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Geopolitic and spatial natural resources

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RESUMEN

El presente trabajo se propone comprender la nueva geopolítica de los recursos naturales a partir de la exploración y explotación del espacio ultraterrestre por parte de actores estatales y no estatales. Significativamente, empresas privadas están realizando inversión, investigación y desarrollo en tecnología espacial, y se involucran donde solamente el Estado-nación soberano tenía competencias por la naturaleza del espacio, lo estratégico de su control y las inversiones de riesgo a largo plazo que el sector público debía hacer para tener cierto nivel de competitividad técnica. Así como hay un sistema interestatal con normas y prácticas diplomáticas de conducta, existen espacios terrestres y no terrestres que tienen normativas y regulaciones para su control, de cuyos mecanismos participan la mayoría de los Estados, pero en los cuales en la práctica pocos cuentan con los medios para llegar, ocupar y regular dichos lugares. El caso del espacio exterior y los cuerpos celestes presentan un eje para discutir la cuestión de la soberanía. En este artículo nos proponemos analizar cómo son las relaciones de poder en el territorio para repensar y representar la nueva geopolítica, qué rol juegan los actores estatales y cómo modifican estas prácticas geopolíticas las empresas privadas que por sus propios medios técnicos, o en asociación con el Estado, re-definen el control y la explotación de los recursos en la frontera tecnológica. También se reflexiona sobre el rol de actores periféricos y semiperiféricos ante la brecha de la tecnología y la nueva frontera de la naturaleza.

Palabras clave
Recursos naturales;
industria aeroespacial;
política internacional;
espacio extraterrestre

ABSTRACT

The present works aims to understand the new geopolitic of natural resources from the exploration and exploitation of outer space by State and non-State actors. Significantly, private companies are making investment, research and development in space technology, getting involved where only the sovereign Nation-State had competences due to the very nature of space environment, the strategic logic of its control, and the long-term risk investments that the public sector must afford to gain technical competitiveness. The international arena is presented as an existing interstate system ruled by diplomatic practices and code of conduct. Notwithstanding, there are terrestrial and non-terrestrial spaces that have regulations for their control. The majority of States participate in such regulatory system, but in practice, few have the means to reach, occupy, and regulate these places. The case of outer space and celestial bodies present an axis to discuss the question of sovereignty. In this article we propose to analyze how are the power relations in the territory to rethink and represent the new geopolitics, what role State-actors play, and how private companies modify these geopolitical practices by their own technical means, or in association with the State, re-define the control and exploitation of resources on the technological frontier. Finally, this article discuss the role of peripheral and semiperipheral actors in the face of the technology gap and the new natural frontier.

Keywords
Natural resources;
Aerospace Industry;
International Politics;
Extraterrestrial Space

INTRODUCTION

Space, Exploitation and Sovereignty

Moon Express is a company based in the United States of America authorized by the National Aeronautics and Space Administration (NASA) to do private space mining. In a televised interview, a representative of that company explained to journalists that they are planning robotic missions to extract lunar minerals, however, their ultimate goal was to colonize the moon in the benefit of all humanity, since it is running out of resources on its own planet.

When the enthusiastic Naveen Jain, born in India and executive of said company, was interviewed by the American chain CNBC, one of the questions asked was about the citizenship humans born on the natural satellite of the Earth would have, he jokingly responded "lunatics". The possibility of extracting resources from ultraterrestrial objects was the sample of what an "entrepreneur can do", and this would make *Moon Express* the fourth power to reach the Moon.

The idea of a citizenship that refers directly to a nation-state and the concept that *Moon Express* would be the fourth space power are geopolitical terms that suppose the exercise of sovereignty over a territory. The geopolitical imagination of the stakeholders involved in international relations is defined as a vision of the interstate system and its functioning. There is a geopolitical discourse on how political and economic events are interpreted, how they are represented in space, how power relations are and how they should be (Agnew, 1995, pp. 46-47, Agnew, 2005a, p. 49).

Geopolitics provides images of that web of global power, and uses geographical metaphors such as "Iron Curtain, Third World, or Canalla State [that] are intrinsically geographic terms since these terms identify the places and inform the decision makers of international politics "(Dodds, 2007, p.4). Political power is closely associated to the modern State, understood as a unitary stakeholder, "as units of territorial sovereignty [...], seeking greater power outside its borders" (Agnew, 2005b, p. 37).

Therefore, there is a naturalized and rigid understanding of the territory where the State operates in an environment characterized by multiple States, a system of territorial States. The power is not a summation of capabilities or a possession exercised by a State that behaves for reasons comparable to the needs, passions or moral power of the individual. A State is only one reality more of many geographical scales and dimensions.

The claim of sovereignty over an extraterrestrial territory by a private company, accompanied and promoted by a State – the United States of America, through the NASA space agency - shows two facts of geopolitical nature: a) that private companies are power stakeholders as relevant as the State, and they could become even more so in the future if state units subcontract / privatize their strategic activities (which at the beginning of the 21st century was a state monopoly); b) of the closest celestial bodies, especially asteroids - Moon and Mars - it is possible geopolitically to imagine the construction of a new map that exceeds planet Earth, but would be centered in it; and

lastly, c) the exhaustion of the "cheap nature" makes the exploitation of resources on other celestial bodies viable.

Wallerstein argues that "a world system is a social system, which has limits, structures, groups, members, legitimacy and coherence rules" (2005, p 489). The world system is an "economic mode [that] is based on the fact that economic factors operate on a larger scale than any political entity can fully control" (2005, p.491), that goes beyond the structures of nation-states and forms central, semiperipheral and peripheral spaces.

A State of the central area has very strong attributes to exercise sovereignty; yet, a peripheral state lacks institutional and political solidity to do so. However, semiperipherals states are in transition, and although they are in peripheral areas of the world-system, some of their internal and state structure characteristics are those of core states, since they enjoy greater industrialization and other economic resources.

From the core countries standpoint, a semi-periphery has the industrial capacity and the scientific-technological development, and demands technology from the core countries that could ultimately become competitive for its market. Capital-intensive technologies such as space technology are driven by core countries and, to a lesser extent, by the semi-periphery. They are sensitive technologies that make up markets that are oligopolistically coveted by the core countries. Therefore, the development of this type of technologies for the global system could be destabilizing.

A semi-periphery country could become in the future the center of the international system. In this process of rising in the hierarchy of States, besides capital, technology is a central factor (Wallerstein, 1974, pp. 4-6). Moreover, the space refers that "it never constitutes a mere scenario where events take place: a spatial arrangement has nothing neutral" (Peter Taylor and Colin Flint, 2002, p. 42). We understand geopolitics as spatial representations (Agnew, 2005) and distribution of power geographically located among state stakeholders, assumptions, designations and geographical interpretations that intervene in politics at all scales (Taylor and Flint, 2002).

Geopolitics implies the geographical distribution of power, of stakeholders other than those of the State that act under its umbrella, its normative framework and the legal omissions of what is not legislated or regulated by a state bureaucracy or a multi state system. The law and regulation are always discussed and written when an issue rises. Can private companies become stakeholders in exercising sovereignty?

If geopolitics is the politics understood in the place and the power relations that exist there -and is a way of looking at the world-, we understand the latter as a web of social relations, where human activity takes place (Massey, 1994). We say that technology is one of the engines through which changes and economic possibilities expand; evidently, the technological boundary provides us with a new and different perspective of the world, in which human activities take place.

As Flint (2006) argues, geopolitics is not solely a matter of the State, but also of the views of individuals, social and political movements, civil society organizations or profit-motivated stakeholders with multiple practices and representations over the

territory; thus, the interest in observing from our perspective and not with a mere economic view the geopolitics of the exploitation of extraterrestrial resources.

According to a text of the Latin-American Economic Commission (ECLAC, [Spanish acronym]), the term *financialization* has several definitions in specialized literature such as: the ascendancy of a corporate governance focused on the valorization of the companies shares, the tendency to short-term decision-making for investment, the growing political power of financial capital, or the tendency to accumulate through financial valorization, among others. In all cases, the logic of financial capital prevails over the actual economy (Abeles *et al*., 2018).

This slows down technological change, as it hinders the incentive entrepreneur to invest in the actual economy, to invest in the financial system through actions and other financing mechanisms, and to seek financial income for its economic benefits at the expense of innovation. (Chena *et al*., 2018).

This generates technological revenues, separating the actual economy from research, investment and development, while giving a direction to the economy; their needs and expectations are always subject to financial logic (Pérez, 2018, Mazzucato, 2018). This leaves workers, businessmen and states little room for manoeuvre in the economy, since they are subsumed to the logic of these capitals. The technological companies analyzed in this paper, whose purpose is the exploitation of non-terrestrial resources, are thus associated or directed by this sector.

What happens when these capitals decide to explore outer space? All technological change entails the reorganization of the productive structure and, eventually, of governmental institutions and society. This technology will be able to exploit previously impossible resources, expanding both the technical and natural boundaries, and therefore, as did other technological revolutions in history - Industrial Revolution (since 1771); the steam and railway era (since 1829); the steel; electricity and heavy engineering (since 1875); oil, automobile and mass production (since 1908); the computer and telecommunications era (second half of the 20th century) - modify the power relations, the social and productive structure (Pérez, 2008).

These new social relationships will be affected by the value and access to new *commodities* and technologies, their distribution, access to knowledge and resources, as well as new places where the human being unfolds. Access to space for the purpose of observing the Earth, telecommunications or research has historically been under the power of the state, with sufficient resources to do so for military or civil purposes. In recent decades, business conglomerates have emerged that have produced satellites for communications.

However, in recent years, private stakeholders, entrepreneurs who develop launchers, before only restricted to the States, have entered the space market. These launches are sold as services for commercial purposes[i] , but also for the government (Moltz, 2014), with the State, businessmen and the financial sector overlapping.

The present article, based on the accelerated technological changes and their scope, sets out to understand the new geopolitics of natural resources in relation to the exploration and exploitation of outer space by state and non-state stakeholders. It will analyze how territorial power relations are rethinking and representing these novel geopolitical facts, the role state stakeholders play and the ways these practices modify private companies with their own means, or in association with the State, redefining the control and exploitation of the resources on the technological boundary. What will be the role of peripheral and semi-peripheral stakeholders in the face of the technology gap and the new boundary of nature in the face of an activity that seems reserved to world powers or large scale companies?

Anthropocene, Resources and Technology

We live at a time when cheap nature has ended. Capitalism has overcome different limits imposed by the indispensable variables for its development, i.e., the *Four Cheaps*[ii]: work, food, energy and raw materials. According to Moore, the problem of the limit nature suffers - climate change, erosion, pollution - is due not to what some scientists have called the *anthropocene* (analogy of the geological eras, highlighting the indelible hand of man on Earth), but to what the author calls *capitalocene*, that is, the capitalist production mode.

The capitalocene has generated an ecological depletion. However, the thesis postulated by Moore is that capitalism, since its inception, has found solutions to its recurrent systemic crises, since it has been able to geographically extend its appropriation zone, the limits of where to obtain work, food, energy and raw materials faster than the exploitation zone: "Hence, capitalism overcomes the allegedly insurmountable natural limits, thanks to the coercive-intensive and symbolically possible appropriations of cheap nature, cyclically renewing the *Four Cheaps*" (Moore, 2016, p. 151).

Nature has been taken as an external factor, something to be appropriated by human beings producers and capital. This idea of externality has functioned because “capital must constantly locate natures external to itself. Because they […] are finite, the depletion of a new historical nature rapidly promotes the 'discovery' of new natures that offer new yet unexploited sources of unpaid work "(Moore, 2016, p 155).

After every cycle of accumulation, capitalism uses its reserves of "external nature that existed as a warehouse [...], the accumulation strategies that operate at the beginning of a cycle creating a particular historical nature through science, technology and new forms of territoriality and governance "(Moore, 2016, p.156). When the depletion of natural resources occurs, there is more demand than supply, which explains their price increase. When the difficulty to extract and exploit resources becomes greater, more technological complexity is required[iii].

When nature, as a reserve warehouse, makes access difficult, innovation in technology is necessary. This is the case of spatial exploitation: it requires complex technological developments, a large investment in research and development, expensive launches to

outer space, expensive industrial devices, with more risks of error or destruction, insurance and financing, among others. That is, the access to this boundary outside the Earth implies higher costs:

> Historically, the border areas [...] have provided great opportunities for the capital to reduce the prices of the *Big Four* [...]. These costs reflect, directly or indirectly, the composition of the value of the production of goods as a whole [...]. Borders are fundamental during long periods of accumulation for an elementary reason: they verify the growing organic composition of capital and, therefore, the tendency of the profit margin to fall [...]. In Marx's rarely cited 'general law' about underproduction, the overproduction of machinery tends to lead to the underproduction of raw materials which, in turn, determines not only the composition of the value of non-human labor - raw materials - but also, through the cycles of successive accumulation, of the fixed capital itself. Cheap coal, for example, reduced not only the costs of circulating capital - energy costs - but also the costs of manufacturing steam engines and other vital production forces in the second half of the 'long' nineteenth century (Moore, 2016, p.164).

Is aerospace technology, investment in robotics, the development of new materials, nanotechnology, renewable and mineral origin energy expanding the possibilities of this new exploitation of the outer border? Are they reducing energy costs and manufacturing costs of this entire technical network necessary for exploration, colonization and exploitation of space resources?

Vernon Ruttan studied how in the history of United States of America of the twentieth century some high-tech industrial developments have been not only the engines of progress and of the economic, military and international power of that country that established her as one of the main powers of the world, but they were also the vectors that guided the world economy.

The United States has led technological change since the second half of the 20th century, from the path of mass production to space technology, using in a complementary way, recent technologies with mature technologies: space technology makes use of the Internet, semiconductors and computing, nuclear energy, aviation and the mass production industry (Ruttan, 2006, pp. 167-171). Furthermore:

> Mature technologies are a major problem. As a field of commercial technologies, which initially fell heavily into military research and development and defense acquisitions, the dependence of these commercial and mature technologies with the ones linked to those of warlike use have had the tendency to decline. The flow of technological knowledge could be reversed, from a spin-off to a spin-on[iv] (2006, p. 5).

According to Ruttan, general-purpose technologies are those that develop or integrate new technologies in the US industrial context: interchangeable parts and mass production, commercial and military aircraft, nuclear and electric power, computers and semiconductors, the Internet, the space industry (Ruttan, 2006, p. 7).

All these technologies have the characteristic of having reached technological maturity, that is, a period of stagnation or maturity after a rapid or explosive development of the initial phase of the trajectory of a technology, (Ruttan, 2006, p. 163). These technologies studied by the author make the expansion of the nature reservoir boundary possible, but they also become strategic since there are few states or private stakeholders that can manage it. What is strategic technology? In the words of Lawrence Gershwin and Frank

Gac: "strategic latency refers to the inherent potential of a technology to create military or economic changes in the balance of power. This potential could remain unexploited and even unrecognized and, therefore, latent, until the combination of factors produces powerful capabilities" (2014, p. 3).

All technological development can be used to exercise economic or military power. Strategic technologies are those of dual use, but also have an intrinsic strategic value for being economically profitable, technologies linked to strategic sectors of the industry.

The very dynamics of the development of capital, which in Schumpeterian terms results from creative destruction, requires progress and improvements, innovations that make certain businesses and sectors of the economy profitable. Some, however, are more successful than others, and some are more creative, revolutionary in creating new niches, markets and possibilities.

Innovative industries are important as a platform for hegemonic ascendancy, since they produce large indirect benefits for the national economies from which they emerge, and they also generate technological revenues (Chase-Dunn and Reifer, 2002). The origin of the enormous benefits obtained should be sought in the technological and industrial policies designed by the core countries that aim at building dominant positions through the development and control of technologies (Hurtado *et al*., 2017, page 67); therefore, they drive, extend and orient the power countries' hegemonic cycles, and technologies that are considered state-of-the-art, underlie these new industries.

These economies need the resources offered by nature, and also require technology to exploit them: only the hegemonic or consolidated countries in which these new industries are located can offer a political-institutional framework, as well as amore favorable economic financial context to successfully develop these ventures. In this way, few companies from core countries -or with certain technical capacities- will be able to achieve goals and support their undertakings in this frontier market, whether through the government or third parties of the private sector.

Race, Companies and Exploitation

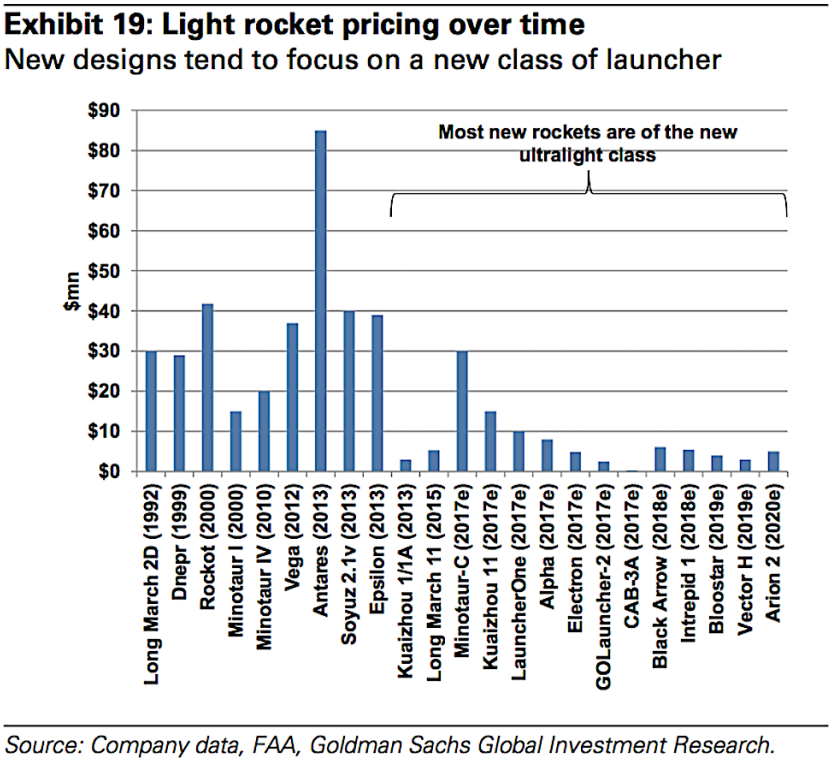
A few years ago, private companies began to venture where only a state monopoly existed for strategic reasons: the launching of space vehicles and the use of space outside our planet. This does not mean that countries with stronger space programs and decades of experience no longer have their own launches, but rather, given the dynamics of the market, this process is being developed by individuals through profit investment, in technology-based companies.

The essential task to perform undertakings in space is to be able to send the objects, and for that, launching rockets are needed. Since before the start of the space race between the Soviet Union and the United States of America, rockets were understood as missiles, that is, they are basically of dual-use technology. They can be used to launch attacks

thousands of kilometers away or put satellites into orbit. Likewise, the latter may have a military purpose, whether for communications, espionage or other purposes.

In the 1990s there was a global explosion of satellites, which multiplied the amount that orbited the Earth due to the rise of telecommunications and the expansion of markets after the collapse of the Soviet bloc. Over time, the number of suppliers began to increase due to the increase in demand, at the same time private stakeholders were entering the market.

The lowering of launch costs also reduced the price of communications, making the services provided more accessible. The following graph shows the evolution of the launching costs, which highlights, in general terms, the cost lowering that also allows other stakeholders to enter this market:



Graph 1. Costs of the launch with a projection into the future (1992-2020).
Source: taken from Edwards, 2017.

After the defeat of Germany in 1945, the former Soviet Union and the United States of America began a race to take over the scientific and technological resources of the Nazis (Neufeld, 2008). To do so, they entered the territory of the defeated Germans, and seized all available technology as well as scientists, taking them to the American territory

(Brzezinski, 2008). In principle, the Soviet Union had the leadership of the space race, but in the end the United States won.

In 1957, the USSR successfully launched the first artificial satellite in the history, Sputnik 1, and then 2, manned by Laika the dog -the first living creature sent to space. In 1961 Yuri Gagarin managed revolving in orbit around the Earth, and in 1963 the Soviets managed to send the first woman into space, Valentina Tereshkova, along with Valeri Bykovsky (Phillips and Priewer, 2009).

Until 1968, the Russians had achieved the greatest accomplishments in space field, competing with the Americans. However, due to the military implications of the Soviet achievements in space, the United States of America Congress created the *National Aeronautics and Space Administration* (NASA), for a mission manned by astronauts to the Moon, whose success in 1969 marked the history of humanity. The space race meant, in the middle of the Cold War, a symbolic as well as technological competition: it consisted in a political competition between the USSR and the United States for the scientific-technical superiority.

The main superpowers' achievements in this field were, among others, to place communication satellites (1957), live animals in the cosmos and then humans, lunar missions and probes to other planets such as Venus and Mars (1960), Jupiter (1973), Saturn (1979), Uranus (1986) and Neptune (1989) (Compton, 1988, Siddiqi, 2000, Phillips and Priewer, 2009).

In 1956, China began her space program, when Qian Xuesen returned to his country after being imprisoned and accused of having communist sympathies in the early 1950s, for allegedly being on good terms with the Soviet Union. In 1970 China successfully achieved its first launch of its own satellite, after having detonated its own atomic bomb in 1964. China achieved a long series of successes with its "Long March" rockets, and in the 1990s, it was able to interact with different countries to build satellites and launch them (Smith, 2005; Solomone, 2005, p. 27; Solomone, 2006; Xin, 2007).

People's Liberation Army acquired special interest in the Chinese space program, especially for its potential war use (Solomone, 2005, pp. 28-29), and therefore it was not clear who controlled that program, if civilians or the military, due to the export of missile material to countries such as Pakistan (Solomone, 2005, pp. 31-32).

The United States worked on transparency policies with China, which had ambitions to establish a base on the Moon and Mars during the following decades, which would have implications not only for science, but for military matters (Solomone, 2005, pp. 34-36; Johnson-Freese, 2003, pp. 51-53). Furthermore, in 2003, China entered the exclusive club, together with the Russians and the Americans, of the States that can make space flights manned by humans (Johnson-Freese, 2007, p. 5).

The People's Republic of China was seen by the United States of America as a future global power in a multi-polar world in the coming decades (National Intelligence Council, 2008). The key concern of the other powers is a new space race. Therefore, China is in competition with the United States, since it considers itself as having

abundant power, both on Earth and in space: its develops anti-satellite cosmic weapons based on terrestrial and satellite platforms, and Lunar and Martian bases projects by 2040 (Johnson-Freese, 2003).

China's plans find its regional competitors, especially India, Japan, Russia and South Korea; for this reason, it never neglects its interdependence and cooperation with Germany, Canada, Italy, France, England, Pakistan, Brazil and even Russia and India (Johnson-Freese, 2003, p.68, Kulacki, 2008, p.29).

In 2007 it successfully completed the operation of the total sale of the service to Nigeria, which consisted in the manufacturing of a communication satellite, the launch and the service in orbit of the same, placing China as a major player in the industry. The United States of America sees China as a developing power of these capabilities and a possible challenger in the future (Smith, 2006, Blazejewski, 2008).

China has repeatedly stated its intention to peacefully develop its space program[v]. It has supported the ban on the proliferation of space weapons. According to the Chinese position, the US National Space Policy monopolizes the use of the skies, and China cannot delegate the custody of its national interests in space to another State. This forces the Chinese planners to exercise asymmetric countermeasures - they have not yet developed the capacity to equate these weapons - to be able, from Earth, to defend themselves and in the future to enter the race for the weapon development that their great American adversary has (Shixiu, 2007, p. 9).

Despite the foregoing, China is mistakenly perceived as an irresponsible space stakeholder, an imminent threat to international space security, based primarily on ideological and military perceptions, lack of experience in interstate negotiations and non-compliance with legal guidelines. On the contrary, China has shown to be an active and cooperative international space stakeholder, and although there is a link with the military in the space program, China's main interest is non-armament and peaceful (Wu, 2015). Since the birth of the Chinese space program, it has had a stable institutional trajectory with important technological achievements, focused mainly on its development policy (Chen, 2016).

In fact, over the decades - since the Soviet Sputnik was launched in 1957 - the number of launch rockets aiming at placing orbital charges has increased. Many of these launches, over the first few years since the late 1950s, have failed. But over the years and technical progress, these launches have achieved a higher level of effectiveness and safety, in taking humans to the Moon.

The following graph shows the launches made around the world year after year. At first only by the two main contending powers in the space race, but after with the entry of new stakeholders to the select group of countries that dominate technology:

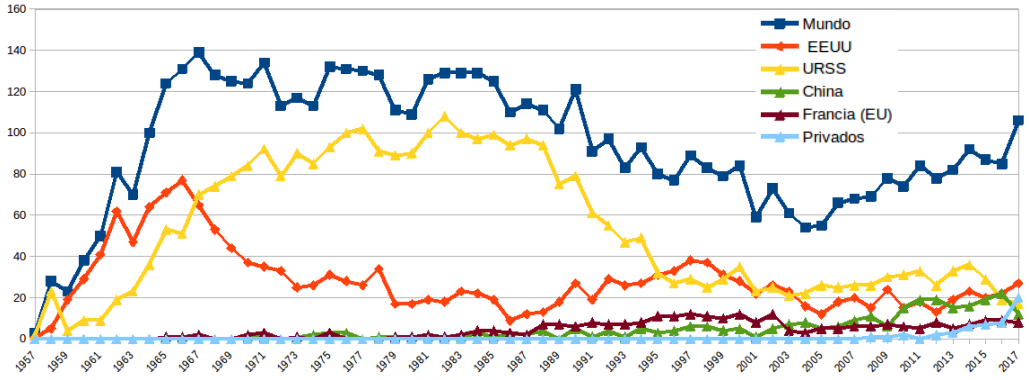


Figure 2. Space Launches, 1957-2017.
Source: Krebs, G. (2012). Gunter's Space Page and space agencies.

From the total of launches that occurred every year, an exponential increase in the number of space launches has been observed, starting with the Soviets in 1957 and the failed attempts by the Americans. The peak of orbital launches the space race had, took place between the 1960s and 1970s, decreasing in the 1980s and 1990s.

Throughout the period called the Space Race (within the Cold War), the Soviet Union stood out for the number of rocket charged launches it made, and how these decreased abruptly after the collapse and disintegration of the communist giant. However, the Soviet State included in its union other countries that would eventually leave the Russian Federation, and that were launching centers such as Baikonur in Kazakhstan, that, after its birth as an independent republic, continued to use the cosmodrome, always under the administration of Russia. Ukraine also received the Soviets' heritage of space science and technology[vi].

For methodological reasons, the graph does not show the launches of other countries that have achieved this complex development such as Israel, that, in the 1960s and 1980s, began launching satellites in the opposite direction of the Earth rotation, i.e., to the West, since Middle East countries lie to the East, which constituted a possible threat and invasion of the air space. We also omitted Japan, which already made high-quality launches in the 1970s, as did India (in the same decade), South Korea and North Korea - the former at the beginning of the 1990s and the latter at the end of the same decade -, and Iran, whose achievements were made around 2005.

The launches of international organizations such as Intelsat (Westwen block international organization of public domain created in 1964, that was privatized until 2001), Inmarsat (the United Kingdom public satellite company), Eutelsat (France public satellite company) or Intersputnik (Eastern block interstate organization, created by the Soviet Union in 1971, still functioning today) were not either accounted for.

Our graph does not include Argentina or Brazil, which in the 1990s had their own satellites, or the missions of different American universities, or those of private companies that, even though they have launch plans in the short term, at the time of the

writing of these lines, they have not specified their objectives. The most prominent indicators are those related to private orbital launches.

In effect, after the whole history of launches came to a standstill, private launches began in 2008, and their number has increased ever since. From 2014 to 2016, 6, 7 and 8 satellites were launched, respectively, and reaching 20 in 2017, an amount that exceeds European, Chinese and Russian launches, and surpassed only by the Americans, where all these satellite launches have been carried out.

This leads us to understand that innovation and development in space technology are still concentrated geographically in the United States. However, we should remember that the great technological development of this country was based on state public investment, as do the other cases analyzed in this article (Mazzucato, 2013).

In this way, it could be assumed that in the future the countries that have certain levels of development could change opinion and open their activities to private investments. In any case, this will depend on geopolitics: whether the State dimension of sovereignty prevails over resources and power monopoly, or privatization entails a new level and redefinition of the concept of sovereignty, from whoever exercises power over a territory and the means to reach it and control it.

Geopolitics beyond the Earth and the State

Several years ago, the geopolitics of outer space modified the future strategic scenarios of the powers. Consequently, the countries that have such capacities have different developments in their portfolios to occupy that practically empty territory, whose main stakeholder was only the State. The spatial competition among the contenders of the East-West conflict had its climax with the development of "Star Wars": The Strategic Defense Initiative was a 1983 project of great economic and technological importance. This project sought to protect the United States from a Soviet nuclear attack from Earth as well as from space.

According to a government budget report, $ 991 million US were spent in 1984, $1,777 million US in 1985 and $ 3,790 million US in 1986. Other calculations estimated that since 1983 $ 8 billion US have been spent on research and development of a missile defense, and they have even reached up to 15 billion US annually.

This technology could not materialized, but the technical advances allowed projecting non-terrestrial power, and the occupation of different countries of said space, as well as the making up of an international legal plexus of cooperation and prohibition of militarization of space, which diffused limit and control is complex, since few stakeholders with the capacity to exercise power can decide whether to comply or not with these rules (Blinder, 2012), always under the umbrella of the state sovereignty that had such capabilities, ergo the space powers.

But it's not just about militarization. The North American National Intelligence Council published a document in which it is stated that space is becoming democratic, in the

sense that more stakeholders are participating in its use, including private ones. According to the report, this will deserve a growing intervention of the users with space governance capacities such as space debris created by objects destroyed or unused without control, orbiting into space and which are endangering operational objects. It also warns against militarization that can be increased with a greater participation of countries (National Intelligence Council, 2017).

Some authors have already called the geopolitics of outer space "astropolítics", that is, the concepts of classical geopolitics -the nineteenth and twentieth centuries- in their spatial context. This requires a realistic view of the international system and the behavior of the Nation-States as central stakeholders in this process, but bearing in mind that technological advances allow reaching non-terrestrial objectives and modifying the approach that should be given to the understanding of geopolitics

Thus, the Earth and all the stakeholders that create its territorial policy must take into account that it is orbiting within a physical and astronomic context, in which technology plays a prevailing role. Hence,

> an optimal deployment of space assets is essential to the present and future terrestrial victory in space-based wars [...]. In accordance with Sir Halford Mackinder and Nicholas Spikman's postulate, the formulation of a neoclassical astropolitics establishes that: whoever controls the Low Orbit controls the Near Earth Orbit. Whoever controls the Near Orbit will dominate the Earth. Whoever dominates the Earth will determine the destiny of humanity (Dolman, 2002, pp. 6-7).

Other authors led the way to astropolitics, arguing that the thought of the orbital supremacy of a State in having the terrestrial control is a mere modernized continuity of the classic geopolitics of the last 200 years. State and corporate powers that seek new forms of power through the technical use of the means that expand geographical dimensions by accumulating capital or expanding areas of influence should do a critical reading of geopolitics and outer space and observe its policies.

However, space technology does not simply emerge, nor is it merely a means to dominate, but it is a social, political and technical construction with a historical context where different stakeholders have intervened for its existence, and which use results in an exercise of power. The outer space is not a strange arena to daily life, but it is rather a constituent part of the economy, communications and the society (MacDonald, 2007).

In this sense, the technological control of space is key, but this should not be part of a realistic and justifying reading of the hegemony of one State over the others, as classical geopolitics did; that is, a project by state elites to expand state power as the only means of survival (Tuathail, 1996).

Power relations with territorial anchoring and spatial politics are problematized when the exercise of this power, sovereignty, is practiced in a milieu where the sovereign entity is not in absolute control. More specifically, similarly to the great maritime spaces on the planet or to polar regions, human beings can go to the outer space, control it, dominate it and remain there, however, with greater difficulty that in places of greater terrestrial habitability.

The outer space will always be subject to a logistics that will be based on some part of the geography with routes and supply methods that go from one or several places where management, administration, technological operation, maintenance, transport workers, etc. come together.

The sovereignty over these ultra-terrestrial territories is implied in a relationship plexus, in which the terrestrial space plays a key role. This external space is governed by the terrestrial geopolitics rules of power, where the former and the latter cannot be understood or divided. The State is equipped with elements to act according to the material resources available and the legal/regulatory framework, but also accepts to be a risk stakeholder where the private sector does not invest given the risks the costs and benefits of a similar investment entail.

But when there is deregulation, this new astropolitics, which is a hierarchical structure in which very few state stakeholders participate, acquires another dimension, providing agencies to stakeholders capable at that moment of making a large-scale risk investment which grants them the control of space hardly explored, up with (technical capacities) and over other States (without technological capabilities but participate in the legal institutional framework that regulates the space), that participate in the exploration and exploitation.

Final thoughts

The idea of "lunatics", lunar inhabitants, other inhabitants or visitors of non-terrestrial spaces implies a strong geopolitical discourse, which consequences will redefine the sovereignty concept. The discourse, in Foucauldian code, constitutes a network related to the idea of power, that is, it legitimizes and institutionalizes knowledge, the truth.

It is almost ironic to have the ability to name future inhabitants of a still uninhabitable place, or to postulate a private company as a fourth power in an area where the State practically controls everything, legitimizes a concept of sovereignty different from those traditional absolute sovereignty or popular sovereignty, that is, where said sovereignty resides: in the ruler, in republican institutions, in the town or in private companies that perform tasks previously reserved only to the State given their complexity and sensitivity.

The neoliberal era, from the 1980s, involved the privatization of public activities, but never reflected on the cession of sovereignty. By living in an era where there are companies that are authorized to exploit the nature located in areas of difficult access forces us to think of different possibilities in the geopolitical future, since in a world (at the close of this work in 2017) made up by 193 countries – of which only ten have a launching capacity and ten others can make geostationary satellites – the possibility of an enterprise proclaiming its sovereignty over 180 countries approximately, which is a relevant datum.

Nature is expensive, in the terms described in this work, and leaves behind dozens of countries in the periphery, given their lack of natural resources, skilled labor,

infrastructure, industry and technology. The expansion of the terrestrial boundary has exploited resources to a certain limit, but the expansion of the technological boundary is allowing the exploitation of extraterrestrial resources. That is, that even finding and acceding to a new nature in the scheme proposed by Moore, the technological complexity, the distance, the oligopoly of the stakeholders with capacity for space exploration, will broaden the boundary, but will not necessarily result in a reduction of the cost of resources.

Being on the technological boundary is a privilege for very few state and private actors: it implies a projection of power in classical terms of military and diplomatic capacities, the possibility of accessing new sources of nature and the control of that economy, the monopoly to define who accesses these riches, if there is a militarization of resources and leadership in innovation, research, development and investment.

The new geopolitics of natural resources poses a new scenario of conflict outside the terrestrial space. The development of future events will determine the role of the economy, the technological role and fundamentally the power of the state and non-state stakeholders that operate in this new reality. It is necessary to pay attention to the role of the financial sector as a predominant stakeholder when defining policies, both the value of *commodities* as well as the technical possibilities for their extraction in hostile or weightless scenarios.

The exhaustion of cheap nature represents a key factor in what is described in this text. This scenario could further deepen the balance of power towards financial capital, due to the huge sums of money that must be invested to ensure that the exploration, exploitation, control and transportation of stellar resources yield profits.

Therefore, it is also possible that there be a new stage of financialization of technological income for investors. Such a panorama can widen the gap even more between countries and territories, core-periphery. The conditions of semi-periphery countries to reach certain levels of development, in such a scenario, will be even more difficult, hence, investing in science and technology will be fundamental, as well as those who developed strategic technologies.

How much power, autonomy and capacities can be made by private companies in relation to state stakeholders, and the forging of a new world, legal and institutional order that legitimizes it remain to be answered. The role of the semi-periphery countries also remains to be answered, since the peripheries do not have elements other than those of diplomacy and international negotiation to obtain some revenue from this, either as a launching site, suppliers of raw materials for these undertakings, or as purchasers and passive users of goods and technologies.

And what about the semi-periphery? It is likely that providing technical means for space exploration and the exploitation of these new spaces and resources, as well as telecommunications and energy, among others, these be hegemonic developments of core stakeholders. However, it is likely that several semi-periphery stakeholders are developing capacities that lead to competition with core countries and companies as it has happened with the state-of-the-art technology until now.

A foreign policy confluent to this purpose, a policy of scientific-technological education and an industrial policy of semi-periphery stakeholders will tend to weave the necessary policies to develop and associate, when circumstances require, with the ultimate goal of dominating the technological and vertical boundary.

Promoting the creation of technology-based companies could be a good mechanism to guarantee financing and management; but the role of the State is inescapable, in light of the bibliography and experience. The public policies that tend to develop this sector could improve the perspectives of any stakeholder that embarks on this venture. They were not the only ones in history.

The then rising powers of early capitalism created the Indian Companies in the 17th century with the purpose of weaving commercially and militarily the geopolitical framework that made these countries powerful. The astropolitics of the 21st century must be set in that scheme that presents a plexus of competing powers on a global scale, of state and private stakeholders. They all did so in the forefront, dominating strategic and general-purpose technologies, appropriating themselves of a new external nature.

Private companies and financial capitals will probably influence the decisions made about space missions, which are going to extract natural resources. This will undoubtedly design a new geopolitical conception, mapping places outside the planet, making the extraterrestrial peripheries where the resources are located relevant: in the core-periphery scheme, the latter constituted centers of development because they are, mostly, places where resources are extracted for the metropolis.

The core countries could exercise their military and administrative control over that territory, if they had the necessary technologies for such purpose, transportation, administration and war. Here the peripheries would be located in outer space, and to reach high levels of financing, organization and technology would be required. The public-private framework described in this paper calls for the discussion of who and how will the regulation and control of spaces be exercised, since under current international legislation, these spaces belong to all of humanity and not to a State or any other stakeholder in particular.

Lastly, when dealing with the end of cheap nature we can ask ourselves about the *status quo* of these extraterrestrial peripheries, which will be spaces -of power and to be exploited- widely technical and extremely expensive due to the difficulties of extraction and transportation. The core or periphery of the different places of the Earth will have greater attention, since the investment needs to achieve an advanced capitalism anchored in the space economy, will be greater, making difficult the emergence of state enterprises from semi-periphery countries, making more difficult the emergence of state undertakings of semi-periphery country, relegating peripheries and empowering the cores. The latter will print, not without the possibility of armed conflicts in the case of several stakeholders competing for the new way of regulating the exploitation of these common spaces that can only be accessed by those with the technological and financial means to do so.

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[i] Countries with space capacity have companies that offer these services.
[ii] English term; the literal Spanish translation is the four cheap ones.
[iii] Fracking or hydraulic invoicing is a technological example of the exploitation of unconventional hydrocarbons, which extraction presents greater difficulties, but thanks to rock drilling, this resource can be obtained, however, the exploitation work is more complex and expensive.
[iv] Spin-off is a product derived from another in the research and development process. Spin-on is a change, a turn in the process.
[v] The national security strategy of the People's Republic of China has been, since 1960, that of people's war and nuclear deterrence. China has large amounts of conventional forces and a preparation for popular mobilization in case of invasion; likewise, it has the nuclear power to deter an attack on a superpower, whether American or Soviet. The impact generated by the US Strategic Defense Initiative on Chinese decision makers is that it would minimize its nuclear power and violate security with the potential of being blackmailed by the United States (Garver, 1986, pp. 1220-1221). This was a variable that drove the subsequent Chinese space development, which led her to enter the new race with the United States of America.
[vi] Among the countries of the former Soviet Union, Ukraine is the most developed in space technology and studies on the cosmos, with promising commercial potential in that industry having been able to take advantage of being a high-ranking link in the Soviet cosmonautic project. As the Soviet Union disintegrated, Ukraine took advantage of the technological legacy of the communist era, which consisted of a space research and development complex and its missile complex, making Ukraine a leading power in this matter, and cooperating with the most important space agencies of the world.