

THE U.S. CHIPS AND SCIENCE ACT OF 2022: A SELF-INTERESTED INDULGENCE IN FOREIGN TRADE AND SCIENCE OR A MODEL FOR FUTURE DEVELOPMENT?

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ABSTRACT

This article focuses on the United States (hereinafter “U.S.”) CHIPS and Science Act of 2022 and the U.S. Export Control Reform Act of 2018, with reference to the manufacture, export, and scientific research of certain types of advanced chips in and from the U.S. The article has a two-pronged objective. First, it analyzes the U.S.’s measures from the perspective of WTO law. Second, it explores, from an international law and policy standpoint, the research in science agenda set out in the legislation, i.e., with reference to the international law on the conduct of scientific advancement at the national and international levels. The author takes a critical approach to the U.S. management of its industrial policy on chips, including the science of chips, from an international standpoint.

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INTRODUCTION

The recently enacted CHIPS and Science Act of 2022 (CHIPS Act), the CHIPS section of the Act, heralds a new U.S. position on its approach and priorities in trade, investment, and multilateral cooperation. Whilst it is certainly consistent with its arsenal of unilateral legislation already in place,¹ it is an innovation in the size, specificity, and departure from the underpinning ethos of international trade and investment. The CHIPS Act could be conceived as an example of an industrial policy in a nascent sector, albeit of a super-economy, wherein a long-lost child is the infant industry. In principle, there is no reason the infant industry call should only be the prerogative of developing countries. In the same vein, the U.S. response could be explained as an effort to co-exist in an international economy where there are differences in the *modus operandi* of dirigiste planned and market economies, respectively. Moreover, the U.S. response can be viewed as a reaction to a perceived failure in the WTO system in ensuring level playing fields in the interface between countries with market and state operators, in particular, in the fields of trade

1. See Omnibus Trade & Competitiveness Act of 1988, Pub. L. No. 100-418, §301, Special 301, 102 Stat. 1107 (1988); Trade Facilitation & Trade Enforcement Act of 2015, Pub. L. No. 114-125, 130 Stat. 123 (2016); Trade Expansion Act of 1962, Pub. L. No. 84-794, 76 Stat. (1962).

remedies, technical barriers to trade, and unfair trade practices affecting U.S. workers.² If so, this unilateral approach to the extent that it is, is not the appropriate manner of bringing reform in the multilateral system. Similarly, the U.S. actions could be understood as partaking a new consciousness of what comprises ‘necessity’ and national security for the building blocks of technologically advanced economies. The legislation, however, must be proven to achieve these objectives. From a political perspective, if the legislation is a geopolitical economic foreign policy response to a possible Chinese invasion of Taiwan, it could signal a long-term U.S. reconciliation to China’s One China approach to Taiwan. Finally, in economic analysis — ultimately how this arrogation of the manufacturing of semiconductors (hereinafter referred to loosely as chips) to the U.S., with the cooperation of certain allied countries—impacts the chips industry worldwide, and generally on the manufacturing sector reliant on chips, is dependent on the long-term outcome of this reorganization of the sector in question.

The Science section of the CHIPS Act raises a distinct set of concerns.³ It injects a significant amount of funds in scientific innovation in the chips sector. This targeted provision of funds impacts the freedom and independence of universities and research institutions in the U.S. The targeted provision of funds undermines their capacity to create a free and nurturing environment in the pursuit of diverse spheres of scientific research. The provision distorts, discourages, and disadvantages the pursuit of research that is non-prioritized under the Act; and that is of a theoretical as opposed to an applied nature. Whilst this may be the case with any kind of targeted research support from the government, that does not detract from what occurs when the amount of funding is substantial. The ethos of this directed research in science is not in service of humanity, it is an appropriation of the sciences in the interest of the U.S. alone. The fact that directed research is done by other States does not detract from the article’s point, especially given the scales involved. Thus, it does not focus on the sciences with reference to the alleviation of poverty, underdevelopment, and diseases that afflict underdeveloped countries. Moreover, the manner of the disciplines and parameters set for scientific research, i.e., national security, Intellectual Property safeguards, ethical and social considerations, whilst in themselves understandable, are

2. See United States *Continues to Block New Appellate Body Members for the World Trade Organization, Risking the Collapse of the Appellate Process*, 113:4 AM. J. OF INT’L L. 822-31 (2019), doi:10.1017/ajil.2019. 59..

3. See 117th Congress Division B: Research and Development, Competition, and Innovation Act, Pub. L. No. 117-167, 136 Stat. 1366 (2022).

nevertheless inconsistent and incoherent with the advancement of mankind, including the ethos undermining the world trading system.⁴ Thus, the Act inhibits scientific exchanges between disparate countries and the inclusion of the most talented scientists regardless of nationality. The Act inhibits the transfer of technology to other countries, which according to U.S. perceptions alone, present a threat to U.S. national security—defined to include economic security. This manner of a country's scientific research, based as it is on industrial policy, along with the methodology employed to facilitate it, provides unfortunate leadership to the world and relates to the dynamics of the international economic order. There should be a multilateral approach to certain scientific frontiers that are of common interest to humanity. To maintain such an expectation is not to deny State involvement at the national level in research.

In sum, the CHIPS Act raises important questions in various disciplines, i.e., law and economics, international economics, political economy, international economic law, and the public international law of research in the sciences. This paper will focus however on two broad themes: the WTO law and the international framework on cooperation in scientific endeavors.

I. THE US CHIPS AND SCIENCE ACT 2022

The Chips Act was enacted in July 2022. Authorization for this legislation is set out in Sections 9902-9906 of the William M. (Mac) Thornberry National Defense Authorization Act (“NDAA”). The CHIPS Act has two distinct areas of focus. The first (the chips section of the CHIPS Act) is on semiconductors, with three objectives—economic security, national security, and future innovation.⁵ Economic security involves ensuring a significant manufacturing presence in the U.S., along with addressing any supply-chain obstacles for the US in the manufacture of chips. Moreover, the CHIPS Act is justified in the U.S. on the basis that the old U.S. model of R&D and commercialization abroad is no longer viable or in the interest of the U.S.⁶ This is important because it is

4. Whilst the multilateral trading system as originally intended is concerned by the overall benefits to all states derived from David Ricardo's theory of comparative advantage, a state's industrial policy is essentially concerned with the state's own self-aggrandizement.

5. *A Strategy for The Chips for America Fund*, THE U.S. DEP'T. OF. COM., (Sept. 6, 2022), available at <chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.nist.gov/system/files/documents/2022/09/13/CHIPS-for-America-Strategy%20%28Sept%206%2C%202022%29.pdf>, (last visited Dec. 8, 2023).

6. *See Id.*

contended it for the continuation of the U.S.’s lead in innovation in this field.⁷ This premise of course is not necessarily self-evident given contemporary technological advances in remote and distant working environments; and a comparison of the cost-benefit analysis of the new model and status quo. Additionally, there is the goal of ensuring U.S. national security concerns concerning sophisticated advanced chips manufacture and technology—including a US lead over China. Chips are essential components in electronics, with advanced versions necessary for both military and civilian applications. The U.S. wants to ensure its lead in innovation in the advanced chip sector. The achievement of these objectives is appropriately reflected in using the acronym CHIPS in the legislation, which stands for “Creating Helpful Incentives to Produce Semiconductors.” The CHIPS section of the CHIPS Act creates a CHIPS America fund of \$52.7 billion. Of this amount, some \$39 billion is set to ensure chips manufacturing in the US and \$11 billion for research and development.⁸ According to the U.S. Department of Commerce, while this amount is large and significant (in terms of the costs involved in the manufacture and research in chips,) there is need for generating further financing from the private sector which is forecasted.⁹

The policy objectives underlying the legislation are premised on the assumption that this is the only way to ensure the economic and defense security of the U.S. through regular supply and research originating in the U.S.; the assumption that advanced semi-conductor technology would be stolen by countries competing with the U.S.; and the assumption that the apparatus in the legislation will ensure for the U.S. a lead in manufacture and innovation. Moreover, the chips initiative is set against the background of a significant amount of the semi-conductors currently being manufactured in Taiwan—a country susceptible to a potential hostile takeover by China, and, thus, leaving U.S. supply chains vulnerable in this event. It is also intended to redress the historical decline of manufacture in this sector in the U.S.; to respond to and mirror foreign state

7. *See Id.*

8. *See* Donna Dubinsky, Sreenivas Ramaswamy, and Jason Boehm, CHIPS for America Presentation, (Sept. 2022), *available at* <chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.nist.gov/system/files/documents/2022/11/18/CHIPS%20Incentives%20Briefing%20Strategy%20Paper-Sept%202022.pdf>, (last visited Dec. 8, 2023).

9. U.S. Dep’t of Com., *Supra* note 5; *See also* FACT SHEET: CHIPS and Science Act Will Lower Costs, Create Jobs, Strengthen Supply Chains, and Counter China, (Sept. 2022), *available at* <https://www.whitehouse.gov/briefing-room/statements-releases/2022/08/09/fact-sheet-chips-and-science-act-will-lower-costs-create-jobs-strengthen-supply-chains-and-counter-china/> (Last visited Dec. 8, 2023).

subsidies in the manufacture of semi-conductors; and the need to adopt an industrial policy that departs from a *laissez-faire* market determined strategy, given that semi-conductors function as a building block in almost all electronic goods.¹⁰ These considerations reflect the current-day geopolitical economic rivalry between the U.S. and China.¹¹ Furthermore, the CHIPS Act is part of a greater scheme which includes efforts aimed at ensuring cooperation in this sector with allied countries via Chip 4 Allies;¹² use of U.S. export controls to stop exports of high technology semi-conductors to China; and deterring an important global supplier, a Dutch manufacturing company, from supplying machinery that manufactures advanced semi-conductors to China.¹³

Second, the Science part of the CHIPS Act further authorizes a wide-range of funding for the advancement of U.S. scientific research to the tune of two hundred billion dollars.¹⁴ This funding is available in specific areas of research and those that will contribute to the enhancement of U.S. competitiveness and national security. The legislation does not purport to inject funding in the sciences broadly—it lists research areas including the development of specific technologies.¹⁵ The groupings are the energy, environment, computational sciences, artificial intelligence, the science of genome, and the aeronautics and space sectors.¹⁶ The list does not cover all the sciences, for example: biology, evolution, behavioral sciences, infectious diseases, vaccination, and other sciences that may directly alleviate poverty.¹⁷ This U.S. strategic approach to the sciences echoes the one taken by China in its Outline of the 14th Five Year Plan focusing on “quantum information, photonics, micro and

10. Shira Ovide, *Taxpayers for U.S. Chips*, The New York Times, (Aug. 10, 2022), available at <https://www.nytimes.com/2022/08/10/technology/us-computer-chips.html> (Last visited Nov. 11, 2023).

11. *Id.*

12. Christian Davies et al., *US struggles to mobilise its East Asian ‘Chip 4’ alliance*, Financial Times, (Sept. 12, 2022), available at <https://www.ft.com/content/98f22615-ee7e-4431-ab98-fb6e3f9de032>, (Last visited Dec. 8, 2023).

13. Suranjana Tewari and Jonathan Josephs, *US-China chip war: How the technology dispute is playing out*, BBC News, (Dec. 16, 2022), available at <https://www.bbc.com/news/business-63995570>, (Last visited Dec. 8, 2023).

14. *See e.g.*, Olive, *supra* note 10.

15. *See* 117th Congress Division B: Research and Development, Competition, and Innovation Act, Pub. L. No. 117-167, 136 Stat. 1366 (2022).

16. *Id.*

17. *Id.* The Act was not intended for these purposes. However, the science being promoted is specific and targeted. This focus is reinforced by the exclusion of certain equally compelling spheres of scientific priorities.

nanoelectronics, network communications, artificial intelligence, biomedicine, modern energy systems, and other major innovation areas.”¹⁸ In the U.S., the targeted financial incentives are accompanied by the creation of technological hubs and arrangements for employment diversity, national security, intellectual property, and ethical safeguards.¹⁹

In this manner, the legislation serves to advance various national objectives including: U.S. industrial strategy, U.S. competitiveness internationally, U.S. supply chains and employment, U.S. science and innovation globally, and U.S. national security.²⁰ This is an extremely ambitious “America First” legislation. While all nations are entitled to put their interests first within reason, many argue that states holding leadership positions in the world have a special responsibility in advancing global stewardship, along with an enlightened and initiative-taking approach to the development of humanity.²¹

II. FAIR TRADE OR TRADE DISRUPTION UNDER WTO LAW?

The U.S. measures concerning chips from the standpoint of the WTO are not only set in the CHIPS Act, but also in the U.S. Export Control Reform Act of 2018 (ECRA) which authorizes the U.S. to impose export prohibitions on advanced chips.²² Under WTO law, these U.S. measures pose three distinct questions:

Are the various types of subsidies set out in the CHIPS Act the subject of WTO disciplines under the Agreement on Subsidies and Countervailing Measures (ASCM Agreement)?

Under both measures viz., ECRA and CHIPS Act, is China being discriminated against under Article 1 of GATT 1994?

Are there any quantitative restrictions being imposed on the exports from the U.S. of certain types of chips under Article XI of GATT 1994?

For reasons of space, the analysis here is not intended to be in-depth or exhaustive. Its main purpose is to highlight the key issues within the ambit of this paper.

18. See Chapter 4 of the Outline of the 14th Five-Year Plan (2021-2025) for National Economic and Social Development and Vision 2035 of the People’s Republic of China.

19. See 117th Congress Division B: Research and Development, Competition, and Innovation Act, Pub. L. No. 117-167, 136 Stat. 1366 (2022).

20. *Id.*

21. This suggestion may seem idealistic. It is incumbent on scholars, however, to make it and to judge those who claim the higher moral ground in accord with those expectations.

22. Including the US Export Administration Regulations (EAR).

In June 2022, this author wrote with reference to aspects of ECRA in terms of conformity with U.S. WTO obligations.²³ On December 15, 2022, China instituted consultation proceedings in the WTO with reference to U.S. export prohibition measures on certain semiconductors under ECRA.²⁴ China's position under its consultations reflects in substance the questions this author raised in his work in relation to the compatibility of ECRA with WTO law. China, at the consultation phase at any rate of the proceedings, does not focus on the CHIPS Act, as such, nor does it raise any questions in terms of U.S. subsidies. The U.S. response at the consultation phase is grounded on its national security concerns.

Here the focus is in the first instance on a consideration of subsidies—given that it was not raised as an issue by China in its request for consultations with the U.S. Second, a brief consideration of China's allegations with respect to the export controls under ECRA within the framework of the WTO. Brief, because the case is still pending, and moreover this work is not intended as an exhaustive legal opinion. Finally, in outline form some observations on the U.S. defense, given the recent WTO jurisprudence on the meaning of national security.

A. Subsidies²⁵

The WTO ASCM regulates two types of subsidies: actionable and prohibited subsidies.²⁶ R&D subsidies are no longer exempt from the disciplines of the ASCM and therefore such subsidies under the CHIPS Act are subject to the ASCM disciplines.²⁷ The CHIPS Act gives direct

23. See ASIF QURESHI, *THE AMERICANISATION OF THE WORLD TRADE ORDER*, at 128-43 (Routledge: June 2022).

24. See Request for Consultations by China, *United States – Measures on Certain Semiconductor and Other Products, and Related Services and Technologies* WT/DS615 (Dec. 15, 2022).

25. See WOLFGANG MULLER, *WTO AGREEMENT ON SUBSIDIES AND COUNTERVAILING MEASURES A COMMENTARY* (CUP:2017); and Nu Ri Jung, *Are There 'Exceptions' to the SCM Agreement? Applicability of the GATT Exceptions Vis-à-Vis the International Rules on Subsidies*, 57 *J. OF WORLD TRADE*, ISSUE 3, 457-72 (2023).

26. See *Agreement on Subsidies and Countervailing Measures*, WORLD TRADE ORG., available at https://www.wto.org/english/docs_e/legal_e/24-scm.pdf (last visited Dec. 8, 2023).

27. See ASCM Agreement, *WTO Analytical Index*, WTO (Dec. 2021), available at https://www.wto.org/english/res_e/publications_e/ai17_e/subsidies_art8_oth.pdf (last visited Dec. 8, 2023) (Article 8(2)(a) of the ASCM making R & D subsidies non-actionable no longer applicable).

financial assistance to the chips manufacturing sector in various forms including tax credits and R&D funding.

First, all the financial assistance is specific to the chips sector under the ASCM.²⁸ Therefore, there is *prima facie* evidence of an actionable subsidy under the WTO dispute settlement system; or through countervailing measures provided, there is injury to a domestic industry. Evidence of an adverse effect is a requirement for an actionable subsidy; for example, an injury to domestic industry of another; export displacement; and/or nullification or impairment of a benefit under GATT 1994.²⁹

Thus, under Section 102 of the CHIPS Act, \$52.7 billion is set out to enhance chips' domestic manufacturing capability, including research and development and workforce development programs. \$39 billion of the \$52.7 million is earmarked over a period of five years to implement the programs under Sec. 9902 of the NDAA (to incentivize investment in facilities and equipment in the U.S. for semiconductor fabrication, assembly, testing, advanced packaging, or research and development). \$2 billion of this amount is explicitly set out for "legacy chip production" to further "economic and national security interests." A further \$2 billion is set for "a CHIPS for America Defense Fund;" and \$500 million for a CHIPS for an "America International Technology Security and Innovation Fund." Larger amounts beyond a set threshold of \$3 billion can be received if they "(i) significantly increase the proportion of reliable domestic supply of semiconductors relevant for national security and economic competitiveness that can be met through domestic production; and (ii) meet the needs of national security."³⁰ In addition, under Sec. 107 of the CHIPS Act, there is a 25-percent tax credit for investments in semiconductor manufacturing and includes incentives for the manufacturing of semiconductors, as well as for the manufacturing of the specialized tooling equipment required in the semiconductor manufacturing process. This tax credit, albeit at the taxpayers' option, can be used to off-set taxes due.

Second, with reference to the subsidies being considered as prohibited subsidies. This is dependent on several considerations which touch upon export performance or local sourcing, as follows. The CHIPS Act is not only about enhancing the U.S. capacity to manufacture chips for

28. *Agreement on Subsidies and Countervailing Measures*, *supra* note 26, at 230 art. 2.1(b) n. 2.

29. *Id.* at 233 art. 5.

30. William M. (Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021, sec. 9902.

the domestic market alone, but also about increasing, albeit in the long run, the U.S. competitiveness globally.³¹ There are aspects of the domestic capacity building in the chips sector, the fruits of which will not be insulated from the export market or parts of the export market. Some manufactures will be found in the world market or markets of some countries alone. There are indications in the legislation that promote local sourcing, for example the injunction to “incentivize investment in facilities and equipment in the U.S. for semiconductor fabrication, assembly, testing, advanced packaging;” or the prohibition to use technology or products albeit in association with a foreign entity of concern.³²

The extraterritorial export control (including engaging in significant transactions involving expansion of manufacturing capacity in PRC) imposed on other countries is induced through the apparatus of financial assistance and therefore can be considered a subsidy related to export performance, albeit extraterritorially and in terms of negative performance. Under Section 9905, a provision is made for the creation of a Trust Fund to “secure semiconductors and measurably secure supply chains.” Foreign participation in this Fund is subject to the foreign government maintaining “export control licensing policies on semiconductor technology substantively equivalent to the U.S. with respect to restrictions on such exports to the People’s Republic of China.” Section 102 also prohibits “the recipients of Federal incentive funds from expanding or building new manufacturing capacity for certain advanced semiconductors in specific countries that present a national security threat to the U.S.”³³ This includes “expanding or building new manufacturing capacity” for the purposes of expanding exports from those specific countries. It should be noted here that expanding and building manufacturing capacity abroad can be facilitated through direct investment and/or necessary exports.

In sum, it is sufficient in this discourse to raise relevant questions and pointers generally in terms of this query. There is much in the jurisprudence of the WTO Appellate Body that is also relevant here—most notably, the cases involving the U.S. Measures Affecting Trade in Large

31. *See id.* (referring to economic competition); *see also id.* at sec. 9906 (referring to “leadership and competition of the US in microelectronic technology and innovation”). Moreover, the microtechnology is of use and will be used in various US export products in the future.

32. H.R. 6395, 116th Cong. § 9902 (2nd Sess. 2020).

33. *See* U.S. Dep’t of Com., *supra* note 5.

Civil Aircraft.³⁴ Indeed, there are parallels here in the U.S. measures and facts involving R & D funding, including tax breaks concerned with the U.S. Aircraft industry. The U.S. in these cases was found to have been in violation of the ASCM.

B. ECRA Under WTO Law

The U.S. recently imposed tighter export controls on the export of chips to address U.S. national security and foreign policy concerns, including the pursuit of regional stability, by way of an amendment to its Export Administration Regulations (EAR), specifically aimed at China.³⁵ These are the subject of the Chinese complaint under the WTO.³⁶ The export controls concern (1) “advanced computing integrated circuits (ICs),” (2) “computer commodities that contain such ICs,” and (3) “certain semiconductor manufacturing items.” The controls comprise of (1) an expanded application of the Foreign Direct Product Rule³⁷ to super-computer and semiconductor manufacturing end users by extending “the scope of foreign-produced items subject to license requirements for twenty-eight existing entities located in China on an Entity List;” and (2) introducing licensing requirements for “U.S. persons” that “support” the

34. See Appellate Body Report, *United States—Measures Affecting Trade in Large Civil Aircraft (Second Complaint)*, WTO Doc. WT/DS353/AB/R (adopted Mar. 12, 2012); Appellate Body Report, *United States—Measures Affecting Trade in Large Civil Aircraft (Second Complaint), Recourse to Article 21.05 of the DSU*, WTO Doc. WT/DS353/AB/RW (adopted Mar. 28, 2018). For analysis of this case, see Sara Angeleska, *United States—Measures Affecting Trade in Large Civil Aircraft – Second Complaint – Recourse to Article 21.5 of the DSU by the European Union (US – Large Civil Aircraft (2nd Complaint))*, 19 World Trade Rev. 472, 472-76 (2020); Jennifer A. Hillman and Kara M. Reynolds, *Article 21.5 DSU Appellate Body Report United States—Measures Affecting Trade in Large Civil Aircraft (Second Complaint); Spillovers from Defense R&D Add to the Tug-of-War between Panels and the WTO Appellate Body*, 20 World Trade Rev. 466, 466-478 (2021).

35. See generally 15 C.F.R. §§ 734, 736, 740, 742, 744, 762, 772, 774; see also Export Control Reform Act, 50 U.S.C. § 58.

36. See Export Control Reform Act, 50 U.S.C. § 58; see 15 C.F.R. § 730-774; see 87 Fed. Reg. 62,186 (Oct. 13, 2022). See also Chinese Complaint: WT/DS615/1/Rev.1, G/L/1471/Rev.1 (15 December 2022) & WT/DS615/1/Rev.1/Add.1 (19th September 2023).

37. A Foreign Direct Product Rule is a rule contained in the Export Administration Regulations that enables the extraterritorial application of U.S. export controls to transactions outside the US. These transactions involve a product wherein U.S. origin technology/software is used directly or indirectly where the foreign plant for manufacture of the product was itself produced using U.S. origin software or technology that is the subject of U.S. export controls; or the product is destined for certain designated countries of U.S. concern including China. See George W. Thompson, *The Foreign Direct Product Rule*, Thompson & Associates, PLLC, (Mar. 29, 2022), available at <https://gwthompsonlaw.com/the-foreign-direct-product-rule/> (last visited Dec. 8, 2023); see 15 C.F.R. § 734.9.

development” or “production” of certain ICs in the PRC “even when the precise end use of such items cannot be determined by the “U.S. person.”³⁸

Where there are license requirements for regional stability reasons applied to China—these are “under a presumption of denial, based on the risk of these items being used contrary to the national security or foreign policy interests of the U.S., including the foreign policy interest of promoting the observance of human rights throughout the world.”³⁹ In terms of the Foreign Direct Product Rule, the rule “imposes a license requirement for exports, re-exports, and transfers (in-country) of identified items” to or within and from the PRC. Specifically, the U.S. security and foreign policy concerns relate to the use of advanced computing ICs, “supercomputers,” and semiconductor manufacturing equipment for enabling military modernization, including the development of weapons of mass destruction (WMD), and human rights abuses involving the monitoring, tracking, and surveillance of citizens.⁴⁰ China alleges that such export control measures are contrary to Articles X(1) and X(3) of GATT 1994 and Article VI of GATs on the basis that certain of the measures were not published promptly and/or administered fairly; Article 1 of GATT 1994 on the basis that all the measures singled out China; Article XI of GATT 1994 and Article 2 of TRIMs on the basis that certain measures through license requirements constituted quantitative restrictions; and Article 28 of TRIPS on the basis of violations of the rights of patent holders to assign and transfer patent rights.

C. National Security Defense

The U.S. response to the Chinese complaint has been in terms of its national security. Thus, the U.S. has entered consultations with China without prejudice to its view that:

Issues of national security are political matters not susceptible to review or capable of resolution by WTO dispute settlement... Every Member of the WTO retains the authority to determine for itself those

38. *Implementation of Additional Export Controls: Certain Advanced Computing and Semiconductor Manufacturing Items; Supercomputer and Semiconductor End Use; Entity List Modification*, THE U.S. DEP'T. OF. COM. (Oct. 13, 2022), available at <https://www.federalregister.gov/documents/2022/10/13/2022-21658/implementation-of-additional-export-controls-certain-advanced-computing-and-semiconductor> (last visited Dec. 8, 2022).

39. 15 C.F.R. §§ 734, 736, 740, 742, 744, 762, 772, 774; see also Export Control Reform Act, 50 U.S.C. § 58.

40. Dubinsky et al., *supra* note 8.

measures that it considers necessary to the protection of its essential security interests, as is reflected in the text of Article XXI of the GATT 1994, Article XIV bis of the GATS, and Article 73 of the TRIPS Agreement.⁴¹

There are three questions raised here: first, whether the national security exception under Article XXI of GATT applies to the ASCM; second, if it does, whether it is justiciable; and third, what is the scope of this exception? As to the first question, the relationship has not yet been formally decided in the WTO dispute settlement system.⁴² According to Jung however, Article XXI of GATT 1994 applies to an actionable subsidy under the ASCM, but has a more restrictive bearing on export subsidies under the ASCM.⁴³ Yet, there are important considerations that suggest the security exception is in principle invocable with reference to the obligations on export subsidies as well under the ASCM.⁴⁴

First, the ASCM is an elaboration and reinforcement of the disciplines under Article XVI of GATT 1994 concerning subsidies. It further strengthens the existing disciplines as far as a prohibited subsidy is concerned. It does not “contradict” it.⁴⁵ Article XVI:1 of GATT 1994 imposes a restriction on export subsidies. This restriction has been further strengthened in the ASCM to an outright prohibition. Thus, it is not so much that Article XVI:1 of GATT 1994 is permissive of export subsidies. Rather, it is restrictive of it. Second, the two sets of subsidy disciplines, in principle, should not be interpreted differently—especially given that both types of subsidies have an impact on competition between like goods in international trade. Moreover, there are several references in the ASCM to Article XVI of GATT 1994 that underpin coherence in the

41. Panel Report, United States-Measures on Certain Semiconductor and Other Products, and Related Services and Technologies Communication from the United States, WTO Doc. WT/DS615/4 (Jan. 12, 2023).

42. See, e.g., Peter Van den Bossche & Sarah Akpofure, *The Use and Abuse of the National Security Exception under Article XXI(b)(iii) of the GATT 1994* (eds. World Trade Inst., 2020).

43. See Jung, *supra* note 24.

44. *Id.* at Article XVI:1 (Article XVI:1 contains a general obligation to report all subsidies that operate to increase exports or decrease imports and to consult, on request with other Members on the possibility of limiting the subsidization. Stated differently, Article XVI of the GATT allows, as a general rule, provision of the export and import subsidies.⁴⁸). Contra Nu Ri Jung (2023) *op cit.* Article XVI:1 contains a general obligation to report all subsidies that operate to increase exports or decrease imports and to consult, on request with other Members ‘on the possibility of limiting the subsidization. Stated differently, Article XVI of the GATT allows, as a general rule, provision of the export and import subsidies.

45. *Id.*

WTO framework of subsidy disciplines. Third, the national security exception under Article XXI of GATT 1994 is underpinned by and set against the background of the inherent right of a State to safeguard its national security. In the circumstances, given that a State's national security partakes of its sovereignty it can only be displaced expressly, or circumscribed expressly as they have been under Article XXI of GATT 1994 (*contra* Article XX of GATT 1994 exceptions). This right to national security is grounded in sovereignty and international law, wherein it has historically had a wide scope. This background would be relevant in any interpretation of this relationship as per Article 31(3)(c) of the Vienna Convention of the Law of Treaties.

At present, the overwhelming weight of both academic⁴⁶ and WTO jurisprudence⁴⁷ is opposed to the way the U.S. has couched its national security defense to justify its departure from its obligations under the WTO. In four recent WTO Panel decisions as of December 2023, the Panels have unanimously refuted this national security stand.⁴⁸ Out of these four decisions one panel decision has been adopted; and three have been appealed and therefore not adopted by the Dispute Settlement Body. In this paper, the Panel decision involving Steel and Aluminum Products, has on its facts, a greater relevance to the U.S. response to the international manufacture of chips and therefore this decision will be the basis

46. See, e.g., Tatiana Lacerda Prazeres, *Trade and National Security: Rising Risks for the WTO*, 19 WORLD TRADE REVIEW 137, 137-48 (2020); Andrew Emmerson, *Conceptualizing Security Exceptions: Legal Doctrine or Political Excuse?*, 11 J. INT'L ECON. L. 135, 135-54 (2008); Hannes L. Schloemann & Stefan Ohlhoff, "Constitutionalization" and Dispute Settlement in the WTO: National Security as an Issue of Competence, 93 AM. J. INT'L L. 424, 424-51 (1999); Wolfgang Weiß, *Adjudicating Security Exceptions in WTO Law: Methodical and Procedural Preliminaries*, 54 J. WORLD TRADE 829, 829-52 (2020). See also for a recent more practical approach to resolving the national security impasse in the WTO: Alan Wm. Wolff & Warren Maruyama, *Saving the WTO from the National Security Exception*, PETERSON INST. FOR INT'L ECON. (May 19, 2023), available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4453718 (last visited Dec. 21, 2023).

47. Panel Report, Russia—Measures Concerning Traffic in Transit, WTO Doc. WT/DS512/7 (adopted Apr. 26, 2019) [hereinafter Measures Concerning Traffic]; Panel Report, United States—Certain Measures on Steel and Aluminum Products, WTO Doc. WT/DS544/R (adopted Dec. 9, 2022). US appealed panel decision [hereinafter Measures on Steel and Aluminum]; and Panel Report, United States – Origin Marking Requirement WTO. Doc. WT/DS597/R (Panel Report circulated 21st December 2022) [Hereinafter Measures on Origin Marking] U.S. appealed Panel Decision). See also Saudi Arabia - Measures Concerning the Protection of Intellectual Property Rights WTO.Doc. WT/DS567/R (Panel Report circulated June 16th 2020. Saudi Arabia appealed panel decision).

48. *Id.*

of evaluating national security in what follows—against the background of the adopted Measures Concerning Traffic Case.⁴⁹

First, the Panel in Measures on Steel and Aluminum does not consider that Article XXI(b) of the GATT 1994 is “self-judging” or “non-justiciable” in the sense argued by the U.S., nor that the provision contains a “single relative clause” that wholly reserves the conditions and circumstances of the subparagraphs to the judgment of the invoking Member.⁵⁰ Second, the phrase, “in time of war or other emergency in international relations,” in Article XXI(b), relates to “a condition requiring immediate treatment”; and in the term “international relations,” “relations” focuses on the “various ways by which a country, State, etc., maintains political or economic contact with another”; whereas, “the term ‘international’ may be defined as ‘[e]xisting, occurring, or carried on between nations’ in contrast to ‘an emergency in purely domestic or national affairs.’”⁵¹ Third, “emergency in international relations” within the meaning of Article XXI(b)(iii) must be, if not equally grave or severe, at least comparable in its gravity or severity to a “war” in terms of its impact on international relations.⁵² Furthermore, the “action for the protection of essential security interests must be ‘taken in time of’ an emergency in international relations.”⁵³ Fourth, “essential security interests” refer to “circumstances of a certain gravity or severity in terms of their impact on the conduct of international relations.”⁵⁴

However, can these panel decisions be decisive in terms of the U.S. stand on national security? There are several issues implicated here. First, it is difficult to see if the U.S. can be persuaded with respect to its stand on national security as a matter of politics, with these decisions on their own. This is borne out by its continued mantra of the self-judging nature of the national security defense under Article XXI of GATT 1994, in the U.S. response to the Chinese complaint (at the time of writing under consultations between China and U.S. in the WTO Dispute Settlement

49. In both cases, the focus is on the supply/demand of a particular commodity: chips and “steel and aluminum.” In both instances, U.S. measures implicate both national security and economic competitiveness. See William M. (Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021, Pub. L. No. 116-283, § 9902, 134 Stat. 3388 (2021).

50. US Measures on Steel and Aluminum, *supra* note 47, ¶ 7.128.

51. *Id.* ¶ 7.137.

52. *Id.* ¶ 7.139.

53. *Id.* ¶ 7.140.

54. *Id.* ¶ 7.141.

System), relating to chips.⁵⁵ The U.S. appears to be reluctant to comply with the Panel decisions as it has appealed the Measures on Steel and Aluminum and Measures on Origin Marking panel decisions.⁵⁶ Indeed, regardless of that, USTR Spokesperson Adam Hodge rejected the interpretation and decision of the Panel on U.S. Steel and Aluminum and observed that the U.S. will not alter its decision-making over its essential security to WTO panels.⁵⁷ However, despite the rhetoric with respect to Measures on Steel and Aluminum, the U.S. could take a more pragmatic approach in its response, if this decision were adopted. On the other hand, with respect to the Chinese complaint in the WTO on the U.S. measures concerning chips, the U.S. seems to have much more at stake. An adverse panel decision would more likely not be adhered to. Second, the panel decisions are set in a dispute settlement system made up of an additional layer of an appellate process, albeit at present not functioning. Moreover, two Panel decisions deliberating on national security have not yet been adopted by the Dispute Settlement Body given the U.S. appeals.⁵⁸ Therefore, there is a concern involving the weight that should be accorded to these panel decisions. Third, the Panel decisions are specific to the facts of the cases and are not caught necessarily in a framework of binding precedents. Thus, the Panel in Measures on Steel and Aluminum emphasized that the “assessment of the Panel in this dispute concerns the U.S.’s specific arguments in connection with the existence of an emergency in international relations under Article XXI(b)(iii) and, in particular, its references to an international situation of global excess capacity in steel and

55. See United States—Measures on Certain Semiconductor and other Products, and Related Services and Technologies, [hereinafter U.S. Measures on Semiconductor], WTO Doc. WT/DS615/4 (Jan. 12, 2023); WT/DS615/7 (03/03/2023); WT/DS615/5 & 6 (16/02/2023).

56. Notification of an Appeal by the US under Article 16 of the Understanding on Rules and Procedures Governing the Settlement of Disputes (DSU), *United States—Certain Measures on Steel and Aluminum Products*, WTO Doc. WT/DS544/14 (Jan. 30, 2023); United States—Origin Marking Requirement Notification of an Appeal by the U.S. under Article 16 (WT/DS597/9) (Jan. 30, 2023).

57. Press Release, Off. of the U.S. Trade Representative, Statement from USTR Spokesperson Adam Hodge (Dec. 21, 2022), available at <https://ustr.gov/about-us/policy-offices/press-office/press-releases/2022/december/statement-ustr-spokesperson-adam-hodge-0> (last visited Dec. 8, 2023).

58. Panel Communication, *United States—Certain Measures on Steel and Aluminum Products*, WTO Doc. WT/DS554/24 (dated June 23, 2023); Panel Report, *United States—Origin Marking Requirement*, WTO Doc. WT/DS597/R (Panel Report circulated 21st December 2022).

aluminum.”⁵⁹ Fourth, a distinction needs to be made between the factors that are taken into account in making an objective assessment under the DSU, and factors that go in defining the scope of a member’s national security. Thus, the Panel itself leaves the question open as to what the parameters of a member’s national security are comprised of; for example, it observed that “in accordance with the ordinary meaning of its terms, subparagraph (iii) requires a distinct inquiry as to whether the actions were taken in time of an ‘emergency in international relations’ based on an objective assessment of relevant evidence and arguments.” In other words, the Panel was not in abstract reflecting on the shape and contours of a member’s national security interests, rather it was engaged in a consideration of whether the claims made on national security considerations were grounded on national security interests under the circumstances of the case.

D. Grounds for Appeal in the Steel and Aluminum Case

Finally, there are potential grounds for an appeal in the Steel and Aluminum case. An appeal has been lodged,⁶⁰ and, if deliberated upon, the appeal has relevance to the Chinese WTO challenge in relation to U.S. measures on chips. Such grounds of appeal constructed herein, if considered credible, have a bearing on the weight of the panel deliberations on national security thus far pronounced. These are not intended to be exhaustive.

First, with respect to the methodology availed by the panel in the Steel and Aluminum case, it may be argued that the panel erred in failing to consider at the outset the “threshold point of interpretive disagreement between the parties,” i.e., “the extent to which the terms of Article XXI(b) of the GATT 1994 permit review of a Member’s invocation of that provision by a panel established under the DSU.” Rather, the Panel instead first considered whether there had been breaches of the substantive provisions of the WTO agreements GATT 1994 and the Safeguard Agreement. The subsequent interpretation of Article XXI(b) in terms of whether the Panel could review the U.S. decision on its national security concerns potentially could have become skewed—i.e., informed by the

59. Panel Report, *United States—Certain Measures on Steel and Aluminum Products*, ¶ 7.143, WTO Doc. WT/DS544/R (adopted Apr. 5, 2019) [hereinafter U.S. Measures on Steel and Aluminum].

60. Panel Communication, *United States—Certain Measures on Steel and Aluminum Products*, WTO Doc. WT/DS544/14 (dated Jan. 26, 2023) [hereinafter U.S. Measures on Steel and Aluminum (DS544/14)].

gravity of the departures from WTO obligations.⁶¹ In addition, it was not necessary for the Panel to engage in an exhaustive interpretation of XXI(b) to answer the question of reviewability. The Panel, in adopting this *modus operandi*, did not properly set itself the task of interpreting whether Article XXI(b) allowed for review or not. Moreover, this approach of interpretation detracts from the Panel's Terms of Reference.

Second, grounds for appeal deal with substantive interpretations. It may be argued that the Panel erred when it observed there is no textual indication that the sentence endings in the subparagraphs of Article XXI(b) are merely illustrative, or that Article XXI(b) may apply to actions other than those described in the subparagraphs. The Panel observed that these considerations indicate that the subparagraphs are exhaustive in establishing the circumstances in which a Member may take the "action which it considers necessary for the protection of its essential security interests"⁶² within the meaning of Article XXI(b).⁶³ It is not safe to infer merely from an omission of a textual indication that the paragraphs are non-exhaustive. Members of the WTO could not have understood that in signing the text of this agreement they were forever forsaking their capacity to invoke national security to the limited circumstances set out in Article XXI(b). Conceptions of national security can vary in time and according to the circumstances. In a sense, national security is assimilated to a sovereignty that is always a concept in a state of contestation. The only indication here is that there was no comprehensive focus and consensus on national security and that there was a presumption that the inherent right to preserve national security would remain intact. Furthermore, the Panel took a purely textual approach to defining national security when such a significant concept needs to be considered from the prisms of General International Law. International law has a bearing on the extent to which a State has complete discretion in defining its sovereignty and the related concept of national security within the framework of sovereign equality of States.⁶⁴

Third, the Panel erred in expecting clarity concerning the scope and nature of the review of a member's invocation of Article XXI(b) of the

61. Note in Panel Report, United States–Origin Marking Requirement WTO. Doc. WT/DS597/R (Panel Report circulated 21st December 2022. U.S. appealed Panel Decision) the Panel did consider at least the reviewability/justiciability question at the outset (see ¶ 7.20).

62. *See id.* ¶ 7.83.

63. *See id.* ¶ 6.14.

64. *See* Qureshi, *supra* note 22, at 79–98.

GATT 1994 in proceedings under the DSU.⁶⁵ The standard of expectations here is too high. Additionally, this absence reinforces the U.S. claim. The Panel erred in not finding “any clear indication” in the materials made available to it by the parties’ “self-judging nature” or “non-justiciability” of Article XXI(b) of the GATT 1994 as contended by the U.S.⁶⁶ Again, the Panel seems to be looking for an express reference. It could be that the lack of a clear indication was considered unnecessary given that the international practice—for example, the IMF practice—was to give deference to its members in this regard in the context of the invocation of national security by a member of the IMF.⁶⁷

Fourth, the Panel does not explain the basis for suggesting that there is a presumption in favor of the member in interpreting Article XXI (b) of GATT 1994 as the Panel states: “In conclusion, the entirety of Article XXI(b) of the GATT 1994 is to be given meaning and effect in a manner that preserves the right and discretion of a Member to take action it considers necessary for the protection of its essential security interests under the conditions and circumstances described in subparagraphs (i) to (iii).”⁶⁸

Fifth, did the Panel give an unduly narrow definition of “international relations” when relying on the dictionary meaning of the words? The Panel observed: “The relevant emergency within the meaning of subparagraph (iii) must be ‘in international relations.’” It went on to elaborate the term “relations” may be defined as “[t]he various ways by which a country, State, etc., maintains political or economic contact with another,” while the term “international” may be defined as “[e]xisting, occurring, or carried on between nations; pertaining to relations, communications, travel, etc., between nations.” The phrase “international relations” may thus be understood to mean interactions between nations or national governments.⁶⁹ Somewhat in contrast, the Panel in *Saudi Arabia and Intellectual Property Rights* drawing on *Russia—Traffic in Transit* stated that while “political” and “economic” conflicts could sometimes be considered “urgent” and “serious” in a political sense, such conflicts will not be “emergencies in international relations” within the meaning of subparagraph (iii) “unless they give rise to defense and

65. See US Measures on Steel and Aluminum, *supra* note 47, ¶ 7.127.

66. *Id.*

67. IMF, *Decision No. 144-(52/51), Bilateralism and Convertibility*, IMF ELIBRARY (Aug. 14, 1952), available at <https://www.elibrary.imf.org/downloadpdf/book/9781451942552/ch016.xml> (last visited Dec. 8, 2023).

68. U.S. Measures on Steel and Aluminum, *supra* note 45, ¶ 7.128.

69. *Id.* ¶ 7.137.

military interests, or maintenance of law and public order interests.”⁷⁰ Thus, in the *Saudi Arabia* and *Russia Traffic in Transit* cases where a circumstance results in the raising of an internal “maintenance of law and public order interests” as a consequence of an international occurrence—then that is a situation that falls within the ambit of being an international relationship. Moreover, the Steel and Aluminum Panel was influenced in its interpretation by the dictionary meaning of the words. This is not the right approach to interpreting a provision whose language is to be found in other international agreements wherein the same language has been given a different interpretation; granted, the context may be different.⁷¹

In conclusion, there is a strong probability of the panel in *United States—Measures on Certain Semiconductor* delivering a decision in favor of China. However, the overall outcome is not easy to predict. This is in some measure dependent on developments relating to appeals with respect to the *Steel and Aluminum* and *Origin Marking Requirement* cases—if these appeals are ever heard given the paralysis of the WTO Appellate Body.

III. INTERNATIONAL COMPETITION OR UNJUST COMPETITION IN SCIENTIFIC ENDEAVORS?

The “Science” part of the CHIPS Act raises important questions about global scientific advancement and the role of international law and policy in facilitating it. It is also significant with respect to the impact of subsidies, albeit for scientific advancement, on international trade. This has already been alluded to, and with respect to intellectual property rights, including the transfer of technology.

State funding for scientific research is common in most OECD countries. For example, in 2021, the total government budget allocation for research and development (R&D) in the U.S. was \$165.56 billion; EU €156 billion; and Japan ¥81.46 billion.⁷² Against this background, in

70. See Panel Report, *Saudi Arabia—Intellectual Property Rights*, ¶ 7.244-7.245, WTO Doc. WT/DS567/11 (Apr. 21, 2022) [hereinafter SA Intellectual Property Rights]; see also *WTO Analytical Index*, WTO, available at https://www.wto.org/english/res_e/publications_e/ai17_e/trips_art73_jur.pdf (last visited Dec. 8, 2023).

71. Katia Yannaca-Small, *Essential Security Interests under International Investment Law*, ORG. FOR ECON. COOP. & DEV. [OECD] (2007), available at <https://www.oecd.org/daf/inv/investment-policy/40243411.pdf> (last visited Dec. 21, 2023).

72. See *Main Science and Technology Indicators*, at 68, Volume 2022 Issue 1 Table 57, ORG. FOR ECON. COOP. & DEV. [OECD] (2022), available at <https://read.oecd->

2022, the CHIPS Act alone authorized \$200 billion for R&D and commercialization spread over ten years. This is a significant amount allocated to a specific sector, albeit fundamental and critical to the advancement of technology for both civil and military use. Moreover, it is proffered specifically in a framework intended to advance the objective of increasing U.S. international competitiveness, with important consequences in the pattern of international trade, investment, and manufacture in the sector.⁷³ The U.S. CHIPS funding has the effect of thwarting scientific development and competition in another country through, for example, measures that withhold the dissemination of certain high technology science. Internally, such a massive amount of funding has an opportunity cost for research in other areas of scientific endeavors within the U.S.

Until now, there has not been much focus on the public international law dimension of research and development in science, although research in science has been the subject of much deliberation in terms of intellectual property law. Yet, international facilitation, coordination, cooperation, and safeguards have a role to play in the advancement of R&D. There is no one institution at the international level that is organized to facilitate and manage research in science globally.

At the level of General International Law, a State is presumed to have freedom with respect to its engagement in scientific research.⁷⁴ Some constraints to this freedom can be discerned, albeit fragmented and in exceptional circumstances, for example: where that research might have a negative transboundary impact;⁷⁵ partakes in the advancement (contra enforcement) of an activity that is contrary to a peremptory norm of international law; undermines individual, collective or state rights and prohibitions under General International Law, including the concepts of the common heritage of mankind and “accumulated scientific knowledge of indigenous people.”⁷⁶ The presumed freedom for scientific research raises legal questions that call for clarification given that they touch on the extent of that freedom. What is meant by scientific research? Clarity

ilibrary.org/science-and-technology/main-science-and-technology-indicators/volume-2022/issue-1_4db08ff0-en#page68 (last visited Dec. 21, 2023).

73. See Chips Act, Pub. L. No. 117-167 (2022).

74. See, e.g., The Case of the S.S. Lotus (Fr. v. Turk) (PCIJ: 1927) (several multilateral agreements also affirm although not expressly this freedom).

75. See Trail Smelter Case (U.S. v. Can.), 3 R.I.A.A. 1905, (Perm. Ct. Arb. 1938 & 1941).

76. See Anna-Maria Hubert, *The Human Right to Science and Its Relationship to International Environmental Law*, 31 EUR. J. INT’L L. No. 2 625, 636 (2020).

on this can be important, for example, in the allocation of rights in research in a spatial context to respective states. In a legal analysis, the meaning of scientific research is the subject of an objective evaluation and not open to the state to self-judge. Thus, “an objective test of whether a program is for purposes of scientific research does not turn on the intentions of individual government officials, but rather on whether the design and implementation of a program are reasonable in relation to achieving the stated research objective.”⁷⁷ What is meant by freedom in scientific research? This is as significant in terms of the State as it is at the individual level. Is that freedom limited by an obligation to cooperate in scientific research with other nations and their citizens? This question is also about transferring knowledge and working toward certain community goals even if it raises the specter of protecting intellectual property rights.

At the level of conventional international law there are various agreements wherein “scientific research” of a certain genre is expressly regulated and/or prohibited.⁷⁸ Conversely, a certain level of research engagement may be called for by the State under international agreements,⁷⁹ for example, in the environmental field, the promotion of “scientific research, to encourage the exchange of scientific information and data about environmental protection.”⁸⁰

The freedom of a state in scientific research is also constrained by the individual’s human right to science, and the state’s obligation to ensure such a right.⁸¹ The human right to science finds its primary expression in Article 15 of the International Covenant on Economic, Social and Cultural Rights, 1966.⁸² Under this human right, first, everyone has the

77. See, ICJ: Whaling in the Antarctic (Austl. v. Japan: N. Z. intervening), 2014 paras 70-90 at para. 97: para. 97 (although this is a statement made in the context of interpreting the undefined term in the Article VIII of the International Convention for the Regulation of Whaling 1946 it is of equal relevance in terms of General International Law).

78. See generally the International Convention for the Regulation of Whaling 1946; the International Atomic Energy Agency; the 1972 Convention on the Prohibition of Biological Weapons; and the work of the International Atomic Energy Agency and associated Conventions on Nuclear Armaments.

79. E.g., in the environmental and the health spheres.

80. Anna-Maria Hubert, *supra* note 76, at 626.

81. See *id.* at 629 (discussing these instruments albeit in the context of the environment).

82. Council of Europe, *International Covenant on Economic, Social and Cultural Rights*, COUNCIL OF EUROPE, available at <https://www.coe.int/en/web/compass/international-covenant-on-economic-social-and-cultural-rights#:~:text=Article%2015,Economic%2C%20Social%20and%20Cultural%20Rights> (last visited Nov. 13, 2023); See U.N.,

right to “enjoy the benefits of scientific progress and its applications.” Second, everyone has the right to “benefit from the protection of the moral and material interests resulting from any scientific, literary, or artistic production of which he is the author.” Third, states need to take steps “to ensure ‘the conservation, the development and the diffusion of science.’” Fourth, states “undertake to respect the freedom indispensable for scientific research and creative activity.” Finally, the states party to the Covenant “recognize the benefits to be derived from the encouragement and development of international contacts and co-operation in the scientific” field.

In sum, Article 15 sets out certain individual rights as well as obligations of the state to ensure the realization of those rights. These include not interfering or distorting freedom in scientific endeavors that come into play through subsidies or their lack of, along with an expansive umbrella of national security. In addition, the right to enjoy the fruits of scientific research, for example by denying exports, or interfering with supply chains established in response to market conditions, for further scientific research and its application—undermines this human right of science as it applies to everyone. Moreover, the state’s responsibility extends beyond its borders in the “encouragement and development of international contacts.” Whilst the texture of these rights and obligations generally is of a soft nature, they cannot be so easily dismissed given their articulation in various instruments, including international agreements. Indeed, they are relevant in the interpretation of WTO law and other international agreements containing provisions of scientific endeavors, for example in space and international maritime law, including General International Law norms on cooperation as between states applicable to the U.S. as per Article 31(3)(c) of the Vienna Convention on the Law of Treaties.

Briefly, what follows are the outlines of such organized scientific cooperation arrangements in key areas of importance: maritime; space; health and nuclear science. They illustrate how states have avoided conflict in the pursuit of science; how they have organized systems of cooperation and navigated through concerns of safety and national security.

First, a comprehensive normative framework for marine scientific research is found in the Law of the Sea Convention 1982 (UNCLOS).

Universal Declaration of Human Rights: Article 27–28, UNITED NATIONS (Dec. 10, 1948), available at <https://www.un.org/en/about-us/universal-declaration-of-human-rights> (last visited Dec. 8, 2023), (for other international instruments, the human right to science is also to be found).

UNCLOS allocates states' rights for marine insurance within maritime zones; clarifies liabilities for damage arising from such research; ensures marine research for the benefit of humanity; and incorporates a variety of processes for cooperation and development of marine scientific research. Thus, UNCLOS protects the right to engage in marine scientific research in the various maritime zones of the sea, giving priority to the coastal state in its territorial sea, continental shelf, and exclusive economic zone. In relation to the high seas, all States can engage in marine research.⁸³ On the other hand, with respect to the area of the seabed and ocean floor and the subsoil thereof, beyond the limits of national jurisdiction, where state parties to UNCLOS may engage in marine research, all marine scientific research is to be exclusively conducted for peaceful purposes, and for the benefit of mankind as a whole.⁸⁴ In the conduct of marine research, member states of UNCLOS are liable for any damages occurring for such research,⁸⁵ and for encroaching on the rights of other member States.⁸⁶ Moreover, they cannot claim "any part of the marine environment of its resources" as a result of the research.⁸⁷ Finally, UNCLOS is littered with provisions with respect to the sharing of information;⁸⁸ cooperation, coordination, and transfer of technology in the sphere of marine scientific research.⁸⁹ Such engagements could contravene provisions of the CHIPS Act. Some reflection here may be necessary. In sum, there is a balance of state-centric and global approach to the engagement and sharing of marine scientific research.

Outside UNCLOS, the international community has also established Antarctic scientific cooperation endeavors in the "interest of all mankind" given the "the substantial contributions to scientific knowledge resulting from international cooperation in scientific investigation in Antarctica," whilst also acknowledging the need for "freedom of scientific investigation in Antarctica."⁹⁰

83. U.N. Convention on the Law of the Sea, Art. 87, Dec. 10, 1982, 1833 U.N.T.S. 397 (entered into force Nov. 16, 1994).

84. *Id.* at 72, art. 143.

85. *Id.* at 124, art. 263.

86. *Id.* at 117, art. 238.

87. United Nations Convention on the Law of the Sea Art. 24, U.N., Dec. 10, 1982, available at https://www.un.org/depts/los/convention_agreements/texts/unclos/unclos_e.pdf (last visited Dec. 8, 2023).

88. *See id.* at art. 119.

89. *See id.* at art. 123, 143, 144, 200, 243, 266.

90. *The Antarctic Treaty*, NAT'L SCI. FOUND. Dec. 1, 1959, available at <https://www.nsf.gov/geo/opp/antarct/anttrty.jsp> (last visited Nov. 16, 2023).

Second, the International Space Law provides a universal framework for scientific research given its focus. Thus, first the objectives for research and exploration of the “Moon and other celestial bodies” are (1) for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind,⁹¹ and (2) in the “interest of maintaining international peace and security and promoting international cooperation and understanding.”⁹² Second, there is freedom for exploration and scientific research for all states “without discrimination of any kind” under the condition of “equality and in accordance with international law.”⁹³ The CHIPS Act potentially hinders this equality. Third, states are enjoined to “facilitate and encourage international cooperation in” scientific research,⁹⁴ including the desirability of sharing of samples.⁹⁵ Generally, the Space Treaties are also littered with injunctions to cooperate and exchange information.⁹⁶ Fourth, the “use of any equipment or facility necessary for peaceful exploration of the Moon and other celestial bodies shall also not be prohibited.”⁹⁷ This provision arguably could conflict with the U.S. CHIPS Act. Fifth, the Moon and other celestial bodies are the province and common heritage of all humanity. Therefore, states must ensure an equitable sharing of the Moon’s resources.⁹⁸ States bear international responsibility if their scientific research and space exploration is contrary to their treaty obligations, including where harm and damages result on Earth “in air space or in outer space, including the Moon and other celestial bodies.”⁹⁹

91. Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies art. 1, Jan. 27, 1967 [hereinafter Outer Space Treaty].; Agreement Governing the Activities of States on the Moon and Other Celestial Bodies 1979 art. 4, 11, Dec. 18, 1979 [hereinafter Moon Treaty].; *See also* G.A. Res. 1962 (XVIII) (Dec. 13, 1963).; G.A. Res. 41/65 (Dec. 3, 1986).; G.A. Res. 51/122 (Dec. 13 1996).

92. Outer Space Treaty, *supra* note 91, at art. III.; Moon Treaty, *supra* note 91, at art. 6.

93. *Id.* at art. I.

94. *Id.*

95. *Id.*

96. *See generally id.* at art. 5 & 6.

97. Outer Space Treaty, *supra* note 91, at art. IV.

98. *Id.* at art. 11(7).

99. *Id.* at art. VII.

The International Atomic Energy Agency (IAEA) is the principal forum for facilitating research in nuclear science.¹⁰⁰ Its framework represents a centralized approach to collaboration in nuclear research. The IAEA was established to “accelerate and enlarge the contribution of atomic energy to peace, health, and prosperity throughout the world”¹⁰¹ through facilitating “research on, and development and practical application of, atomic energy for peaceful uses throughout the world.”¹⁰² In carrying out this mandate, the IAEA needs to ensure nuclear safety and that the research is conducted for peaceful purposes. The IAEA’s approach to facilitating research is proactive and hands-on through the exchange of information and enabling the availability of special fissionable materials. In addition, the IAEA also engages in a hands-on manner with its program on research through collaborative arrangements such as establishing International Centers based on Research Reactors (ICERs), Collaborative Centers based in member states, and regional Cooperative Agreements. Nuclear research has a particular potency in terms of national security. Yet, despite this, a framework of cooperation and an enabling environment for a collective approach to nuclear research has been set up. The recent U.S. model of national security concerns does not sit well with this research approach.

The World Health Organization (WHO) was established to ensure the highest possible level of health for all people. To achieve this object, the WHO is to, *inter alia*, “stimulate and advance work to eradicate epidemic, endemic and other diseases,” and “to promote co-operation among scientific and professional groups which contribute to the advancement of health,” and to “promote and conduct research in the field of health.”¹⁰³ As such, the WHO is the principal international institution charged with giving leadership in advancing science in human health. It does so by engaging in research itself, and by collaborating and coordinating research with other international organizations, non-state actors, academic institutions, academics, and WHO Collaborating Centers. In this manner, the WHO ensures that “access to new therapies, diagnostics, and vaccines under development is equitable and that they are available to all who need

100. International Atomic Energy Agency, *Overview*, HOME, available at <https://www.iaea.org/about/overview> (last visited Dec. 8, 2023).

101. Statute of the IAEA, art. 2, October 23, 1956; International Atomic Energy Agency.

102. *Id.* at art. 3.

103. *See, id.* at art. 2-3.

them.”¹⁰⁴ Nevertheless, the work of the WHO could be thwarted by the US approach to the exports of certain advanced chips (where these are relevant to the work of the WHO).

These different regimes accommodate a balance of interests in scientific research. However, wherever there is a need to advance shared community goals, there is a collective perspective to scientific research that is underpinned by requirements of cooperation and coordination in scientific explorations, along with a requirement to share the fruits of the scientific pursuits. Research in chips does not obviously fall squarely within the frameworks discussed above. Yet, the U.S. could have drawn from the spirit that underpins these regimes concerned with scientific research.

Finally, the U.S. CHIPS Act not only adopts a unilateral approach to scientific research and its application, with reference to semiconductors, but it also has the effect of stifling innovative developments that rely on advanced semiconductors, specifically in China. Thus, chips are considered as being essential to the development of the auto industry, the computer sector, and artificial intelligence - to name but a few. The U.S. action comes against the background of the China-U.S. tensions, and this of course explains why there has been a blind spot in exploring a more internationalist management of research in the development of chips. Another reason would be the absence of an obvious international legal framework for scientific research that could take place in a manageable manner. There is no universal body that manages research in science for the benefit of humanity—despite the obvious need and benefits in the pooling of the world’s resources for scientific advancement and development of nations. As outlined above, there are, however, piecemeal developments in normative frameworks.

One lesson that can be gleaned from state practice is the concept of “heritage of mankind” and the “accumulated knowledge of Indigenous people.”¹⁰⁵ Thus far, the roots of the concept of the heritage of mankind are spatial—the deep seabed, and celestial bodies such as the Moon. In recent times, the concept has been stretched to “embrace human rights,

104. World Health Organization, *Science Division: Harnessing the Power of Science to Achieve Health for All*, WORLD HEALTH ORG. (2023), available at <https://www.who.int/our-work/science-division>, (last visited Dec. 8, 2023).

105. See Anna-Maria Hubert, *supra* note 76; Farida Shaheed, *The Right to Enjoy the Benefits of Scientific Progress and its Applications* (2012), available at <https://digitallibrary.un.org/record/730844#record-files-collapse-header> (last visited Dec. 8, 2023).

human genomes, and plant genetic resources.”¹⁰⁶ This concept can be stretched to a technology such as a chip—a small piece of technology that is, in a sense, a building block of a greater whole. It has spawned over time through the development of a multitude of differing final manufactured products, and possibly wherein the use of these manufactured products is an inherent trajectory of further innovation. In short, the chip is a technological genome in the very fabric of the manufacturing industry that has become a common heritage of human technology. It is a piece of technology that has become—that has benefited from being, and upon which reliance has been placed — a part of the accumulated knowledge of the modern manufacturing sector. This common legacy that has emerged can be managed as a whole or jointly between affected States and the collectivity of States with due regard to intellectual property rights.

In sum, in the continuum of technological advancement, where there exists a potential trajectory for further advancement, there is no scope for a state to unilaterally arrogate to itself an important building block involved in continued technological advancement. The status of the common heritage of humankind is acquired when the technology becomes a technological heritage albeit of an evolutionary kind. There are now layers of different building blocks in the electronics sector which have been developing for decades. These building blocks have become entrenched in the fabric of many industries and now our advanced civilization. Just as the “accumulated scientific knowledge of Indigenous people” needs to be protected,¹⁰⁷ there is a case for characterizing certain building blocks of modern technology as now partaking in the accumulated inheritance of an industry no longer capable of individual appropriation. To put it another way, the common chip and its continuing development have become the “common heritage of mankind.” This is not to suggest, to reiterate, that the IPR rights of those involved in the development of chips are no longer to be recognized—it is to suggest that their complete lack of availability internationally undermines their common heritage character given their transformative nature in an industry.

Overall, there are sound policy reasons to adopt a multilateral approach to the advancement of R&D in chips, if the objective is to advance R&D. There are also persuasive principles embedded in the practice of

106. See Edwin Egede & Eden Charles, *Common Heritage of Mankind*, MARINE TECH. SOC'Y J. (2021), available at <https://doi.org/10.4031/MTSJ.55.6.10> (last visited Dec. 8, 2023).

107. *Id.*

states and in the collective consciousness of the international community that push for an international approach that will be to the benefit of humanity. There are also models of cooperative architecture designed in international organizations that have coordinated, facilitated, and balanced the divergent concerns of states and stakeholders, including security ones. Such an enlightened approach would surely bury monumentally the divisive and disruptive approach into which billions of dollars are being invested. The political rivalry between the U.S. and China that is being cemented in this unilateral design of the economic chips market, is also dragging in third countries, much to the long-term detriment of international peace and harmony between nations. An international approach, however, is commendable.

CONCLUSION

The unilateral and coercive nature of the U.S. approach to R&D and its application including the manufacturing of chips points to unfair competition and discrimination. The U.S. CHIPS Act raises questions under the ASCM including violations of GATT 1994. For example, the *prima facie* evidence of the 25% tax credit for investments in semiconductors manufacturing intended to give the U.S. global leadership in the manufacture and export of chips is contrary to the ASCM. The R&D subsidies impacting exports cannot be justified under the ASCM; the prohibitions on building manufacturing capacity of certain advanced semiconductors in particular countries constitutes the unreasonable exercise of extraterritorial jurisdiction and is discriminatory. Moreover, the prohibition on exports of chips including re-exports from third world countries is contrary to the quantitative prohibitions under GATT 1994. The national security basis of the U.S.'s justification for its export restrictions is controversial under WTO law. With respect to the unilateral massive injection in R&D in chips, the U.S. could have authored a global architecture for the scientific advancement of chips with an even higher globally funded amount, including its multilateral management, thus eliminating the politically divisive impact of its current approach. To conclude, the U.S. has digressed from its international obligations, pandered to the basest of protectionist and nationalistic instincts, and deprived the international community of an enlightened direction in scientific advancement.