



POLICY FORUM

A seawall is constructed in Miyako, Japan, 11 March 2021. Hardening coastal infrastructure against sea level rise could benefit from R&D collaboration. PHOTO: THE YOMIURI SHIMBUN

SCIENCE

26 NOVEMBER 2021 • VOL 374 ISSUE 6571

INTERNATIONAL COLLABORATION

Capitalizing on the G7 Research Compact

Rules for S&T collaboration should be integrated with trade and investment agreements

By Harry G. Broadman¹, Bruce R. Guile², David T. Delpy³, Albert P. Pisano⁴

Abstract At the close of their June 2021 summit in Cornwall, the heads of state of the G7 nations issued a blueprint for developing potentially pivotal sovereign-to-sovereign science and technology (S&T) agreements for robust collective action in research and development (R&D): the G7 Research Compact. If such agreements can be properly focused and executed—and broadened over time to include other democracies—it could unlock solutions to a class of pressing global problems that can only be effectively addressed by multilateral, public-private applied R&D collaboration. Yet, an uneven track record of such collaboration thus far suggests that the G7 must modernize their international S&T agreements to generate more dexterity in establishing and managing cross-border R&D relationships, especially to enhance their economic growth and global competitiveness. To do this, the G7 must redesign their approach so that R&D collaboration is integrated into their international trade and investment agreements.

¹Berkeley Research Group, LLC and School of Advanced International Studies, Johns Hopkins University, Washington, DC, USA. ²Global Innovation and National Interests Working Group, BRG Institute, Emeryville, CA, USA. ³Emeritus, Medical Photonics, University College London, London, UK. ⁴Jacobs School of Engineering, University of California San Diego, San Diego, CA, USA. Email: hbroadman@thinkbrg.com

At the close of their June 2021 summit in Cornwall, the heads of state of the G7 nations issued a blueprint for developing potentially pivotal sovereign-to-sovereign science and technology (S&T) agreements for robust collective action in research and development (R&D): the G7 Research Compact (1). If such agreements can be properly focused and executed—and broadened over time to include other democracies—it could unlock solutions to a class of pressing global problems that can only be effectively addressed by multilateral, public-private applied R&D collaboration. Yet, an uneven track record of such collaboration thus far suggests that the G7 must modernize their international S&T agreements to generate more dexterity in establishing and managing cross-border R&D relationships, especially to enhance their economic growth and global competitiveness. To do this, the G7 must redesign their approach so that R&D collaboration is integrated into their international trade and investment agreements.

The class of global problems that desperately needs attention is at the frontier of international economic and geopolitical competition. Consider the design and deployment of 6G wireless networks (2); mounting effective cross-border digital epidemiology (3); assuring the resilience of artificial intelligence (AI)-enabled global supply chain management;

hardening coastal zone infrastructure in the face of sea level rise; and developing and rolling out sustainable aviation fuels and propulsion systems.

To address these types of global challenges, the advanced democracies depend heavily on companies, often in collaboration with universities or government laboratories, for applied R&D. Such applied R&D is the locus of activities that determine the cost, quality, and functionality of goods and services—from electric vehicles to mobile device apps, among others—available to citizens and companies. Just as important, international economic competition and collaboration in new technologies determine whether a nation and its citizens can afford new or improved goods and services.

Governments, citizens, and companies thus have critical interests in applied R&D but, given the integration of the global economy and of S&T knowledge networks, no one party has control. The scale and scope—and often cross-border network characteristics—of such problems greatly exceed the R&D capacity of any single nation, company, or corporate partnership. These challenges are not amenable to traditional international scientific collaboration—which is often explicitly agnostic with regard to market competition and geopolitics— or to “science diplomacy”— which relies on cross-border scientific activity to build diplomatic bridges between nations.

The move toward collaboration among democracies in applied R&D is apparent in a host of recent economic or national security–focused international partnerships with a heavy focus on technology. These include the Quadrilateral Security Dialogue (India, Japan, US, and Australia), the Australia–South Korea Diplomatic and Defense Alliance, and AUKUS (Australia, UK, and US) for “deeper integration of security and defense-related science, technology, industrial bases, and supply chains” (4–6). These agreements are consistent with calls for more applied R&D collaboration arising in G7 nations. The recent White House report on building resilient supply chains is a case in point (7). It calls for working “with allies and partners to secure supplies of critical goods” and acknowledges that “in an interconnected world, the United States has a strong interest in ensuring its allies and partners have resilient supply chains as well.”

Promoting Public Goods

Acknowledging that liberal democracies face such cross-border applied R&D challenges at the economic and national security frontier, the national academies of sciences of the G7 nations prepared a policy statement in advance of the Cornwall summit calling for collaboration on problem-oriented research (8). The types of applied R&D efforts on which the G7 might collaborate have several important characteristics in common. They focus on bona fide frontiers in both science and engineering that have been readily identified but are not formally settled in practice or in terms of standards to be codified and to which parties shall adhere.

Also, their objectives are to promote “public goods.” Without a credible commitment—indeed the assumption of an obligation—to oversight by a national authority, “free riders” will undercut welfare for all. Think economic growth and social inclusion, for 6G; data privacy, for digital epidemiology; economic security, business resiliency, and market agility, for supply chain management; and flood prevention for coastal zone infrastructure.

As a corollary to the above, the social pay-off of investments in such activities cannot be privately appropriated to provide for adequate compensation. This is, of course, the classic economic argument for government support of R&D and intellectual property (IP) protection.

Additionally, the benefits are not containable within national boundaries. Hence, there is a clear need to devise mechanisms and institutions that simultaneously provide for sharing globally (or subglobally but supranationally) the expenses for applied, public-private R&D investment, but which also stimulate competition for discovery, invention, innovation (application), and commercial diffusion.

Although some of these (e.g., 6G and supply chain management) largely stem from the current “contest” between G7 countries and China, many entail the shared interests across all nations regardless of their political economy structures (e.g., climate change adaptation, epidemiology, aviation fuels, and propulsion systems). Moreover, as economic history teaches us, although global “leadership” by one specific or a few countries is not a permanent

phenomenon, the complexity of aligning incentives with geographic spillovers of public benefits inherent in innovation is a recurring challenge.

Fragility and Incoherence

Facing such challenges and opportunities, one might assume that the G7 countries already regularly partner with one another in commercially important applied R&D as they do in diplomacy, defense, and national security. This is not the case.

It would have been ideal if the architecture, content, and objectives articulated in the Compact issued in Cornwall would have provided the necessary basis upon which meaningful coalition building among the R&D enterprises of the G7 could occur to enhance jointly their technological edge and thus raise their prospects for intensified international competitiveness. Yet the Compact only begins to move in this direction. It also fails to specify an actionable results-oriented agenda or terms of reference among key constituencies.

Unfortunately, the elements of the Compact largely reflect the fragility, incoherence, and lack of robustness that pervade the present-day scheme of problem-oriented R&D collaboration among the leading democracies. This does not bode well for the G7 to drive or even influence the multitude of operational decisions needed to be taken in a coordinated fashion by government, universities, and industry to advance meaningful cross-border applied R&D collaboration and exchange.

At its core, the Compact simply ratifies the long tradition of focus on international collaboration in basic science rather than moving toward precompetitive applied research, technology development, and engineering. To be sure, international collaboration in basic science is important. But the leading democracies need to specify the mechanisms to launch and benefit from international public-private problem-oriented R&D collaboration that engenders near- as well as long-term benefits to the economic and national security of participant countries.

Notably, the Compact fails to call for a fundamental overhaul of the web of international S&T agreements that have been in place for some time among the G7 and other countries. These agreements are antiquated, do not contain credible enforcement mechanisms, and are focused at the wrong end of the research spectrum. Moreover, existing S&T agreements do not capitalize on, nor are they integrated with, the countries' mature, state-of-the-art network of investment treaties and trade agreements (9).

Multilateral international agreements on trade and investment are a critical shared platform for inherently messy cross-border economic activity in which outcomes are shaped by competition among differing forms of corporate organization and governance; market structures and rules; and, of course, government objectives and policies—to say nothing of cold-shoulder relationships and hot wars. Yet even though innovation systems are increasingly global—and determine the availability and affordability of life-improving innovation in all nations and regions (10)—there is no robust system of S&T agreements among nations comparable to those in place for trade and investment. Thus, although businesses in G7 countries can effectively engage in impactful cross-border R&D partnerships, governments have been far less effective in doing so.

Except for the Compact's recognition of the importance of infusing "reciprocity" as a standard of conduct governing sovereign-to-sovereign collaboration in basic (and not applied) research—one of the long-held central tenets underlying cross-border economic modes of cooperation—there is no call for creating explicit linkages between international S&T agreements, international investment treaties, and international trade agreements—which, taken together are the three legs of the "competitiveness stool" (11) This does not mean that international S&T agreements should be shoehorned into existing international trade and investment agreements. Rather, the approach to R&D collaboration needs to be redesigned to integrate it into international trade and investment strategies. That the overarching goal of the standing regime of international S&T agreements is to promote "science diplomacy" says it all (12). A fix is long overdue.

Despite the sizable number of existing international S&T agreements, most are structured only on a bilateral rather than a plurilateral or multilateral basis. This is hardly a structure conducive to meaningful collective action. Moreover, despite some lofty goals stated in their texts, these rarely have specificity or measurable objectives, for

example, in terms of expected expenditures on R&D. Nor do they attempt to set enforceable terms, for example, with respect to protection of IP rights. And there is no articulation of anticipated economic impacts likely to be generated from the R&D activities covered.

Their contrast with international trade agreements and investment treaties is stark. The negotiation and oversight of the implementation of cross-cutting international trade agreements and investment treaties typically draw on contributions from a range of departments and agencies. This differs from “umbrella” international S&T agreements—the bedrock pacts that cut across each nation’s R&D enterprise rather than those that focus on specific sectors, functions, or missions. In most countries, the agencies that lead the negotiation and oversight of these umbrella S&T agreements are frequently the ministries for foreign affairs. Surprisingly, the governmental entities with S&T policy and cross-sectoral economic expertise play a less consequential role. In the US, for example, there are effectively only two agencies in the driver’s seat for the negotiation of umbrella international S&T agreements: the State Department and the Office of the US Trade Representative. Of course, the US, like other countries, negotiates international S&T accords that are sector focused, such as on energy, health, or defense matters. In those cases, the agencies specializing in those areas are often at the head of the table.

At the same time, in trade and investment negotiations, there is a well-defined process for government officials—in both the executive and legislative branches—to interact with important “external” domestic stakeholders who will be affected by international agreements and treaties as they are negotiated and monitored. These include industry trade associations, labor unions, consumer groups, and a host of nongovernmental organizations concerned with a wide range of environmental and social policies. Moreover, in the case of international investment treaties, there is a public airing among these domestic constituencies of a “model” treaty text. This is a key step as it usually serves as the initial basis for the negotiations with foreign parties. Overall, the process governing these arrangements is quite inclusive—in contrast with that for international S&T agreements.

Equally important, international S&T agreements do not typically contain bedrock principles that give international trade agreements and investment treaties their real power. Two of the most important are “national treatment,” or treating foreigners the same as domestic parties, and “reciprocity,” where the same benefits or penalties are applied to all parties to an agreement. Even when S&T agreements do contain these provisions, they are routinely viewed as lip service and go unenforced. Indeed, few if any S&T agreements contain any meaningful tools to exact remedies when there are violations or disputes. This contrasts with their international trade and investment counterparts, where penalties such as the imposition of tariffs or entering into binding arbitration can be compelled.

The result is that firms engaging in commercially oriented, precompetitive R&D in a foreign country have no protection against being treated less favorably than domestic counterparts. Even worse, few international S&T agreements specify who owns the IP generated by joint R&D activities, how confidential business information is to be treated, and the parameters governing joint R&D commercialization. These amount to disincentives to cross-border applied, public-private R&D collaboration.

Capitalize on Momentum

The G7’s Compact does not establish an institution for developing and executing international S&T agreements. Of course, the G7 itself is an informal group of countries, and it does not have a permanent secretariat or staff, or a self-standing budget. The chair rotates annually: the UK’s role as chair terminates at the end of 2021, Germany assumes the chair at the start of January 2022, and Japan will be the G7 chair for 2023. At the same time, little happens of real consequence among the G7 countries between their yearly head-of-state summits. Thus, the task of operationalizing cross-border R&D collaboration—even as envisioned in the Compact—is a far cry from what international trade has had since the late 1940s in the World Trade Organization and its forerunner entities.

Although the Research Compact is imperfect, it does present a valuable opportunity that should not be wasted. If the G7 countries are serious about breathing life into the Compact—with perhaps a long-run goal of creating with other democracies around the globe an independent collectively governed entity overseeing a modernized system of international S&T agreements—several steps should be taken at the earliest possible moment to capitalize on the Compact’s momentum.

First, recognizing that the Compact is a draft blueprint, the UK—and then Germany—should systematically seek feedback for fine-tuning it through meetings with a special G7 task force composed of the G7 countries’ business communities, universities, governmental economic agencies responsible for trade and investment agreements, and other relevant stakeholders. Based on the work of the taskforce, the blueprint should be finalized in the first 2 months of 2022.

Second, in parallel with updating the blueprint, the task force will need to develop a plan for its execution with well-defined timelines and key performance indicators over the course of 2022 that the Germans can then begin to implement upon taking the G7 Chair.

Finally, the task force should evaluate the various G7 plurilateral institutions that have been established to govern the negotiations and enforcement of international trade and investment agreements, including their scope, budgets, and staffing. On the basis of that analysis, the task force could then draft a proposal for the potential creation of a like-minded entity in relation to launching an initiative to modernize international S&T agreements, including the development of a “model S&T agreement.” Before the end the first quarter of 2022, the German delegates should chair a discussion among the G7 leaders about implementation of this proposal.

At a high level, the theoretical arguments for cross-border, public-private sharing of precompetitive or generic technology R&D burdens, and for organizing activities among the liberal democracies (and their approach to capitalism), are well known, and largely accepted. But only rarely have policy-makers within the G7 and countries considered the empirical realities. The Cornwall Compact might be a useful initial blueprint. The challenge ahead is to develop a rigorous governance platform upon which to launch pioneering, promising systemic initiatives for cross-border public-private applied R&D collaboration to establish a viable path forward for a modern regime of international S&T agreements.

Acknowledgments

The authors are members of the International Working Group of the project on Global Innovation and National Interests at the BRG Institute in Emeryville, California. Two other members of the Working Group, S. McLaughlin and C. Wagner, made important contributions to the thinking behind the policy arguments presented in this paper. The project is funded by a grant from David Sainsbury.

References and Notes

- <https://www.g7uk.org/wp-content/uploads/2021/06/G7-2021-Research-Compact-PDF-356KB-2-pages-1.pdf>
[GO TO REFERENCE](#)
- A. Pisano, B. Guile, “*Case Statement and Proposal: International 6G R&D and Innovation Consortium*” Discussion Paper No. 2, Working Group on Global Innovation and Value-Capture, Berkeley Research Group Institute, December 2020.
[GO TO REFERENCE](#) • [GOOGLE SCHOLAR](#)
- M. Blumenthal et al., “*The Case for Cross-Border R&D*” in *Digital Epidemiology: Proposal for an International Research Consortium*,” Discussion Paper no. 8, Working Group on Global Innovation and Value-Capture, Berkeley Research Group Institute, December 2020.
[GO TO REFERENCE](#) • [GOOGLE SCHOLAR](#)
- <https://www.whitehouse.gov/briefing-room/statements-releases/2021/09/24/fact-sheet-quad-leaders-summit/>
[GO TO REFERENCE](#)
- <https://www.foreignminister.gov.au/minister/marise-payne/media-release/joint-statement-australia-republic-korea-foreign-and-defence-ministers-22-meeting-2021>
- <https://www.whitehouse.gov/briefing-room/statements-releases/2021/09/15/joint-leaders-statement-on-aukus/>
[GO TO REFERENCE](#)
- <https://www.whitehouse.gov/wp-content/uploads/2021/06/100-day-supply-chain-review-report.pdf>
[GO TO REFERENCE](#)

8 <https://royalsociety.org/news/2021/03/royal-society-partner-academies-launch-g7-agenda/>

[GO TO REFERENCE](#)

9 H. G. Broadman, [“Time for a New Chapter to Forge and Leverage International S&T Agreements”](#) Discussion Paper No. 4, Working Group on Global Innovation and Value-Capture, Berkeley Research Group Institute, December 2020.

[GOOGLE SCHOLAR](#)

10 B. Guile, C. Wagner, *Issues Sci. Technol.* **37** (2021); <https://issues.org/global-science-technology-policy-guile-wagner/>.

[GO TO REFERENCE](#) • [GOOGLE SCHOLAR](#)

11 L. D. Tyson, B. R. Guile, *Issues Sci. Technol.* **37** (2021); <https://issues.org/innovation-based-economic-security-tyson-guile/>.

[GO TO REFERENCE](#) • [GOOGLE SCHOLAR](#)

12 H. G. Broadman, [“The G7 Needs an R&D7 to Beat China,”](#) *fDi Intelligence/The Financial Times*, February 2021.

[GOOGLE SCHOLAR](#)

Powered by **TREND MD**

Science

Science
Advances

Science
Immunology

Science
Robotics

Science
Signaling

NEWS

[All News](#)
[ScienceInsider](#)
[News Features](#)
[Subscribe to News from Science](#)
[News from Science FAQ](#)
[About News from Science](#)

CAREERS

[Careers Articles](#)
[Find Jobs](#)
[Employer Profiles](#)

COMMENTARY

[Opinion](#)
[Analysis](#)
[Blogs](#)

JOURNALS

[Science](#)
[Science Advances](#)
[Science Immunology](#)
[Science Robotics](#)
[Science Signaling](#)
[Science Translational Medicine](#)
[Science Partner Journals](#)

AUTHORS & REVIEWERS

[Information for Authors](#)
[Information for Reviewers](#)

LIBRARIANS

[Manage Your Institutional Subscription](#)
[Library Admin Portal](#)
[Request a Quote](#)
[Librarian FAQs](#)

ADVERTISERS

[Advertising Kits](#)
[Custom Publishing Info](#)
[Post a Job](#)

RELATED SITES

[AAAS.org](#)
[AAAS Communities](#)
[EurekAlert!](#)
[Science in the Classroom](#)

ABOUT US

[Leadership](#)
[Work at AAAS](#)
[Prizes and Awards](#)

HELP

[FAQs](#)
[Access and Subscriptions](#)
[Order a Single Issue](#)
[Reprints and Permissions](#)
[Contact Us](#)

