



Outer Space as a Global Commons: An Empirical Study of Space Arrangements

COMMONS IN SPACE
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ABSTRACT

The designation of outer space as a global commons is a contentious issue. Some argue that officially recognizing it as such could discourage private investment, while others claim that it would not sufficiently promote sustainability. To address these debates, this article examines how space actors use a global commons framework in their institutional arrangements. Based on a collection of 1042 space arrangements, we characterize a subset of arrangements that explicitly reference concepts related to the notion of global commons. We observe that this framework is seldom used in bilateral arrangements and is mostly absent from recent agreements made by influential players. Furthermore, we find that employing principles related to global commons in arrangements does not result in significantly different operational rules. As a result, we conclude that a clearly defined global commons perspective has yet to be articulated and institutionalized.

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INTRODUCTION

Do political actors consider outer space as a “global commons”? This is a contentious issue. On the one hand, the Organization for Economic Cooperation and Development defines global commons as “natural assets outside national jurisdiction,” and cites outer space as an example (OECD, 2008, p. 228). The influential Brundtland Commission also “considers space as a global commons,” alongside the oceans and Antarctica (World Commission on Environment and Development, 1987, p. 226). On the other hand, the Outer Space Treaty does not explicitly use this concept (Byers and Boley 2023). An executive order issued by President Trump in 2020 even states that “the United States does not view [outer space] as a global commons” (Executive Office of the President, 2020). Clearly, there is no global consensus on this matter.

The question of whether outer space should be considered a “global commons” has significant political implications (Brando et al., 2019). Some argue that formally recognizing outer space as a global commons is a necessary “symbol of moral commitment [...] to promote stewardship and a sense of urgency to protect outer space as a resource for all nations” (Hollingsworth, 2013). Conversely, others fear that this approach would hinder private investment and the exploitation of space resources (Goehring, 2020; Pace, 2017). Additionally, some experts argue that the concept of commons is too vague and contested for making space activities sustainable (Hertzfeld, Weeden, & Johnson, 2015; Tepper, 2019), advocating instead for a more pragmatic approach based on specific sets of rights and obligations for different regions and objects in outer space.

This article informs these debates. However, it neither directly addresses theoretical questions on the *nature* of outer space nor does it take position on the normative question on how space *should* be labeled. Instead, this article examines how space actors *perceive* outer space. Our premise is that, as Van Eijk puts it, “the language of the commons lacks common language” (Van Eijk, 2022: 34) and that space actors themselves shape the idea of “commons” when elaborating institutional arrangements.

To inform our investigation, we draw from a collection of 1042 space arrangements. This collection of documents allows us to examine the frequency and implications of the “commons” frame among them. We analyze the use of a series of closely related concepts, including the “common heritage of humankind”, “province of humankind”, and “common interest of all humankind” – keeping in mind the possible different implications and interpretations of each of these concepts. We also study the prevalence of potential regulatory implications of a “commons” frame, such as the proscription of appropriating the commons and the requirement to share benefits arising from their use.

Our research yields two main findings. First, we observe that the concept of global commons and its related terms are infrequently used, particularly by the most powerful space actors and in recent arrangements. Second, we find that a global commons perspective is not linked to a set of regulatory implications. These two findings are at odds with policy actors’ strong opinions on the nature of outer space as a global commons and what this recognition entails. As a result, we conclude that there is still room to articulate and institutionalize a clear global commons perspective for outer space.

The article is divided in four parts. The first section reviews the existing literature on outer space as a global commons and highlights the distinctive approach taken in this article. The second section presents the collection of institutional arrangements and outlines our methodological strategy to analyze them. The third section presents our main findings on the distribution and implications of a “global commons” perspective in space arrangements. The last section discusses the significance of our findings for academic and policy debates.

FROM A COLLECTIVE ACTION PROBLEM TO A SOCIAL CONSTRUCT

There are three streams of literature that look at the outer space as a potential global commons: (1) collective action theory applied to Earth’s orbits, (2) research on the social construction of the outer space, (3) and legal studies on multilateral space treaties. This section contextualizes our approach within these three streams of literatures.

Many collective action theorists do not question the assumption that the Earth’s orbits are a global commons (Johnson-Freese & Weeden, 2012; Kurt, 2015; Lambach & Wesel, 2021; Morin & Richard, 2021; Shackelford, 2014; Tepper, 2014; Weeden & Chow, 2012). They typically consider that commons are goods that are both rivalrous and nonexcludable (Ostrom, 2003). Scholars in this tradition point out that the Earth’s orbits meet both of these criteria: (1) they are rivalrous as two spacecrafts cannot occupy the same orbital slot; (2) they are also non-excludable since the 1967 Outer Space Treaty provides that outer space “shall be free for exploration and use by all States”. Under these conditions, space actors face a collective action problem as they have an incentive to use the Earth’s orbits unsustainably. This problem structure exacerbates the congestion of the Earth’s orbits and the proliferation of space debris. Therefore, for collective action theorists, the question is not whether space is a global commons, but rather how to govern it sustainably. The status of the Earth’s orbits as a commons is taken for granted in this line of research.

While applying the concept of “commons” to outer space is useful analytically for collective action theorists, it is only an imperfect analogy. The idea of rivalrous resources that are freely accessible to all without restrictions is an ideal type that rarely matches the messiness of empirical realities (Ostrom, 1965). Moreover, the accessibility of a good depends less on its intrinsic nature than on human-made institutions. Even the idea of rivalrous consumption partly depends on human perceptions.

The analogy of the commons evokes the image of a medieval pasture freely accessible to all villagers. Garrett Hardin (1968) famously employed this analogy to argue that human overpopulation would inevitably lead to the depletion of shared resources and to criticize free access to procreation. However, as Cox pointed out (1985), Hardin’s analogy was misleading: in medieval times, elaborate norms regulated grazing activities in communal lands. This analogy is even more flawed when used to conceptualize areas beyond national jurisdiction. This extension from local to global resources changes several elements of the analogy, including the nature of the actors involved, the timeframe, the incentives, and opportunities for experimentation (Keohane & Ostrom, 1994; Stern, 2011). Areas beyond national jurisdiction have little in common with communal grazing in medieval England (Hertzfeld et al., 2015; Mendenhall, 2018). Cashore and Bernstein have recently criticized the unreflective use of the commons analogy in the academic literature and lamented “the tragedy of the diffusion of the commons metaphor” (2022).

That said, social constructivists have shown that imperfect analogies help in making sense of complex problems such as the governance of areas beyond national jurisdiction (Freeman, 2016; Ranganathan, 2019). John Vogler rightly points out that all “global commons” are “social constructs that overlay, interpret, and allocate ‘brute’ physical facts” (Vogler, 2012, p. 61). From this perspective, the commons analogy can be productive analytically and provide a much-needed basis for international cooperation (Riddervold & Newsome, 2021). Social scientists, however, must keep in mind that it is a social construct. As such, the idea of outer space as a commons is unstable, open to contestation, and in constant competition with alternative conceptualizations (Brando et al., 2019).¹ It is not a fixed and objective reality that exists prior to social interactions; it is instead an idea produced by social interactions. Therefore, while the commons analogy can be useful for understanding outer space governance, it must be treated as a contested and dynamic concept.

At least three studies usefully trace the historical process that led to the social construction of the “global commons” frame for outer space. Mai’a Davis Cross (2021) uncovers its origin in the spaceflight movement of the 1920s and 1930s.

She argues that this movement, which was fundamentally transnational, collaborative, pacifist, and driven by scientific motivations, provided the normative foundation for the ensuing global commons frame. M.J. Peterson (1997) traces the following emergence of the space commons frame in the 1950s and 1960s. As she points out, the Soviet government accepted, after lengthy debates, the idea that outer space was more analogous to the high seas, which were already regarded as a global commons, than to national airspace. Jason Beery (2016) shows that the global commons frame remained contested in the 1970s, as the line of demarcation between airspace and outer space was disputed. He argues that the persistence of the global commons frame reflected the preferences and interests of space powers who did not want to negotiate access to geostationary orbits with equatorial countries.

The three studies mentioned above, which explore the social construction of the space commons, rely on archival research. Cross (2021) uses archives from NASA, the European Space Agency, Boeing, and the John F. Kennedy Presidential Library, while Peterson (1997) and Beery (2016) base most of their analysis on documents from the United Nations General Assembly. However, agreements concluded among space actors offer another source to document how particular actors view outer space at a specific time and under certain circumstances. While archival research is useful in documenting individual perspectives and points of contention, arrangement analysis can provide better insights into their shared understanding.

Space arrangements have been analyzed mainly by legal scholars. Most space lawyers focus their attention on the 1967 Outer Space Treaty, which is undeniably the most important multilateral treaty governing outer space. Article I of the Outer Space Treaty is particularly relevant for the discussion on the outer space as a global commons. It provides that “the exploration and use of outer space, including the Moon and other celestial bodies, shall be carried out 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.” This provision has led to conflicting interpretations among legal scholars (Tepper 2019). Some argue that the reference to the province of humankind is evidence that outer space “is considered under international law to be a global common” (Blount, 2022, p. 5; von der Dunk, 2015). Others point out that, according to the Outer Space Treaty, only the activities of “exploration and use” are the province of humankind and this provision does not imply that outer space is a global commons (Goehring 2020). A related debate is whether space is part of the common heritage of humankind. Some space law experts consider that “global commons”, and “common heritage of humankind” are synonymous and

are both applicable to the outer space (Dalledonne, 2021; Fountain, 2002; Nicholson, 2002). Others disagree and stress that most states reject the idea that the outer space is part of the common heritage of humankind (Khatwani, 2019; Pop, 2009). Legal scholars also debate the meaning of these terms. For example, Welly forcefully argues that outer space “belongs to everyone” (2010, p. 277) whereas Hertzfeld et al. contend that it “belongs to no one” (2015, p. 4).

Overall, these various strands of literature explore the concept of the global commons from different perspectives. Collective action theorists primarily assume that outer space is a global commons. In contrast, social constructivists incorporate a political dimension and trace the genealogy of this contested label. Legal scholars, for their part, tend to see the idea of a “commons” as a principle associated with certain implications, even if they disagree on these implications and their application to outer space.

This article departs from the existing literature in three significant ways. Firstly, unlike many collective action theorists, it acknowledges that the concept of the global commons is a contested and socially constructed idea. Rather than attempting to define outer space as it is or should be, this article aims to explore how space actors themselves construct outer space in their social interactions. Secondly, this article uses space arrangements to investigate how space actors perceive outer space. Unlike archival research, which is more commonly used by social scientists investigating the construction of outer space, the analysis of space arrangements enables us to understand the shared understanding of involved parties. Thirdly, in contrast to legal scholars who focus on multilateral treaties, our analysis covers over 1042 arrangements concluded since 1957. This diversity of arrangement enables us to explore geographical and historical variations in the frequency of a global commons perspective and its regulatory implications. The next section details our methodological approach.

METHODS

To gain a better understanding of how actors conceptualize outer space, we analyzed the text of 1042 space arrangements, concluded between 1957 and 2022.² For this purpose, we define a space arrangement as any written agreement that voluntary unite at least two space actors. Space actors are any organizations, public or private, that design, own, launch, operate, track, monitor, or regulate objects in space. This definition of space arrangements encompasses various institutional forms, including treaties (24.3%), contracts (39%), certifications (3.8%), memorandums of understanding (30.4%), and guidelines

(2%). However, it does not include domestic laws and regulations.

This collection of space arrangements addresses a wide range of issues, such as resource exploitation (0.6%), space debris (4.6%), safety (1.7%), military uses (0.9%), space traffic management (7.3%), telecommunications (10.6%), position, navigation and timing systems (1.6%), remote sensing (15.9%), liability (1.5%), scientific research (11%), launch services (6.9%), and general cooperation (31.8%). While most arrangements are bilateral (73.9%), some involve more than 30 parties (3.7%). Our collection primary consists of arrangements between public organizations (92.4%), but some are concluded between private organizations (4.7%), and a few involve both public and private organizations (2.5%).

To obtain the full texts relative to these arrangements, we engaged in a multifaceted approach that involved contacting hundreds of organizations, filing formal requests for information from different governmental agencies, and cooperating with several archive centers. Our effort resulted in a collection of the full text of 53.9% of all 1931 known arrangements. We acknowledge that we missed several contracts concluded between private organizations as they are often secret or confidential. Given that references to the global commons are more likely to be found in public than in secret agreements, we recognize that our findings likely overestimate the frequency of references to the global commons.

Using this collection of arrangements, a team of coders read each of the 1042 arrangements and identified segments of the texts explicitly mentioning (in various languages) an expression related to the concept of “global commons”. We operationalized the frame based on the legal literature looking at the commons and identified three main commons-related principles in addition to the concept of “commons” itself: (1) “common heritage of humankind” (hereafter *COMMON HERITAGE*), (2) “province of humankind” (*PROVINCE*), and (3) “common interest of humankind” (*COMMON INTEREST*) (Frakes, 2003; Garcia, 2021; Shackelford, 2009; Welly, 2010).³ Any time one of these expressions appeared in an arrangement, we considered it a variation of the global commons concept. In addition, we coded references to two landmark agreements regarded as keystone interpretations of space as a global commons: the Outer Space Treaty and the Moon Agreement.

We also examined our collection of 1042 arrangements for potential regulatory implications of a “global commons” perspective, which we again derived from the legal literature. These potential implications are (1) ensuring open or free access to the commons (hereafter *FREE ACCESS*), (2) prohibiting national or private appropriation of the commons or its resources (*NON-APPROPRIATION*), (3) assigning

a supranational authority with a managerial function over the commons (supranational authority), (4) sharing the benefits arising from the commons (BENEFIT SHARING), (5) utilizing the commons for peaceful purposes (PEACEFUL PURPOSES), and (6) managing the commons sustainably to safeguard the interests of future generations (PRESERVATION) (Frakes, 2003; Hertzfeld, Weeden, & Johnson, 2016; Khatwani, 2019; Mirzaee, 2017; Porras, 2006; Shackelford, 2009; Tepper, 2019; Zhao & Li, 2021).⁴

FINDINGS

DISTRIBUTION AND DIFFUSION OF COMMONS-RELATED CONCEPTS

One striking observation is that the term “global commons” does not appear in any of the 1042 arrangements we analyzed, despite its frequent mention in discourses surrounding outer space.⁵ Moreover, the frequency of the three commons-related principles (COMMON HERITAGE, COMMON INTEREST, and PROVINCE) is also limited, with only 20 arrangements incorporating at least one of them (see table in Annex 1 for a complete list of these arrangements). This accounts for less than two percent (1.9%) of our collection of arrangements. Most space arrangements address either a specific aspect of space activity or adopt a more general perspective on space regulations. However, none of these arrangements explicitly establish outer space as a global commons from the outset. Figure 1 provides a detailed overview of the frequency and combinations of commons-related principles in space arrangements.

The concept of COMMON INTEREST is the most frequently used among commons-related principles, both on its own and in association with others. It is also consistently employed across arrangements, with each of the twelve instances of the expression within our dataset appearing in the same context – i.e., in clauses promoting the use of Outer Space for peaceful purposes. For instance, the United Nations General Assembly (UNGA) *Resolution 69/32 No First Placement of Weapons in Outer Space* begins with the following statement: “Recognizing the common interest of all mankind in the exploration and use of outer space for peaceful purposes.” This phrasing is used verbatim in 10 of the 12 arrangements that incorporate the COMMON INTEREST principle.

Legal scholars often discuss the concepts of PROVINCE of humankind and COMMON HERITAGE in relation to outer space. However, these commons-related principles are only incorporated in nine and three arrangements, respectively. The sustained scholarly attention to these principles despite their scant occurrences can be partly attributed to the fact that they appear in landmark arrangements governing space activities. The most influential arrangement using the PROVINCE concept is the Outer Space Treaty. This principle is also present in other multilateral instruments, including the Moon Agreement, the *Guidelines for the Long-term Sustainability of Outer Space Activities of the Committee on the Peaceful Uses of Outer Space*, the *European Code of Conduct for Space Debris Mitigation* and the *European Space Policy*. For example, this preamble of the European Space Policy states that “all of Europe’s space activities [...] fully respect the principles set out by the United Nations’ ‘Outer Space Treaty’, in particular: [...] the recognition of outer space as a province of all mankind.”

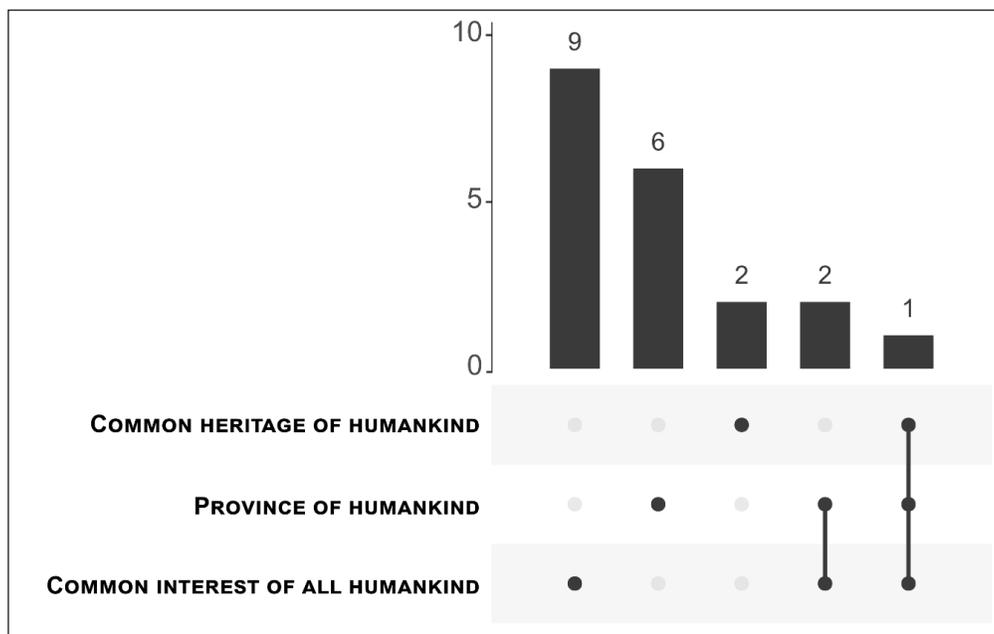


Figure 1 Arrangements using commons-related principles.⁶

The COMMON HERITAGE principle is primarily used in the 1979 Moon Agreement, which states that “The Moon and its natural resources are the common heritage of mankind [...]” The principle also appears in the 1976 Declaration of the First Meeting of Equatorial Countries, better known as the Bogota Declaration. However, these arrangements did not garner broad support and were not recognized by major space players. Out of our 1042 arrangements, only three make reference to the Moon Agreement, compared to 179 that cite the Outer Space Treaty.

Most arrangements that refer to any of these commons-related principles were concluded prior to the 1980s. Despite the exponential rise in the number of space arrangements in recent decades, the occurrence of these principles has sharply decreased. Four arrangements out of 104 concluded in the 1960s incorporate at least one of the principles (equating to 3.8%). In the 1970s, this figure goes to 6 out of 128 in the 1970s (or 4.6%). Conversely, in the 2010s, only 4 out of 757 arrangements (or 0.5%) mention a commons-related principle. They are altogether absent from arrangements signed after 2014.

The distribution of arrangements using a commons perspective does not differ significantly from other arrangements when categorized by issue areas. However, there are three notable exceptions. Firstly, arrangements concerning security and the military use of space, which account for less than 5% of our collection of 1042 arrangements, constitute over 15% of the “commons” subset. Secondly, arrangements governing resource exploitation comprise less than 1% of our entire collection,

but almost 10% of arrangements incorporating a commons-related principle. Lastly, approximately 5% of all arrangements in our dataset concern sustainability and debris, while this number goes up to more than 10% for those that employ a commons-related principle. While the small size of the subset limits our ability to make extensive inferences based on these observations, it is worth noting that arrangements governing these specific issues appear more likely to include a commons perspective.

The distribution of arrangement by type reveals more notable contrasts. As depicted in Figure 2, none of the certifications or contracts in our collection include a commons-related principle. This is particularly noteworthy as private organizations are more likely to be involved in such arrangements. Conversely, general guidelines (i.e., guidelines that are not targeting specific organizations) are slightly more represented among the subset of arrangements that incorporate one of the principles. Furthermore, there is an over-representation of memoranda of understanding (MoUs) in the “commons” subset. This suggests that a commons perspective is more likely to be employed in non-legally binding arrangements, such as MoUs. However, the same caveats apply regarding the limited number of arrangements using commons-related principles and the need for caution when drawing conclusions based solely on these observations.

The data presented in Figure 3 indicates a clear negative correlation between the use of a commons-related principle and gross domestic product (GDP) per capita. To create this figure, we categorized organizations

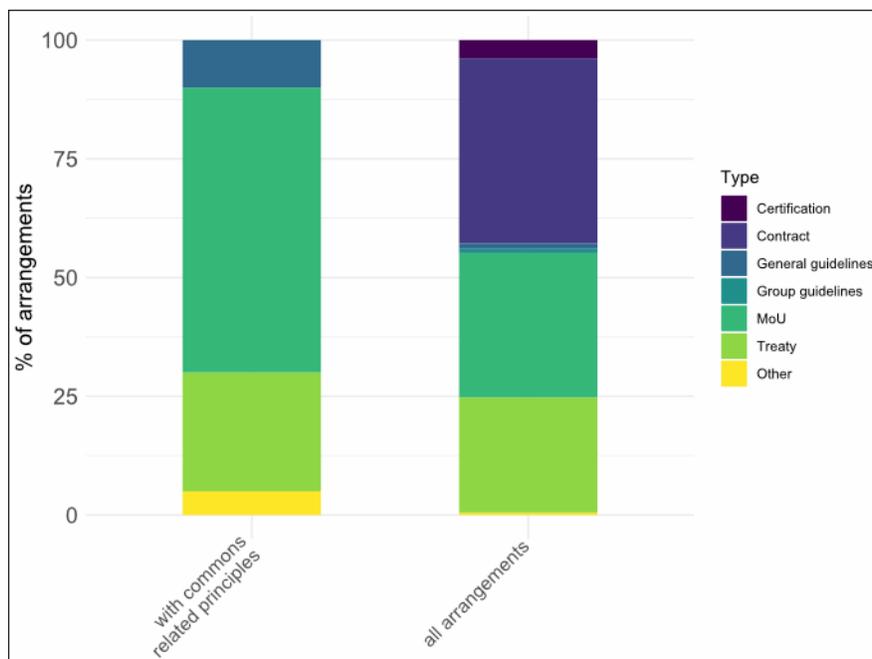


Figure 2 Distribution of arrangements by type.

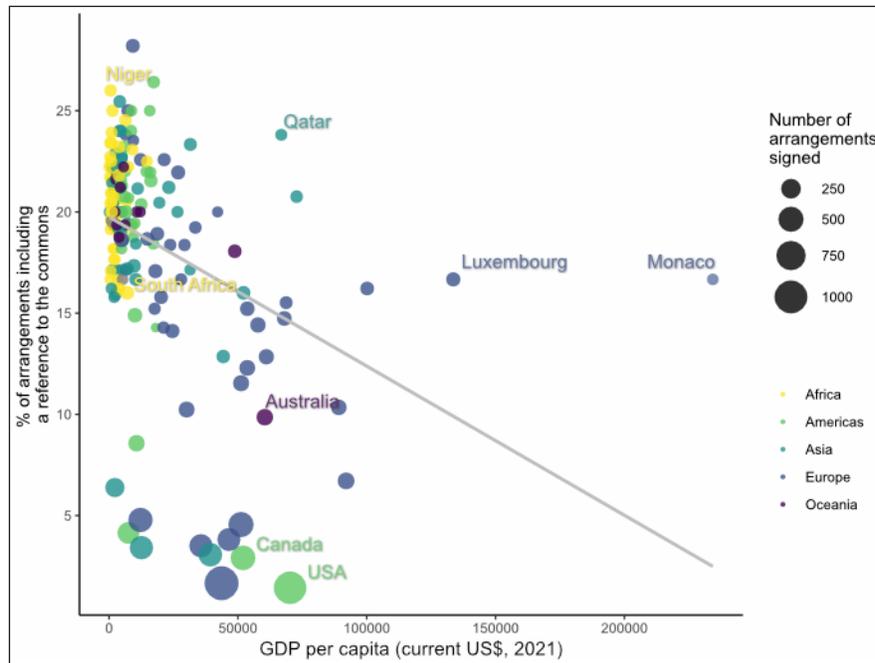


Figure 3 Relation between GDP/capita and percentage of arrangements using a commons-related principle.

by the location of their headquarters. This means, for example, that the circle representing France encompasses arrangements signed by French organizations as well as the ESA, which is headquartered in Paris. As expected, countries with a higher GDP/capita are typically parties to a greater number of space arrangements. More noteworthy is that their arrangements are also less likely to incorporate commons-related principles. Only 1.4% of all arrangements concluded by organizations based in the US include a commons-related principle. Other countries with human spaceflight capabilities, such as Russia, China, and Japan, have similarly low percentages of 4.8%, 3.4%, and 3%, respectively. Countries with lower GDP per capita and more modest spacefaring capacity have a significantly higher ratio of arrangements containing at least one commons-related principle. For example, Kenya and Nigeria have ratios of 19.6% and 22%, respectively. The average percentage for countries that do not have a satellite in space is 74.4% and the average percentage for countries without a space agency is 63.1%. These findings suggest that countries with higher income per capita and more advanced space capacities are less inclined to frame their activities in space under a commons-related principle.

POTENTIAL REGULATORY IMPLICATIONS OF A COMMONS PERSPECTIVE

This section examines the potential regulatory implications of a commons perspective. [Figure 4](#) presents the frequency of various combinations of commons-related principles

and potential implications in arrangements. [Figure 5](#) displays patterns of relation between commons-related expressions and potential implications.

The idea of *PEACEFUL PURPOSES* is widely accepted in space arrangements. The expression appears 1079 times in 456 different arrangements, both within and outside of a “commons” framing. This suggests that the peaceful use of space has achieved widespread acceptance among space actors and is independent of a “commons” concept. To illustrate this point, we can consider two agreements – the 1995 *Agreement on Cooperation Between the Government of the People’s Republic of China and the Government of Ukraine on the Peaceful Use and Research of Space*, and the 2014 *Memorandum of Understanding between the Indian Space Research Organisation and the China National Space Administration on Cooperation in the Peaceful Use of Outer Space*. Both agreements have important similarities, including China as a signatory, their bilateral nature, and their focus on general cooperation. However, the former agreement uses the *COMMON HERITAGE* principle while the latter does not use any principle related to the commons. Despite this difference, both agreements strongly emphasize the importance of using outer space exclusively for peaceful purposes, mentioning the idea four and five times respectively. This indicates that the promotion of the peaceful use of outer space is not dependent on the use of a commons-related perspective. This principle rather seems to be widely considered as a requirement for space activities. Other regulatory implications are much less frequently used and with less independence.

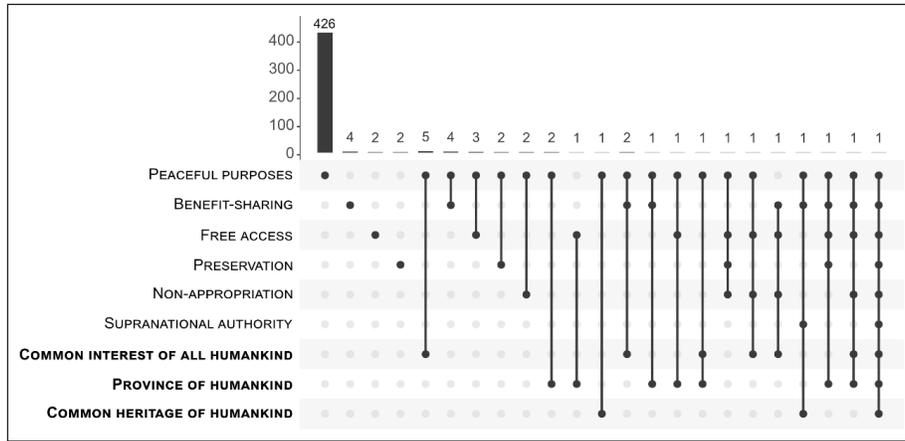


Figure 4 Frequency of combination of 3 commons-related principles and 6 potential implications

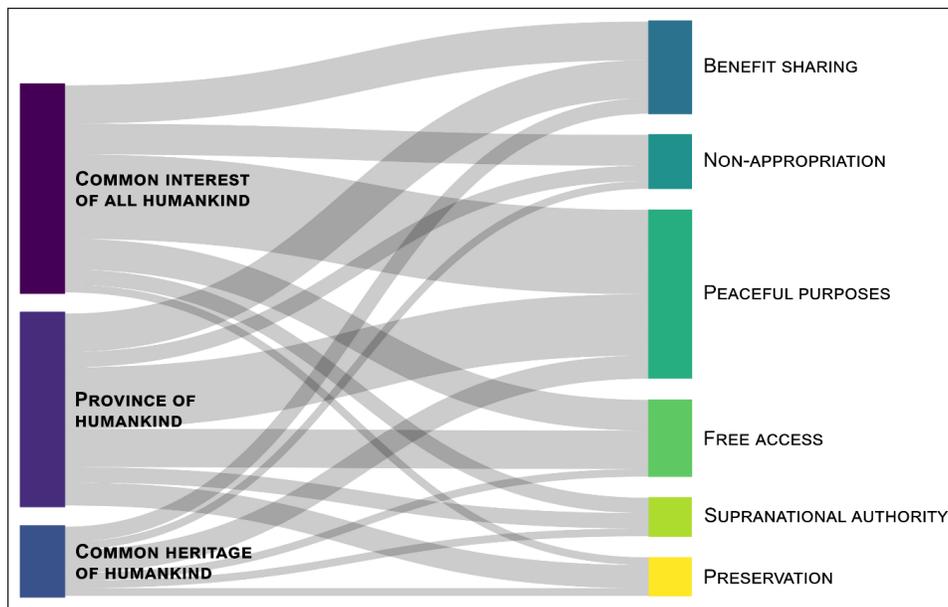


Figure 5 Associations between 3 commons-related principles and 6 potential implications.

The implications of FREE ACCESS, PRESERVATION, and BENEFIT SHARING are mentioned less frequently in space arrangement than PEACEFUL PURPOSES. They are nevertheless present in arrangements with each of the three commons-related principles (PROVINCE, COMMON HERITAGE, and COMMON HERITAGE) as well as without any of these three principles. Closer attention to the arrangements reveals qualitative differences in the manner these potential implications are used. For example, a comparison of the Moon Agreement with the UNGA Resolution 2733 (XXV) is instructive on variations regarding BENEFIT SHARING. Both arrangements are general in character, use a commons perspective (its COMMON INTEREST version), and were concluded in the 1970s. The UNGA Resolution refers to the use of space technologies “for the benefit of all countries, particularly the developing countries,” and states that “the benefits of space exploration can be extended to states at all stages of economic and scientific

development.” The Moon Agreement also uses this type of phrasing, but it is the only arrangement in our collection that goes so far as to specify how this would be done, namely through the establishment of “an international regime, including appropriate procedures, to govern the exploitation of the natural resources of the moon as such exploitation is about to become feasible.” While several arrangements, like UNGA Resolution 2733 (XXV), mention a vague intent of sharing the benefits of the exploration and exploitation of outer space, only the Moon Agreement specifies how this would be achieved.

Out of the 20 arrangements using a version of a commons perspective, only 4 explicitly mention NON-APPROPRIATION. However, all four are important multilateral arrangements: the 1967 Outer Space Treaty, the 1979 Moon Agreement, and UNGA Resolutions 1721 (XVI) and 1962 (XVIII). In addition, three arrangements mention the NON-APPROPRIATION implication

without using a commons-related principle, including the 2020 Artemis Accords. An analysis of all arrangements mentioning NON-APPROPRIATION reveals a substantial difference in the way it is presented. For example, UNGA Resolution 1721 (XVI), which concerns “international co-operation in the peaceful uses of outer space” and uses the COMMON INTEREST OF HUMANKIND version of “commons” concept, clearly states that “Outer space and celestial bodies are free for exploration and use by all States in conformity with international law and are not subject to national appropriation.” The USA-initiated Artemis Accords share a similar general objective and scope. However, it asserts that “the extraction of space resources does not inherently constitute national appropriation under Article II of the Outer Space Treaty.” It is interesting to note this more specific and restrictive interpretation of NON-APPROPRIATION, and that it is not used jointly with a principle associated with a commons perspective.

As it appears, most implications are used both with and without commons-related principles. The following section examines what this implies in terms of the construction of outer space as a commons.

DISCUSSION

The purpose of this article is to advance scholarly and policy discussions on the conceptualization of outer space as a global commons. In this section, we discuss how our findings contribute to the collective action, social constructivist and legal literatures surrounding the governance of outer space. Our analysis suggests that the emphasis on whether and how outer space is a global commons may be overstated. The current legal framework does not generally regard space as a commons, and the few exceptions to this are inconsistent in their treatment of the issue.

While it is difficult to dispute the assumption by collective action theorists that space resources are rivalrous, it is far from clear that all space actors consider them nonexcludable. Although the Outer Space Treaty mentions that space is accessible to all, a more comprehensive examination of space governance reveals a more nuanced picture. Out of our collection of 1042 arrangements, only 13 refer to FREE ACCESS. Moreover, the evolving interpretations of NON-APPROPRIATION by major space actors, allowing for public and private exploitation of space resources, adds a layer of uncertainty to the assumption of nonexcludability (Boley & Byers, 2020). The Artemis Accords notably open the door for “the extraction and utilization of space resources, including any recovery from the surface or subsurface of the Moon, Mars, comets, or asteroids” (section 10.2). What actors perceive as nonexcludable in outer space results from negotiated, intersubjective meanings imposed upon physical reality and enshrined in

institutional arrangements. In this context, the absence of principles like FREE ACCESS and NON-APPROPRIATION in a majority of arrangements may be indicative of more contestation than is often assumed over the meaning and prevalence of the principles. Consequently, our results caution against accepting the premises of collective action scholarship on outer space without further examination.

Similarly, our findings lend additional weight to constructivist assumptions on the social construction of outer space through negotiation over meaning. This is illustrated by the fact that fuzzy principles such as COMMON HERITAGE OF COMMON INTEREST are used in an inconsistent manner, accompanied by various sets of potential implications. Beery (2016) and Peterson (1997) have detailed the historical processes of contestation over principles guiding the governance of outer space. Our analysis completes these archive-based studies by showing that this contestation is also evident in the design of various arrangements – and also in what they do *not* contain. While academics and policy-makers debate the question of space commons, their lack of agreement on what this entails is visible in the scarcity and in the diversity of expressions related to this frame.

Our analysis also points to the role of power in processes of social construction, a recognized blind spot of constructivist scholarship (Epstein, 2012). Indeed, our study indicates that the most powerful space actors tend to avoid commons-related principles in their arrangements. This reluctance may have contributed to the lack of a coherent and unified understanding of how outer space should be governed. Yet, space powers seem to have been able to impose their preferences in the web of mostly bilateral arrangements that constitute our dataset. In fact, bilateral arrangements, where space powers are overrepresented and which tend to be more recent, are less likely to use commons-related principles than multilateral and older arrangements.

Furthermore, actors with limited spacefaring capacity have not been able to propose alternative governance principles or mechanisms through one-on-one arrangements. The most elaborate attempt from more modest space players at proposing a detailed interpretation of space commons was the 1979 Moon Agreement. To date, only 22 states have signed it, 18 of which have ratified it. Importantly, the leading space powers, such as the US, Russia and China, have not ratified it. Most of its parties do not actively promote its norms and principles in their bilateral agreements. Saudi Arabia even withdrew from the treaty in 2023 (UN Secretary General, 2023). The influential Artemis Accords explicitly mention and endorse all the UN space treaties, with the exception of the Moon Agreement (Wedemig and Nelson 2023). The failure of the Moon Agreement is subject to debate, and the reasons behind it are beyond the scope of this work. Nonetheless, it is significant that this arrangement, asserting one of

the strongest frameworks of space as a global commons, received little echo in the outer space governance system.

The qualitative difference between multilateral and bilateral arrangements, combined with the over-representation of space powers within bilateral arrangements, raises important considerations. A dense and far-reaching web of bilateral arrangements can potentially have more significant structural effects than a prominent multilateral agreement. In addition, bilateralism is more susceptible to power asymmetry, whereas multilateralism allows for coalition building and consensus building. The proliferation of bilateral arrangements dominated by powerful states suggests that they can impose their preferences on the general normative landscape of outer space. This adds to the sense that attempts at detailing a commons perspective beyond mere rhetoric and vague principles have so far failed to permeate shared understandings of space actors.

This paper contributes to the legal literature on space as a commons by providing a more comprehensive analysis of the legal regime, beyond just a few landmark arrangements. The multilateral arrangements often examined by legal scholars tend to mention commons-related principles and to detail their implications, albeit in a usually vague and inconsistent manner. Our results reveal that a vast majority of other arrangements tend to avoid such principles. Instead, they often refer to respecting the Outer Space Treaty without specifying what this entails. Although our analysis does not allow us to examine the reasons behind this pattern, it confirms the lack of universal recognition of outer space as either a global commons, the COMMON HERITAGE of humankind or other related principles. Furthermore, the absence of references to such principles in certifications and contracts hints to a reluctance on the part of private actors to take position on the matter, or to their indirectly taking a stance by not addressing it.

Regarding the differences of substance between different articulation of global commons principles (common heritage, province and common interest of humankind), we acknowledge the different histories behind each of these formulations (e.g., Blount, 2022; Koch, 2018; Pop, 2009). However, in contrast with existing literature, we attempted to approach our analysis without any prior assumptions regarding their implications, and instead to look empirically at what they entail in institutional arrangements. One finding of interest is the infrequent use of the common heritage principle in the corpus of space arrangements. This scarcity prevents us from documenting what exactly space actors understand in this concept that they seem to reject. Those who interpret common heritage as entailing non-appropriation, peaceful purposes, supranational authority, benefit sharing and preservation (Frakes, 2003; Shackelford, 2009, Van Eijk 2022) may see this low occurrence as a confirmation of space actors

rejecting such an ambitious conception of a global commons. At the very least, the general lack of uniform implications for a given principle demonstrates that even principles purported to imply a specific interpretation of space as a commons, there is little coherent articulation of specific implications. This finding helps explain the uncharacteristic disagreements on the matter among space lawyers.

In general, our analysis underlines that space actors tend to cherry-pick specific measures instead of attempting to coherently regroup several types of measures under an overarching doctrine like the COMMON HERITAGE of humankind. One noteworthy example is the idea of PEACEFUL PURPOSES as it permeates the outer space legal landscape without being associated with a “global commons” frame.⁷ While scholars and commentators focus their attention on grand principles, space actors have constructed, at least rhetorically, a common normative understanding that outer space should not be the scene of violent conflict. We conclude by reflecting on the implications of this *à la carte* approach to treaty making, as opposed to a more comprehensive “commons” perspective, for the future of outer space governance.

CONCLUSION

Our analysis suggests that a cohesive “global commons” perspective remains to be constructed. Our data indicates that most space arrangements have refrained from using a global commons framing. There have been a few attempts at drawing clearer contours to space governance, chief among them the Moon Agreement, the Bogota Declaration and the Artemis Accords (see respectively Shackelford 2009, Beery 2016 and Deplano 2021). However, to date, none has garnered generalized international support. A closer look at the diffusion of normative frames within space arrangements reveals that space governance is perhaps best characterized as a normative stalemate.

We stand at a critical juncture in space governance. The rapid proliferation of private actors in outer space has significant implications for a fair and sustainable use of Earth’s orbit and the risk of jurisdictional shopping. Additionally, cooperation between major space powers is becoming increasingly complicated, hindered by power rivalry and the dual-use nature of space technology. Therefore, it is imperative for policymakers to carefully consider the long-term implications of the regulatory framework they establish and maintain in their arrangements. As Yap et al. recently argued, “a broader and clearer problem framing” is necessary to inform effective space policy (2023: 1). Viewing outer space as a global commons is neither a consensual nor a clearly defined idea. Rather than assuming this to be the case, we should recognize it as a project that still needs to be constructed.

APPENDIX

ARRANGEMENT	YEAR	COMMONS-RELATED PRINCIPLE	IMPLICATIONS
United Nations Resolution 1348 (XIII): Question of the Peaceful Use of Outer Space	1958	Common interest	Peaceful purposes
United Nations Resolution 1472 (XIV): Establishing the Committee on the Peaceful Uses of Outer Space	1959	Common interest	Peaceful purposes
United Nations Resolution 1721 (XVI): International Co-operation in the Peaceful Uses of Outer Space	1961	Common interest	Free access; Non-appropriation; Benefit sharing
United Nations Resolution 1962 (XVIII): Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space	1963	Common interest	Free access; Non-appropriation; Peaceful purposes
Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and other Celestial Bodies	1967	Common interest; Province	Free access; Non-appropriation; Peaceful purposes; Benefit sharing
United Nations Resolution 2453 (XXIII) A and B: International Co-operation in the Peaceful Uses of Outer Space	1968	Common interest	Peaceful purposes; Benefit sharing
United Nations Resolution 2733 (XXV) A-D: International co-operation in the uses of outer space	1970	Common interest	Peaceful purposes; Benefit sharing
Convention on International Liability for Damage Caused by Space Objects	1972	Common interest	Peaceful purposes; Supranational authority
Convention on Registration of Objects Launched into Outer Space	1975	Common interest	Peaceful purposes
Exchange of Notes Constituting an Agreement Between the United States of America and Indonesia Relating to Launching and Associated Services for Indonesian Satellites	1975	Province	Peaceful purposes
Declaration of the First Meeting of Equatorial Countries	1976	Common heritage	Peaceful purposes; Benefit sharing
Agreement Governing the Activities of States on the Moon and Other Celestial Bodies	1979	Common interest; Common heritage; Province	Free access; Non-appropriation; Peaceful purposes; Benefit sharing; Preservation; Supranational authority
United Nations Resolution 45/55: Prevention of an Arms Race in Outer Space	1990	Common interest; Province	Peaceful purposes
United Nations Resolution 51/122: Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of All States, Taking into Particular Account the Needs of Developing Countries	1996	Province	Peaceful purposes
European Code of Conduct for Space Debris Mitigation	2004	Province	Free access; Supranational authority
European Space Policy	2007	Province	Peaceful purposes; Benefit sharing
Guidelines for the Long-term Sustainability of Outer Space Activities of the Committee on the Peaceful Uses of Outer Space	2010	Province	Free access; Peaceful purposes; Benefit sharing; Preservation
McGill Declaration on Active Space Debris Removal and On-Orbit Satellite Servicing	2011	Province	Free access; Peaceful purposes; Benefit sharing; Preservation
United Nations Resolution 69/32: No First Placement of Weapons in Outer Space	2014	Common interest	Peaceful purposes
Memorandum of Understanding between the Indian Space Research Organisation and the China National Space Administration on Cooperation in the Peaceful Use of Outer Space	2014	Common heritage	Peaceful purposes

Annex 1 List of arrangements mentioning at least one commons-related principle.

NOTES

- 1 Other popular and consequential metaphors for outer space include the concepts of “race” and “frontier”.
- 2 At the time of writing, this dataset remains unpublished. A website (www.institutions.space) is under construction to make it public. In the meantime, please contact Jean-Frédéric Morin, the corresponding author and the creator of the dataset, for more information on the collection of arrangements.
- 3 We also coded potential variations on these principles, including their more antiquated but potentially more historically prevalent “mankind” versions.
- 4 We derive these potential implications from the maximalist interpretation of what is entailed by the “common heritage of humankind” principle (see references quoted above). This principle has a distinct history as a manner for developing states of contesting the hegemony of powerful states in areas beyond national jurisdiction (Vadrot, Langlet, and Tessnow-von Wysocki 2022; Wood 2022). It is often associated with the “New Economic Order” promoted by some states in the 1970s in the wake of decolonization. As such, it is generally assumed to imply a degree of benefit sharing and supranational authority and to imply more than a market-based perception of the commons. Other commons-related principles can have, at the most, identical implications to the common heritage principle, but are unlikely to entail more than this perception. We thus use the maximalist interpretation of the common heritage principle as the basis for what any global commons principle could imply.
- 5 In this paper, our analysis was conducted using a database that was last updated on January 30th, 2023. On May 5th, 2023, the Council of the EU published conclusions regarding the “fair and sustainable use of space”, which explicitly acknowledge that space is a global commons. Although this declaration does not represent a significant shift in the EU space policy, it is noteworthy.
- 6 Figures 1 & 4 were obtained using the UpSetR package (Gehlenborg 2019).
- 7 However, the meaning of “peaceful use” remains contested. See Vlastic 1991 and Grunert 2022.

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The authors have no competing interests to declare.

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