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Competitive space foresight: Incentivizing compliance through antitrust

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ABSTRACT

The purpose of this paper is to address STM through an unconventional but pragmatic angle to help optimize efficient compliance governance. This paper proposes using antitrust mechanisms in space as a pragmatic and utilitarian tool for sustainable purposes with regards to STM within a soaring space ecosystem. In the context of accelerated space commercialization and privatization, having a new space antitrust framework at the helm of such transition might indeed prove to be a flexible yet decisive tool into shaping the future of STM and ensuring perennial protection of higher space principles which are enshrined in the Outer Space Treaty and form the essence of space law.

On one hand, examples of antitrust key components include fair competition while, on the other hand, higher ethical principles of space law include non-discrimination and benefits sharing. Furthermore, in between these two extremes, security and commerce both rely, respectively on non-harmful interference and competitiveness.

To navigate through all these factors, a new space antitrust framework might indeed prove strategic and beneficial to incentivizing the creation of an adaptive, polycentric and action-oriented governance mechanism with great resonance among the commercial new space players and reaffirm the importance of sustainable space traffic management before return on investment, while still making a profit in the long run.

1. Introduction

While higher ethical principles such as non-discrimination, equal access, and benefit sharing are enshrined within the *magna carta* (the Outer Space Treaty (OST) of 1967) [1], of the *corpus juris spatialis*, it becomes a challenge to ensure the perennialism of such principles given the recent acceleration of commercialization and privatization of the outer space sector. Given this transitional trend, it is important to delve into new regulatory methods to deal with the private actors contributing to the thriving new space economy and to regulate accordingly. Arguably, global outer space governance is lacking, and space law is facing fragmentation. Consequently, space traffic management (STM), including space situational awareness (SSA), faces the risk of a battle of standards of sorts. In the meantime, the Kessler effect [2] urges action since time is ticking. In that regard, it is relevant to look for regulatory alternatives and find a pragmatic and efficient approach for STM governance, since STM implies both a technical and a regulatory aspect. In this paper, we propose that such an alternative approach might be found in antitrust – or competition law, especially given its power to intervene in the commercial sector. We also address some of the key arguments in favor or against our proposal and make some recommendations as to how antitrust might provide answers to the STM conversation.

2. Context

STM is becoming a top priority in the space sector as, so far, there are no "rules of the road" on orbit. The lack of regulation and inherent legal void leaves room for either navigating through loopholes or setting customary practices, especially by the private sector seeking to protect commercial interests, regardless of ethics, public policy or international law. This might trigger a battle of standards in the realm of STM, which would rather be unacceptable as there is no place for more than one code of conduct about "rules of the road" and interoperability in that regard is essential. A battle of technical standards, downstream, might be caused, *inter alia*, by a battle of suppliers and services, upstream. Most strikingly, such upstream battle might be exacerbated by the fact that STM services, including SSA, are engulfed by the digital sector, including artificial intelligence (AI), algorithms (algos), big data, cloud infrastructure, and intellectual property (IP). Since cloud providers are part of the GAFAM

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world [3] which appeared relatively recently in antitrust hearings [4], and since IP plays a determining role in antitrust, we formulate the hypothesis that antitrust is a relevant regulatory option, when there is no global consensus in either space law or in STM standards, and when harmonization efforts need to be set in motion.

3. The decade-long problem

As mentioned above, there is no global space governance in STM as of this writing. According to a recent report by the Institute for Defense Analysis (IDA), there is a danger that no international STM regime will be agreed upon within the next decade:

> "Issues related to lack of trust and transparency pose challenges to efforts to develop more binding and formal institutions for STM. For these and other reasons, unless some "wildcards" (an example being a significant collision event in space) come into play, or unless significant political will is exerted, there is likely to be no international agreement on an international STM regime in the next decade" [5].

At the fast pace with which the space exploration is soaring and given the growing number in both space faring nations and private actors, ten years is a long time and, therefore, it increases the risks of fragmentation despite the urgency to act (e.g., Kessler effect). As far as fragmentation concerns the private actors, a recent report by the Chatham House confirms that:

> "The rise in private space actors has increased the number of commercial STM providers and, with plans in the US to move responsibility for STM to civilian control, there will likely be more opportunities for international collaboration, particularly through the EU Space Surveillance and Tracking (SST) programme" [6].

In an ideal world, such collaborations would indeed solve the issue rapidly. However, the fragmentation does not stop there. International geopolitical differences cause further hurdles, as stated in the same report:

> "There are worldwide challenges, both political and technical, to providing STM coverage, which may lead to a lack of collaboration and gaps in understanding of activities in orbit. Existing sensors have limitations in terms of the size of objects that can be detected and the precision with which their movements can be predicted. These capability gaps represent opportunities for the EU to contribute."
>
> These fragmentation issues might slow down the progress of collaborative efforts such as the recent UN Long Term Sustainability (LTS) guidelines [7], which lays down the foundations of behavioral sustainability in outer space.

4. The imminent need

While the digital sphere of influence is skyrocketing and while regulation struggles to keep up, it is important to monitor and contain the high-tech industry which is growing out of control and if, "too big to fail", it might overlap with the sectoral regulation of the aerospace sector. Traditionally, the outer space sector was a sanctuary for states and public actors, hence its reliance on international space law. However, due to the privatization and commercialization of the space sector, diversified non-governmental actors are growing both in size and importance. Moreover, some of these new entities are of a multinational nature. However, this multinationalism is in fact turning into an elusive transnationalism, which is more complex to deal with in legal terms. This adds to the fragmentation of international space law since it faces new challenges. For this reason, global space governance is at an *impasse*. Therefore, we propose the alternative of antitrust.

Furthermore, as previously mentioned, the OST focuses on principles such as non-discrimination, benefit sharing, equality of access and opportunity. The International Telecommunications Union (ITU) Constitution protects fair competition of telecommunications services through "equitable distribution" [8]. Interestingly, antitrust provides protection to fair competition, more particularly, fair economic competition. The economic term here responds to the newly privatized space sector and market. Antitrust defines what an economic activity is and whether it prevents fair competition within that market. In our case, that would be space-based services, more precisely, space-based STM services.

5. Commercial aspects of STM

As explained, STM is composed of both a technical and a regulatory side [9]. On the one hand, the technical aspect delves gradually more into the information age (AI, etc.) and IP plays a crucial role. On the other hand, on the regulatory part, we witness initiatives such as the recent US Space Policy Directive-3 (SPD-D) to transfer civilian and commercial STM from the Department of Defense (DOD) to a civilian governmental agency such as the Department of Commerce (DOC) [10]. If this goes on as planned, initially, it will open the possibility of further commercialization of STM and hence the growing role which will be played by *the lex mercatoria*. However, due to more recent policy and budget modifications, this particular scenario is on hold.

Regardless, STM rules and potential related services include:

> Safety provisions for launches; specific regime for space between airspace and outer space; zoning (selection of orbits); right of way rules for in-orbit phases; prioritization with regard to maneuvers; security rules for human spaceflight; specific rules for GSO, LG Points, Polar Orbits; specific rules for LEO satellite constellations; debris mitigation regulations; safety rules for re-entry (i.e. descent corridors); environmental provisions (e.g. pollution of the atmosphere/troposphere); radiofrequency use and avoidance of interference, etc. [11].

These are important elements to be aware of with regards to the development of the sector and to potentially new services. As a reminder, here is a broad definition of STM, while keeping in mind that there is no single definition accepted worldwide:

> "… the set of technical and regulatory provisions for promoting safe access into outer space, operations in outer space and return from outer space to Earth free from physical or radiofrequency interference." [12].

This definition once again brings us to competition, and most particularly ethical and fair competition. Firstly, let us emphasize the word "access". While one of the OST's principles focuses on the need to protect equal access to space, anti-competitive behavior should consequently be precluded. Secondly, radiofrequency (RF) interference refers to non-harmful interference, as enshrined within the OST, but it also refers to the ITU constitutional provisions which include fair competition and non-discrimination. Therefore, both "access" and "RF interference" add up to our arguments in terms of adopting pro-competitive regulatory measures in outer space, notably in the STM sub-sector.

6. A bridge of principles

STM and antitrust share quite a few aspects. Indeed, both have issues with global governance. There is no international STM regime – despite research consortia, such as the IAF-IAA-IISL STM Task Group pr the European Anyways consortium –working on recommendations in that sense; there is no international antitrust framework. The existing situation involves UN guiding principles, as well as political tensions, battles of "gold" standards and protection of national champions. However, the key common ground in that backdrop that is of interest to us is the STM-related IP issue and GAFAM involved, which, incidentally, are

monitored by antitrust.

7. Why antitrust? Space, ecosystem, STM, antitrust = "EcosySTM"

As discussed, space is developing as an economic ecosystem and antitrust is well equipped to define economic activity and to assess market power. For instance, in European case law (*in SELEX Sistemi Integrati SpA v Commission)* [13], the Court had to determine, through a functionalist approach, whether Eurocontrol was providing public services (under sectoral regulation) or undertaking an "economic activity" (under competition law). Such filter might further be applied throughout the aerospace industry.

Some might argue that STM's data, still heavily militarized and sensitive, is not ready to be shared. That might be the case for now, however, just like in the case of the internet, first a military technology which subsequently opened itself to privatization that enabled a transformational economy globally, STM plausibly faces the same fate, especially with the digitalization of SSA and the heavy reliance on big data and cloud infrastructure – which in most cases, is held by private entities. This precisely highlights the need of antitrust monitoring to prevent excesses. Such excessive tendencies include mono/oligopolistic ambitions.

Others could also argue that in space, "natural" monopolies are legitimized since they enable significant economies of scale [14]. However, the saga of the long legal battle between Space Exploration Technologies Corp. (SpaceX) and the United Launch Alliance (ULA) – a joint venture between Boeing and Lockheed Martin – proved otherwise. Indeed, as a product of a rather controversial merger, ULA was the exclusive supplier of defense launches in the US, charging the government for both 1) site maintenance and readiness, and 2) per each launch. SpaceX contested both the monopoly and the "economy of scale" which was disputed in court by SpaceX's CEO, Elon Musk. After several lawsuits against the Department of Defense (DOD), more precisely the US Air Force, SpaceX finally settled and was granted access to the defense sector launchers market, which proved beneficial for the DOD, in terms of costs, and for the market [15], in terms of precedent. Still, the battle goes on.

This brings us to asking why space infrastructure monopolies are to be avoided. Such infrastructures are likely to be more of a digital nature. Let us take the example of the cloud and the entities about to have the most "cloud clout" or control and power of the space cloud infrastructure (e.g., Amazon Web Services (AWS) or Starlink in alliance with Azure, etc.). GAFAM are already aiming for that market (e.g., AWS and Microsoft with Azure Orbital in tandem with SpaceX's Starlink, and so forth). Mega constellations only add to the race. AWS is a relevant actor to speak of in terms of antitrust related issues. Amazon built its business on a very competitive strategy, involving both pro-competitive and anti-competitive tactics, as well as many competition lawsuits. Furthermore, its now former CEO, Jeff Bezos, built his business on the shoulders of giants (i.e., the US postal services infrastructure which was already in place) and he claimed that he aims to build such an infrastructure in space to enable other entrepreneurs to use it as a basis and further contribute to the thriving space economy. However, he omitted to mention that the US postal services had its private competitors (e.g., FedEx, UPS, etc.) which optimized his shipping services. For this reason, his envisioned space infrastructure should not be a monopoly.

8. What is antitrust?

With respect to US law, antitrust is defined as:

> "Antitrust laws exist to protect the existence of private competition. Antitrust law, when functioning appropriately, allows companies to take advantage of economies of scale while also allowing start-ups to enter the market.) In the United States, antitrust laws—also referred to as 'competition laws'—are statutes developed by the U.S. Government to protect consumers from predatory business practices by ensuring that fair competition exists in an open-market economy." [16].

US antitrust is based on the Sherman Act of 1980 [17], the Clayton Act of 1914 [18] and the Federal Trade Commission (FTC) created by Congress. The Sherman Act outlaws "every contract, combination, or conspiracy in restraint of trade," and any "monopolization, attempted monopolization, or conspiracy or combination to monopolize". It requires an overt action in terms of anti-competitive behavior and applies the test of "reasonableness". The complementary Clayton Act addresses further aspects such as mergers which "may be substantially to lessen competition, or to tend to create a monopoly".

In Europe, the approach is different in that the European Commission (EC) analyzes different aspects of antitrust, under articles 101 to 109 of the Treaty on the Functioning of the European Union (TFEU) [19], at the transnational level. Article 101 mostly concerns cartels, collusion, or other anti-competitive behavior such as, under Article 102, abuse of dominant position on a given market. Abuse of market dominance is defined as:

> "Article 102
>
> (ex Article 82 TEC)
>
> Any abuse by one or more undertakings of a dominant position within the internal market or in a substantial part of it shall be prohibited as incompatible with the internal market in so far as it may affect trade between Member States.
>
> Such abuse may, in particular, consist in:
>
> (a) directly or indirectly imposing unfair purchase or selling prices or other unfair trading conditions;
>
> (b) limiting production, markets or technical development to the prejudice of consumers;
>
> (c) applying dissimilar conditions to equivalent transactions with other trading parties, thereby placing them at a competitive disadvantage;
>
> (d) making the conclusion of contracts subject to acceptance by the other parties of supplementary obligations which, by their nature or according to commercial usage, have no connection with the subject of such contracts.

This is also very relevant in our space infrastructure case. Still, at this point, further digging into antitrust detailed measures, on both sides of the Atlantic as well as in other parts of the world (e.g., Asia) is necessary.

Moreover, while addressing the international aspect of antitrust, we begin to face some of its limitations. Indeed, just as in the space sector, antitrust has no harmonized global governance. It is also confronted with fragmentation. Attempts to harmonize it at the World Trade Organization (WTO) failed. One of the reasons behind this is that antitrust is still heavily politicized. For instance, in the aerospace sector, Europe tried blocking a few mergers which were previously cleared by the US (such as the merger between Boeing and McDonnell Douglas [20] or the one between GE and Honeywell [21]). In both cases, Europe acted that way to protect its own "national champions", respectively Airbus and Arianespace. Paradoxically, both European champions benefited from European mergers recently as in the case of Airbus' serial consolidations (i.e., the merger between Airbus and Safran Launchers, to create Airbus Safran Launchers, which became ArianeGroup). This is contradictory since the European rationale behind its antitrust vision is to protect competition itself and not competitors. This is an example of how antitrust is politicized and dealt with on a case-by-case rationale. This can be frustrating considered its discretionary/arbitrary nature. Europe is not always successful in blocking competitors' mergers. In fact, the

Boeing/McDonnell deal finally went through because of threats by the US to take the dispute to the WTO arbitration mechanisms and retaliate with trade war. Negotiations finally settled. However, this battle still rages and now we have SpaceX firing back at the European State aids towards ArianeGroup. In the aerospace sector, antitrust is torn between competitive markets and national interests.

9. Antirust limitations

As mentioned above, there are international hurdles preventing the successful harmonization of antitrust at the global level despite several initiatives such as the International Competition Network (ICN) forum, bi/multilateral agreements, etc. The Organization for Economic Cooperation and Development (OECD) provides a widely agreed upon definition of antitrust which states that:

> "Anti-competitive practices refer to a wide range of business practices in which a firm or group of firms may engage in order to restrict inter-firm competition to maintain or increase their relative market position and profits without necessarily providing goods and services at a lower cost or of higher quality" [22].

Further attempts at harmonization include the non-binding principles of the UN Conference on Trade and Development (UNCTAD) [23] which prevents, *inter alia*, transnational corporations from:

> "Agreements fixing prices, including to exports/imports; collusive tendering; market or customer allocation; allocation by quota as to sales and production; collective action to enforce arrangements (e.g. concerted refusals to deal, etc.); concerted refusal of supplies to potential importers; collective denial of access to an arrangement crucial to competition; abuse of dominant position of market power unduly restraining competition (predatory behavior; discriminatory pricing; mergers, takeovers, JVs, etc. – horizontal or vertical; price fixing, etc." [24].

Furthermore, the UNCTAD drafted a "Model Law on Competition: substantive possible elements for a competition law, commentaries and alternative approaches in existing legislations" [25] which could contribute with guiding in the pursuit of international harmonization efforts.

It is important that the UNCTAD focuses on transnational corporations and issues. This might provide us with some guidance as to how antitrust can overcome global governance challenges and how it might also frame growing transnationalism within the space sector, and STM sub-sector.

10. Discussion

As said *supra*, international space law is being challenged by a growlingly complex and elusive transnational commercial law given the arrival of non-governmental actors at the table. Besides the Article VI of the OST which posits that States are responsible for and must supervise the activities of their non-governmental nationals in outer space, international space law is not well equipped as of this writing to deal with the private sector. Commercialization is indeed dealt with at the national level, through national space legislations, which sometimes tend to differ in terms of interpretation of the OST. For example, the nascent space mining industry convinced several States to legislate permissively in that sense (US, Luxembourg, UAE, etc.), which causes an ongoing debate within the community of space law scholars. Such fragmentation would have significantly and potentially irreversible consequences on STM and sustainable development in outer space.

Therefore, since 1) transnationalism in outer space is growing; 2) Europe has successfully implemented transnational governance of antitrust; 3) *lex mercatoria* is essentially transnationalist; 4) transnational corporations such as the GAFAM expand to outer space; and 5) transnational corporations rely heavily on IP, which is imbedded within competition law, we conclude that recommending antitrust measures in the STM is relevant.

It is relevant indeed since STM is not only about visible kinetics and On Orbit Servicing (OOS) operations. Future traffic rules in outer space will be visible either frontend or downstream, as part of STM. However, the main focus of this paper is on the backend, the invisible algorithms and AI, integrated within multiple (space-based) cloud infrastructures, perhaps through quantum technology in the near future, More importantly, this paper focuses on regulatory measures surrounding the providers of such invisible backend services in outer space, to secure upstream fair competition in terms of prohibiting monopolistic endeavors relative to STM "gold" standards and thus help prevent a battle of downstream standards which could translate into dysfunctional rules of the road and obstacles to interoperability. Outer space has no national boundaries. Therefore, there can be no multiple national rules of the road in orbit, but one –a harmonized one—to cope with all the orbital clutter that affects all public and private actors equally. International Codes of Conduct failed [26] (either the European one or the ICoC). Let us then try another alternative that takes into account the new private actors as well.

11. Recommendations

However, for antitrust to be successful in space, it must first be successful internationally. For this reason, it must first be depoliticized, especially since the sectoral regulation of space is being challenged. Author Eleanor Fox has written several recommendations to that end which we adhere to:

> "1. Nations should apply their antitrust laws without discrimination.
>
> 2. Nations should not allow "national champion" interests to trump competition interests.
>
> 3. If nations pursue noncompetition objectives in antitrust cases, such as national security or a clean environment, they should do so transparently.
>
> 4. Political officials should neither provoke nor threaten trade retaliation against nations that have credibly applied their antitrust laws.
>
> Politicians should leave antitrust to the experts" [27].

Depoliticizing antitrust might prove beneficial if most States play the game (e.g., US, Europe and China). On the one hand, if not, given that States are increasingly both subsidizing and relying on private actors, antitrust will basically remain a political tool among others. But, on the other hand, the question for how long prevails since the space sector involves gradually more powerful private actors, overly ambitious space-fan tycoons, increasingly reliant on AI tech.

This backdrop illustrates antitrust issues according to which the future of the space ecosystem can unfold as an oligopolistic or monopolistic scenario, where giant corporations fight each other through unfair competition practices to seize market shares and enforce their own technical standards and rules of the road, unless regulation prevents them to do so. This could result into a race to the bottom situation, in a perceived zero-sum world, which is known as toxic competition, highly unsustainable.

While this paper posits that space antitrust must be depoliticized to avoid national partiality and ensure predictability, the need to intervene somehow remains owing to the fact that space antitrust is not an end in itself, but must serve a higher purpose, such as the benefit of all humankind and other higher ethical principles as enshrined within international space law. The meaning sought by such an agenda must, therefore, be ensured through a proper governance system, which can be composed of both a top-down hard law approach, in addition to

concurring bottom-up soft law initiatives and self-regulatory incentives based on a series of compliance mechanisms to be determined, multilaterally. In that sense, space can be interpreted as a purposeful market to be channeled through "noble" competition, which is a new academic movement considering antitrust as a force leading to a race to the top, if granted the right instruments. This is uncharted legal territory, and the space arena is the appropriate testing field to start such a new framework from scratch. Indeed, enforcing a new "noble" space antitrust, based on the higher ethical principles of international space law (e.g., peace, equality, freedom, duty to assist, benefit sharing, due regard, non-interference, equitable distribution, transparency, etc.) can ensure the perennialism of space law, preclude monopolistic excess and abuse of a dominant position while maintaining a high level of security and safety in terms of STM standards and best practices since competition law in space, based on a "noble" space antitrust framework, is destined to lead the sector in the collaborative and constructive dynamic of a "race to the top" [28].

11.1. Summary: key takeaways

To summarize, here are three main takeaways:

- Antitrust provides (in theory) with the possibility of STM to harmonize upstream services through fair competition principles and enable thus harmonization of otherwise competing standards in downstream STM services by preventing unfair competition in setting/enforcing upstream standards and market practices.
- Its mission is to fight monopolization, collusion, conspiracy, and cartelization.
- This would contribute to both ethical interoperability efforts and competitive market dynamics.

12. Conclusion

Because of the risk of no internationally agreed upon regimes within the next decade, this paper analyzes a few alternative options and selects antitrust for formulating the hypothesis as to whether competition law could help solutioning the problem. We look both into pro and con arguments and find that 1) UN principles, transnational *lex mercatoria* and economic efficiency build a solid bridge between antitrust and the commercialized space sector; however, 2) politicized antitrust and the lack of global governance cause important challenges for successful space and STM-related objective and predictable antitrust at the international level. Nonetheless, these hurdles and challenges can be solved. It has happened before, such as in the case of the telecommunications sector (*United States v AT&T* in the eighties, followed by Europe opening its own telecom market). We are entering the Still in the telecom sector, with regards to the growing 5G tech, for instance, one might argue that competition law is once again used as a political tool as in the case of Huawei, notably in China's alleged attack on Google [29]. Further cases are to be held under close scrutiny in the future: Nokia's 4G infrastructure on the Moon [30] or ESA's call for a privately led lunar telecommunications network [31].

The main point here is to prevent space monopolies. In terms of cloud infrastructure and AI services, such monopoly, either natural or artificial, might harm STM. Today already, we can witness attempts at monopolizing orbits by the private sector, especially in the satellite mega-constellations sub-sector. For example, this can be illustrated by the battle between Project Kuiper mega-constellation vs Starlink. To summarize the facts, Amazon's Project Kuiper was designed, apparently, to avoid interfering with Starlink. However, when Elon Musk chose to ask permission to the US Federal Communications Commission (FCC) to modify Starlink's orbital altitude, Amazon tried to prevent this by stating that Kuiper's design is specifically based on not interfering with Starlink and that any modification of Starlink would be detrimental towards Kuiper in terms of harmful interference and risk of collision:

> "The facts are simple. We designed the Kuiper System to avoid interference with Starlink, and now SpaceX wants to change the design of its system. Those changes not only create a more dangerous environment for collisions in space, but they also increase radio interference for customers. Despite what SpaceX posts on Twitter, it is SpaceX's proposed changes that would hamstring competition among satellite systems. It is clearly in SpaceX's interest to smother competition in the cradle if they can, but it is certainly not in the public's interest." [32].

This illustrates indeed nascent battles in terms of competition (law) and STM and potential toxic competition through accrued contention points. Furthermore, Starlink has formed an alliance with Microsoft's Azure to directly compete against Amazon's AWS in space. This leads to thinking that anti-competitive behavior in STM is actually taking place and, according to Amazon, this could lead to STM issues such as interference and collision; clearly something that SpaceX denies. Nonetheless, the issue stands, and it raises concern over future STM conflicts and anti-competitive behavior, which is unsustainable and has a negative impact on the healthy development of the space ecosystem. This paper suggests that competition law provides an equitable solution to avoid such scenario, under the condition that space antitrust be depoliticized, yes, but at the service of an agenda based on higher collective purposes, determined multilaterally.

However, if no one is allowed to take a certain form of lead, discussions could last at least a decade, as referred to *supra*, which is a considerable time for space debris to build up and endanger orbital activity. Incentivizing leaders through fair competition, internationally, while ensuring interoperability, has indeed a potential benefit. Interoperability is crucial. The recent NASA's "minilateral" Artemis Accords value this concept and succeed in gathering an ever-growing number of signatory States (with South Korea to join as a 10th member [33] as of this writing). However, Russia, China and France did not sign. Can the market, then, help bridge the gap and lead by example through bottom-up innovative alternatives? Can fair competition play this role and ensure that the nascent "*lex mercatoria spatialis*" complies with the "*corpus juris spatialis*"? Future on-going investigation is required to answer this question, but the analysis presented in this paper determines that the potential of an ethical and "noble" new space antitrust framework to channel market forces towards sustainability is far from negligeable.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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