everybody Else* (New York and London: Portfolio, 2003); Bethany McLean and Peter Elkind, *The Smartest Guys in the Room: The Amazing Rise and Scandalous Fall of Enron*, updated edition (New York and London: Portfolio, 2004); and Carmen M. Reinhart and Kenneth S. Rogoff, *This Time Is Different: Eight Centuries of Financial Folly* (Princeton and Oxford: Princeton University Press, 2009). In an anti-statist political culture, much of the ordinary work of the U.S. state, for good or for ill, also remains relatively hidden, not always to the benefit of the government. See Brian Balogh, *A Government Out of Sight: The Mystery of National Authority in Nineteenth-Century America* (Cambridge and New York: Cambridge University Press, 2009); and Michael Lewis, *The Fifth Risk* (New York and London: W. W. Norton and Company, 2018).

with its own tensions. At the most basic level, the Anglo-American contract theory of liberal order assumes reciprocity between equal parties, in which both sides benefit from the act of exchange. The uneven landscape of power upon which transactions take place, however, turns exchange relationships into terrains of conflict.[23]

Export controls thus operate within and simultaneously shape the fields of power that govern exchanges. Historically they should be placed against the backdrop of contestation over the prerogatives of trade itself, running along a spectrum from statist or civilizational assertions of a right to acquire goods to claims of authority to stem the flow of commodities, manufactured goods, or ideas. Different societies throughout history have invented a variety of ideological constructs to rationalize various positions along this spectrum, such as universalist ideas about knowledge and nature as the patrimony of all humankind, particularist claims about ownership and property rights, or the strategic objectives of states.[24] Where do US export controls fit within this long history of power struggles over whether particular scientific and technological goods properly constitute a rightful inheritance of all humankind or objects of controlled access?

In the realm of global, cross-border flows of knowledge and its material manifestations, states' sense of ownership—not in the sense of title, but in the sense of sovereign authority—condition the terms of mobility. Based on Daniels and Krige's account, one might think of contemporary US export controls as resting upon a hybridization between the legal regimes that legitimate intellectual property, the apparatus of rights that governs freedom of speech and other components of democratic citizenship, and the American state's assertions of authority over movements of knowledge that it has defined as sensitive and in need of regulation. Within the United States, specific historical contexts—namely, Cold War geopolitics and then post-Cold War economic imperatives—molded the ever-evolving chimera that produced today's behemoth of knowledge regulation in an era that has redefined the maintenance of competitive advantage in high-technology markets as a matter of national security.

Regulation of exports, however, constitutes just one configuration of state-regulated knowledge flows. The field of power also encompasses a long history of expropriation, from the early modern era of exploration to the developmental imperatives of the twentieth century. Colonial ideology assumed a civilizational entitlement to claim the bounty of nature from those deemed unable to use valuable resources properly. The seventeenth-century Spanish empire, for example, had no qualms about appropriating Native uses of cinchona bark under the rubric of discovery, but then zealously defending a colonial monopoly on cinchona. Meanwhile, competing powers worked to subvert the prohibitions of Spanish America and its successor states. In the mid-nineteenth century, British personnel at Kew Gardens succeeded, through a combination of bribery, subversion, and other underhanded tactics, in acquiring cinchona and cultivating it in India. To add insult to injury, British experts at Kew Gardens justified their efforts by claiming that South American governments practiced poor stewardship and were driving cinchona into extinction.[25]

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[23] Eric Foner, *The Story of American Freedom* (New York and London: W. W. Norton and Company, 1998), ch. 6 provides a useful account of liberty of contract as theory versus its increasingly unworkable nature in a late nineteenth-century industrial and urban society. For a quick introduction to the idea of uneven development more generally, see Trevor J. Barnes and Brett Christophers, *Economic Geography: A Critical Introduction* (Hoboken, NJ and Chichester, West Sussex: Wiley Blackwell 2018). A more extensive elaboration of the concept appears in Neil Smith, *Uneven Development: Nature, Capital, and the Production of Space*, 3rd ed., with a new afterword (Athens, GA: University of Georgia Press, 2008).

[24] Universalist discourses about knowledge and nature as part of a global commons and statist claims about the strategic necessity of regulating trade are discussed below. With respect to ownership and property rights, the legal architectures and political concepts surrounding land tenure quickly come to mind. On the power relations and forms of institutionalization that conditioned Native land dispossession in colonial America and the United States, see Stuart Banner, *How the Indians Lost Their Land* (Cambridge, MA and London: Harvard University Press, 2007. Charles S. Maier, *Once within Borders: Territories of Power, Wealth, and Belonging since 1500* (Cambridge, MA and London: Harvard University Press, 2016), ch. 3 provides a thoughtful and useful global overview of the processes by which land became fungible and the implications of land's status as exchangeable property.

[25] Lucile H. Brockway, *Science and Colonial Expansion: The Role of the British Botanic Gardens* (New Haven and London: Yale University Press, 2002; originally published Academic Press, Inc., 1979), 111-19.

This imperial logic of rightful appropriation permeated the sciences of surveying and extraction, ranging across Native land dispossession, the identification and development of botanical resources, and mineral extraction regimes spanning from guano and rock phosphate for fertilizers to the latter-day energy infrastructure of oil. The *Sydney Morning Herald* in 1912 delivered a typical example of such thinking when it observed the following about the island of Banaba and its phosphate resources: "it is inconceivable that less than 500 Ocean Island-born natives can be allowed to prevent the mining and export of a produc[t] of such immense value to all the rest of mankind."[26] Invocation of the global commons has also profoundly shaped US mineral frontiers. As Megan Black has noted of the U.S. Department of Interior, "To justify departmental involvements in extraction abroad, Interior leaders argued that minerals belonged to all *and* were dangerously misunderstood by primitive peoples." Furthermore, as Black has pointed out, such notions paved a direct path from the civilizational arguments of colonialism to the development discourses of the second half of the twentieth century.[27] Yet, in late colonial and post-colonial contexts, nationalists did not always find unequivocal support from the outside for their technocratic aspirations for economic development. Post-World War II global conservation efforts, for example, at times struck uncomfortable overtones of foreign control over nature and its national resources. Not surprisingly, African leaders bristled when outsiders argued for environmental protection on universalist grounds, as in British conservationist Peter Scott's pronouncement in 1956 that wildlife conservation in Uganda sought to preserve the "unique heritage of the African people…for their enjoyment and for the enjoyment of all mankind in generations to come."[28] In the decolonizing context of the African continent, appeals to the patrimony of all humankind sounded all too much like colonialism revisited.

Universalist claims, however, sometimes provide means to challenge the power differentials that define advantage within the uneven terrain of the global economy. Pharmaceuticals offer an intriguing point of comparison to the export control story told by Daniels and Krige. Advanced pharmaceuticals are no less high-tech than the manufacturing methods, military hardware, satellites, and other technological endeavors discussed in *Knowledge Regulation and National Security*, yet their recent international history has been one of increased flows of knowledge and manufacturing know-how, rather than the erection of barriers. AIDS therapies constitute a case in point. In the late 1990s, new antiretroviral drugs made living with AIDS long-term into a reasonable prospect, but their extraordinarily high costs made them prohibitively expensive in the parts of the Global South where the AIDS epidemic was taking the highest human toll. The novel pharmaceutical advancements, however, came on the heels of equally novel arrangements by the World Trade Organization surrounding intellectual property, particularly the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS). On the one hand, WTO members had to agree to respect patent rights, which threatened to impede pharmaceutical production in countries that had previously not recognized intellectual property rights in life-saving medicines that, from their standpoint, required universal access without regard to profit. On the other hand, TRIPS permitted compulsory licensing, in which governments could issue licenses for the production of pharmaceuticals without obligation beyond "adequate remuneration" for patent holders. TRIPS provided a framework for India to produce and export generic antiretroviral drugs that have lowered the barriers to treating AIDS around the world, and that have ushered in a now-familiar era of advanced generic pharmaceuticals at lower prices throughout the Global South.[29]

This range of trajectories of trade and knowledge transfers raises the question of what makes some things part of a global commons, and other things not? There is nothing inherent about ownership or non-ownership of plants, minerals, life-saving drugs, arable land, endangered species and their landscapes, high tech computers and satellites, or international spaces such as the oceans, Antarctica, or outer space. In a lumpy economic world defined by uneven development, what then makes the technology and know-how for pharmaceutical production, but not satellites, shareable? Or in the post-1970s world of gene patenting, are the life sciences headed down the same road that Daniels and Krige have described for hard-

[26] Quoted in Katerina Martina Teaiwa, *Consuming Ocean Island: Stories of People and Phosphate from Banaba* (Bloomington, IN: Indiana University Press, 2015), 17.

[27] Megan Black, *The Global Interior: Mineral Frontiers and American Power* (Cambridge, MA and London: Harvard University Press, 2018), 14 (for the quotation) and 67.

[28] Stephen J. Macekura, *Of Limits and Growth: The Rise of Global Sustainable Development in the Twentieth Century* (New York: Cambridge University Press, 2015), 44.

[29] Ellen 't Hoen, Jonathan Berger, Alexandra Calmy, and Suerie Moon, "Driving a Decade of Change: HIV/AIDS, Patents and Access to Medicines for All," *Journal of the International AIDS Society* 14(15) (2011): 1-12.

wired technologies? Will they, too, be remade as engines of the U.S. economy that are essential to national security and therefore subject to export controls? Or to what extent are they already?

It does not take much imagination to see geopolitics and international relations as the field of power that constructs answers to such questions. Entanglements of science, technology, and knowledge with the imperatives of power may be particularly fraught in a mode of existence where the production of nature is inherent to capitalism.[30] The classic problem in science and technology studies (STS) of how best to harness the benefits of science and technology, and for whom, remains unresolved.

[30] See Smith, *Uneven Development*.

Review by Alex Wellerstein, Stevens Institute of Technology

When they met at the Reykjavik summit in October 1986, United States President Ronald Regan and Soviet General Secretary Mikhail Gorbachev came famously close to an agreement to eliminate their respective nuclear stockpiles once and for all. The sticking point was Reagan's insistence on developing the Strategic Defense Initiative, the high-tech, space-based anti-ballistic missile system that Reagan claimed would shield the world from nuclear "maniacs," and that Gorbachev claimed would make it impossible for him to sell their deal to the military. Reagan attempted, in vain, to convince Gorbachev that SDI need not be a threat — that the United States would, he insisted, even share its technology with the Soviets when it was developed. Gorbachev's reply was bitter: "Excuse me, Mr. President, but I do not take your idea of sharing SDI seriously. You don't want to share even petroleum equipment, automatic machine tools or equipment for dairies, while sharing SDI would be a second American revolution. And revolutions do not occur all that often."[31]

There is a bitter humor in Gorbachev's rebuke: if the United States would not share "milking machines" (as the line is frequently interpreted in the West), then what are the odds it would not share anti-missile space-laser technology? It also raises the question: why control the proliferation of dairy equipment, or even oil drilling equipment? These are not secret technologies developed by national laboratories as part of Cold War arms races, but banal commercial and industrial technologies of the sort used globally for basic economic purposes. And yet the regulation of their technological diffusion, like many other banal technologies, were part of an immense national and transnational apparatus that flourished during the Cold War and still operates to this day: export controls.

Mario Daniels and John Krige's new book, *Knowledge Regulation and National Security in Postwar America*, is a history of export controls in the United States, and is a valuable and important work that requires the attention of historians of many stripes, as well as policymakers today. The American export control system amounts, ultimately, to the largest state apparatus of formal censorship in the United States. Export control is not, as Daniels and Krige are at pains to emphasize, a form of state secrecy, in that it is not about attempting to divide the world up into a private and public sphere. Rather, export control is about regulating the public sphere: it applies to all Americans (and all who might work with and contact Americans), regardless of whether they have a formal security clearance, receive government funding, and have any access to classified information. Export controls exclusively are applied to unclassified science and technology, and are regulations on what kinds of communication (including speech, conference papers, written publications, journal articles, books, physical objects, etc.) Americans (and those they contact) are allowed to have with designated national enemies or competitors. While the American system of secrecy is vast, the scope of export controls is in principle far vaster, because it applies to far more people.

Any researcher, in any field, who has received sponsored funding at a university in the last decade is likely aware that their university maintains some kind of export control office, and that they must self-report whether their intended research might take them into possibly regulated territory. Most humanists and social scientists, however, have likely never encountered the controls personally, because (for reasons that Daniels and Krige explain) their work falls under a "Fundamental Research Exclusion" that was carved out as a compromise of sorts in the 1980s. Nevertheless, Daniels and Krige emphasize that humanists and social scientists should be more aware of export controls and the role they play in American research and development, diplomacy, and politics.

[31] As quoted from the official Russian transcript of the meeting, as translated by the US Foreign Broadcast Information Service: "Russian transcript of Reagan-Gorbachev Summit in Reykjavik, 11 October 1986 (afternoon)," published in FBIS-USR-93-087 (12 July 1993), on 6. The official US notes, which do not purport to be verbatim quotes, word it slightly differently: "He was sorry to say that with regard to sharing he could not take the President seriously; speaking frankly. The U.S. was unwilling to give the Soviets oil drilling equipment, automatic machinery, even milk factories. For the U.S. to give the products of high technology would be a second American Revolution, and it would not happen." U.S. Memorandum of Conversation, Reagan-Gorbachev, Second Meeting, 11 October 1986, 3:30 p.m.–5:40 p.m., on 14-15. Copies of both come from Svetlana Savranskaya and Thomas Blanton, eds., "The Reykjavik File," National Security Archive Electronic Briefing Book No. 203 (31 October 2006), documents 11 and 12, online at https://nsarchive2.gwu.edu/NSAEBB/NSAEBB203/ (accessed 6 June 2022).

Despite their reach, there has yet to be any attempt at a comprehensive historical account of the development of export controls. Why not? Daniels and Krige go over several reasons in their excellent introduction, ranging from the sociological (e.g., the aforementioned fact that the researchers who might be expected write such a thing rarely encounter them personally) to the intellectual (e.g., their inherently boundary-crossing nature makes it hard for any scholar to imagine grasping the whole issue). They also mention the reason I would have given, a priori, based on my own occasional glances into export controls as part of my own research into secrecy:[32] export controls are about as deeply bureaucratic as it gets, are governed by long (and usually secret) lists of potential technologies, are policed largely by the (snore) Department of Commerce, and are, as Daniels and Krige put it, "dauntingly dry" (17). Whenever I have dipped a toe into anything regarding export controls, I immediately thought: this is deadly dull. Which put into more defensible terms, means: I would personally find it hard to tell an interesting story about this.

Fortunately, Daniels and Krige have managed to make their own book on the topic intellectually stimulating and a swift-enough read. As they thoroughly emphasize, their book is not meant to be the last word on this subject at all, but an almost preliminary attempt to periodize and organize the history, and to set some of the framework for future work that they hope historians of science and technology, historians of government policy, and historians of diplomacy will someday undertake. And the book is a success at doing this, even if — as they acknowledge — it has its limitations.

The book tells a narrative that has extremely familiar broad outlines, though the specifics and details will likely be new to most readers. Export controls were, like much of the national security state, legally created during the First World War as temporary wartime provisions, then brought back with more enthusiasm in the Second World War, and then, after a liminal period in which it was widely expected that they would be allowed to evaporate, turned into a permanent measure as the uncertain postwar coalesced into a hardened Cold War around 1950. It was not until the early 1960s, however, that the Department of Commerce decided to show their 'teeth' by punishing export control violators — even ones who did so out of ignorance or misinterpretation of the deliberately-vague regulations.

From here the narrative shifts into different conceptions of export controls in the period of détente and the late Cold War, both in what they were trying to regulate, and what their goals were. Export controls present a fascinating study in categorization for anyone who is epistemologically inclined. Whereas secrecy already presents various epistemological quandaries — dividing the world up into the 'public' and the 'secret' — export controls rely on questions about what technology is, how technology spreads, what knowledge is, how knowledge spreads, how nationality is applied to categories of knowledge regulation, definitions of what it means for something to be 'published' or not, questions about basic, applied, and fundamental research, and so on. And the goals of export control were equally fluid, including the proliferation of sensitive technologies, worries about maintaining American 'lead time' in certain technological areas, to a far more expansive definition of 'economic security' which essentially argued that all economic competition was, by definition, a form of 'national security' (because a poor state cannot project power effectively), thus 'weaponizing' even the dairy equipment that Gorbachev bitterly complained about in my opening anecdote. Export controls, the authors make abundantly clear, were the locus of several interwoven debates about technology, economics, education, military power, and state regulatory power in general, and as such were an immensely complex political-epistemological site for thinking about knowledge and its role in the world during the Cold War and beyond.

The main deficit of the book comes from its documentary nature. Its heart is what I think of as 'report to report' and 'memo to memo' history: a history of policy that primarily works by looking at landmark reports (or memos) and describing the changes that occur between each one. This has its benefits, especially as a first-stab, because these reports, memos, laws, and so on, are what make up the export control regime that is being described. But without a deeper contextualization of these documents, there are missed depths, some of which are likely quite valuable. As an example, this book unsurprisingly makes reference to Vannevar Bush's *Science—The Endless Frontier* (1945), the oft-quoted report on postwar American research and development written by the head of the wartime Office for Scientific Research and Development.[33] This is a report

[32] Alex Wellerstein, *Restricted Data: The History of Nuclear Secrecy in the United States* (University of Chicago Press, 2021).

[33] Vannevar Bush, *Science–The Endless Frontier* (United States Government Printing Office, 1945).

whose context shapes how one understands it today: Roosevelt did not ask Bush to write him a report; Bush instigated the entire thing. The report is not just an expression of the value of 'basic research,' but was written specifically by Bush as a counter to alternative, more socialistic science funding proposals (esp. that of Senator Harley Kilgore) that had been advocated during the war. Knowing this changes how one reads Bush's work: not as a "generic" advocacy for postwar R&D, but a very specific type of proposal meant to thread the needle between government sponsorship of research and government control of research.[34] The background context of the report is known to historians of science and technology, and the report is only one very small piece of the overall story that Daniels and Krige tell, but I bring it up just as an illustration of the differences between taking a report as a face-value presentation of ideas, and what a deeper historical investigation of its generation, the personalities involved, and the underlying motivations and choices can reveal, and how that can radically alter the historical meaning of the document.

The authors do justifiably spend an entire chapter on the Bucy Report, an attempt in 1976 to enact a radical re-thinking on the US export control regime. The authors persuasively argue that the Bucy Report is important for many reasons: as a barometer for how industry and the Department of Defense were thinking about export controls in the waning part of détente; as the subject of a major political and bureaucratic clash between the Department of Defense, Congress, and industry; and as part of a crucial moment in which the United States was beginning to grapple with the fact that it was no longer as obviously dominant in economic and global affairs as it had been in earlier Cold War. But I suspect they were also quite drawn to (as was I) the "novel and somewhat idiosyncratic conception of technology" (102) that sat at the heart of the report. Whereas previous approaches to defining "technology" for the purpose of export control (which is meant, of course, to regulate the diffusion of technology) had focused on technological "products" as the identification of both "technology" and the thing to be regulated, the Bucy Report instead gives a very different definition: "Technology is not science and it is not products. Technology is the application of science to the manufacture of products and services. It is the specific know-how required to define a product that fulfills a need, to design the product, and to manufacture it. The product is the end-product of this technology, but it is not technology" (102). This is, as the authors label it, a discernment between "technology-as-end product" and "technology-as-know-how," and is a fascinating epistemological argument, one with far-reaching implications for what the object of export controls was meant to be. And in the rest of the chapter, the authors go into what those implications are in great detail.

What the chapter lacks, however, is any indication as to how the Bucy Report authors came up with this particular definition, and why they did so (other than their stated justifications, which, again, are probably incomplete). It is not clear how important the task force chair, J. Fred Bucy, the executive vice president of Texas Instruments Incorporated, was relative to the other members of the "fifteen-man task force that included a roughly equal number of corporate leaders and administration officials (from the Departments of Commerce and Defense, the CIA, and the White House)" (101). Whose interests did this report, with its varied inputs, end up serving? And why, ultimately, did it lose out to other conceptions of the problem? Again, it is easy to read the report for its face-value presentation about its goals and interests and mindset, but a deeper historical investigation into the context behind the report and its reception would probably reveal an even more complicated story.

There are a few other areas where the narrative touches on aspects of this history I have researched deeply (the Tolman Committee on Declassification, the development of the Restricted Data clause of the Atomic Energy Act, the *U.S. v. The Progressive* case),[35] and where I felt that telling a little more of the 'story behind the story' could have enriched the overall interpretation, and potentially avoid some possible misunderstandings. This also made me only wish I knew more of the 'story behind the story' for many of the other core documents that shape the narrative of this book. Along with the aforementioned Bucy Report, I hungered for the inner-workings of the National Academy of Science's Corson panel of 1982, which attempted to carve out freedoms for research and education while still providing a framework for export controls. This attempt to thread the needle, which ultimately led to the Fundamental Research Exclusion (which allows "fundamental research" to be exempt from export controls), pleased some and angered others, but what we get of it is an

[34] Daniel J. Kevles, "The National Science Foundation and the Debate over Postwar Research Policy, 1942–1945: A Political Reinterpretation of *Science–The Endless Frontier*," *Isis* 68, no. 1 (March 1977): 4–26.

[35] Wellerstein, *Restricted Data*, chapters 4.3, 4.2, 8.1 and 8.2.

account of its final product (another report), and not much of the undoubtedly fraught process that led to it. Similarly, we get an excellent analysis of the contents of the Cox Report of 1996, which attacked the Clinton administration for giving away secrets to China, but not much about its gestation.

But there is nothing more annoying to be told by a reviewer that one's long and hard-won work of detailed historical scholarship, especially one that tries to forge new ground, could have been even longer and more hard-won than it was. There is always more that could have been written. The authors themselves are quite up front about their intention that this book be a contribution that will stimulate further research inquiries, and I hope that this is indeed what happens, because these issues are extremely important. My desire for more is an indication of how successful they are at provoking this interest.

As with probably any historical work that tries to run nearly up to the present, the later chapters of the book feel somewhat less focused and archival than the earlier chapters. Aside from the difficulty of getting non-public sources from these periods, part of this can be explained by the fact that export controls themselves became murkier over the years, both in terms of what they applied to and what their goals were. Over the course of this narrative, export control shifted from being conceived of as a relatively narrow means of maintaining a critical military advantage to a tool of choice for trying to promote "economic security," which at times is hard to see as much more than an excuse for rank protectionism. The case of Japan in the 1980s feels like a particularly egregious mixture of panic and xenophobia directed at a stalwart ally, and the use of export controls to try to hobble Japanese businesses hardly defensible in retrospect. The indignant arguments that the Japanese were using "unfair" amounts of state-funding and state-protection to increase their research and development output seem particularly pathetic coming from a Cold War superpower whose position was based on the application of exactly these same sorts of forces. One possible way to read Daniels and Krige's overall narrative is that the US got ahead, then forgot what it needed to do to get ahead, and then tried to hobble even its own allies when they seemed to be on the verge of out-playing it at its own game. It may be that export controls, in their more narrow definition, could at times feel at least somewhat defensible (though I admit to never getting fully on board with the idea that trying to regulate the export of unclassified research is a good or practical idea). Still, the "economic security" paradigm, especially applied to allies, does not appear to be the action of a nation on the right side of history, but rather the desperate move of a declining power.

There is one question that the authors do not ask in this book, that I wish they had, even if it is ultimately unanswerable: did (or do) export controls 'work'? That is, did they accomplish the goals they set out to accomplish at various moments, and if so or not, at what costs? This is ultimately a counterfactual question ("if export controls had not existed, or had been applied differently, how different would the world be from what it was?") and, as such, is obviously not something anyone, much less principled historians, can answer with any confidence. After reading this book my sense is that export controls have a pretty spotty track record at best when it comes to increasing American competitiveness in terms of national security and economic issues, and that their impact on both university and commercial research may have been ultimately negative for what little security they may have bought. But after their long study of this issue, I would be very interested in knowing what the authors think about such a question, and what form they think an answer might take.

The last two chapters of the book bring the history of the issue up to 2020. Though the authors do not draw any overt policy lessons from the work (and I would defend the right of historians to avoid such activity if they wish, because it is hard enough to understand the past on its own terms, much less make arguments about potential futures), any reader currently in a university, an industrial firm, or a governmental role (in any country) will find much food for thought regarding present discussions, which are still ongoing, about the tricky problem that is the People's Republic of China: a major economic and potentially military competitor to the United States that is nonetheless a major trading partner and a source of a significant amount of funding to American research universities. I have been approached several times in the last decade by people working for the US government to give informal opinions about what kinds of restrictions could be put in place, or ought to be put in place, on Chinese students wanting to acquire an education in the United States. I admit I had been surprised by the request: we are talking about unclassified educations, so why should there be any restrictions? What happened to Robert Merton's norms of science, and the old appeals (however historically dubious) to the universalism and internationalism of knowledge? Restrict classified information all you want, I have tended to reply, but when you start to try to restrict

unclassified information, you are getting into very tricky and probably counter-productive territory. I can now see, thanks to the work of Daniels and Krige, that my response is but one in a line of similar responses by historical actors, and represents one position (specifically, eliminating controls on anything that is not under classification, or under a specific US government contract, or applies only to the process of receiving an education, and otherwise abolish any idea of a "gray area" between the classified and unclassified worlds of knowledge) in a long list of positions that have been vigorously advocated and occasionally enacted over the last century. This is, as I hope I have indicated clearly, a thoroughly stimulating and important book.

Review by Mark Wilson, University of North Carolina-Charlotte

Mario Daniels and John Krige have produced a book that is ambitious and timely. As they suggest, paying more attention to export controls—especially the regulation of technical data and knowledge—allows us to better understand the broader histories of international relations, military competitions, economics, and science and technology. Most of the volume is focused on the history of US export controls over the last half century, from the 1970s to 2020. This allows Daniels and Krige to discuss US policies that attempted to limit transfers of key items and know-how to three different rivals: the Soviet Union, Japan, and China. Along the way, they touch on US policymakers' efforts to regulate a variety of sensitive technologies, ranging from oil refining equipment to bubble memory to space launch.

Daniels and Krige have a lot to report about the many fascinating aspects of knowledge regulation and export control history, which they have discussed not just in this volume, but in a variety of other recent publications.[36] Even within this book, there are at least two distinct narratives, each of which might have been the basis of a separate monograph. First, the authors offer an updated history of post-1945 export controls, in conversation with influential previous accounts of the subject, including the work of Michael Mastanduno and other scholars who have already written a great deal about the activities of the Coordinating Committee for Multilateral Export Controls (CoCom) during the Cold War and its immediate aftermath.[37] To their credit, Daniels and Krige not only update this history to include more recent developments, but also begin to offer a fresh perspective by emphasizing flows of knowledge, as opposed to tangible goods. Second, Daniels and Krige use parts of several chapters to discuss the related matter of how export controls have affected universities, in particular, and how academic communities have participated in struggles over the regulation of knowledge.

As the historians of CoCom have suggested, export control policies are often highly contested, and are frequently overhauled, not least because they are so difficult to design and manage. Over many decades, control hawks, making apparently commonsensical arguments about the dangers of transferring technologies to rivals, have clashed with liberalizers, who have pointed out the futility of many controls, and the costs of limiting exchange. Daniels and Krige rarely make strong interpretive arguments about which approaches were more effective at different points in time, or about the lessons the history may suggest for new policies in the mid-twenty-first century. However, they do offer something of a framing historical argument, suggesting that the US government's regulation of knowledge exports has been increasing, over time. "Export controls are just one of an increasing, and increasingly invasive, regulatory system devised by the architects of the US national security state," they claim in the book's introduction (7). Toward the end of the book, they repeat this claim: "the rationale for state intervention in the market using export controls has not only persisted; it has become amplified over time" (294). This is a noteworthy statement, because it seems to clash with previous histories of CoCom, which have emphasized a more cyclical pattern of regulation and liberalization, over the decades. It might also be understood to complicate other accounts of the recent history of the US state, many of which focus on neoliberalism.

[36] Mario Daniels and John Krige, "Beyond the Reach of Regulation? 'Basic' and 'Applied' Research in the Early Cold War United States," *Technology and Culture* 59, no. 2 (2018): 226-250; John Krige, "Regulating International Knowledge Exchange: The National Security State and the American Research University from the 1950s to Today," *Technology and Culture* 60, no. 1 (2019): 252-277; John Krige, ed., *How Knowledge Moves: Writing the Transnational History of Science and Technology* (Chicago: University of Chicago Press, 2019); Mario Daniels, "Controlling Knowledge, Controlling people: Travel Restrictions of US Scientists and National Security," *Diplomatic History* 43, no. 1 (2019): 57-82; Mario Daniels, "Safeguarding Détente: U.S. High Performance Computer Exports to the Soviet Union," *Diplomatic History* (2022), published online May 2022, dhac031, https://doi.org/10.1093/dh/dhac031 ; John Krige, ed., *Knowledge Flows in a Global Age: A Transnational Approach* (Chicago: University of Chicago Press, 2022).

[37] Michael Mastanduno, *Economic Containment: CoCom and the Politics of East West Trade* (Ithaca, NY: Cornell University Press, 1992); Richard T. Cupitt, *Reluctant Champions: U.S. Presidential Policy and Strategic Export Controls—Truman, Eisenhower, Bush and Clinton* (New York: Taylor and Francis, 2000); Alan P. Dobson, *US Economic Statecraft for Survival, 1933-1991: Of Sanctions, Embargoes, and Economic Warfare* (New York: Routledge, 2002); Tor Egil Førland, *Cold War Economic Warfare: CoCom and the Forging of Strategic Export Controls, 1948-1954* (Dordrecht: Republic of Letters, 2010).

Although it is obvious that the last five years have seen increased controls, the book does not do enough to sustain the broader claim about the amplification of regulation since the 1940s. It has trouble doing so in part because of the incomplete, disjointed narratives it offers for different parts of the story. The discussion of universities, for example, is confined mostly to Chapters 5, 6, and 10, dealing with the 1980s and the 2010s. Readers are not given enough information about universities in the early Cold War (which have been discussed in a rich scholarly literature[38]) to be able to compare an early baseline against subsequent developments. Similarly, with regard to the control of knowledge in the hands of private business firms, Daniels and Krige discuss several remarkable examples of disputed transactions from across the decades, but the book does not provide the kind of sustained, systematic survey of change and continuity over time, from the perspective of the private sector.

As Daniels and Krige point out in their introduction, it is hard to manage a research and writing project of the kind undertaken for this book, in part because of the abundance of possible source material. Ultimately, the book deals with this problem by relying mainly on low-hanging fruit, especially reports by US government agencies and quasi-governmental boards and commissions, Congressional hearings, and other published documents. Indeed, a good deal of the book is devoted to summarizing a series of influential reports on US export control policy, including the Bucy Report (1976), which called for more attention to transfers of know-how, rather than just tangible items; the Corson Report (1982), which sought to limit restrictions on the publication of basic research; and the Cox Report (1999), which criticized the lack of strong controls on transfers of technology to China. This discussion of key published sources from a mostly top-down perspective is valuable, but it does little to illuminate behind-the-scenes struggles, which might have enlivened the narrative and offered readers a more profound understanding of the subject.

The book's heavy reliance on published US government documents contributes to its inadequate consideration of flows of goods and knowledge running in directions other than from the US to its rivals. As the historians of CoCom have shown, past US efforts to apply tight export controls were often stymied by European allies, who typically were more eager to sell to the Soviet Union and Eastern Europe. Even more than Daniels and Krige suggest in the book's final chapters, recent US policy struggles over exports to China should be understood as occurring in the context of a competitive global economy, in which China may be able to find non-US-based substitutes for many high-tech items and bodies of knowledge.[39] More global perspective might also have allowed for consideration of cases in which the United States has been the importer, rather than the exporter, of specialized knowledge. As the historian Peter Westwick has observed, one of the more remarkable stories of Cold War scientific knowledge transfer occurred in the case of stealth, where the translation of a paper by Soviet mathematician Pyotr Ufimtsev ended up providing theoretical foundations for new US aircraft designs that would be mostly invisible to radar.[40]

Daniels and Krige rightly suggest that this book may be used by some readers as an up-to-date introduction to the subject and "a gateway" to future scholarship, which should use additional evidence, including more archival research (18). Here, there are many possibilities. Some scholars should follow the lead of Hugo Meijer, whose book on US export controls directed at China (on which Daniels and Krige rely) was enriched by the author's dozens of original interviews with

[38] Stuart W. Leslie, *The Cold War and American Science: The Military-Industrial-Academic Complex at MIT and Stanford* (New York: Columbia University Press, 1993); Roger L. Geiger, *Research and Relevant Knowledge: American Research Universities since World War II* (New York: Oxford University Press, 1993); Rebecca S. Lowen, *Creating the Cold War University: The Transformation of Stanford* (Berkeley: University of California Press, 1997); John George Terino, Jr., "In the Shadow of Spreading Ivy: Science, Culture, and the Cold War at the University of Pennsylvania, 1950-1970" (Ph.D. diss., University of Pennsylvania, 2001); Margaret O'Mara, *Cities of Knowledge: Cold War Science and the Search for the Next Silicon Valley* (Princeton, NJ: Princeton University Press, 2005); Stephen B. Adams, "Follow the Money: Engineering at Stanford and UC Berkeley during the Rise of Silicon Valley," *Minerva* 47, no. 4 (2009): 367-390. On the later Cold War period, see Elizabeth Popp Berman, *Creating the Market University: How Academic Science Became an Economic Engine* (Princeton: Princeton University Press, 2012).

[39] Dong Jung Kim, *Compound Containment: A Reigning Power's Military-Economic Countermeasures against a Challenging Power* (Ann Arbor: University of Michigan Press, 2022).

[40] Peter Westwick, *Stealth: The Secret Contest to Invent Invisible Aircraft* (New York: Oxford University Press, 2020), 40-44.

policymakers.[41] Other scholars can do more to mine the growing body of newly opened, not-yet-much-used collections of the papers of National Security Council officials and other records, at some of the newer presidential libraries. More research using the records of universities and business firms, as well as legal cases, would likely provide some valuable perspectives on the subject that might reach different conclusions than accounts that focus on US government documents. As suggested above, more research in non-US archives will likely bring great rewards. Finally, as Daniels and Krige suggest in the early part of their book, there should also be opportunities for new research into knowledge regulation and export controls before World War II.

Ideally some of the book's readers will take up the challenge laid down by Daniels and Krige, who argue that political scientists, historians, and economists have failed to do enough to study export controls and knowledge regulation. Recent global developments would seem to vindicate this claim. As many nations try to coordinate economic warfare against Russia, and as the US continues to try to impose stricter export controls against China, the historical perspective offered by Daniels and Krige provides plenty of food for thought. Future scholarship, building on their work, will provide even richer accounts of the long struggle over knowledge regulation and global security.

[41] Hugo Meijer, *Trading with the Enemy: The Making of US Export Control Policy toward the People's Republic of China* (New York: Oxford University Press, 2016).

Response by Mario Daniels, University of Amsterdam, and John Krige, Emeritus, Georgia Tech

We would like to express our heartfelt thanks to Kate Epstein for putting together this distinguished panel, and to the four panelists who have devoted so much time and intellectual energy to our book. It is a rare treat to have such a close and critical reading of a long and complex text, all the more so when the reviewers have outlined our main argument so well and posed such challenging questions for further consideration.

One major aim of this book, covering the time period from 1917 to 2020, was to unpack how the US government managed the tension between "a belief in minimal government intervention and the primacy of the marketplace, on the one hand, and the desire by government to intervene systematically in the market and regulate transactions in the name of national security, on the other."[42] In this regard Stefan Link is not alone in stressing the importance we attach to the period from the 1970s through the 1990s, when the US passed from being the undisputed world leader in mobilizing science and technology to economic and military ends to grappling with the onset of a new wave of globalization and the revolution in information technologies. Link draws on his own fine study of technology transfer in the interwar period to see that the US was once a 'catcher-upper' who had to learn that "military strength grows from a diversified, technologically capable civilian economy."[43]

He rightly sees the expansions of national security to embrace economic security as a key strategic move to resolve the tension between free markets and regulatory demands, legitimating state intervention in the civilian economy to meet the Japanese threat in the semi-conductor industry in particular. The success of these new policies was evident by the time of the Clinton neo-liberal era — reversing what Alex Wellerstein characterizes as "the desperate move of a declining power." But did this mean, as Link suggests, that the global regulation of technology flows was now "outsourced [...] to the intellectual property lawyers of US corporations"? Or that the importance of intellectual property rights in US foreign and trade relations "rose as the Berlin Wall fell" and that they, "more than export controls" became "critical to protecting American high-tech trade," as Greg Whitesides has argued in his book?[44]

We think it would be wrong to imagine the relationship between intellectual property rights (IPR) and export controls as a simple shift from one regime to the other. Rather we see them as intertwined, at times complementary, at times contradictory systems of knowledge regulation. In the 1980s and 1990s there were indeed close links between the sphere of IPR and the US policy of expanding "free" markets. Export controls and the international establishment of IPR simultaneously made important conceptual, political and institutional strides during the decades of accelerated globalization of high technology markets that began in the 1970s.

On the one hand, as we show in our book, from this time on the protection of intangible knowledge became – after a long gestation period that began during World War I (see our chapter 2) – the key concern of US export controls. This paved the way for the development of new bureaucratic rules and instruments which would even be used against allies, especially Japan in the 1980s. On the other hand, US high technology companies also began to push for the globalization of US intellectual property *standards* at this time in order to defend their increasingly embattled market position against the catcher-uppers like Japan and the "Asian Tiger" states. The leaders of some of the biggest US chemical, biotech, semiconductor, software and media companies teamed up to make the spread of US intellectual property standards an integral and central part of US foreign (trade) policy.

[42] Michael Mastanduno, *Economic Containment: CoCom and the Politics of East-West Trade* (Ithaca, NY: Cornell University Press, 1992), 32.

[43] Stefan Link, *Forging Global Fordism: Nazi Germany, Soviet Russia, and Contest over the Industrial Order* (Princeton: Princeton University Press, 2020).

[44] Greg Whitesides, *Science and American Foreign Relations since World War II* (Cambridge: Cambridge University Press, 2019), 237-238.

It is easy to forget today that this was a major political innovation. Before the 1980s international trade agreements like the GATT dealt exclusively with impediments to the movement of *tangible goods*, for example, tariffs. Taking advantage of a wave of declinist and protectionist sentiments in Washington, the high-tech companies successfully established *intangible knowledge* as a central concern of foreign relations and brought the Reagan, George H.W. Bush, and Clinton administrations, as well as Congress, on board. The Reagan administration threatened and then used aggressive trade sanctions under the amended sec. 301 of the Trade Act of 1974 to force industrializing countries to implement IPR in accordance with US law.[45] Even though these US measures targeted countries like Hong Kong, Mexico and South Korea, this new urge to protect industrial knowledge was fueled by fears of Japanese economic power. IPR appeared to policy makers and high tech companies as the central asset and weapon they could use to strengthen US competitiveness and contain Japanese (and Western European, for that matter) prowess to capture global markets.[46]

The history of US IPR policy is the flipside of our chapter on the rise of "economic security" as the guiding thread of export control debates in the 1980s and 1990s. Both strands of US policy share some central features: often the same actors (the semiconductor industry for example, or the US Trade Representative); some of the same enemies (Japan, the Western Europeans, and the catcher uppers – but in the case of IP, minus the Soviet Union and its Communist allies); the same rhetoric of knowledge loss and charges that others were "stealing" US technology[47]; the same protectionist impulse against the perceived loss of US competitiveness; the same targets (states, in order to make them control their companies, and companies, to encourage them to exert influence on states); and the same emphasis on intangibles as the foundation of the US hegemonic position in the international economic system.

This suggests that we need to integrate the history of export controls, the "economic security" paradigm, and their impact on the political economy of knowledge sharing and denial fully into the history of the US trade and IPR policy before and since the Agreement on Trade-Related Intellectual Property Rights (TRIPS) was integrated into the architecture of the World Trade Organization in 1994.[48] This fuller picture would be a response to Link's injunction to think more thoroughly about the way "states aggressively manage innovation and shape the markets by which it spreads" and would show how IPR policy and export controls interact in practice. It would also highlight the often messy and contradictory nature of US knowledge control policy. After all, the business leaders who were lobbying for TRIPS saw export controls as a serious obstacle to their competitiveness on world markets.

At the same time that US companies and the government promoted trade liberalization at the Uruguay Round of GATT, Bush and then Bill Clinton formally tied export controls to proliferation controls, thus linking them not only to new regimes of regulation but also to an extended concept of what counted as proliferation technology that, for some, included dual-use technologies like high performance computers. In fact the regulatory terrain was populated with new actors in the late 1980s and 1990s in addition to the Nuclear Suppliers Group (the Missile Technology Control Regime, the Wassenaar Arrangement replacing CoCom, the Australia Group that harmonized export controls to regulate the proliferation of biological and chemical weapons) that intersected with free trade in the neoliberal era. What we see, then, is that the caesurae at the end of the Cold War and the following rapid expansion of neoliberal world markets went along with the construction of several new multilateral institutions to regulate trade in sensitive commodities. In short, there is more continuity in overall policy than Link allows. Indeed, emphasizing the close relationship between export controls and international IPR and trade agreements shows that the "national security state does not sit on top or aloof of an otherwise 'free' economy and society, it is embedded in them and formative of their very structures," as he puts it.

[45] See for a short overview, including on the most recent vigorous uses of sec. 301, Andres B. Schwarzenberg, "Section 301 of the Trade Act of 1974," *Congressional Research Service*, May 26, 2022, https://crsreports.congress.gov/product/pdf/IF/IF11346 (accessed July 24, 2022).

[46] For an excellent historical overview see Peter Drahos with John Braithwaite, *Information Feudalism: Who owns the Knowledge Economy?* (New York: The New Press, 2002).

[47] Drahos/Braithwaite, 61-62, 97-98.

[48] Amrita Narlikar, *The World Trade Organization: A Very Short Introduction* (Oxford: Oxford University Press, 2005, 80-84).

This would also allow for a more careful positioning of export controls in the history of north-south relations as shaped by instruments like TRIPS – a point Jessica Wang touches upon. In her view, the development of pharmaceuticals markets since 1980s "has been one of increased flows of knowledge and manufacturing know-how, rather than the erection of barriers." But the increase of knowledge flows does not necessarily mean a reduction of control. The very nature of IPR, as regulated by TRIPS and other instruments, is to control knowledge in order to commodify its flows. In many cases this implies that this flow (which is usually limited to carefully identified knowledges only) *enhances* control, as every farmer who has to deal with Monsanto-owned corn seeds can tell you. And in the case of AIDS medication, corporate control was expressed by controversially high prices based on the competition-reducing monopoly character of patents. Knowledge flows can produce dependencies – which in turn can be exploited politically. Export controls included this in their calculus during the Cold War. Allowing the export of US technology was time and again understood as a way to produce path-dependencies and thus another form of control over global trade.

Jessica Wang's reflections on the 'fields of power' in which export controls are embedded provide us with an opportunity to define their specificity. Export controls were put in place by the state to regulate the global circulation of strategic commodities and technical data in the name of national security (or for reasons of foreign policy, and to constrain trade in materials that are critical to the national economy that were in short supply). During the Cold War, every item exported from the US required a license. Such strong protectionist leanings notwithstanding, this intervention by the state in the 'free market' is ideologically constrained — which is why export control regulations had to be reauthorized repeatedly by Congress for 70 years until finally they were made a permanent feature of US economic statecraft in 2018.

It is also why much of US trade was conducted under what was called a General License, which required no specific approval from the government (today labeled No License Required). Of course their number varies considerably depending on circumstances. For example, in 1979 an official from the Department of Commerce told a Congressional Subcommittee that more than 95% of exports were made under a General License. That same year the Department recorded an average annual rate of 77,000 applications for Validated Licenses i.e. licenses to export (mostly) items identified as militarily significant, as specified in a Commodity Control List.[49] Validated Licenses authorize a US entity to export a specific item to a specific country for a specific use. The contents of these (and related) lists are constantly (re)negotiated in response to the need to protect new and emerging strategic commodities and technical data in changing geopolitical and international distributions of scientific and technological power, as Wang suggests. Within that general context, as we stress time and again, export controls in the name of national security are just one of many instruments intended to secure US scientific and technological pre-eminence, or 'leadership.'

Herein lies the answer to Wang's questions on "what then makes the technology and know-how for pharmaceutical production, but not satellites, shareable"? and what defines the boundary "that makes some things part of the global commons"? The short answer is: perceived strategic value, defined within a complex economic, political and technological context, subject to historical change. As for pharmaceuticals in particular, as Michael Falcone has shown, the US government took a number of crucial steps to control the technology and know-how of penicillin production and marketing during and after World War II, notwithstanding the crucial insights shared with American corporations by the British research ecosystem that discovered the drug's therapeutic properties and that made halting steps towards its mass production.[50]

Both Alex Wellerstein and Mark Wilson draw attention to the 'limited' scope of the primary sources that we have relied on for this book, notably "reports by US government agencies and quasi-governmental boards and commissions, Congressional hearings [...]." Both of them remark that, working at this level, we miss the behind-the-scenes negotiations that produced these materials in the first place, and that might be accessible in presidential libraries, through interviews, and so on. This is

[49] Statement by Henry J. Marcuse, Department of Commerce, to the Subcommittee on Foreign Economic Policy and Trade, of the Congressional Committee on Foreign Affairs, *Extension and Revision of the Export Administration Act, 1969,* 96th Congress, First Session, March 7, 1979, 89, 90

[50] Michael Falcone, "Culture Diplomacy: Penicillin and the Problem of Anglo-American Knowledge Sharing in WWII," in John Krige, ed., *Knowledge Flows in a Global Age. A Transnational Approach* (Chicago, IL: University of Chicago Press, 2022), 103-48.

indeed a limitation of our study, as we openly admit in the introduction, even though our chapters 3 and 4 are crucially based on a host of sources from the US National Archives. However we cannot agree that we have simply relied "mainly on low-hanging fruit" (Wilson) to build our narrative. If these fruits are so readily available, why has nobody harvested them before?

Reading through thousands of pages of reports and Congressional hearings and negotiations over export controls, along with many long articles in law journals, was more akin to navigating a dark and tortuous labyrinth than to taking a stroll through a grove of trees groaning under the weight of unpicked fruit! We plunged into a vast understudied domain of economic and political statecraft and took our bearings from these 'official' sources specifically so as to lay the foundations for the more extensive and rich studies that Wilson and Wellerstein call for, and that we welcome wholeheartedly.

Wellerstein asks if export controls 'work', i.e. whether they achieve their goal of restricting the flow of strategic knowledge and know-how to the United States' military and economic competitors? There is no clear-cut answer to this question. It has accompanied all export control reform debates since the Export Control Act of 1949. And the final assessment lies very much in the eye of the beholder, depending on one's political, economic, and ideological interests and outlook. Since the 1970s private corporations have tended to emphasize that export controls fail to defend US lead time because they go against the grain of globalizing markets that stimulated sharing and "diffusing" technology. Control hawks, by contrast, always highlighted Soviet technological backwardness, and the fact that US technology was in high demand from all competitors and enemies, to argue that protection of US knowledge was indeed successful and a versatile political instrument. Everyone agrees, however, that export controls are a leaky bucket. Nobody can entirely stop the flow. The best one can hope for is to reduce it, and to channel its direction so as best to secure US technological pre-eminence and leadership in key areas. How effective was this policy? As Wellerstein rightfully points out, we cannot answer this counterfactual question with any certainty. And all the more so when already in 1967 two astute legal scholars of export controls suggested that "exporters do not submit license applications unless they are reasonably sure that their licenses will be approved."[51]

Self-restraint apart, deliberate strategies have been invoked to make export controls effective. One extremely intrusive 'safeguard' was to actually insist that US monitors were physically present when sensitive technology and know-how were discussed with, or used by, a Communist client, as with high-performance computers at Serpukhov in the 1970s or with US-manufactured satellites launched on Chinese rockets in the 2000s.[52] Penalties for violation can be severe, and weigh increasingly heavily on business and academia today. In a global knowledge economy, in which the US is no longer the sole major scientific and technological power on the planet, the demand for compliance is increasingly voluble and the instruments deployed in the regulatory toolbox are increasingly muscular (see Epilogue). Indeed, the determination to comply with regulations denying the circulation of technology and know-how is evident in interviews with academic faculty and encounters with some private contractors, notably in the face of the rising power that is China. [53]

The cooperation of foreign governments and firms is also essential. In order for export controls to 'work' it is imperative that other countries do not violate US export controls when they trade with third parties, thereby sharing technology and know-how with competitors and taking markets away from US entities that respect their government's regulations. This so-called 'foreign availability' issue was a constant source of concern for US industry and the government, and US officials took steps

[51] Harold J. Berman and John R. Garson, "United States Export Controls — Past, Present, and Future," *Columbia Law Review*, 67:5 (1967), 791 – 890, 812.

[52] For the first see Mario Daniels, "Safeguarding Détente: U.S. High Performance Controls to the Soviet Union," *Diplomatic History* (2022), published online May 2022, dhac031, https://doi.org/10.1093/dh/dhac031; for the latter, see this book, chapter 9.

[53] One of us made extensive interviews with research faculty and STEM graduate students at Georgia Tech (John Krige, "Regulating the Academic 'Marketplace of Ideas'. Commercialization, Export Controls, and Counterintelligence," *Engaging Science and Technology Studies* 1:1 (2015), 1-24) and attended a two-day training course in export control practice by a private vendor, along with over 40 representatives of US high-tech industry.

to ensure that allies, at least, aligned their export control regulations with US priorities (for example by establishing CoCom and by making US export control law apply extraterritorially).

Mark Wilson agrees that "the last five years have seen increased controls," but is not convinced by our "broader claim about the amplification of regulation since the 1940s." He goes further: our claim "seems to clash with previous histories of CoCom which have emphasized a more cyclical pattern of regulation and liberalization, over the decades." There is no doubt that the ideological commitment to free markets, the increased foreign availability of strategic commodities and technical data, and pressure from private industry, constantly push back against an expansion of regulations. The Export *Control* Act of 1949 was replaced by the Export *Administration* Act of 1969 in a deliberate effort to limit the scope of export controls to dual-use *militarily significant* items. The suggestion to abolish export controls altogether after the collapse of the Soviet empire led to a major reduction in the number of Validated Licenses granted by the Department of Commerce in line with the Clinton administration's neo-liberal agenda and in the name of economic security.

But then again, as we show in our book, blowback against liberalization was always immediate, relativizing regulatory cutbacks that never really damaged the foundations of national security controls. Control hawks in Congress aggressively attacked Clinton for putting business interests ahead of national security, and even though they lost the battle to control trade in high performance computers, they not only succeeded in having Congress itself define some export control regulations but they also transformed international cooperation in space science and technology. Moreover, attempts to loosen the grip of export controls could have unintended effects. The suggestion by Fred Bucy, the CEO of Texas Instruments, in his report for the DoD in 1976 that one could simplify regulations by concentrating on know-how rather than commodities as such, had precisely the opposite effect. It spawned a huge and unwieldy Militarily Critical Technologies List (MCTL) by the early 1980s that ran to 800 pages. In short there is *always* pressure to reduce regulations, and there are *always* attempts to push back against trade liberalization. Whether the regulatory system is 'cyclical' in response to these ebbs and flows or one of gradual 'amplification' depends on the depth to which one probes. What looks discontinuous and cyclical at a micro level appears to be continuous and expanding at a macro-level.

Wilson compares our work with "previous histories of CoCom." This book was never intended to be a new history of CoCom. Nor did we feel the need to give it much attention, granted the excellent work already done on the organization (Wilson quotes some of it), and the broader focus of our study. What we do offer, however, is a history of US export controls that is vastly different from those currently available. What struck us was that over time, the reach of export controls expanded beyond firms (that are emphasized in CoCom histories) to embrace research universities, and placed a new emphasis on deemed exports that regulate face-face-face exchanges with foreign nationals inside the US and abroad. So too did their scope. The index of the 'Commodity Control List' in the late 1950s ran to about 8 pages.[54] The index of the Commerce Control List (as it is now called) of March 2022, contains almost 3000 items spread over 78 pages at a high level of precision.[55] For example, there are 17 entries related to acoustic systems alone, including Acoustic beam forming software; Acoustic seabed survey equipment; Acoustic systems, diver deterrent; Acoustic underwater communications systems; Acoustic vibration test equipment; and Acoustic-wave device manufacturing equipment and systems. We already mentioned the parallel-running 800 page MCTL that the Department of Defense developed in the 1980s to which the Trump administration added a list of 20 critical and emerging technologies that has been further extended by his successor. In short, we stand by our claim of 'gradual amplification' when viewing the variety and sweep of export controls at a macro-level and over the *long durée*.

Does our book have "overt policy lessons" (Wellerstein), or suggest "new policies in the mid-twenty-first century" (Wilson)? As historians, we do not feel comfortable on this terrain. This book has other aims. First, it is intended to raise awareness in the scholarly community of a pervasive and yet understudied aspect of US economic, technological, and scientific statecraft.

[54] *Export Control. Forty-Second Quarterly Report (Fourth Quarter 1957) by the Secretary of Commerce to the President, Senate and House of Representatives*, February 1, 1958, 51-59. It was called the Positive List at the time.

[55] https://bis.doc.gov/index.php/documents/regulations-docs/13-commerce-control-list-index/file, accessed on July 24, 2022.

Our hope here is that it will both help readers make better sense of their life-worlds (as it did for Wellerstein) as well as "challenge" political scientists, historians, and economists to study export controls and knowledge regulation more closely (Wilson). Secondly, we believe that by exposing the deeply embedded bureaucratic structures of decision-making and the national goals and ambitions that they serve — regulating the global circulation of sensitive, unclassified technology and know-how in the name of national military and economic security — we highlight the constraints that limit any policy proposal, and that shape the physiognomy of the 'free market.'