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Note

Reclassifying Geostationary Earth Orbit as Private Property: Why Natural Law and Utilitarian Theories of Property Demand Privatization

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The impending catastrophic destruction of satellite communications necessitates an immediate reexamination of the underlying assumptions made about private property in outer space.[1] Recent advances in technology have reduced barriers to space exploration and utilization, leading to increased investment in space in the form of satellites.[2] This

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1. *See* Joseph S. Imburgia, *Space Debris and Its Threat to National Security: A Proposal for a Binding International Agreement To Clean Up the Junk*, 44 VAND. J. TRANSNAT'L L. 589, 598 (2011) ("Experts warn that if the cascade effect occurs, space will be unusable for centuries due to the time it will take for all of the debris to eventually disintegrate in Earth's atmosphere. If space debris is not immediately countered by preventative and removal measures, the cascade effect could occur in little more than a decade."); Lawrence D. Roberts, *A Lost Connection: Geostationary Satellite Networks and the International Telecommunication Union*, 15 BERKELEY TECH. L.J. 1095, 1124 (2000) ("Satellite developers forego costs when they can design and operate spacecraft that take advantage of the communal environment. Losses due to pollution are borne by society as a whole, while the cost savings accrue solely to the developer. In this instance, the costs to the community environment manifest themselves in the form of orbiting debris.").

2. *See* Richard Berkley, *Space Law Versus Space Utilization: The Inhibition of Private Industry in Outer Space*, 15 WIS. INT'L L.J. 421, 421 (1997) (describing the rapid increase in the number of man-made satellites since the 1957 launch of Sputnik); April Greene Apking, Comment, *The Rush To Develop Space: The Role of Spacefaring Nations in Forging Environmental Standards for the Use of Celestial Bodies for Governmental and Private Interests*, 16 COLO. J. INT'L ENVTL. L. & POL'Y 429, 430 (2005) ("The time has come when the concept of going straight up for the average person is much

increased investment has brought about numerous scientific discoveries,[3] military applications,[4] and may one day lead to a dispersal of the population across the solar system.[5] This increased saturation of Earth's orbits has created a problem with debris that threatens to grow until it cuts off access to space.[6] To further complicate the issue, some corporations are reluctant to commit large quantities of resources to space because of the current disposition of international law,[7] even

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more of a reality as both the public and private sectors push to develop the necessary technology to explore space.").

3. *See, e.g.*, Nola Taylor Redd, *6 Biggest Space Science Discoveries of 2013*, SPACE.COM (Dec. 28, 2013, 2:00 PM), http://www.space.com/24099-biggest-space-science-discoveries-2013.html (describing six scientific discoveries made through investments in space during the year 2013).

4. *See, e.g.*, Barry R. Posen, *Command of the Commons: The Military Foundation of U.S. Hegemony*, INT'L SECURITY, Summer 2003, at 5, 12 ("Though the United States is not yet committed to actual combat in or from space, it spends vast amounts on reconnaissance, navigation, and communication satellites. These satellites provide a standing infrastructure to conduct military operations around the globe.").

5. Ross Andersen, *Exodus: Musk Argues that we Must put a Million People on Mars if we Are to Ensure that Humanity has a Future,* AEON (Sept. 30, 2014), http://aeon.co/magazine/technology/the-elon-musk-interview-on-mars.

6. *See* Imburgia, *supra* note 1, at 597–99 (identifying scholarly support that the effects of the cascade effect will only worsen in coming years).

7. *See* RICKY J. LEE, LAW AND REGULATION OF COMMERCIAL MINING OF MINERALS IN OUTER SPACE 96 (Ram S. Jakhu ed., 2012) ("[I]mportant fundamental terms of the [space] treaties were left vague and ambiguous . . . . Not surprisingly, however, private and commercial interests often require relative legal certainty over their rights and liabilities before being able to obtain largescale investments that commercial activity requires."); Benjamin David Landry, *A Tragedy of the Anticommons: The Economic Inefficiencies of Space Law*, 38 BROOK. J. INT'L L. 523, 528 (2013) (noting that currently "each state has an equal right to the 'benefits' derived from outer space" while "national sovereignty is prohibited"). *But see* Ashlee Vance, *Revealed: Elon Musk's Plan to Build a Space Internet*, BLOOMBERG BUS. (Jan. 16, 2015, 7:50 PM), http://www.bloomberg.com/news/articles/2015-01-17/elon-musk-and-spacex-plan-a-space-internet (describing Elon Musk's plan to place hundreds of satellites into space for internet purposes). Vance notes that Musk's satellites will likely be positioned in low earth orbit. This accounts for his willingness to invest more than those interested in GEO satellites, which must be built for long-term use and accordingly cost more. *See generally* Rolfe Winkler & Andy Pasztor, *Elon Musk's Next Mission: Internet Satellites*, WALL STREET J. ONLINE (Nov. 7, 2014, 6:35 PM), http://www.wsj.com/articles/elon-musks-next-mission-internet-satellites-1415390062 ("Musk and Wyler have discussed launching around 700 satellites, each weighing less than 250 pounds . . . . That is about half the size of the smallest communications satellites now in commercial use.").

with the economic benefits gained from utilizing outer space as a resource.[8] Rather than allowing for the private appropriation of space, the "Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies," also known as the Outer Space Treaty, which governs actions taken in space, essentially requires that all property remain communal.[9] The communal approach to this area of space has affected the method of distributing geostationary Earth orbit (GEO) zones.[10] The International Telecommunications Union (ITU), an agency created during the 1860's to help facilitate telegraph communications, now works to help companies find orbital zones and frequencies that are not currently in use by other GEO satellites, but the ITU does not confer upon such companies a property right in either the frequencies or orbital zones.[11] The current method of GEO allocation has created a number of problems including the increasing number of non-operational satellites, and debris resulting from satellite collisions.[12] The current orbital zone surrounding Earth

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8. *See, e.g.*, Julie A. Jiru, *Star Wars and Space Malls: When the Paint Chips Off a Treaty's Golden Handcuffs*, 42 S. TEX. L. REV. 155, 157 (2000) (describing some of the numerous benefits available to entities utilizing the moon and space generally).

9. *See* Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, Jan. 27, 1967, 18 U.S.T. 2410 [hereinafter Outer Space Treaty] ("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."). *But see* LEE, *supra* note 7, at 166–69 (discussing how, in contrast to its prohibition on claims of sovereignty regarding celestial bodies, the treaty likely does not foreclose the possibility of either private or governmental appropriation of property in space).

10. *See generally* Roberts, *supra* note 1, at 1111 ("It is important to note that the ITU process does not, strictly speaking, allocate the frequencies or orbital positions that it registers.").

11. *Id.* at 1106, 1111.

12. *Id.* at 1124. *But cf. Orbital Debris Frequently Asked Questions*, NASA ORBITAL DEBRIS PROGRAM OFF, http://orbitaldebris.jsc.nasa.gov/faqs.html#14 (last updated Mar. 2012) ("Our ability to detect orbital debris [in GEO] is limited, but studies indicate that the orbital debris population is probably less severe there than in low Earth orbit. However, since the geostationary orbit is a special natural resource, many spacecraft operators boost their old spacecraft into higher, disposal orbits at the end of their mission.").

contains over 20,000 pieces of debris.[13] While much of this debris remains in low Earth orbit (LEO), "the unique utility of the geostationary orbit has resulted in high concentrations of debris being located [in geostationary orbit]."[14] Orbital debris poses a severe threat to U.S. national security, and will present problems to future space operations.[15] While different programs have been offered to solve the orbital debris problem, none of these solutions focuses on whether GEO should be considered private or public property.[16] In order to choose an effective and just solution to the problems facing GEO, it is important to understand whether GEO exhibits the same kinds of qualities found in areas capable of private ownership or

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13. STEVEN A. HILDRETH & ALLISON ARNOLD, CONG. RESEARCH SERV., R43353, THREATS TO U.S. NATIONAL SECURITY INTERESTS IN SPACE: ORBITAL DEBRIS MITIGATION AND REMOVAL 2 (2014) ("Today, the Space Surveillance Network tracks more than 23,000 objects 10 cm in diameter or larger in orbit around the Earth. Of those, only about 1,100 (5%) are active satellites. The rest is orbital debris."). *See generally* Karl Tate, *Space Junk Explained: How Orbital Debris Threatens Future of Spaceflight*, SPACE.COM (Oct. 1, 2013, 5:49 PM), http://www.space.com/23039-space-junk-explained-orbital-debris-infographic.html ("A 4-inch-wide (10 cm) particle impacting a spacecraft would likely result in a catastrophic disintegration.").

14. Roberts, *supra* note 1, at 1125.

15. *See* Theresa Hitchens, *Space Debris*, GLOBAL NETWORK AGAINST WEAPONS & NUCLEAR POWER IN SPACE (Aug. 2005), http://www.space4peace.org/articles/debris_facts.htm ("The amount of space junk is increasing by about 5 percent per year; meaning that by the end of the century a satellite in GEO will have a 40 percent chance of being struck during its operational life-time."); William J. Lynn, III, *A Military Strategy for the New Space Environment*, WASH. Q., Summer 2011, at 7 ("Space systems enable our modern way of war. They allow our warfighters to strike with precision, to navigate with accuracy, to communicate with certainty, and to see the battlefield with clarity. Without them, many of our most important military advantages evaporate.").

16. *See, e.g.*, Roberts, *supra* note 1, at 1135 ("Permitting available orbital positions and frequencies to be auctioned instead of simply coordinated among competing applicants enhances the procedural efficiency of the process, eliminates the substantive market subsidy, reduces the likelihood of conflict within the international community, and allows for the allocation of the benefits of geostationary communications on a more equitable basis."); Gabrielle Hollingsworth, Comment, *Space Junk: Why the United Nations Must Step in to Save Access to Space*, 53 SANTA CLARA L. REV. 239, 264 (2013) ("The best option for UN COPUOS, then, is to develop a stronger, clearer, more uniform binding regime to deal with space debris specifically."); Mark J. Sundahl, Note, *Unidentified Orbital Debris: The Case for a Market-Share Liability Regime*, 24 HASTINGS INT'L & COMP. L. REV. 125, 138 (2000) ("Market-share liability provides the only fair and effective solution to the unidentified debris problem.").

whether GEO exhibits the kinds of qualities found in areas foreclosed to privatization.[17]

This Note seeks to determine whether the current, communal, approach to property rights in GEO accurately reflects the principles underlying the division between public and private goods. The current law of property in space has not only limited investment, but has also led to an apathetic approach to the communal area, necessitating a reconsideration of the presumptions underlying the initial classification of space as communal. Section I of this Note will first examine the current problem facing GEO, and describe the international approach to property rights in space. Second, this Note will detail two natural law approaches to property acquisition, and examine Harold Demsetz's utilitarian approach to the creation of property rights. Section II of this Note will first analyze whether satellite operators meet the criteria distilled by the natural law theorists as being sufficient for the creation of a property right. Then, this Note will determine if a property interest is warranted under a utilitarian approach to property. This Note will conclude that, due to the inherently scarce and labor-intensive nature of GEO as well as the numerous economic benefits derived from privatization, the orbital zone should be privatized.

I. BACKGROUND

A. THE NATURE OF GEOSTATIONARY EARTH ORBIT

GEO is an orbital zone above Earth's equator where the satellite remains above the same point on Earth.[18] GEO is

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17. FRÉDÉRIC BASTIAT, *The Law, in* "THE LAW", "THE STATE", AND OTHER POLITICAL WRITINGS, 1843–1850, at 107, 108 (Jacques de Guenin ed., Jane & Michel Willems trans., Liberty Fund, Inc. 2012) (1850) ("Each of us certainly holds from nature and God the right to defend our person, our freedom, and our property . . . . [S]ince force on the individual level cannot legitimately be aimed at the person, freedom, or property of another individual, by the same argument force cannot legitimately be used collectively to destroy the person, freedom, or property of either individuals or classes."). It follows that if the state is to act to protect or eliminate a property right, we must first determine whether there exists a right at all, lest the government take an unjust action.

18. *Planetary Orbits*, NASA JET PROPULSION LABORATORY, http://www.jpl.nasa.gov/basics/bsf5-1.php (last visited Oct. 13, 2015) ("To achieve a geostationary orbit, a geosynchronous orbit is chosen with an eccentricity of zero, and an inclination of either zero, right on the equator, or else low enough that the spacecraft can use propulsive means to constrain the

important for satellite communication because it allows permanent installations on Earth to point directly to the satellite, receiving information without constant re-calibration.[19] The number of satellites that can use a GEO at a time is limited to roughly 2000 satellites because of the potential for communication frequency interference.[20] Currently, the approximate number of active satellites occupying a geostationary orbit is 412.[21] GEO differs from LEO in that LEO objects are closer to Earth's surface and do not remain fixed over a specific location.[22] The different movement of these satellites is due to the increased speed at which they must travel so that they do not fall to the surface.[23] While GEO satellites are typically used for communications, LEO satellites are often used for experimentation because of the relative ease

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spacecraft's apparent position so it hangs seemingly motionless above a point on Earth.").

19. Michael J. Finch, Comment, *Limited Space: Allocating the Geostationary Orbit*, 7 NW. J. INT'L L. & BUS. 788, 788 (1986) ("The importance of the geostationary orbit becomes apparent when one considers that most telecommunications, broadcasting, and weather satellites must be in an orbit over a specific point of the earth, usually over a receiving station."); *Satellite Orbits*, EMEA SATELLITE OPERATORS ASS'N, http://www.esoa.net/Orbits.htm (last visited Oct. 14, 2015) ("The geostationary orbit is useful for communications applications because ground based antennas, which must be directed toward the satellite, can operate effectively without the need for expensive equipment to track the satellite's motion.").

20. Finch, *supra* note 19, at 789 ("The reason for this limitation is that, while occupying a slot in space, a satellite requires a specific radio frequency in the electromagnetic spectrum. These radio frequencies must be different and the satellites must be approximately eighteen kilometers apart so that there is no interference between the different transmissions. Theoretically, the total number of satellites capable of remaining in geostationary orbit is approximately 2000.").

21. *List of Satellites in Geostationary Orbit*, SATELLITE SIGNALS (Aug. 19, 2015), http://www.satsig.net/sslist.htm.

22. Mak King & Michael J. Riccio, *Military Satellite Communications: Then and Now*, CROSSLINK, Spring 2010, at 40, 44, http://www.aerospace.org/wp-content/uploads/crosslink/V11N1.pdf ("When a satellite orbits at less than GEO altitude, its orbital period is less than Earth's period of rotation, so it moves across the sky. The lower the altitude, the faster the satellite moves.").

23. DAVID WRIGHT ET AL., THE PHYSICS OF SPACE SECURITY 20 (2005) ("Since the gravitational pull grows weaker the further a satellite is from Earth, the centrifugal force needed to balance gravity also decreases with distance from the Earth. The higher the satellite's orbit, the lower its orbital speed.").

with which they may be accessed.[24] However, because of these satellites' proximity to the Earth's surface, their orbits decay more quickly than those of GEO satellites,[25] which remain in orbit essentially forever.[26] The chance that non-operational satellites or other debris will remain in geostationary orbit forever is problematic for future investors hoping to use the limited spaces remaining for their own satellites.[27]

B. THE PROBLEMS FACING SATELLITES IN GEO

With the investment of satellites in space comes an increase in debris.[28] Debris is largely made up of inactive payloads, rocket bodies, and fragmented satellite components

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24. *Types of Orbits*, IOWA ST. UNIV.: POLARIS PROJECT, http://www.polaris.iastate.edu/EveningStar/Unit4/unit4_sub3.htm (last visited Oct. 26, 2015) ("Low Earth Orbit is used for things that we want to visit often with the Space Shuttle, like the Hubble Space Telescope and the International Space Station . . . . It is also about the only way we can have people go up, do experiments, and return in a relatively short time.").

25. *Id.* ("Even though the amount of atmosphere is far too little to breath [sic], there is enough to place a small amount of drag on the satellite or other object. As a result, over time these objects slow down and their orbits slowly decay.").

26. Manpreet Kaur Thind & C. Lokesh, *Removal of Space Debris Using Laser*, 3 ADVANCES AEROSPACE SCI. & APPLICATIONS 107, 108 (2013) ("Satellites in GEO drift along after the end of their service life coming to the so called potential holes where satellites may remain forever."); *Orbital Debris Frequently Asked Questions*, *supra* note 12 ("The higher the altitude, the longer the orbital debris will typically remain in Earth orbit. Debris left in orbits below 600 km normally fall back to Earth within several years. At altitudes of 800 km, the time for orbital decay is often measured in decades. Above 1,000 km, orbital debris will normally continue circling the Earth for a century or more.").

27. W. Flury et al., *Searching for Small Debris in the Geostationary Ring*, EUR. SPACE AGENCY BULL., Nov. 2000, at 92, 99, http://www.esa.int/esapub/bulletin/bullet104/flury104.pdf ("The population of anthropogenic objects in the geostationary ring is steadily increasing. There is no natural cleaning mechanism, such as air-drag, which removes objects from the ring . . . . About 250–270 satellites in GEO are controlled, but more than 100 have been left there at their end-of-life rather than being transferred to a 'disposal orbit'. The latter constitute a hazard for operational spacecraft in GEO and are therefore a burden for the future.").

28. Meghan R. Plantz, Note, *Orbital Debris: Out of Space*, 40 GA. J. INT'L & COMP. L. 585, 592 (2012) ("As the demand for and use of orbital space increases, due in part to advancing technology that requires satellite operations, the potential for orbital debris likewise increases. The increasing accumulation of orbital debris directly correlates with the increasing risk of a debris collision with spacecraft.").

created by accidental collisions.[29] Debris orbiting Earth mostly occupies the LEO zone, however, GEO's special attributes mean that large clusters of debris have accumulated there as well.[30] The current mass of debris is problematic because it creates a risk of damaging satellites in orbit,[31] and, as a result, requires satellite operators to undertake expensive protection measures like incorporating satellite shielding and maneuvering capabilities.[32] Additionally, this increasing risk to satellites reduces the incentive to invest in GEO positions because the lifespan of the satellite is key to its profitability.[33] Ultimately, action must be taken soon to curb the threat to current and future satellites because debris will continue to collide with satellites, producing more debris in a cascade effect, which could, in turn, prevent access to certain orbits.[34]

C. THE CURRENT STATE OF SPACE LAW

The ambiguity inherent in the current approach to space law reflects the desire to quickly reduce tensions between the United States and Russia during the Cold War.[35] These two

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29. *Id.*

30. *See* Roberts, *supra* note 1, at 1125 ("[T]he unique utility of the geostationary orbit has resulted in high concentrations of debris being located there.").

31. *See, e.g.*, Imburgia, *supra* note 1, at 596 ("Unfortunately, the space debris problem is not limited to near misses. On February 10, 2009, five hundred miles above Siberia, a Russian communications satellite collided with a privately owned Iridium telecommunications satellite 'in an unprecedented orbital accident that would have been visible from the Earth.'").

32. *See* Jared B. Taylor, Note, *Tragedy of the Space Commons: A Market Mechanism Solution to the Space Debris Problem*, 50 COLUM. J. TRANSNAT'L L. 253, 262 (2011) ("In response to these risks, satellite and spacecraft manufacturers implement several defensive mechanisms to reduce the probability of losing spacecraft to space debris: debris shielding, evasive maneuvering and debris monitoring. Each of these defense mechanisms, however, entails an entirely new set of costs.").

33. *See* Eur. Space Agency [ESA], *Position Paper on Space Debris Mitigation: Implementing Zero Debris Creation Zones*, at 16, ESA SP-1301 (Oct. 15, 2005), http://www.esa.int/esapub/sp/sp1301/sp1301.pdf ("Net Present Value (NPV) and Return on Investment (ROI) are both seen to decline dramatically as the effective lifetime of a communication satellite is reduced in order to move to a disposal orbit.").

34. *See generally* Imburgia, *supra* note 1, at 598 ("If space debris is not immediately countered by preventative and removal measures, the cascade effect could occur in little more than a decade.").

35. *See* Alan Wasser & Douglas Jobes, *Space Settlements, Property Rights, and International Law: Could a Lunar Settlement Claim the Lunar Real*

countries, along with others, signed the Outer Space Treaty in 1967.[36] The Outer Space Treaty prevents countries from using space for military purposes, and requires that all uses of space "shall be carried out for the benefit and in the interests of all countries . . . and shall be the province of all mankind."[37] The statement that space "shall be the province of mankind" is mirrored in another provision of the treaty, which states, "[o]uter space . . . is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means."[38] This treaty provision is subject to differing interpretations;[39] however, when the treaty is applied to GEO, most governments and international agencies have acted as though the provision precludes private ownership.[40]

Estate It Needs to Survive?, 73 J. AIR L. & COM. 37, 59, 41 (2008) ("In fact, the framers of the Outer Space Treaty were deliberately ambiguous about private property, as opposed to nationally owned property, to allow ratification of the Treaty by both the U.S., which wanted to encourage private enterprise in space, and the U.S.S.R., which did not . . . . The treaty was negotiated by the United States and the Soviet Union in order to end the costly space race between them."); *cf.* Outer Space Treaty, *supra* note 9 (reflecting Cold War-era fears of space warfare and highlighting several times the desire for space exploration to be for "peaceful purposes").

36. *See* Outer Space Treaty, *supra* note 9; Bryon C. Brittingham, *Does the World Really Need New Space Law?*, 12 OR. REV. INT'L L. 31, 34 (2010) ("The first and most important of these treaties is . . . the Outer Space Treaty. It was drafted by the U.N. Committee on the Peaceful Use of Outer Space (COPUOS). This treaty has been ratified by 100 nations, including all of the nations involved in space, so it is widely accepted as the international law governing outer space activities.").

37. Outer Space Treaty, *supra* note 9, at art. I.

38. *Id.* at art. II.

39. *See* Landry, *supra* note 7, at 533 ("There has been debate over whether this anti-appropriation language applies to public *and* private entities, with scholars coming to conflicting conclusions. So even if private entities are able to retain most of their profits through interpretation of Article I, it is uncertain whether they can take property without staking a sovereign claim to it."); Scott J. Shackelford, *The Tragedy of the Common Heritage of Mankind*, 28 STAN. ENVTL. L.J. 109, 142 (2009) ("Interpreting Article II has engendered debates among academics and policymakers. Some see it as giving private interests freedom of action in space, so long as a government supervises but does not 'nationalize' new territory. Others believe this clause hinders economic development by voiding property rights and making entrepreneurs less apt to invest.").

40. *See, e.g.*, 47 C.F.R. § 25.158 (2014) (providing licenses but not a property right in geosynchronous orbit positions); Roberts, *supra* note 1, at 1111. *But see* Declaration of the First Meeting of Equatorial Countries, I.T.U. Doc. WARC-BS 81-E (Dec. 3, 1976), http://www.jaxa.jp/library /space_law/chapter_2/2-2-1-2_e.html [hereinafter Bogotá Declaration]

Subsequent treaties have attempted to clarify provisions of the current ambiguous space law concerning the privatization of space, asserting that there cannot be private property in space, but these efforts received little international support from major spacefaring nations.[41] As a result, the interpretive value of these later treaties is dubious at best.[42]

In contrast to passively assuming GEO is not subject to private or national appropriation, most countries actively argued against national appropriation when eight equatorial countries attempted to assert sovereign control over the orbital zone.[43] In response to what the equatorial nations perceived as an inequitable distribution of GEO slots, these countries declared that the GEO zones above their land were their sovereign territory.[44] These countries based their claim of sovereignty on the theory that GEO is not a part of space since the effect of GEO depends solely upon Earth's gravitational

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(declaring that a number of equatorial nations assert an ownership interest in the GEO above their countries).

41. *See, e.g.*, Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, *opened for signature* Dec. 18, 1979, 1363 U.N.T.S. 22 (notably absent 'major spacefaring nation' signatories: United States, China, Russia, India, any European Space Agency members). *See generally* Vienna Convention on the Law of Treaties, May 23, 1969, 1155 U.N.T.S. 331, at § 3, art. 31 (describing how later treaties may be used to define the context of an earlier treaty and assist in interpretation).

42. *See* MATTHEW J. KLEIMAN ET AL., THE LAWS OF SPACEFLIGHT: A GUIDEBOOK FOR NEW SPACE LAWYERS 66 (2012) ("None of the major space powers are party to the Moon Agreement, so it is generally considered dormant.").

43. *See* Finch, *supra* note 19, at 790 ("Such a claim of sovereignty is rejected by nations that have launched satellites into geostationary orbit and developing nations which have not yet launched such satellites. A majority of nations believe the geostationary orbit is a part of outer space and, as such, is governed by the provisions of the 1967 Outer Space Treaty."); Nima Nayebi, *The Geosynchronous Orbit and the Outer Limits of Westphalian Sovereignty*, 3 HASTINGS SCI. & TECH. L.J. 471, 489 (2011) ("In the end, the overwhelming consensus at the Subcommittee was that claims of sovereignty over the GSO [Geostationary Synchronous Orbit; synonymous with GEO] or any other part of outer space are incompatible with the express and implied spirit of the Outer Space Treaty and should be dismissed.").

44. Bogotá Declaration, *supra* note 40 ("The solutions proposed by the International Telecommunications Union . . . are at present impracticable and unfair and would considerably increase the exploitation costs of this resource especially for developing countries that do not have equal technological and financial resources as compared to industrialized countries, who enjoy an apparent monopoly in the exploitation and use of its geostationary synchronous orbit.").

field.[45] Additionally, the Bogotá Declaration suggests that these GEO zones are akin to natural resources because of their scarcity.[46] Under this theory, the Outer Space Treaty does not govern GEO because GEO is considered a part of Earth.[47] Critics have pointed out that "*all* orbits around the earth rel[y] exclusively on the gravity of Earth and, accordingly, this is no justification for the singular treatment for the geostationary orbit."[48] While the means by which these eight countries asserted their sovereign rights might be problematic, their underlying premise—that the current method of GEO distribution is inequitable—remains true.[49]

D. COMPETING THEORIES ABOUT THE NATURE OF PROPERTY

1. Natural Law Theories of Property

In determining whether newly discovered property should be private or communal, the two relevant theories rest on natural law and economics of law.[50] Natural law is based on the fundamental principle that there is a readily discernable truth that governs relationships among people.[51] John Locke argues that the inherent equality of man implies that nature is not

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45. *Id.* ("[G]eostationary synchronous orbit is a physical fact linked to the reality of our planet because its existence depends exclusively on its relation to gravitational phenomena generated by the earth, and that is why it must not be considered part of the outer space.").

46. *Id.* ("The geostationary orbit is a scarce natural resource, whose importance and value increase rapidly together with the development of space technology and with the growing need for communication.").

47. *Id.*

48. LEE, *supra* note 7, at 171.

49. *Id.* at 176–77 ("However, even though these claims have been widely rejected, it demonstrates a deep sentiment among some States that the space law framework under the Outer Space Treaty does not adequately protect the interests of the developing States . . . .").

50. *See* Harold Demsetz, *Toward a Theory of Property Rights*, AM. ECON. REV., May 1967, at 347, 350 (describing the economic theory); JOHN LOCKE, THE SECOND TREATISE OF GOVERNMENT: AN ESSAY CONCERNING THE TRUE ORIGINAL, EXTENT AND END OF CIVIL GOVERNMENT 4 (J. W. Hough ed., Basil Blackwell & Mott, Ltd. 1966) (1690) (describing the natural law theory).

51. LOCKE, *supra* note 50, at 9 ("The state of Nature has a law of Nature to govern it . . . ."). *See also* HUGO GROTIUS, THE FREEDOM OF THE SEAS OR THE RIGHT WHICH BELONGS TO THE DUTCH TO TAKE PART IN THE EAST INDIAN TRADE 7 (James Brown Scott ed., Ralph Van Deman Magoffin trans., Oxford Univ. Press 1916) (1633) (describing how God has handed down certain laws which govern the relationships among men).

initially under the exclusive control of any one person.[52] Rather than suggesting that this leaves everything in communal ownership, Locke argues that, in the state of nature, things are simply not owned at the outset.[53] However, once an individual controls something such that he makes use of it, benefitting from it, the property becomes his; this is the labor theory of value.[54] Locke expands on this, concluding with the suggestion that an investment of labor will confer a property right over that which is removed from the state of nature.[55] Locke identifies the initial input of labor as the bright-line at which a property is conferred.[56] These same principles apply to land as they do to objects in the world.[57] It should be noted that Locke's theory of natural law, as outlined by Locke, is deontological in nature, meaning that the conferral of a property right is not determined by who can best utilize the space, but by the simple test of which person first invested labor.[58] This deontological

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52. *See* LOCKE, *supra* note 50, at 25 ("[N]obody has originally a private dominion exclusive of the rest of mankind in any of [the Earth's natural resources] as they are thus in their natural state . . . .").

53. *See* John T. Sanders, *Justice and the Initial Acquisition of Property*, 10 HARV. J.L. & PUB. POL'Y 367, 375 (1987) ("If Locke had really thought that resources were communally owned before private acquisition, then he would have been driven to the conclusion that everyone's permission must be asked before an individual's labor was mixed with such resources. Since this conclusion plays no part in his theory, he can not have thought that resources were communally owned in the first place."). *But see* Jeffrey M. Gaba, *John Locke and the Meaning of the Takings Clause*, 72 MO. L. REV. 525, 536 (2007) ("Given these premises - a world of communal property to which each individual had an equal claim - the justification of private property was difficult. Locke solved this problem, in a way no predecessor had, through his 'labor' theory.").

54. LOCKE, *supra* note 50, at 25 ("Whatsoever, then, he removes out of the state that Nature hath provided and left it in, he hath mixed his labour with it, and joined to it something that is his own, and thereby makes it his property. It being by him removed from the common state Nature placed it in, it hath by this labour something annexed to it that excludes the common right of other men.").

55. *Id.*

56. *See id.*

57. *Id.* at 28 ("But the chief matter of property being now not the fruits of the earth and the beasts that subsist on it, but the earth itself, as that which takes in and carries with it all the rest, I think it is plain that property in that too is acquired as the former. As much land as a man tills, plants, improves, cultivates, and can use the product of, so much is his property. He by his labour does, as it were, enclose it from the common.").

58. *See id.* at 38–40 (describing how money creates a feedback mechanism allowing actors to exchange goods they can no longer use for goods which have

approach is based on considerations of justice that require a recognition of a person's labor so long as that labor does not unjustly deprive another of their pursuits.[59]

One issue with Locke's approach to property is determining how much labor is enough to confer a right of ownership.[60] Some theories of Locke's definition of labor claim that improvement of the object is a necessary condition for ownership, though these readings often do not take into account key passages of Locke's work that suggest otherwise.[61] John Sanders' article on the justness of Locke's theory outlines the most consistent approach to the definition of labor in Locke's theory of property acquisition, claiming that an investment of labor "indicates an intent to do something or produce something that is important to the laborer," and that considerations of justice preclude others from preventing a pursuit of the laborers end.[62] Under Sanders' interpretation of Locke's theory, not only must a laborer actually invest some kind of effort into a thing, but they must do so with an intent of

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more value to them; suggesting that the inefficiencies created by an overinvestment of one person do not deprive him of his rights to the spoils of his labor); Sanders, *supra* note 53, at 396 ("The labor-mixing criterion derives its force from the fact that the investment of labor almost always indicates an intent to do something or produce something that is important to the laborer. In general, justice requires that we respect such projects, at least where the projects themselves do not involve injustice to others, whether intended or not. To acknowledge that a person acquires property through mixing labor with unowned resources is simply to acknowledge the injustice of interfering with projects that other people deem important, or of robbing them of the fruits of those projects.").

59. *See* Sanders, *supra* note 53.

60. *See, e.g.*, ROBERT NOZICK, ANARCHY, STATE, AND UTOPIA 175 (1974) (discussing the problem of limiting the labor theory and eventually asking, "[i]f I own a can of tomato juice and spill it in the sea so that its molecules . . . mingle evenly throughout the sea, do I thereby come to own the sea, or have I foolishly dissipated my tomato juice?"); Kojo Yelpaala, *Owning the Secret of Life: Biotechnology and Property Rights Revisited*, 32 MCGEORGE L. REV. 111, 150 (2000) ("Although Locke did not define labor, examples of activities he considered labor suggest that he had set a very low threshold for conduct that would constitute labor. For him, the simple act of picking up acorns was sufficient labor to confer property rights over them.").

61. *Compare* Robert Thompson, *Property Theory and Owning the Sandy Shore: No Firm Ground to Stand on*, 11 OCEAN & COASTAL L.J. 47, 55 (2006) ("Thus, Locke's labor theory essentially creates the elements for prior appropriation: one finds land that is unoccupied (or at least inadequately occupied), encloses it, and improves it with one's labor."), *with* LOCKE, *supra* note 50, at 25.

62. Sanders, *supra* note 53, at 396.

doing something important as opposed to simply converting the thing into property.[63]

Locke's theory places one limitation on the initial acquisition of property: a person may convert as much from the state of nature to his own property as possible, "at least where there is enough, and as good left in common for others."[64] Locke derives this limitation from his foundation that the purpose of private property is the public welfare, concluding that the acquisition of private property should not be used in opposition to this end.[65] While Locke discusses this limitation on the acquisition of property, he also concludes that the exchange of goods will suffice to see the excess used such that its taking will not violate the limitation.[66] Essentially, Locke argues that surplus creates the need for money, which will be used to

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63. *See id.* The value of this additional component of the definition of labor is dubious since all labor is undertaken in the pursuit of an end, whether the end is personal or altruistic. *See* ARISTOTLE, NICOMACHEAN ETHICS, bk. I, ch. 1 (Albert Keith Whitaker ed., Joe Sachs trans., Focus Publishing 2002) (c. 350 B.C.E.) (discussing the different kinds of possible ends in relation to others). Sanders uses this approach to distinguish between individuals who take action for the sake of converting the state of nature into property, from those who take action in order to create a benefit, which does make more sense. Sanders, *supra* note 53, at 396.

64. LOCKE, *supra* note 50, at 25, 38 ("For this 'labour' being the unquestionable property of the labourer, no man but he can have a right to what that is once joined to, *at least where there is enough, and as good left in common for others* . . . . He that gathered a hundred bushels of acorns or apples had thereby a property in them; they were his goods as soon as gathered. He was only to look that he used them before they spoiled, else he took more than his share, and robbed others.") (emphasis added).

65. *See* LOCKE, *supra* note 50, at 24–25 ("The earth and all that is therein is given to men for the support and comfort of their being . . . . [Y]et being given for the use of men, there must of necessity be a means to appropriate them some way or other before they can be of any use, or at all beneficial, to any particular men."); Sanders, *supra* note 53, at 372 ("It is a just way of acquiring property, so long as one does not lose sight of the whole purpose of private property: human welfare. Where private property comes into conflict with human welfare, private property loses."). *See also* NOZICK, *supra* note 60, at 178 ("Whether or not Locke's particular theory of appropriation can be spelled out so as to handle various difficulties, I assume that any adequate theory of justice in acquisition will contain a proviso similar to the weaker of the ones we have attributed to Locke.").

66. *See* LOCKE, *supra* note 50, at 39 ("And thus came in the use of money, some lasting thing that men might keep without spoiling, and that, by mutual consent, men would take in exchange for the truly useful but perishable supports of life.").

ensure an efficient use of resources.[67] Thus, so long as there is the property interest created in GEO is freely alienable, it will not fall into unnecessary disuse and the proviso is satisfied.[68]

While this specific restriction on Locke's theory may not apply, other natural rights theorists have argued there are restrictions on the initial acquisition of property in certain contexts. Such a theory underlies the law of the sea, which, in turn, serves as a foundation for the current space law regime.[69] The law of the sea was initially recognized by Hugo Grotius on natural law principles, which held, "[e]very nation is free to travel to every other nation, and to trade with it."[70] Grotius further argues that if the use of a thing implies the exclusion of others' uses, then that thing can be privately owned.[71] Building from these premises, Grotius argues that occupation and exclusion are necessary conditions for the creation of property rights.[72] This explanation may suggest a difference between

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67. *See* Gaba, *supra* note 53, at 539 ("If property could be transformed into a non-perishable and productive form, then the spoilage proviso would be satisfied . . . . By creating systems of currency, humans could transform property into a form that would never spoil but could still be put to productive use in satisfying the wants of individuals.").

68. *See id.*

69. *See* Shackelford, *supra* note 39, at 141 ("The governing treaties of space law share many similarities with [United Nations Convention on the Law of the Sea] and the [Antarctica Treaty System].").

70. GROTIUS, *supra* note 51; *see* Lea Brilmayer & Natalie Klein, *Land and Sea: Two Sovereignty Regimes in Search of a Common Denominator*, 33 N.Y.U. J. INT'L L. & POL. 703, 707 (2001) ("Grotius noted that use of the oceans for fishing or for navigation by one did not preclude their use by others. The oceans were created by nature in such a state that their usage could not be exclusive but belonged to all humankind.").

71. *Id.* at 24 ("For since there are some things, the use of which consists in their being used up, either because having become part of the very substance of the user they can never be used again, or because by use they become less fit for future use, it has become apparent, especially in dealing with the first category, such things as food and drink for example, that a certain kind of ownership is inseparable from use.").

72. *Id.* at 27 ("The first is, that that which cannot be occupied, or which never has been occupied, cannot be the property of any one, because all property has arisen from occupation. The second is, that all that which has been so constituted by nature that although serving some one person it still suffices for the common use of all other persons, is today and ought in perpetuity to remain in the same condition as when it was first created by nature."). *See* Brilmayer, *supra* note 70, at 707 ("[T]hings that cannot be seized or enclosed cannot become property."); Adam Mossoff, *What Is Property? Putting the Pieces Back Together*, 45 ARIZ. L. REV. 371, 385 (2003) ("The ocean is incapable of being the subject of *dominion* because it is

Locke's and Grotius' basic theories of property, however the fundamental underpinning of their theories is the same: the right to exclude others is necessary for property rights.[73] Locke's theory of labor closely matches Grotius' theory because, for Locke, labor itself implies exclusion of others.[74] However, there is a tension on this point because Grotius does not argue that labor is enough to confer a property right, and his conclusion essentially contradicts Locke's bright-line claim.[75] Applying these fundamental principles to the law of the sea, Grotius argues, "all that which has been so constituted by nature that although serving some one person it still suffices for the common use of all other persons, is today and ought in perpetuity to remain in the same condition as when it was first created by nature."[76] Grotius recognizes one exception to this statement: that if a person does come to occupy something generally used in common, then that person gains an exclusive right to use that area for as long as the area remains occupied.[77] Grotius finds that all men hold the sea in common because it typically cannot be enclosed, and its use by one person does not foreclose its use to others.[78] These qualities

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incapable of being occupied, which means that it is incapable of an exclusive possession that would give rise to a right to property. Without the ability to exclude others physically, according to the first application of the modern concept of property, there can be no right to property. The right to property is analytically predicated upon the right to exclude.").

73. *See* Mossoff, *supra* note 72, at 386 ("Although he parts company with Grotius . . . in the details, Locke begins from the same theoretical starting point.").

74. *See id.* at 389 ("In this context, the 'mixing labor' argument reflects the premises of *suum* and *dominion* that explicitly take center stage in Grotius's and Pufendorf's arguments for property."). *Compare id.* at 389 ("Locke is clear that 'labor' begets the concept of property by extending one's exclusive moral claim to one's life and liberty over material objects in the world at large."), *with* GROTIUS, *supra* note 51, at 24 ("For 'own' implies that a thing belongs to some one person, in such a way that it cannot belong to any other person.").

75. *See* GROTIUS, *supra* note 51, at 30 (arguing that even if someone invests labor into building something in the sea, that building is only sufficient to confer a limited right to the area).

76. *Id.* at 27.

77. *Id.* at 30 ("If any part of these things is by nature susceptible of occupation, it may become the property of the one who occupies it only so far as such occupation does not affect its common use.").

78. *Id.* at 28 ("For the same reasons the sea is common to all, because it is so limitless that it cannot become a possession of any one, and because it is adapted for the use of all . . . .").

require the sea to be considered common property and not privatized.[79] This does not preclude the extension of a country's legal jurisdiction into the sea, but only precludes the state and private individuals from exercising an ownership interest in the sea.[80]

This limitation is expressed in the Outer Space Treaty.[81] The non-appropriation principles of the treaty are based on the theory that space, like the sea, is a potential medium of transport, and that the occupation of one small part of the area will not foreclose another's use of the remaining portions of space.[82] The current GEO regulation regime also follows the

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79. *Id.* at 34 ("Therefore the sea is one of those things which is not an article of merchandise, and which cannot become private property."). Jonathan Thomas notes that Grotius explicitly relates the sky and the sea, concluding, "[t]herefore, the skies and the seas are not susceptible to private occupation 'because it is so limitless that it cannot become a possession of anyone,' and 'it is adapted for the use of all.' Under these auspices, the skies and seas are not subject to national appropriation because they cannot be occupied definitively and are provided by nature." Jonathan C. Thomas, *Spatialis Liberum*, 7 FLA. COASTAL L. REV. 579, 595–96 (2006). *But cf.* Shackelford, *supra* note 39, at 124 (suggesting that changes in technology and ability to occupy formerly impossible to occupy zones challenges the fundamental premise of Grotius' theory on the law of the sea).

80. *See* GROTIUS, *supra* note 51, at 35 (contrasting the contractual rights to jurisdiction in piracy matters with claims of private property rights).

81. *See* Outer Space Treaty, *supra* note 9, at pmbl., art. 12 ("Recognizing the common interest of all mankind in the progress of the exploration and use of outer space for peaceful purposes, . . . All stations, installations, equipment and space vehicles on the Moon and other celestial bodies shall be open to representatives of other States Parties to the Treaty on a basis of reciprocity."); *see also* Shackelford, *supra* note 39, at 142 ("Space law is based on the principle that outer space, including celestial bodies, should remain freely accessible for exploration and use by all peoples. This is similar to the original law of the sea."); Brandon C. Gruner, Comment, *A New Hope for International Space Law: Incorporating Nineteenth Century First Possession Principles into the 1967 Space Treaty for the Colonization of Outer Space in the Twenty-First Century*, 35 SETON HALL L. REV. 299, 322–23 (2004) ("The final and most important principle, i.e., that nations cannot appropriate portions of space, stems from the idea that outer space is res communis.").

82. *See* Shackelford, *supra* note 39, at 142; Thomas, *supra* note 79, at 601–02 ("For example, both sea and outer space are mediums of travel, require vessels for human transport, are perilous, and virtually unlimited in scope. Not only are there similar physical characteristics, but they also embody intangible ideas of the pursuit of exploration, possibility, expansion, technological evolution, colonization, scientific experimentation, fascination with the unknown, and increased freedom of movement. Due to these similarities, the seas are a good analogy for addressing issues which may arise from the use of outer space.").

exception proposed by Grotius, that a person may use a common area he occupies for as long as the occupation lasts, as shown by the fact that the ITU only grants temporary, forfeitable licenses to use areas of GEO.[83] While these licenses do not confer a property right, they do purport to confer a right to use an area of space; and, even though the ITU likely has no authority to exclude others from operating in the same space, the mere presence of the satellite would deter and likely prevent others from attempting to occupy the same location.[84] Thus, the Outer Space Treaty not only relies on Grotius' theory as an initial basis for preventing private ownership, but also employs the exceptions Grotius identifies.

2. Economics of Law Theory

Harold Demsetz's approach to property differs from these natural law approaches in that his theory is eminently pragmatic, holding that property rights should exist if it would be beneficial for society to have them exist.[85] While Demsetz's justification for his utilitarian theory differs from the justifications of natural law theories, both answer the same question: is it a good idea to confer property rights?[86] The main thrust of Demsetz's argument is that it is a good idea to create

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83. *See* Roberts, *supra* note 1, at 1113 ("Once an orbital position and frequencies have been registered, the registration remains in effect until the operator-defined system life expectancy has expired, or until the ITU is notified that the frequency and orbital position are no longer in use by the registrant.").

84. *Id.* at 1112–13 ("Though some obligation to accommodate remains when conflicts between early and later registrants arise, early registration affords a measure of legitimacy that supports the first registrant's negotiating position. Because the notification process affords preferential treatment to early registrants, it is often characterized as 'first come, first served.'").

85. *See* Abraham Bell & Gideon Parchomovsky, *A Theory of Property*, 90 CORNELL L. REV. 531, 548 (2005) (describing Demsetz's theory as a utilitarian or economics of law approach to property); *see also* Demsetz, *supra* note 50, at 347 ("Property rights are an instrument of society and derive their significance from the fact that they help a man form those expectations which he can reasonably hold in his dealings with others.").

86. *See* James Graham Lake, Note, *Demsetz Underground: Busking Regulation and the Formation of Property Rights*, 87 N.Y.U. L. Rev. 1100, 1106 (2012) ("Demsetz did not provide much detail about how property rights change. The most he offered was that 'the emergence of new property rights takes place in response to the desires of the interacting persons for adjustment to new benefit-cost possibilities,' suggesting that new rights are created endogenously among the resource-users themselves, a form of spontaneous private ordering.").

property rights when property is used to create an internalization of externalities.[87] Externalities, for Demsetz, mean the benefits and costs of an action, which are typically not accounted for by an actor who does not have a stake in the costs and benefits.[88] The function of granting an individual property rights is that it allows the individual to have a greater stake in the benefits and costs associated with his actions, allowing him to make more efficient choices.[89] In common areas with no property interest, actors will often ignore these externalities since their effects are typically not worth the cost of calculating the potential harm or benefit to the actor.[90] By analyzing historical examples such as hunter-gatherer tribes of Native Americans, Demsetz concludes there is a close historical relationship between increased knowledge of how to efficiently exploit resources and the conferral of property rights.[91] This suggests a possible explanation to the current problem facing GEO since the increase in knowledge of how to exploit the resources is conflicting with the lack of a private right to do so.

It is important to note that while the underlying values of the natural law theory and Demsetz's utilitarian theory are not identical, they will often lead to the same conclusion.[92] Thus, the utilitarian argument for efficiency is not inherently inconsistent with a theory of fairness expressed in the natural law theories.

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87. *See* Demsetz, *supra* note 50, at 348.

88. *Id.* ("Externality is an ambiguous concept. For the purposes of this paper, the concept includes external costs, external benefits, and pecuniary as well as nonpecuniary externalities.").

89. *Id.*

90. *Id.* ("What converts a harmful or beneficial effect into an externality is that the cost of bringing the effect to bear on the decisions of one or more of the interacting persons is too high to make it worth-while, and this is what the term shall mean here.").

91. *Id.* at 351.

92. *Compare id.* at 351 (discussing how before the advent of the fur trade, Native Americans had no need to control herds of animals in pens or other enclosures, and so allowed them to wander, taking what they needed), *with id.* at 352–53 (describing how the increase in the fur trade increased incentives to enclose herds of animals, and invest in farms requiring the cultivation of the land), *and* LOCKE, *supra* note 50, at 25–28 (describing how the investment of the land with labor, through cultivation can lead to a property right).

II. ANALYSIS

A. LOCKE'S THEORY SUGGESTS INDIVIDUALS SHOULD BE ABLE TO CONVERT GEO INTO PRIVATE PROPERTY

Analyzing the situation first from a Lockean perspective, GEO should be open to private ownership when individuals have invested their labor in the space.[93] Companies that currently have satellites in orbit have invested time and resources sufficient to attain a property right in the orbital zone.[94] Looking to the theories of Locke's work, which argue that an increase in value is a necessary condition for labor, satellites in GEO clearly meet the standard.[95] Since space is essentially void,[96] a satellite's presence will increase the value of the space by generating industry and allowing for communications and other activities, which were not possible because that space was empty to begin with.[97] One argument against this theory is that the space is at its highest value as void, since the voided area itself allows for travel through that point on future space missions.[98] However, this argument would overstate the need for a spacecraft to cross the very narrow belt of satellites in GEO.[99] It is also possible to argue

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93. *See* LOCKE, *supra* note 50, at 26.

94. *See generally The Cost of Building and Launching a Satellite*, GLOBALCOM, http://www.globalcomsatphone.com/hughesnet/satellite/costs.html (last visited Oct. 5, 2015) (describing the extensive costs that are involved in designing, launching, and maintaining a satellite).

95. *See* Thompson, *supra* note 61, at 55 (arguing that Locke's theory requires improvement before conferring a property right).

96. *See* David Ferguson, *Neil deGrasse Tyson Explains the Vacuum of Space*, RAWSTORY (Sept. 12, 2013, 13:02 ET), http://www.rawstory.com/rs/2013/09/neil-degrasse-tyson-explains-the-vacuum-of-space/ (describing how space is a vacuum and has little to no particles).

97. *See, e.g.*, WRIGHT, *supra* note 23, at 20 (explaining how GEO satellites are often used for communications).

98. *See* Janey Tracey, *Hunting Down Garbage that May Hinder Space Colonization*, OUTER PLACES (Sept. 11, 2014, 10:43 AM), http://www.outerplaces.com/universe/technology/item/5859-garbage-orbiting-earth-may-hinder-space-colonization ("The space debris problem may . . . lead to increased danger surrounding future space missions . . . .").

99. *See India's First Mars Satellite 'Mangalyaan' Enters Orbit*, BBC NEWS (Sept. 24, 2014), http://www.bbc.com/news/science-environment-28268186 (describing how India sent a satellite to Mars). While GEO is not completely filled with satellites yet, it is clearly possible to traverse large areas of the solar system without running into a satellite in GEO, as proven by the recent Indian satellite success.

that the satellite would produce higher values elsewhere, suggesting an opportunity cost and thus a net loss compared to the current location.[100] However, this argument relies on the fluctuating value of the satellite and not the value of the GEO. Since the party launching the satellite already owns it, the question of its value has no bearing on whether they have improved the GEO area for purposes of Locke's theory.[101] Thus, under this interpretation of Locke's labor requirement, the space is sufficiently increased in value so that it can be considered property.

The same conclusion results under different interpretations of Locke's theory of property. The more general interpretation of Locke's theory is that any time someone interacts with something with the purpose of bringing about a better result, then that interaction constitutes labor and confers a property right in the object.[102] The satellites themselves currently occupy a physical location, which does not change relative to Earth's position.[103] This position prevents other satellites from entering a wide area around the existing satellite, and prevents other satellites from transmitting on frequencies, which are already in use.[104] These qualities denote at least a transitive interaction between the person and the GEO area through the satellite, since it was the individual's purpose to place the satellite in that location. Locke's example of tilling the land suggests that transitive relationships between a person and the object of his action are sufficient to confer a property interest.[105] Thus, tilling and planting do not necessarily require the actor to physically touch the soil with his body, but rather allow him to do so through the use of

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100. *Cf. Space is Running Out in Orbital Parking Lot Satellites Jockey for Profitable Slots*, BALT. SUN, Sept. 20, 1993, 1A (describing how a specific GEO location is more profitable than others since it would allow companies to easily communicate between the United States and Asia).

101. *Cf.* Thompson, *supra* note 61, at 57 (examining whether a system which mechanically rakes a beach would improve the beach's value and not examining the effect of the action on the rake).

102. *See* Sanders, *supra* note 53, at 376.

103. *See Planetary Orbits*, *supra* note 18.

104. Finch, *supra* note 19, at 789 (stating that satellites must remain at least 18 kilometers apart and cannot operate on the same frequencies as the current satellites in the area).

105. *See* LOCKE, *supra* note 50, at 29 (describing how a man tilling a field can obtain a property interest).

tools.[106] In the context of a satellite as well, the person who sends the satellite into orbit has a connection with his property and that of the orbital zone.[107] This makes sense on the metaphysical level. For Locke, the reason a person's labor converts common areas into private zones is because each person owns his body.[108] Here, ownership over the body is converted into ownership over a satellite, and that satellite is used in an exertion of great labor to settle a voided location in space.[109] Since a person owns the fruits of his labor, a satellite owner gains a property interest in the GEO occupied by his satellite.[110] Therefore under this reading of Locke's theory, anyone who places a satellite in geostationary orbit should be conferred a property right in that space.

The labor need not alter the orbit itself, since the orbit is simply a scientific property of a location in space allowing the satellite to remain in a fixed point relative to the earth.[111] In this way, the satellite is no different from a house built on Earth since both are bound to a fixed point, and improve the area generally.[112] It could be argued that the house inherently alters the ground beneath it by laying foundations and is therefore distinct from a satellite that simply occupies a position. However, pouring concrete in an Earth bound location is the same kind of action taken by placing a satellite in a location bound to Earth, just farther away. Placing a satellite in orbit is similar to transporting materials from one area and erecting them in another location which does confer a property right under Locke's theory (just as a farmer might harvest

106. *Id.* ("He that in obedience to this command of God, subdued, tilled and sowed any part of it, thereby annexed to it something that was his property, which another had no title to, nor could without injury take from him.").

107. Finch, *supra* note 19.

108. *See* LOCKE, *supra* note 50, at 25 ("[Y]et every man has a 'property' in his 'own person.' This nobody has any right to but himself. The 'labour' of his body, and the 'work' of his hands, we may say, are properly his. Whatsoever, then, he removes out of the state that nature hath provided, and left it in, he hath mixed his labour with it, and joined to it something that is his own, and thereby makes it his property.").

109. *See generally* LOCKE, *supra* note 50, at 36–37 (describing how excess labor created the concept of money). *See also* Caren Chesler, *The New Space Race*, PRIV. WEALTH, Sept.–Oct. 2014, http://www.fa-mag.com/news/the-new-space-race-19032.html?issue=233 (discussing the large cost of GEO satellites).

110. *See* LOCKE, *supra* note 50, at 27.

111. *Planetary Orbits*, *supra* note 18.

112. *Cf. id.*

trees and transport them to his plot to build a house, so the scientist combines electronic components and shoots them off to GEO to make a functioning satellite).[113] Space's lack of matter makes little difference to the question of whether the actor invested labor in a specific location.[114]

B. GROTIUS' NATURAL LAW APPROACH TO PROPERTY LIKEWISE LEADS TO THE CONCLUSION THAT GEOSTATIONARY ORBIT SHOULD ALLOW FOR PRIVATIZATION

While there are many similarities between Locke's approach to property and Grotius' theory, minor differences in their views on occupation require separate analyses. Grotius' theory, while more difficult to satisfy, also supports an argument for privatizing GEO. Under Grotius' theory, private property rights should be assigned to persons occupying an area if that area is not for the common use and is typically capable of being occupied.[115] In the case of GEO, a satellite physically occupies the location.[116] The satellite occupies the location because it manifests the same qualities as other forms of occupation, including the exclusion of others from use.[117] Grotius provides a clear test for determining whether an individual has met the burdens of occupation: if the sought after object is movable, then it must be permanently seized, but if the object is immovable, then the erection of boundaries or the erection of a building will suffice for the purposes of occupation.[118] Geostationary orbits have more in common with

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113. *See* LOCKE, *supra* note 50, at 25–28 (discussing generally how labor investments bring about property rights).

114. *See id.*

115. GROTIUS, *supra* note 51, at 27 (arguing that occupation is a necessary condition for ownership and that occupation will not confer a property right if the area is communal in nature).

116. The existence of a satellite as opposed to a person actively being in the location likely would suffice for Grotius' definition of occupation since he describes a building as a form of occupation ("And whoever shall have constructed a building under the aforesaid circumstances will become the owner of the ground upon which said building is . . . ."). GROTIUS, *supra* note 51, at 30.

117. *See id.* at 25–26 (discussing the erection of immovable objects like buildings qualifying as occupation).

118. *Id.* ("This occupation or possession, however, in the case of things which resist seizure, like wild animals for example, must be uninterrupted or perpetually maintained, but in the case of other things it is sufficient if after physical possession is once taken the intention to possess is maintained.

immovable things than with movable objects, because geostationary orbits are immovable since they simply denote a location in space relative to Earth.[119] While the area of space that allows for geostationary orbits is far from Earth's surface, that distance does not transmute the space into something other than a location.[120] While it is difficult to place a satellite in GEO, the same could be said of building a home in many locations on Earth, but this difficulty does not deprive the location from being occupiable for Grotius.[121] This means that satellites in GEO satisfy the threshold inquiry of Grotius' theory, namely whether there is an occupation.

This threshold inquiry must be followed with another, conferring a limitation on the length of the ownership interest: whether the occupation disrupts the common usage of something, which was inherently meant for common use.[122] While most of space likely does fit Grotius' definition of something common for all persons, the specific area of GEO has properties distinct from the rest of space such that its use will necessarily prevent the use of the area by others.[123] Grotius determines that, "all that which has been so constituted by nature that although serving some one person it still suffices for the common use of all other persons, is today and ought in perpetuity to remain in the same condition as when it was first created by nature."[124] Grotius seems to draw this analysis broadly construing the sea itself as a whole, and not looking to specific locations within the sea to determine the exclusion of others.[125] However, when Grotius applies this theory to smaller

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Possession of movables implies seizure, and possession of immovables either the erection of buildings or some determination of boundaries, such as fencing in.").

119. *See Planetary Orbits*, *supra* note 18 (defining geostationary orbits).

120. *See id.*

121. *See* GROTIUS, *supra* note 51, at 30 (describing how a house built on a sandy shore does occupy the area).

122. *Id.* ("If any part of these things is by nature susceptible of occupation, it may become the property of the one who occupies it only so far as such occupation does not affect its common use.").

123. Finch, *supra* note 19, at 789 (examining the special properties of GEO and concluding that only 2000 satellites can use the area at one time).

124. GROTIUS, *supra* note 51, at 27.

125. *Id.* at 29 (describing a fisherman's use of the sea, and concluding that even though that person's use prevents others from working and benefitting from that same spot, the sea as a whole is still free for all use).

areas, like inlets, he states that the theory no longer applies.[126] The key difference between these two bodies of water is their size,[127] allowing Grotius to conclude that one person's use of the inlet likely could preclude another's use of the same area.[128] Crucially, inlets are part of the ocean, but are readily identifiable locations that may be easily occupied and used to the exclusion of others.[129] While GEO is not on the border of space and Earth like an inlet, the key components of the inlet do exist. Space, considered generally, is vast like the sea.[130] However, the area of GEO, like a cosmic inlet, is extremely limited, allowing only 2000 satellites to occupy key locations.[131] Each satellite then has an immediate and clear effect on the others, preventing them from using the same space and frequency.[132] Just as one fisherman in a small inlet would prevent others from using the same area, a satellite in GEO would preclude others from taking certain actions, like broadcasting on the same frequency.[133] Thus while space generally might fit within Grotius' theory regarding communal nature of certain areas, the exceptions he creates for his theory apply well to GEO. Since GEO is subject to occupation and is not an area of communal use, GEO may be converted to private property upon occupation.[134]

This conclusion suggests that there is at least a foundation in underlying moral principles for this allocation of property

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126. *Id.* at 32 ("Now the same principle which applies to navigation applies also to fishing, namely, that it remains free and open to all. Nevertheless there shall be no prejudice if any one shall by fencing off with stakes an inlet of the sea make a fish pond for himself, and so establish a private preserve.").

127. *Inlet*, DICTIONARY.COM, http://dictionary.reference.com/browse/inlet (last visited Oct. 5, 2015) ("[A]n indentation of a shoreline, usually long and narrow; small bay or arm").

128. *See* GROTIUS, *supra* note 51, at 32 (providing an example of an exclusion of others from an inlet).

129. *See id.* (describing how an individual might use an inlet to the exclusion of others).

130. *See, e.g*, *How Big Is Our Universe*, NASA (July 15, 2004), http://www.nasa.gov/audience/foreducators/5-8/features/F_How_Big_is_Our_Universe.html (describing the enormity of the universe).

131. Finch, *supra* note 19, at 789 (stating only about 2000 satellites can occupy GEO at one time).

132. *See id.*

133. *See id.*

134. *See* GROTIUS, *supra* note 51, at 27 (explaining the limits of occupation and when the communal exception would apply).

rights.[135] While privatization may be morally justified, looking to the practical effects of a policy allowing for privatization will help fill in the analysis.[136] In order to determine whether the morally justified acquisition of property makes sense from a utilitarian perspective, this comment will turn to an analysis of GEO under Demsetz's theory.

C. ALLOCATING PRIVATE PROPERTY INTERESTS IN GEO IS A GOOD IDEA UNDER DEMSETZ'S THEORY

Demsetz argues that property rights arise when "the gains of internalization [of externalities] become larger than the cost of internalization."[137] The current approach to geostationary orbit allocation creates direct, indirect, and administrative negative externalities, which obstruct valuable space in geostationary orbit.[138] The effects of the current common scheme are felt directly though the presence of large amounts of debris.[139] Under the current system, satellite operators have no long term incentives to keep the orbital area clear from debris since competitors will be able to take over the slot once the satellite no longer functions.[140] Since the satellite operator cannot sell rights to the location after the termination of the satellite's functions, they can ensure that their competition cannot easily gain access to the same space by leaving the satellite floating in space.[141] As a result of this type of

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135. *See* Eric R. Claeys, *Jefferson Meets Coase: Land-Use Torts, Law and Economics, and Natural Property Rights*, 85 NOTRE DAME L. REV. 1379, 1397–98 (2010) (explaining how natural law provides a coherent moral foundation for property law). *But cf.* JOHN STEWART MILL, UTILITARIANISM, LIBERTY, AND REPRESENTATIVE GOVERNMENT 100 (A. D. Lindsay ed., E. P. Dutton & Co., Inc. new Am. ed. 1951) (1861) (arguing that the theory of utilitarianism is an ethical theory).

136. *Cf.* Claeys, *supra* note 135, at 1397–98 (describing how American jurists use both natural law and economics of law approaches when deciding property disputes).

137. Demsetz, *supra* note 50, at 350.

138. *See* Roberts, *supra* note 1, at 1124 ("Satellite developers forego costs when they can design and operate spacecraft that take advantage of the communal environment. Losses due to pollution are borne by society as a whole, while the cost savings accrue solely to the developer. In this instance, the costs to the community environment manifest themselves in the form of orbiting debris.").

139. *See* HILDRETH & ARNOLD, *supra* note 13.

140. *See* Roberts, *supra* note 1, at 1113.

141. *See id.* at 1125 ("[U]nlike low Earth orbit debris, which gradually disappears as drag effects produced by the upper reaches of the atmosphere

incentive, "[t]he amount of space junk is increasing by about 5 percent per year; meaning that by the end of the century a satellite in GEO will have a 40 percent chance of being struck during its operation life-time."[142] This poses problems for global communications networks, which rely heavily on GEO for their operations.[143] Not only are these direct costs harmful, but the costs associated with preventing this kind of damage are also relevant.[144] Satellites must now carry debris shields, debris monitoring systems, and maneuvering capabilities.[145] Moreover, the lack of an external cost to profit from the area has increased demand such that the ITU has a large backlog of applications for GEO orbital slots.[146] The ITU's current method of granting orbital registration on a first come first served basis does not allow for an efficient allocation of resources since those who would be willing to invest more in the space (in the hope of obtaining a larger return for their investment) are effectively precluded from doing so by the current registration system.[147] Since the costs to the area are not internalized in the sale value of the area, they are passed on to others wishing to use the space.[148] Under Demsetz's theory, if the costs associated with privatizing geostationary orbit slots are less than the benefits

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eliminate it, geosynchronous debris tends to remain a continual threat in the area.").

142. Hitchens, *supra* note 15.

143. Evan I. Schwartz, *The Looming Space Junk Crisis: It's Time to Take Out the Trash*, WIRED (May 24, 2010, 12:00 PM), http://www.wired.com/2010/05/ff_space_junk/all/ ("[Space debris] proliferation threatens not only current and future space missions but also global communications—mobile phone networks, satellite television, radio broadcasts, weather tracking, and military surveillance, even the dashboard GPS devices that keep us from getting lost.").

144. Taylor, *supra* note 32, at 262.

145. *Id.* at 262–63.

146. Roberts, *supra* note 1, at 1119–20 ("[T]he 'first come, first served' approach to registration has not helped to mitigate the negative effects that arise because of the commons nature of the orbital resource. The relatively low costs of filing an individual application with the ITU for a particular orbital position are grossly inadequate to deter developers from attempting to seize the potentially significant financial benefits associated with a valid registration. Consequently, developers have raced to file as many applications as their resources permit as quickly as possible and thereby prevent others from doing the same. This problem is exacerbated because developers are aware that there are far more applications than positions capable of accommodating them.").

147. *Id.*

148. *Id.* at 1124 ("Losses due to pollution are borne by society as a whole, while the cost savings accrue solely to the developer.").

gained from such privatization, then property interests should be allocated.[149]

First, allowing privatization of geostationary orbit will mitigate future space debris and potentially allow for a clean up of current debris.[150] Analyzing different methods for reducing space debris, Nodir Aldinov, Peter Alexander, and Brenda Cunningham concluded that the lack of costs associated with launching a satellite (apart from the costs necessary to build and place the satellite in orbit) allows for more satellites than optimum.[151] This is because corporations seeking to maximize profits have no need to take account of "the negative externality its satellite launches impose on other firms."[152] Aldinov, Alexander, and Cunningham conclude that by instituting a tax on each launch, actors would be incentivized to internalize externalities, which would in turn bring the number of launches to the socially optimum level.[153] They further contend that the profits from the launch tax could be used to invest in programs to seek out and actively clean up space.[154]

The creation of a property interest in GEO locations will not only accomplish the end results of a tax, but it also provides an incentive to launch a satellite in the first place. By creating a property interest in geostationary orbit, the market will quickly establish a price for the zone.[155] This price will act in

149. *See* Demsetz, *supra* note 50, at 350.

150. *See* Nodir Adilov et al., *Earth Orbit Debris: An Economic Model* 20–21 (Working Paper, May 14, 2013), http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2264915 (describing how a tax on entering orbit would both deter those users of space that did not have a clear intent to remain for long periods of time, and would help to fund resources which could be used to clean up space debris).

151. *Id.* at 14 ("Profit maximizing behavior results in excess launching since firms fail to internalize the impact of debris on industry profits and consumer welfare. A launch will generate lower expected profits since it increases the risk to existing satellites.").

152. *Id.* at 17.

153. *Id.* at 21.

154. *Id.*

155. Joel D. Scheraga, *Establishing Property Rights in Outer Space*, 6 CATO J. 889, 896 (1987) ("The social optimum, of course, is unknown ex ante; rather, it will tend to emerge once private property rights to orbital slots are assigned and enforced. By assigning property rights, a market is established in which the rights to the orbital slots may be bought and sold. Selfish maximization of the profit from property rights will lead to a socially efficient outcome.").

the same way as a tax, forcing actors to consider not just the cost of the satellite (which will inevitably be lost), but also a potential return on the investment in the property right itself.[156] The creation of this additional cost and benefit will eliminate negative externalities associated with too many satellite launches.[157] Additionally, allowing actors to resell their orbital zone or reuse it as needed provides an added incentive to actively clean up the area.[158] Therefore, like the imposition of a tax, creating a private interest in a GEO slots will decrease the number of excess satellites launched into GEO, and provide incentives to clean up the area in order to maximize profits.

Unlike a tax however, property rights more efficiently ensure a preservation of a clean space environment.[159] Murray N. Rothbard's book, *For a New Liberty*, discusses a libertarian approach to pollution and finds that the government's control over pollution regulations is much less efficient than a private property owner enforcing their rights through the court system.[160] In part, this inefficiency results from an apathetic

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156. *See id.*

157. *Id.* ("The negative externalities will be eliminated."). It might be argued that a tax would be a simpler approach to the problem of orbital debris, but determining the social optimum is difficult in any given situation since many presumed benefits related to satellite launches cannot be accounted for in most models. *Id.* ("The social optimum, of course, is unknown ex ante.").

158. *Cf.* Matthew J. Kleiman et al., *Protecting the Space Environment*, SCITECH LAW., Summer 2012, at 20, 22 (describing how under the current regime only about half of satellite operators remove the satellite from GEO once it is non-functioning).

159. *See* MURRAY N. ROTHBARD, FOR A NEW LIBERTY 317–18 (2d ed. 2006), http://mises.org/sites/default/files/For%20a%20New%20Liberty%20The%20Libertarian%20Manifesto_3.pdf (discussing how a lack of private ownership will ultimately entail an apathetic enforcement against pollution).

160. *Id.* ("Government officials cannot sell the rivers or sell stock in them. Hence, they have no economic incentive to preserve the purity and value of the rivers . . . . Anyone has been able to dump polluting garbage and wastes in the waters. But consider what would happen if private firms were able to own the rivers and the lakes. If a private firm owned Lake Erie, for example, then anyone dumping garbage in the lake would be promptly sued in the courts for their aggression against private property and would be forced by the courts to pay damages and to cease and desist from any further aggression."). Rothbard does state that the effectiveness of private property rights as a pollution deterrent does rely on access to an engaged judiciary. *Id.* at 322 ("The remedy is simply for the courts to return to their function of defending person and

enforcement of the laws, which do not benefit the enforcers.[161] Rothbard additionally argues the government's assessment of the potential harms of pollution often differ from those who have a stake in the matter, and thus fail to take into account the full magnitude of the situation, leading to inefficient tax regimes.[162] In a private system with redress to the courts, property owners will zealously defend their property from trespass, and will do so efficiently, because they are able to take into account the relevant variables that threaten their property, where the government cannot take such an individualized approach.[163] Thus, while the benefits derived from a system of taxation and a private property system are similar, the allocation of private property will ultimately lead to a more efficient protection of GEO.

This, in turn, will effectively eliminate the need for indirect costs associated with preventing harm to satellites in orbit. Currently, satellites must contain equipment necessary to track, and maneuver away from orbiting debris.[164] With a reduction in the number of satellites and an increased number of satellites moved to graveyard orbits, and the potential for a reduction in other forms of debris, the need for such sophisticated technology will decrease.[165] The market will control this as well, since risk adverse actors will desire avoidance systems so they can ensure a return on the resale of the property after the satellite's eventual failure.[166]

It is possible to argue that the distribution of property rights will be inequitable and as such will be lead to many parties being worse off than they were under the current

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property rights against invasion, and therefore to enjoin anyone from injecting pollutants into the air.").

161. *Id.* at 317–18.

162. *Id.* at 320.

163. *Id.* at 320–21 (discussing how courts in trespass cases will sometimes not grant injunctions on the theory that the public at large benefits more from allowing pollution than not allowing it, and the legislature's actions to support this claim). *See generally id.* at 323 (arguing that this approach to the enforcement of rights does not account for the true damages caused by the trespass).

164. Taylor, *supra* note 32, at 262.

165. *See id.*

166. *See* Scheraga, *supra* note 155, at 896 (discussing how the market will determine the most efficient price for the transfer of ownership).

approach.[167] First, the current system's allocation of orbital rights on a first come first serve basis has the same problem of inequality, excluding actors from developing nations without advanced space programs.[168] Moreover, the creation of the property right gives the current holder an incentive to transfer the property later once others private investors and smaller countries, which were unable to initially access space, are willing to pay compensation.[169] Under the current system, developing nations or startup companies will have no way of bringing their product to market in a timely manner since the barrier to entry is artificially low.[170] In essence, the allocation of property rights in GEO may not be the most equitable solution initially, however the market will determine a price, which any nation or actor may pay to access the area, and in this way it is eminently equitable.[171]

Under Demsetz's theory, the comparative increase in efficiency brought about by the creation of a property right suggests that the property right should exist.[172] After examining the current problems facing GEO, and the benefits of privatization, it seems clear that the costs of privatizing are minimal,[173] while the costs of not privatizing the area are great.[174] Since the benefits to privatization outweigh the costs, the area should be privatized.

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167. *See id.* (stating that the process of privatization will lead to an efficient, but not always equitable outcome).

168. *See* Bogotá Declaration, *supra* note 40 ("The solutions proposed by the International Telecommunications Union . . . are at present impracticable and unfair and would considerably increase the exploitation costs of this resource especially for developing countries that do not have equal technological and financial resources as compared to industrialized countries, who enjoy an apparent monopoly in the exploitation and use of its geostationary synchronous orbit.").

169. *See* Scheraga, *supra* note 155, at 896 (discussing how the private property system will facilitate an efficient exchange of resources for the orbital zones).

170. *See* Roberts, *supra* note 1, at 1119–20 (analyzing the ITU's current administrative approach to the granting of registrations for GEO satellites).

171. *See* Scheraga, *supra* note 155, at 896.

172. Demsetz, *supra* note 50, at 350.

173. *See* Scheraga, *supra* note 155, at 896.

174. *See* Schwartz, *supra* note 143.

III. CONCLUSION

The current approach to geostationary orbit outlined in the Outer Space Treaty works against both natural law and utilitarian theories of property. The current approach precludes actors from attaining a private interest in an area they have developed both economically and morally. The mischaracterization of geostationary orbit as a non-scarce resource has led to an increase in the amount of space debris and danger for current and future space missions. After analyzing the theoretical and economic justifications for the initial acquisition of property rights, this note concludes that allowing actors to attain a private property right in geostationary orbit is both morally and economically justified.