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From the Birth of the G7's "Compact on Research Collaboration" to Its Activation

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Abstract: The issuance of the "Compact on Research Collaboration" by the heads of state of the G7 nations, the globe's largest advanced democracies, at their Annual Summit in Cornwall, U.K. this June, could prove to be pivotal in the way these governments engage in cross-border partnering in research and development (R&D). Unlike the collective action they take in defense and national security, as well as in international investment and trade, the objective, structure and application of the G7's international science and technology (S&T) agreements have not kept pace with the modern globalized economy. We outline how the UK and subsequently Germany, the 2022 G7 chair, should focus and execute the Compact through multilateral, public-private R&D collaboration to unlock solutions to a class of pressing problems for governments, businesses and citizens, as all parties have a critical interest but no one party has control.

The Communique issued by the heads of state of the G7 nations at the close of their Annual Summit in Cornwall this June contained a potentially pivotal Annex—their *Compact on Research Collaboration*. This statement of intent by the G7 was hardly noticed by the science and engineering communities, let alone those extensively involved in international economic policy. Perhaps because it was assumed that the globe's seven largest advanced democracies already regularly partner with one another in research and development (R&D) as they do in diplomacy, defense and national security, and international investment and trade. Regrettably, this is not the case. While the businesses in these countries are effectively able to engage in impactful cross-border R&D partnerships, the governments have been far less effective in doing so; indeed, they pursue primarily research-only "science diplomacy."

If the G7's Compact can be properly focused and executed — and broadened in the next few years to include other democracies — it could unlock solutions to a class of pressing problems that can only be effectively addressed by multilateral, public-private R&D collaboration. This is because the integration of the global economy and of S&T knowledge networks has created a set of pressing pre-competitive R&D needs in which governments, companies and citizens have a critical interest but no one party has control. Think the design and deployment of 6G wireless networks; digital epidemiology; AI-enabled

global supply chain management; hardening coastal zone infrastructure in the face of sea level rise; and reducing the production and release of biogenic methane into the atmosphere--among other problems where critical applications will vary by location but the body of knowledge underpinning diverse applications is shared globally. The scale and scope — and often cross-border network characteristics — of such problems dramatically exceed the R&D capacity of any single nation or any single company or corporate partnership.

In an ideal world, companies, governments, and other critical stakeholders, such as universities, would join hands and work together for the common good of humankind. While this happens frequently in *basic* science this is not the case in cross-border *applied* R&D—the locus of activities that determine the cost, quality, and functionality of goods and services, from electric vehicles to mobile device apps and business software among others, available to citizens and companies. Just as importantly, international economic competition and collaboration in new technologies determine whether a nation and its citizens can afford new or improved goods and services.

This is neither a purely zero-sum nor positive-sum situation at the country level. While innovation systems are global, the availability and affordability of life-improving innovation in any particular nation or region is 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. The challenge for the G7's Compact, therefore, is how to launch several pioneering and promising *cross-border* public-private R&D collaborations that can demonstrate a viable path forward. Success within the G7 nations in this regard should be a model for international, precompetitive public-private R&D collaboration with immediate implications for all democracies.

In that vein, it might be assumed that the architecture, content and objectives articulated in the Compact provides the necessary basis upon which meaningful coalition-building among the R&D enterprises of these seven advanced democracies to enhance jointly their technological edge and thus raise their prospects for intensified international competitiveness can occur. The imperative to do this is more than obvious to the citizenry of these countries: to counter the intensifying advanced technology-based risks – and thereby economic and national security risks – emanating from China.

China – the globe's most populated country and its second largest economy -- is governed in a fashion that is far away from democratic norms and Chinese firms in both domestic and international commerce generally act as agents of the state. One does not have to be hostile to China, or unappreciative of the country's global contributions to science, to recognize and respond to the economic and national security implications for the world's democracies. The Compact creates a potentially unique opportunity to meet this imperative inasmuch as it is the first recognition that R&D is an important area of broad collaboration among democracies.

Unfortunately, the constituent elements of the research compact largely reflect the fragility, incoherence and lack of robustness that pervade the present-day scheme of R&D collaboration among these leading democracies. Plainly stated, the G7 has a limited track record of moving beyond broad statements of policy agreement. In only very few areas does the Compact advance the G7's policy framework. Worse still, it fails to specify an actionable results-oriented agenda nor terms of reference among key constituencies.

This does not bode well for the G7 to drive or even impact the multitude of operational decisions needed to be taken in a coordinated fashion by government, universities, and industry to actually

advance meaningful cross-border collaboration and exchange of resources and R&D. Moreover, at its core, the Compact simply ratifies the long tradition of focus on international collaboration in *basic science* rather than moving toward *pre-competitive applied research, technology development and engineering*. Not only does that stymie moving the R&D ball down the field to the goalpost, it also encourages basic science interest groups — who felt underappreciated by the last US administration — eager for a “win”. International collaboration in basic science is important but it needs to take a backseat as the leading democracies work out how to launch and benefit from international public-private R&D collaborations with near-term benefits to the economic security of participant nations.

And perhaps most important, the Compact fails to call for a fundamental overhaul of the long-standing web of international agreements in science among the various G7 countries (as well as with other states). These agreements are antiquated, do not contain credible enforcement mechanisms, are focused at the wrong end of the research spectrum, and devoid of capitalizing on, and being integrated with, the mature, state-of-the-art network of investment treaties and trade agreements among these parties.¹

Except for the Compact’s recognition of the importance of infusing “reciprocity” as a standard of conduct governing sovereign-to-sovereign collaboration in basic research²—one of the long-held central tenets underlying cross-country economic modes of cooperation—the call for creating explicit linkages between the G7’s international agreements in science and technology (S&T) with the G7’s international investment treaties and international trade agreements—which taken together are the three legs of the “competitiveness stool”³—is absent.

That the overarching goal of the standing regime of international S&T agreements is to promote “science diplomacy” says it all. Firms, workers and consumers in the G7 countries will readily appreciate this is hardly a strategy by their governments to counter the risks emanating from China’s science and technology driven push to stimulate economic growth, job creation and prosperity at home.⁴

It is imperative that the G7’s international S&T agreements be modernized to generate more dexterity in establishing and managing international R&D relationships to serve both the economic and national security interests of the signatories. Simply put, the G7 countries need to redesign their approach to R&D collaboration so that it is integrated into their international trade and investment strategies.

¹ 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.

² The Communique notes: “We endorse the G7 Compact on Research Collaboration and its commitment to: support policies, legal frameworks and programmes to promote research collaboration; promote sharing of research data; explore enhancements to research assessment and rewards for collaboration and knowledge sharing; and develop a common set of principles which will help protect research and innovation ecosystem across the G7 to open and reciprocal research collaboration.” *Carbis Bay G7 Summit Communique* June 13, 2021.

³ Tyson and Guile, “[Innovation-Based Economic Security](#),” *Issues in Science and Technology*, Vol. xxxvii, no. 4, Summer 2021; and Guile and Wagner, “[A New S&T Policy for a New Global Reality](#),” *Issues in Science and Technology*, Vol. xxxvii, no. 4, Summer 2021.

⁴ Broadman, “[The G7 Needs an R&D7 to Beat China](#),” *fDi Intelligence/The Financial Times*, February 2021.

This fix is long overdue. G7 have entered into a sizeable number S&T agreements with each other. Most, however, are structured only on a bilateral rather than a plurilateral basis. Moreover, despite some admirable goals stated in the texts, they often lack clear, measurable objectives, enforceable terms or anticipated economic and other impacts they have the potential to deliver.

Their contrast with international trade agreements and investment treaties is stark. The negotiation and oversight of the implementation of the G7's international trade agreements and investment treaties typically draw on contributions from a *range* of departments and agencies. This differs from international S&T agreements. In most G7 countries, the agencies that lead the negotiation and oversight of international S&T agreements are frequently the ministries for foreign affairs. The governmental entities with economic and S&T policy expertise play a less consequential role. In the U.S., for example, there are effectively only two agencies in the driver's seat: the Office of the U.S. Trade Representative and the State Department.

At the same time, there is a well-defined process for government officials—in both the executive and legislative branches—in the G7 states to interact with important domestic stakeholders who will be affected by international trade agreements and investment treaties as they are negotiated and monitored. These include industry trade associations, labor unions, consumer groups, and a host of NGOs 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 serves as the basis for the negotiations with foreign parties. Overall, the process governing these arrangements is inclusive, in contrast with that for international S&T agreements.

Equally important, S&T agreements do not typically contain bedrock principles that give the international trade agreements and investment treaties their real power: including the standards of 'national treatment', treating foreigners the same as domestic parties, and, as noted above, of 'reciprocity', 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. In fact, few if any S&T agreements contain any meaningful tools to exact remedies when there are violations or disputes.

The result is foreign firms engaging in commercially oriented, pre-competitive R&D in another country have no protection against less favorable treatment than domestic counterparts. Even worse, few international S&T agreements specify who owns the intellectual property 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 R&D collaboration.

At a high level, the theoretical arguments for cross-border, public-private sharing of pre-competitive 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 policymakers within the G7 countries considered the empirical realities. A few important common and shared challenges make for compelling examples.

- *Future Wireless Systems.* Global competition in 5G generated national economic concerns around sovereign, corporate and personal security vulnerabilities, which have prompted many advanced democracies to institute laws and norms governing individual data privacy, corporate ownership of data, and legal limits on government access to such data. The development and deployment path for 6G (from basic standards and protocols to the characteristics of devices

and services integrated with, or attached to, the wireless network) is a pressing area for public-private, international R&D collaboration if the democracies are to avoid stumbling into an even wider array of such vulnerabilities.⁵

- *Digital Epidemiology.* The COVID-19 pandemic both highlighted and accelerated the cross-border needs of public health authorities and nationally funded bioscience research communities to rapidly analyze multiple types of digital medical information protected by different privacy laws in different geographies. Similarly, advances in digital epidemiology are critical if domestic health care companies, multinational medical device firms, and multinational pharmaceutical corporations are going to provide products and services in multiple countries. This area is ripe for international, public-private R&D collaboration, especially if such a collaboration can be founded on the search for improved information and analysis in the context of privacy by design approaches that can work in and among multiple nations.⁶
- *Cross Border Supply Chain Design and Management.* COVID-19 has also revealed and accelerated a sweeping technological revolution in the use of AI and digitalization for the management of complex cross-border supply chains, which are punctuated by multiple transactional and operational intra- and inter-company relationships.⁷ The need for broad and deep international sovereign-to-sovereign collaboration among economic allies has arisen to address the resilience and data security of these supply chains.
- *Hardened coastal zone infrastructure.* Inasmuch as a substantial portion of the world's population lives within 100 miles of an ocean or sea that will be affected by inches or feet of sea level rise over the next few decades, a critical aspect of humanity's adaptation to the now-inevitable impacts of climate warming is R&D to increase the speed and lower the cost of adaptation in coastal infrastructures. This is a challenge common to any nation with ocean coastline. While there will be a host of different approaches relying on different types of private and public providers (e.g., small and large construction firms, local and regional governments) the scale and scope of this challenge begs for international public-private R&D collaboration to create a widely available body of knowledge about new and newly tested approaches.
- *Sustainable aviation fuels and propulsion systems.* Although CO₂ from commercial aviation comprises only about two percent of global CO₂ emissions, the amount has increased more than 30 percent since the mid-2010s. With the scale of the aviation sector expected to more than double by 2050, international R&D collaboration among both companies and sovereigns is urgently needed. The global air travel and transport system is already governed by international convention (put in place in 1944 and updated many times) but the airline industry, equipment manufacturers and nations would be well served by an R&D collaboration to formulate and

⁵ Pisano and 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.

⁶ M. Blumenthal, Delpy, Guile, Johnson, Koonin, and Taniguchi, "[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.

⁷ Broadman, "[Digitalization Is Upending Global Logistics, Now Augmented By COVID's Social Distancing Imperative](#)," *Forbes*, June 30, 2020.

develop solutions addressing pollutants, cost, safety, and reliability, while connecting research efforts with government, industry, trade association, and passenger and freight customer interests. This is especially pressing because of the projected growth of aviation. The costs and difficulty of systems design changes and infrastructure investments – from aircraft to fuels provision and groundside systems in virtually every nation – will rise along with the growth of aviation globally.

These examples have five important characteristics in common. First, they focus on bona fide frontiers in both science and engineering that have been readily identified but are not formally settled in practice nor in terms of standards to be codified and to which parties shall adhere.

Second, 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.

Third, as a corollary to above, the social payoff of individuals’ investments in such activities cannot not be privately appropriated to provide for adequate compensation. This is, of course, the classic economic arguments for government support of R&D and intellectual property protection.

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

Fifth, while some of these (e.g., 6G and supply chain management) largely stem from the *current* “contest” between the G7 and China, many entail the shared interests across *all* nations regardless of their political economy structures (e.g., climate change adaptation, epidemiology, aviation services). 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.

A Call for Action

The G7 is to be applauded for issuing the Research Compact and thus placing on its agenda the need for international collective action in R&D. Now comes the hard part, however.

If the G7 is serious about breathing life into the Compact, several concrete steps must be taken at the earliest possible moment. Why? Because the G7 is not an institution; it does not have a permanent secretariat or staff; and it has no self-standing budget. Thus, at present, at least, the G7’s task of operationalizing cross-border R&D collaboration—even as envisioned in the Compact—is a far cry from what international trade has, and has had since the late 1940s, in the WTO and its forerunner entities. While the Research Compact is imperfect, it does present a unique opportunity that should not be wasted.

Moreover, little happens of real consequence among the G7 between their yearly head-of-state summits. Indeed, the G7 chair rotates annually. The UK’s term in the chair terminates at the end of

2021, and Germany takes over for 2022. Regardless of who wins the September 2021 German elections, the officials in Berlin who will inherit the G7 chair's tasks, including with respect to implementing the Research Compact, will at best have just located their offices on January 1, 2022.

Therefore, in its remaining months in the chair, the UK—in close collaboration with Germany—and the other five members of the G7 should take three concrete actions.

First, recognizing that the Research Compact is a draft blueprint, they should systematically seek feedback for finetuning it through meetings with a special G7 task force comprised 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 by end-December 2021. Its implementation shall become the responsibility of Germany at the beginning of January 2022.

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

Finally, the taskforce 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. Based on that analysis, the taskforce will need to draft a proposal for the potential creation of like-minded entity in relation to launching an initiative to modernize international S&T agreements, including the development of a "model S&T agreement". In the first quarter of 2022, the Germans shall chair a discussion among the G7 leaders about implementation of this proposal.