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Exploring the Space for Antitrust Law in the Race for Space Exploration

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EXPLORING THE SPACE FOR ANTITRUST LAW IN THE RACE FOR SPACE EXPLORATION

INTRODUCTION: “CLEAR SKIES WITH A CHANCE OF SATELLITE DEBRIS”

Space has been called the final frontier, but The Wall Street Journal’s referral to space as “The Next Business Frontier” seems like a more optimistic view of the expanse of infinite nothingness above us.¹ From overpopulation² and famine³ to disease⁴ and climate change,⁵ humanity faces a number of perils that may prove too great unless it finds a new home.⁶ Avoiding certain peril is not the only incentive for space travel—though, shouldn’t that be enough? First, there are potentially immense economic benefits from space tourism.⁷ And space tourism is not the only potential revenue stream. Some proponents have even suggested mining

1. Mary Kissel, *Space: The Next Business Frontier*, WALL ST. J., Dec. 17, 2011, <http://online.wsj.com/news/articles/SB10001424052970203413304577086660050261668?mg=reno64-wsj>.

2. New estimates suggest that the world will hit 11 billion people by the year 2100. Holly Moeller, *Human Overpopulation: When No News Is Bad News*, THE STANFORD DAILY, Oct. 6, 2014, <http://www.stanforddaily.com/2014/10/06/human-overpopulation-when-no-news-is-bad-news/>.

3. “Ebola could cause a major food crisis in Africa if it continues unchecked, and millions of people in the worst-hit countries are already running short as farms are abandoned and trade interrupted, a UN organisation warns.” *Famine Is the Next Threat from Ebola in Africa, as Farmers Flee Their Fields and Food Runs Short, Un Warns*, DAILY MAIL, Oct. 16, 2014, <http://www.dailymail.co.uk/news/article-2795623/famine-threat-ebola-africa-farmers-flee-fields-food-runs-short-warns.html>.

4. “Preventing infectious disease is important business. If humanity perishes, chances are an infectious disease will be the culprit. The issue is too important to be used as a political bean bag tossed about by knaves and fools.” Kurt Eichenwald, *The Good News About the Great Ebola Panic*, NEWSWEEK, Oct. 20, 2014, <http://www.newsweek.com/fear-infectious-disease-not-ebola-278505>.

5. Economic costs from increased severity of fires due to climate change could triple this century. Michael Safi, *Bushfire Season ‘Will Be More Severe as a Result of Climate Change,’* THE GUARDIAN, Oct. 20 2014, <http://www.theguardian.com/australia-news/2014/oct/21/bushfire-season-will-be-more-severe-as-a-result-of-climate-change>.

6. This Note is written primarily as a poor back-up option to being one of the first colonizers of Mars, as I have just missed the deadline to apply. *What Are the Qualifications to Apply?*, MARSONE, <http://www.mars-one.com/faq/selection-and-preparation-of-the-astronauts/what-are-the-qualifications-to-apply> (last visited Oct. 11, 2015). That said, I wish all the success upon the Mars One team. Finding a new home will not be easy. It is starting to look more feasible, however: “NASA’s Keler Space Telescope . . . has discovered a star with three planets only slightly larger than Earth. The outermost planet orbits in the ‘Goldilocks’ zone, a region where surface temperatures could be moderate enough for liquid water and perhaps life, to exist.” University of Arizona, *Three Nearly Earth-Size Planets Found Orbiting Nearby Star*, EUREKALERT!, Jan. 16, 2015, http://www.eurekalert.org/pub_releases/2015-01/uoa-tne011615.php.

7. “Within a decade, the FAA is predicting that space tourism will become a billion-dollar industry. . . .” Timothy Stenovec, *Space Tourism Expected to be \$1Billion Industry Over Next 10 Years, Says FAA*, THE HUFFINGTON POST, Mar. 22, 2012, http://www.huffingtonpost.com/2012/03/22/space-tourism-1-billion-industry_n_1371354.html.

resources from asteroids.⁸ Whether it comes due to these economic incentives or as a solution to many of the ills that plague society, both corporations and governments are investing heavily in space exploration.

This Note will analyze the interactions between Indian, Japanese, Russian, and United States corporate antitrust laws and those laws' effects on the space race. The first part of this Note will give relevant background information regarding international space law, the policies each country has in place regarding space exploration and an explanation of relevant antitrust law. The second part of this Note will analyze the weaknesses and strengths of the various legal structures that play a part in incentivizing space exploration. The third part of this Note will argue that privatized space exploration has large benefits, so countries around the world should be prepared to tailor antitrust law accordingly. Specifically, in order to combat some of the inefficiencies that exist in space exploration, antitrust law must adapt in a way that it rarely has.

I. THE FACTS—OR “JUST WHAT DO YOU THINK YOU’RE DOING, DAVE?”

This part of the Note will address the factual background necessary to delve into a deeper analysis of the topic. The part will first address the different attempts at space exploration by the various countries—it is important to note, however, that successful past exploration is less important than potential future exploration because this field changes so rapidly.⁹ Then, this part will cover the relevant international law playing a

8. See Kevin Bonsor, *How Asteroid Mining Will Work*, HOWSTUFFWORKS, <http://science.howstuffworks.com/asteroid-mining1.htm> (last visited Oct. 6, 2015). The movie *Armageddon* will likely encourage many oil drillers to pursue work mining asteroids.

9. For example, the following is a brief explanation of several incidents that have occurred during the writing of this Note: (1) multiple crashes—Orbital Science Corporation's unmanned rocket exploded just two days before Virgin Galactic's SpaceShip Two exploded killing one crew member. Pete Spotts, *Virgin Galactic and Antares Crashes: What Now for Commercial Space Efforts*, THE CHRISTIAN SCIENCE MONITOR, Nov. 1, 2014, <http://www.csmonitor.com/Science/2014/1101/Virgin-Galactic-and-Antares-crashes-What-now-for-commercial-space-efforts-video>; (2) China entered orbit around the moon (“A Chinese spacecraft service module has entered orbit around the moon, months after being used in the country's landmark test flight that sent a prototype sample-return capsule on a flight around the moon and returned it to Earth.” Leonard David, *Chinese Spacecraft Enters Orbit Around the Moon*, SPACE.COM, Jan. 12, 2015, <http://www.space.com/28208-chinese-spacecraft-orbiting-moon.html>); (3) NASA's spacecraft moved closer to the dwarf planet Ceres (“Originally launched in 2007, NASA's Dawn Spacecraft has entered an approach phase, as it moves closer to Ceres, a Texas-sized dwarf planet never before visited by a spacecraft. Dawn is scheduled to enter orbit of the dwarf planet in the asteroid belt in March 2015.” Brian Wu, *NASA's Dawn Spacecraft Makes Approach to Ceres*, SCI. TIMES, Jan. 3, 2015, <http://www.sciencetimes.com/articles/2339/20150103/nasa-s-dawn-spacecraft-makes-approach-to-ceres.htm>); (4) the International Space Station worried it experienced a toxic leak (“The threat of a possible toxic leak in the US sector of the ISS forced the American astronauts on board to isolate their module and move to the Russian sector. The

part in the current space race. Lastly, it will explain the role of antitrust laws and the relevant antitrust laws that could benefit or hinder space exploration.

A. “*In Your Face, Neil Armstrong*”

The original space race, between Russia and the United States, resulted in humanity’s first exploration of space.¹⁰ Because of this, a chronological history of space exploration necessarily starts with the United States and Russia.

In 1957, Russia—the former USSR—launched Sputnik into space.¹¹ In early 1958, the United States launched its first satellite into space.¹² Later that year, President Eisenhower created the National Aeronautics and Space Administration (NASA) as an expansion from the National Advisory Committee for Aeronautics.¹³ In 1960, Russia launched the first living creatures into space.¹⁴ In April of 1961, Russia launched the first human into space, less than one month before the first American arrived in space.¹⁵ This competition launched an escalatory spending spree for both countries.¹⁶ It is not unanimously agreed upon when the space race

hatch was reopened hours later after no leak was detected, NASA reported.” *ISS Crew Locks down Inside Russian Sector After Cooling System Glitch*, RT NEWS, Jan. 14, 2015, <http://rt.com/news/222535-iss-toxic-emission-space/>); and (5) NASA found a British probe on Mars (“The UK-led probe tried to make a soft touchdown on the dusty world on Christmas Day, 2003, using parachutes and airbags—but no radio contact was ever made with the probe. . . . The new pictures, acquired by Nasa’s Mars Reconnaissance Orbiter, give the lie to that notion, and hint at what really happened to the European mission.” Jonathan Amos, *Lost Beagle2 probe found ‘intact’ on Mars*, BBC NEWS, Jan. 16, 2015, <http://www.bbc.com/news/science-environment-30784886>). These examples exemplify the trouble with ever changing space exploration. In the matter of a week, three countries can be in three radically different places in the solar system. The missions, though, were started years ago.

10. “The competition was intense and allowed both sides to take the high road with the objectives of science and learning. Eventually it provided a mechanism for engendering cooperation between adversaries and it provided an enduring legacy—an enormous improvement of the understanding of our cosmic neighborhood and indeed of our Earth itself.” DAVID SCOTT & ALEXIE LEONOV, *Foreward to TWO SIDES OF THE MOON: OUR STORY OF THE COLD WAR SPACE RACE* iv, iv (2013).

11. Space Exploration Timeline, ALIC, <http://www.archives.gov/research/alic/reference/space-timeline.html>.

12. *Id.*

13. *July 29, 1958: President Eisenhower Authorizes the Creation of NASA*, HISTORY CHANNEL (2009), <http://www.history.com/this-day-in-history/president-eisenhower-authorizes-creation-of-nasa>.

14. Space Exploration Timeline, *supra* note 11.

15. *Id.*

16. The United States spent more as a percentage of its budget on NASA every year from 1958 to 1966. Simon Rogers, *NASA Budgets: U.S. Spending on Space Travel Since 1958*, THE GUARDIAN, Feb. 1, 2010, <http://www.theguardian.com/news/datablog/2010/feb/01/nasa-budgets-us-spending-space-travel>. NASA spending as a percentage of the overall budget peaked in 1966 at 4.41%. *Id.*

ended,¹⁷ but the last major space achievement for the era occurred when the United States landed humans on the Moon on July 20, 1969.¹⁸

1. *The United States*

The United States federal government has continued to spend less on space exploration—as a percentage of its overall budget—since it landed humans on the Moon.¹⁹ Subsequently, the country has seen massive growth in the area of privatized space exploration.²⁰ In 1984, President Ronald Reagan, signed into law the Commercial Space Launch Act, which first allowed private launches and private licensing agreements with government launches.²¹

Some of the most exciting developments in space exploration for the United States have occurred in relatively recent years. In 1996, the Ansari

17. Some believe Apollo 11 landing on the Moon marked the end of the space race: “For many citizens landing on the Moon ended the space race and diminished support for expensive programs of human space exploration.” *End of an Era*, SMITHSONIAN NAT’L AIR & SPACE MUSEUM, <http://airandspace.si.edu/exhibitions/apollo-to-the-moon/online/after-missions/end-of-era.cfm> (last visited Sept. 29, 2015). Others do not believe the race ended until the United States and Russia started to develop a greater relationship: “The beginning of the end of the Cold War rivalry in space between the two great superpowers is easy to spot: It was the famous handshake between Soviet space commander Alexie Leonov and Nasa astronaut Tom Stafford when their two vehicles docked together in orbit. The Apollo-Soyuz programme, or Soyuz-Apollo as it is known in Russia, took place on July 17, 1975, when the Nasa Apollo spacecraft and the Russian Soyuz gently docked together.” Jeffrey Manber, *The Moment the Cold War Space Race Between the Usa and Soviet Union Cooled*, THE TELEGRAPH, July 22, 2010, <http://www.telegraph.co.uk/sponsored/rbth/features/7904330/The-moment-the-Cold-War-space-race-between-the-USA-and-Soviet-Union-ended.html>.

18. *Apollo 11*, SMITHSONIAN NAT’L AIR & SPACE MUSEUM, <http://airandspace.si.edu/exhibitions/apollo-to-the-moon/online/apollo-11/> (last visited Sept. 29, 2015).

19. Rogers, *supra* note 16. In 2014, the United States spent less than 0.5% of the overall budget on NASA. *Id.*

20. Dana Hull, *Galactic Gold Rush: Private Spending on Space Is Headed for a New Record*, BLOOMBERG, Feb. 5, 2015, <http://www.bloomberg.com/news/articles/2015-02-05/galactic-gold-rush-private-spending-on-space-is-headed-for-a-new-record>.

21. Bonnie E. Fought, *Legal Aspects of the Commercialization of Space Transportation Systems*, 3 BERKELEY TECH. L.J. 99, 102 (1988), available at <http://www.law.berkeley.edu/journals/btlj/articles/vol3/fought.html>. I’d be remiss if I failed to mention President Reagan’s more infamous effect on the United States’ spending on space: Star Wars. The Strategic Defense Initiative—or Star Wars—was a plan for a missile defense system in space that could intercept enemy missiles. The plan was announced by President Reagan without the Pentagon’s approval, or even knowledge. You win some; you lose some. “The technology proposed by President Reagan was ‘Decades away from reality,’ according to The Times. ‘White House officials said the new program might involve lasers, microwave devices, particle beams and projective beams. These devices, most of which are in a very early stage of development, in theory could be directed from satellites, airplanes, or land-based installations to shoot down missiles in the air.’” Here’s to hoping that some of this technology will eventually *trickle down* to the government’s hands! The Learning Network, *March 23, 1983 Reagan Proposes ‘Star Wars’ Missile Defense System*, N.Y. TIMES, Mar. 23, 2012, http://learning.blogs.nytimes.com/2012/03/23/march-23-1983-reagan-proposes-star-wars-missile-defense-system/?_r=0.

X Prize was founded by the St. Louis-based X Prize Foundation.²² The 10 million dollar prize went to SpaceShipOne on October 4, 2004 for becoming the first private company to launch a manned rocket into space twice within two weeks.²³ Some have proposed that international private launch companies threaten the survival of domestic launch companies, so trade limitations should be enforced.²⁴

2. *Russia*

Despite losing the first space race,²⁵ Russia has had many developments in space exploration and now uses an approach similar to the United States: a mix of privatization and government involvement.²⁶ The Russian Space Agency (“RSA”) assisted with the construction of the International Space Station from the beginning, and Russia assists other countries’ space exploration in a variety of ways.²⁷ The RSA is interesting because it has operated very much unlike an American government agency: it has made a profit.²⁸

22. Alan Boyle, *SpaceShipOne Wins \$10 million X Prize*, NBC NEWS, Oct. 5, 2004, http://www.nbcnews.com/id/6167761/ns/technology_and_science-space/t/spaceshipone-wins-million-x-prize/#.VFAG_FPF8U0.

23. “SpaceShipOne crossed the finish line in an 8-year, \$10 million space race Monday, winning the Ansari X Prize with its second space flight in less than a week. Along the way, the world’s first privately developed spacecraft also broke a 41-year-old altitude record and created a new astronaut.” *Id.*

24. “Foreign competition poses a formidable challenge to domestic launch companies, and limitations placed on the ability of domestic companies to utilize non-domestic launcher services would certainly benefit the development of domestic launch companies.” Fought, *supra* note 21, at 122.

25. In an article titled “Russia Leads Nuclear Space Race After U.S. Drops Out,” Alexis Madrigal shows that the United States has chosen to stop competing in the race to use nuclear power to get to space. If you’re keeping score at home, it is now 1–1. Alexis Madrigal, *Russia Leads Nuclear Space Race After U.S. Drops Out*, WIRED, Nov. 3, 2009, <http://www.wired.com/2009/11/nuclear-propulsion-in-space/>. As an American, though, I believe I’m obligated to point out that “determining the game is over” is significantly different from “forfeiting.” *Id.*

26. The Russian Space Agency was formed in 1992. Elizabeth Howell, *Roscosmos: Russia’s Space Agency*, SPACE.COM, Sept. 9, 2013, <http://www.space.com/22724-roskosmos.html>.

27. Russia is the “largest partner” of several countries that provided significant hardware contributions to the International Space Station. Casey Dreier, *No, Russia Did Not Just Kick the U.S. Out of the Space Station*, PLANETARY, May 20, 2014, <http://www.planetary.org/blogs/casey-dreier/2014/0520-no-russia-did-not-just-kick-the-us-out-of-the-space-station.html?referrer=https://www.google.com/>. The United States also relies on Russian-made rockets to get into space. *Id.*

28. The Russian Space Agency has sold spots on spacecraft for the purposes of space tourism. The first such flight was in 2001 to American millionaire Dennis Tito for US 20 million dollars. Mike Wall, *First Space Tourist: How a U.S. Millionaire Bought a Ticket to Orbit*, SPACE.COM, Apr. 27, 2011, <http://www.space.com/11492-space-tourism-pioneer-dennis-tito.html>.

Russian companies, Orbital Technologies and RSC Energia, have also worked out plans for the first commercial space station.²⁹

3. India

India's greatest strength seems to be cost-effectiveness. India has the Indian Space Research Organisation.³⁰ India, developing its space program decades after the United States and Russia, has had the benefit of gaining a lot of the knowledge required to get to space without the massive expenditures that were necessary for Russia and the United States to achieve the same goal.³¹ India has not just undercut the other space agencies historically, though; it is outperforming other countries currently pursuing similar missions.³²

4. Japan

Japan has proposed some of the most interesting space ideas recently. Japan's space agency is Dokuritsu-gyōsei-hōjin Uchū Kōkū Kenkyū Kaihatsu Kikō ("JAXA"). JAXA has stated that it has the goal of sending astronauts to the moon around 2030, with a goal of completing a manned lunar base by 2030.³³

The manned lunar base may seem like the stuff of science fiction, but the most outlandish idea has come from a private Japanese company. The

29. "Two Russian aerospace companies are teaming up to build what they say will be the 'world's first commercial space station' an orbiting outpost open to private citizens, professional astronauts and scientists. For a price." Tariq Malik, *World's First Commercial Space Station Planned in Russia*, SPACE.COM, Sept. 29, 2010, <http://www.space.com/9223-world-commercial-space-station-planned-russia.html>.

30. See *About ISRO*, INDIAN SPACE RESEARCH ORG., <http://isro.org/scripts/Aboutus.aspx> (last visited Oct. 2, 2015).

31. *India's Low-Budget Space Program May Offer Lesson for U.S.—Part 2*, PBS NEWSHOUR, Sept. 24, 2014, <http://www.pbs.org/newshour/bb/indias-low-budget-space-program-may-offer-lesson-for-u-s/>.

32. For example, India recently made it to Mars for a paltry \$74 million USD, while it cost NASA \$671 million to send its MAVEN spacecraft to Mars around the same time as the Indian spacecraft made it to Mars. Madison Park, *India's Spacecraft Reaches Mars Orbit . . . and History*, CNN, Sept. 24, 2014, http://edition.cnn.com/2014/09/23/world/asia/mars-india-orbiter/index.html?hpt=hp_c2. In fact, the movie *Gravity* cost \$100 million USD, a mark-up over the Indian trip to Mars by over one third. *Id.* On the other hand, the movie *Gravity* has grossed over \$700 million internationally. *Gravity*, BOXOFFICEMOJO, <http://www.boxofficemojo.com/movies/?id=gravity.htm> (last visited Oct. 2, 2015). The same data is unavailable for the number of IMAX tickets sold to watch the Indian Mars mission.

33. A spokesperson for JAXA said, "The feasibility of the plan is unclear at this point as we need to gain understanding by the government and the Japanese people on our plan, but technologically it would be possible in a few decades." *Japan Plans Moon Base by 2030*, MOONDAILY, Aug. 3, 2006, http://www.moondaily.com/reports/Japan_Plans_Moon_Base_By_2030_999.html.

Obayashi Corporation announced that it plans to have a working space elevator by 2050.³⁴ This Note provides no thought on the feasibility of such a project.³⁵

5. *Other Countries Space Exploration*

China has one of the best space programs not yet mentioned.³⁶ The European Space Agency is a conglomeration of multiple member countries.³⁷ Due to *space* constraints, these programs will not be thoroughly analyzed.

B. *"I've Got the Whole World In My Hands"*

The key international law in place for space exploration is the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, ("Outer Space Treaty").³⁸ The Outer Space Treaty codifies a belief that resource management should be different in space than it is on Earth.³⁹

34. Michelle Starr, *Japanese Company Plans Space Elevator by 2050*, CNET, Sept. 23, 2014, <http://www.cnet.com/news/japanese-company-plans-space-elevator-by-2050/>. The elevator would reach nearly a quarter of the way to the moon and 290 times further than the location of the International Space Station. *Id.*

35. Canada recently announced plans to pursue a similar space elevator idea. For a more detailed discussion of the feasibility of space elevators in general *see, e.g.*, Jillian Kestler-D'Amours, *How Feasible Is Canadian Firm's Space Elevator Concept?*, THE STAR, Aug. 18, 2015, <http://www.thestar.com/news/canada/2015/08/18/canadian-company-gets-patent-for-20-km-high-space-elevator.html>.

36. China has plans to land a person on the moon in the coming years. Leonard David, *China Has Big Plans to Explore the Moon and Mars*, SPACE.COM, Dec 4, 2014, <http://www.space.com/27893-china-space-program-moon-mars.html>. China spent roughly \$11 billion USD on its space program in 2013. *\$40 Billion: Us Space Budget Still Exceeds Rest of World's Combined*, RT News, Oct. 26, 2014, <http://rt.com/usa/199480-space-budget-nasa-report/>. Even with a great deal of government support for space exploration, China has started pursuing private development of space exploration as well: "China also established new space ties with 4M (the Manfred Memorial Moon Mission), the first private mission to the moon, suggesting an interesting link between China and private space entrepreneurs. . . ." David, *supra*. China has also pursued some joint space ventures with Russia. *Id.*

37. The ESA has 20 member states: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, The Netherlands, Norway, Poland, Portugal, Romania, Spain, Sweden, Switzerland and the United Kingdom. *New Member States*, EUROPEAN SPACE AGENCY, http://www.esa.int/About_Us/Welcome_to_ESA/New_Member_States.

38. The Outer Space Treaty was entered into force in the United States on October 10, 1967. *See UNITED NATIONS OFFICE FOR OUTER SPACE AFFAIRS, UNITED NATIONS TREATIES AND PRINCIPLES ON OUTER SPACE*, available at http://www.oosa.unvienna.org/pdf/publications/ST_SPACE_061Rev01E.pdf.

39. "At the heart of international space law lies a resolve to ensure that outer space, including the Moon and other celestial bodies, will not be inequitably exploited by individual states, but that the exploration and use of outer space shall be a perpetual and peaceful province of all mankind." Linda

One particularly interesting treaty that has gained little traction is the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (“Moon Treaty”). The Moon Treaty was opened for signature in 1979.⁴⁰ The Moon Treaty has only been signed by 11 parties, and no country currently engaging in manned space exploration has signed and ratified the agreement.⁴¹ The Moon Treaty attempts to close a “loophole in the Outer Space Treaty by banning any ownership of any extraterrestrial property by any organization or private person, unless that organization is international and governmental.”⁴² It is unclear the impact the Moon Treaty has on the international community.⁴³ The Moon Treaty is not a mandatory law that countries must follow. If it were, it would have clear effects on the privatization of space exploration. In that case, incentives would radically change, and it would significantly change the direction of this note.⁴⁴ Until actual extraction of resources in space occurs, the Moon Treaty remains in limbo.⁴⁵

Johanna Friman, *War and Peace in Outer Space: A Review of the Legality of the Weaponization of Outer Space in the Light of the Prohibition on Non-Peaceful Purposes*, 16 FINNISH Y.B. INT’L L. 285 (2005).

40. UNITED NATIONS OFFICE FOR DISARMAMENT AFFAIRS, AGREEMENT GOVERNING THE ACTIVITIES OF STATES ON THE MOON AND OTHER CELESTIAL BODIES (1979), available at <http://disarmament.un.org/treaties/moon>.

41. *Id.*

42. Michael Listner, *The Moon Treaty: Failed International Law or Waiting in the Shadows?*, THE SPACE REV., Oct. 24, 2011, <http://www.thespacereview.com/article/1954/1>.

43.

Assuming that the Moon Treaty has no legal effect because of the non-participation of the Big Three is folly. The shadow of customary law and its ability to creep into the vacuum left vacant by treaty law should not be underestimated. To that end, the most effective way of dealing with the question of the Moon Treaty’s validity is to officially denounce it. However, the realities of international politics and diplomacy will likely preclude such an action. The alternative is to act in a manner contrary to the Moon Treaty, and more importantly not to act in conformity with its precepts and hope that is sufficient to turn back the shadows of the Moon Treaty.

Id.

44. For a broader discussion of property rights in space, see Jeremy L. Zell, Note, *Putting a Mine on the Moon: Creating an International Authority to Regulate Mining Rights in Outer Space*, 15 MINN. J. INT’L L. 489 (2006).

45.

Until the day that firm plans are made for the extraction of extraterrestrial resources by private entities, the Moon Treaty and its validity will remain in question. However, for the foreseeable future it will slumber through its uncertainty, perhaps with brief interruptions. If the non-parties to the Moon Treaty consider the accord dead and choose to ignore it, political and diplomatic action by its parties, and the legal inaction of non-parties, will only serve to strengthen it. On that day when it does awaken, the non-parties to the Moon Treaty may find that, instead of a dead international agreement, it has become a greater legal and political force than anticipated, and thus may be more difficult to overcome than anyone thought.

Id.

C. *“I Don’t Care About What Anything was Designed to Do, I Care About What It Can Do”*

This part will examine what antitrust law is, the economic explanation behind antitrust law, and the antitrust law in that can make a difference in space exploration.

1. *What is Antitrust Law?*

Antitrust laws exist to protect the existence of private competition.⁴⁶ Antitrust law, when functioning appropriately, allows companies to take advantage of economies of scale while also allowing start-ups to enter the market.⁴⁷ In the United States, antitrust laws—also referred to as ‘competition laws’—are statutes developed by the U.S. Government to protect consumers from predatory business practices by ensuring that fair competition exists in an open-market economy.⁴⁸

2. *Economic Justification*

The simple reason that antitrust laws are important is because they help to promote competition.⁴⁹ Generally, increased competition drives the

46. One of the most famous, and best, examples of antitrust law being put to use is the breakup of the Bell Operating Companies. AT&T reached a settlement with the Department of Justice to divest itself from the Bell Operating Companies in 1984. Melvin D. Barger, *What Killed Ma Bell?*, BEATRICECO.COM (Apr. 1984), <http://www.beatriceco.com/bti/porticus/bell/whatkilledmabell.html>.

47. “Antitrust law can preserve an environment in which firms have the incentive to behave rivalrously and in which upstarts have a clear and open path to wage their challenges.” ELEANOR M. FOX, *CASES AND MATERIALS ON U.S. ANTITRUST IN GLOBAL CONTEXT* 55 (3d ed. 2012).

48. Justin Bynum, *What Is an Antitrust Law?*, INVESTOPEDIA, <http://www.investopedia.com/ask/answers/09/antitrust-law.asp>.

49. Antitrust law attempts to fight anti-competitive actions. “Anticompetitive practices refer to a wide range of business practices in which a firm or group of firms may engage in order to restrict inter-firm competition to maintain or increase their relative market position and profits without necessarily providing goods and services at a lower cost or of higher quality.” The Organization for Economic Cooperation and Development, *Glossary of Statistical Terms, Anticompetitive Practices* <http://stats.oecd.org/glossary/detail.asp?ID=3145>. Obviously, with such a broad definition of anticompetitive practices, many types of actions can fall under the regulation of anticompetitive law. This can cover forms of collusion, price fixing, bid rigging, bid suppression, complementary bidding, bid rotation, subcontracting, and market divisions. *Price Fixing, Bid Rigging, and Market Allocation Schemes: What They Are and What to Look For*, U.S. DEP’T OF JUSTICE, <http://www.justice.gov/atr/public/guidelines/211578.htm>. An even broader approach would put patents under antitrust law. “All of these developments, in Congress and the Courts, are in the spirit of harmonizing patent and antitrust law, generally in the direction of subsuming patent law under antitrust law. From the perspective of providing clarity and certainty for those who are the targets of patent and antitrust suits, harmonization has much appeal.” Robin Feldman, *Patent and Antitrust: Differing Shades of Meaning*, 13 VA. J.L. & TECH. 1, 7 (2008).

price of a product down.⁵⁰ It is easy to imagine the type of price gouging that could occur if there were only one supplier of a good.⁵¹

A key point of antitrust law, though, deals with decreasing costs due to economies of scale in a large firm like a monopoly.⁵² This economic phenomenon is called a natural monopoly.⁵³ Natural monopolies occur when an industry has high fixed costs and marginal costs continue to drop as production increases.⁵⁴ A trash pick-up route is a good example of this phenomenon in place.⁵⁵

3. Antitrust Laws in Place Around the World

Countries around the world take a myriad of approaches to antitrust laws. The United States has a few major statutes in place to fight anti-competitive behavior: the Sherman Act,⁵⁶ The Federal Trade Commission Act,⁵⁷ and the Clayton Act.⁵⁸ Under United States' law, a violation of an

50. This occurs because competitors must compete based on price. *Competition*, AMOSWEB, http://www.amosweb.com/cgi-bin/awb_nav.pl?s=wpd&c=dsp&k=competition.

51. A great example of this is in the board game Monopoly: when only one of the railroads (Reading Railroad, Pennsylvania Railroad, B. & O. Railroad, and Short Line) is owned by Player A, the offending player, Player B, must pay \$25. This amount doubles, though, for each additional railroad owned. The profit is exponential rather than linear. *Railroads*, MONOPOLY WIKIA, <http://monopoly.wikia.com/wiki/Railroads>.

52. Typically, competition is good because it drops the profit margin an individual company can have. Competition causes other companies to compete based on price and innovate ways to reduce costs. In certain instances, though, a greater number of competitors results in a greater the price.

53. Richard A. Posner, *Natural Monopoly and Its Regulation*, 21 STAN. L. REV 548, 548 (1969), http://chicagounbound.uchicago.edu/cgi/viewcontent.cgi?article=2861&context=journal_articles.

54. *Id.* One interesting aspect of the AT&T suit is that some of the Bell Companies were allowed to remain together to take advantage of some of the aspects of a natural monopoly. Barger, *supra* note 46.

55. Imagine, for example, a garbage collection company, Tony's Trash Takers, in a city with three streets: A, B, and C. Households on each of those streets pay Tony's Trash Takers some amount of money monthly to collect their garbage. Tony's Trash Takers invested some relatively large amount of money for the truck. Each day, Tony's Trash Takers spends very little on the gas needed to get down streets A, B, and C. A new competitor enters the market, Ruby's Rubbish Removers. Half of the town switches to Ruby's Rubbish Removers. Now Tony's Trash Takers and Ruby's Rubbish Removers both have to pay gas to drive down streets A, B, and C, but they only collect garbage from half of the households. The marginal cost per household has doubled for Tony's Trash Takers because it takes no less gas to drive down streets A, B, and C even though it is collecting half as much garbage.

56. The Sherman-Act—"outlaws 'every contract, combination, or conspiracy in restraint of trade,' and any 'monopolization, attempted monopolization, or conspiracy or combination to monopolize.'" *The Antitrust Laws*, FED. TRADE COMM'N, <http://www.ftc.gov/tips-advice/competition-guidance/guide-antitrust-laws/antitrust-laws>.

57. The Federal Trade Commission Act "bans 'unfair methods of competition' and 'unfair or deceptive acts or practices.'" *Id.*

58. The Clayton Act "addresses specific practices that the Sherman Act does not clearly prohibit, such as mergers and interlocking directorates (that is, the same person making business decisions for competing companies)." *Id.*

act typically requires an overt action rather than just a company being a large company.⁵⁹ Antitrust law in the United States has even been applied to private space exploration companies.⁶⁰ Russia uses the Federal Antimonopoly Service to police antitrust law.⁶¹ The most recent update resulted in a liberalization of their policy reducing the administrative barriers to certain transactions.⁶² Japan's Antimonopoly Law has many similarities to US law, but as a whole is stricter than US antitrust law.⁶³ India's antitrust law is relatively new and less important to this discussion because this Note focuses only on Indian government efforts in space.⁶⁴

There has been some push for international antitrust law to begin dealing with international antitrust issues. Because of increasing globalization, "Cooperation is fundamentally important to competition enforcement in today's globalized world."⁶⁵ Different policies from

59. "But we must adhere to the law, and the law does not make mere size an offense, or the existence of unexercised power an offense. It, we repeat, requires overt acts, and trusts to its prohibition of them and its power to repress or punish them. It does not compel competition, nor require all that is possible." U.S. v. U.S. Steel Corp., 251 U.S. 417, 451 (1920). This is an important distinction for the antitrust law. In high innovation fields, it is easy for a firm to get a technological advantage and for that firm to get very large without any wrongdoing. A firm must make an overt action before it is considered violating the law by the Supreme Court of the United States.

60. *SpaceX v. Boeing*, No. CV 05-07533 FMC MANX, 2006 WL 7136649 (C.D. Cal. May 12, 2006), was dismissed because the court held that SpaceX did not have standing: "The first two contentions were rejected by the Court in both dismissal opinions due to SpaceX's failure to enter the market, but one can assume they would be valid had SpaceX been successfully launching EELVs." Jared W. Eastlack, Note, *Defining Antitrust Injury in Government Launch Contracting: The Case of SpaceX v. Boeing*, 32 J. SPACE L. 203, 213 (2006).

61. Grigory Chernyshov & Ksenia Tyunik, *The Subsequent FAS Notification Requirement Under the Competition Law Has Been Abolished*, LEXOLOGY, Jan. 29, 2014, <http://www.lexology.com/library/detail.aspx?g=bc940b36-74dc-4997-9aec-c319bce47520>.

62.

According to the current version of the Competition Law, notifications of such transactions . . . exceeding the relative thresholds . . . must be filed with FAS within 45 calendar days from the completion of the transaction . . . The new version of the CompetitionLaw abolishes this requirement, which is, undoubtedly, a significant reduction of administrative barriers for these companies' activities, since the procedure for the notification preparation and submission is quite similar (in the amount of required documents and time) to the procedure for applying for the preliminary FAS consent.

Id.

63. Japan's Antimonopoly Law has more strict requirements regarding international agreements, restrictions on corporations and mergers, and it regulates corporate strength more closely. Hiroshi Iyori, *A Comparison of U.S.-Japan Antitrust Law*, 4 PAC. RIM L. & POL'Y J. 59, 67 (1995).

64. See generally COMPETITION COMMISSION OF INDIA, THE COMPETITION ACT (2002), <http://www.cci.gov.in/images/media/Advocacy/CompetitionAct2012.pdf?phpMyAdmin=QuqXb-8V2yTtoq617iR6-k2VA8d>.

65. THE ANTITRUST DIVISION'S INTERNATIONAL PROGRAM, U.S. DEP'T OF JUSTICE, (2011), <http://www.justice.gov/atr/public/international/program.pdf>.

country to country can cause serious problems.⁶⁶ This is especially true in an era in which space exploration is becoming more of a joint venture.⁶⁷ The Supreme Court of the United States has considered that even with laws that look similar internationally, there is pressure to resist applying an individual country's laws to international competition.⁶⁸ The outlook for a real change in international antitrust law looks bleak.⁶⁹

66. "The potential for harmonisation of domestic competition policies is also seen as a critical area for all trading nations, including the newly-emerging and rapidly-industrialising economies, in view of the costs and inefficiencies created when these domestic policies collide." Int'l Bar Ass'n, *Overview—Global Competition Forum*, <http://www.globalcompetitionforum.org/gcfover.htm#> (last visited Oct. 1, 2015).

67.

The International Space Station is a vast outpost, its scale inspiring awe even in the astronauts who have constructed it. . . . The station is a joint operation: half American, half Russian, with each nation managing its own side of the craft (the U.S. side includes modules or equipment from Canada, Japan, and Europe, and typically a visiting astronaut from one of those places). Navigation responsibilities and operation of the station's infrastructure are shared, and the role of station commander alternates between a cosmonaut and an astronaut.

Charles Fishman, *5,200 Days in Space: an Exploration of Life Aboard the International Space Station, and the Surprising Reasons the Mission Is Still Worthwhile*, THE ATLANTIC, Jan./Feb. 2015, available at <http://www.theatlantic.com/features/archive/2014/12/5200-days-in-space/383510/>.

68.

Respondents reply that many nations have adopted antitrust laws similar to our own, to the point where the practical likelihood of interference with the relevant interests of other nations is minimal. Leaving price fixing to the side, however, this court has found to the contrary. . . . Regardless, even where nations agree about primary conduct, say, price fixing, they disagree dramatically about appropriate remedies. The application, for example, of American private treble-damages remedies to anticompetitive conduct taking place abroad has generated considerable controversy. And several foreign nations have filed briefs here arguing that to apply our remedies would unjustifiably permit their citizens to bypass their own less generous remedial schemes, thereby upsetting a balance of competing considerations that their own domestic antitrust laws embody.

F. Hoffmann-La Roche Ltd. v. Empagran S.A., 542 U.S. 155, 167 (2004) (internal citations omitted).

69.

The most striking conclusion is pessimistic: International agreements on antitrust policy will continue to be difficult—and may be impossible—to reach because not all countries will benefit from such agreements. This result stems from the very problem that antitrust laws seek to solve. Antitrust policy is intended to restrain the behavior of monopolistic firms to increase the welfare of consumers. Because firms and consumers are distributed unequally across countries, governments do not have identical interests.

Andrew T. Guzman, *Is International Antitrust Possible*, 73 N.Y.U. L. REV. 1501 1548 (1998), available at <http://scholarship.law.berkeley.edu/cgi/viewcontent.cgi?article=2459&context=facpubs>.

II. THE SITUATION—OR “HOUSTON, WE HAVE A PROBLEM”

There are a couple of reasons that antitrust law as a whole might not be well suited to the field of space exploration. The first is the situation of natural monopolies.⁷⁰ The second is the potential problems antitrust law could cause in high innovation fields.

A. *Natural Monopoly Problem*

A natural monopoly occurs when it is the most efficient to have one provider of a good. High fixed costs and low variable costs can cause this phenomenon. The problem is that “. . . in many cases the technology for outer space exploitation shows decreasing cost characteristics, consistent with natural monopoly resulting from scale economies.”⁷¹ This is because of the high costs of the initial research to even enter the “market” of space exploration.⁷² Once a firm is in the market, a firm must invest in high cost equipment from shuttles and rockets to high-tech machinery and lab equipment. Any equipment that can be reused mission-to-mission falls under the category of fixed costs. These relatively high fixed costs mean that it is potentially more efficient to have an incredibly large firm to tackle this task.

B. *Antitrust Problems in High Innovation Fields*

The problems faced by markets with high development costs are potentially compounded in high-innovation markets. There are competing viewpoints in regards to the role that antitrust law should play in high-innovation markets. On the one hand, in high-innovation markets, it is possible for a relatively small firm to usurp the throne of mega-corporations.⁷³ This view likely does not address that many markets still have incredibly high barriers to entry.⁷⁴ In high innovation fields,

70. Posner, *supra* note 53.

71. Todd Sandler & William Schulze, *The Economics of Outer Space*, 21 NAT. RESOURCES J. 371 (1985).

72. *Id.* at 373.

73. Facebook establishing dominance over MySpace is an excellent case-study of this. “Rupert Murdoch. . . picked up social networking darling MySpace for a price (\$580 million) that seemed steep but not outrageous. . . . Four short years later, however, MySpace’s shine has dulled. Upstart Facebook has blown past MySpace to claim dominant leadership in the social networking space.” Scott Anthony, *MySpace’s Disruption, Disrupted*, HARV. BUS. REV., Dec. 16, 2009, <https://hbr.org/2009/12/lessons-from-myspace>.

74. “. . . Rapid technological progress does not necessarily equate to low barriers to entry. For example, markets may remain difficult to penetrate due to large entry costs for producers, high

traditional antitrust law may struggle to fight the right battles.⁷⁵ In fact, antitrust law could theoretically hinder innovation.⁷⁶

C. Other Problems for Privatization

International law, as stated earlier, could prove to be problematic for space exploration. Current law does not necessarily make incentives crystal clear.⁷⁷ If property rights in space were clearly defined, incentives might very well exist.⁷⁸ This is an unfortunate side effect of weak international law in regards to space exploration. Unclear incentives in general might mean that a private approach to space exploration is an ineffective choice because businesses would refuse to take up the charge of investing resources into a business without some assurance of the incentives that exist in space.

III. THE PROPOSAL—OR “THIS IS HOW WE FIX PROBLEM IN THE RUSSIAN SPACE STATION”

Despite what immediately look like problems for space exploration, the current trajectory suggests that in most instances privatization makes a lot of sense. Because privatization has many benefits, countries should continue to adapt antitrust law to create strong protections against monopolies and work toward a strong international antitrust presence that

switching costs for consumers or restricted access to a key input.” Fiona Scott-Morton, *Antitrust Enforcement in High-Technology Industries: Protecting Innovation and Competition*, U.S. DEP’T OF JUSTICE 8 (2012), <http://www.justice.gov/atr/public/speeches/290876.pdf>.

75. “Innovation is a critical dimension of competition and one that antitrust law strongly protects. . . . Innovation inevitably leaves some firms behind and may confer market power on the innovating firm. . . . it is not harm to competition, but rather competition itself. . . . competition policy for digital platforms would benefit from further shifting its focus from conventional price and output effects to innovation effects.” Howard A. Shelanski, *Information, Innovation, and Competition Policy for the Internet*, 161 U. PA. L. REV. 1663, 1692, http://scholarship.law.upenn.edu/cgi/viewcontent.cgi?article=1025&context=penn_law_review.

76. In the situation where entrants to a market are able to enter through innovation, antitrust law effectively becomes purposeless. The only potential effect is that of inefficiency. Companies will waste time and money on litigation when investing in technology would result in a more efficient allocation of resources.

77. “The Outer Space Treaty explicitly forbids the appropriation of celestial bodies, even by a developed country funding the majority of space exploration and discovery.” Zach Meyer, *Privatization of Space Ventures: Proposing a Proven Regulatory Theory for Future Extraterrestrial Appropriation*, 30 U. NW. J. INT’L L. & BUS. 193 (2010).

78. “In other words, the point of public policy is to make big things happen that would not have happened anyway. To do this, big budgets are not enough: big thinking and big brains are key.” Mariana Mazzucato, *Let’s Rethink the Idea of the State: It Must Be a Catalyst for Big, Bold Ideas*, THE GUARDIAN, Dec. 15, 2013, <http://www.theguardian.com/commentisfree/2013/dec/15/george-osborne-public-spending-taxpayers-money>.

would benefit development of the technologies while allowing room for cooperation.

A. *The Natural Monopoly “Problem”*

It might immediately seem concerning that space exploration has such high fixed costs. The other necessary component for a natural monopoly, though, is low variable costs. This is probably not a factor in space exploration. For example, the United States spends \$3 billion a year on the International Space Station.⁷⁹ Even if these are relatively “low” numbers compared to the billions spent on the fixed costs, natural monopolies do not typically include billions of dollars in variable costs. For a true natural monopoly to exist, the firm has to grow significantly but still see economies of scale. The variable cost per mission would include launch prices. Currently, the lowest prices for launches still suggest the variable costs would be too high for a true natural monopoly.⁸⁰

As a caveat to the idea that competition will always be good in the space exploration field, it is important to note that Japan’s space elevator exemplifies the high fixed cost with relatively low variable cost model that occurs in natural monopolies.⁸¹ Japan’s space elevator seems like one of the best candidates for a natural monopoly.⁸² The variable costs suggested

79. “The U.S. currently spends around \$3 billion per year to help maintain the space station with other countries.” Brad Plumer, *Nasa Wants to Keep the International Space Station Going Until 2024. Is That a Good Idea?*, WASH. POST, Jan. 9, 2014, <http://www.washingtonpost.com/blogs/wonkblog/wp/2014/01/09/nasa-plans-to-keep-the-international-space-station-going-until-2024-is-that-a-good-idea/>. Despite that astounding price, it is a bargain compared to other expenditures the United States pursues: “As it happens, the cost to run and sustain the Space Station is about the same as the cost to run a single U.S. Navy aircraft-carrier battle group. We have 10 aircraft carriers at sea, with two more under construction. And while an aircraft carrier at sea is a hive of nonstop activity, that activity is arguably just as circular as what goes on in space. It involves maintenance and routine operations and practice for fighting that most likely will never happen.” Fishman, *supra* note 67.

80. “As advertised on the company’s Web site, a Falcon 9 launch costs an average of \$57 million, which works out to less than \$2,500 per pound to orbit. That’s significantly less than what other U.S. launch companies typically charge, and even the manufacturer of China’s low-cost Long March rocket (which the U.S. has banned importing) says it cannot beat SpaceX’s pricing.” Andrew Chaikin, *Is SpaceX Changing the Rocket Equation?*, AIR & SPACE MAGAZINE (Jan. 2012), <http://www.airspacemag.com/space/is-spacex-changing-the-rocket-equation-132285884/?no-ist>.

81. Once solutions like space elevators become more feasible, governments may benefit from picking “winners” in certain markets. Just as a municipality may pick a single trash removal company, a country may find it is the most efficient to pick one space elevator company. Moreover, the world may find that it does not need more than one or two such elevators as a whole.

82. “Now projected to be on the order of a \$6 billion investment, the first space elevator could quickly reduce lift costs to \$100 per pound. That far outstrips today’s pricey launch costs of roughly \$10,000 to \$40,000 per pound, depending upon destination and choice of rocket launch system.” Leonard David, *High Hopes for Space Elevator*, NBC NEWS, Sept. 17, 2003, http://www.nbcnews.com/id/3077701/ns/technology_and_science-space/t/high-hopes-space-elevator/#.VF0kWfdIdk.

for the space elevator are more than a 95% reduction over those lowest prices available right now from SpaceX. The elevator in general *looks* more like a natural monopoly than a market of launches and space vehicles.⁸³

All of this analysis presupposes no difficulties in government regulation of a monopoly, which also seems naïve.⁸⁴ While some have proposed insight into the best methods for regulation of a natural monopoly,⁸⁵ the regulatory concerns of a government monopoly is just one more reason that private industry seems like the wiser choice for the time being.

B. The Incentive “Problem”

It is hard to argue that a clearer international policy on extraterrestrial property rights would not help solidify the incentives that exist in space. It is likely an irrefutable fact that if companies knew for certain what the potential prospects of space mining and property development were that it would be easier to determine the incentives that exist for space exploration. As that is not the case, it is important to analyze the current incentives under the most conservative estimate.

Even under a conservative model that suggests there is no ability to develop individual property rights in space, the market for space tourism and government contracts appears to be incredibly lucrative. Companies can make billions on tourism that would require no property rights. Even if

83. Companies racing to make the best rockets and vehicles for space exploration may have radically different goals and destinations in mind. Space elevator technology likely has some fixed cap on maximum distance from the Earth that it could ever be. Two space elevators likely share the same purpose and provide the same services to the same market of people. That looks much more like the example of a trash pick-up service than the more traditional space exploration market currently looks.

84. For example, as a model the United States Postal Service certainly looks like a natural monopoly. If one truck is delivering to houses A and C, it does not make sense for a second truck from a second company to deliver a package to house B. The variable cost for the first truck to also deliver to house B is next to zero because the gas has already been allotted to deliver to the other two houses. Despite a near perfect fit to the model, the federal government has had great difficulty in regulating this market. First, it is clear there are other competitors. The fact that other companies are able to compete with USPS suggests that something is wrong with the model. USPS should see such great economies of scale that no company should be able to enter the market. Second, the federal government has mismanaged the monopoly somewhere along the way. Despite the USPS being funded with both taxes and charging per unit shipped, the USPS has run into major fiscal problems. Doug Bandow, *The Post Office Is Broke: It's Time To End Washington's Postal Monopoly*, FORBES, Aug. 12, 2013, <http://www.forbes.com/sites/dougbandow/2013/08/12/the-post-office-is-broke-its-time-to-end-washingtons-postal-monopoly/>.

85. See generally S. Ran Kim and A. Horn, *Regulation Policies Concerning Natural Monopolies in Developing and Transition Economies*, U.N. DEP'T. OF ECON. & SOC. AFF. (Mar. 1999), <http://www.un.org/esa/esa99dp8.pdf>.

the federal government were to stop all funding of research and development for space travel, the necessity of space travel still exists. Private companies would have the opportunity to pursue lucrative government contracts to provide governments with their space travel needs. On top of government and private industry travel, companies can pursue space based alternative energy.⁸⁶

Space still has adequate incentives in place even if international space law isn't clear; space tourism and solar power together appear to provide enough benefits that companies will ultimately still invest in space exploration. Antitrust law should adapt to the changing circumstances of high innovation field, though. As stated earlier, antitrust law can cause a hindrance in a high-innovation field. Countries should take serious efforts to ensure that antitrust laws are being used as a way protect incentives rather than becoming a sinkhole for funds that could be better utilized elsewhere.

Most important in this changing landscape is the potential for government legal innovation. While many countries have modeled their antitrust laws on the United States, this era opens the door for a new global leader in antitrust law. The country that first develops effective antitrust measures for private space companies may find itself the global leader and model for antitrust efforts. An important aspect of that legal innovation will be global cooperation. As companies find more cooperation internationally, countries will benefit from not only expanding the reach of their own antitrust laws but more so from an expansion of international antitrust law.

C. What Does It All Mean?

The solution is one that governments tend to shy away from: a commitment to remain flexible in enforcement of antitrust law.⁸⁷ Space exploration as a whole is not one industry that can be treated uniformly. Space elevators must be treated differently from a more typical space

86. While this Note has addressed mining and potential resource extraction in space, space based solar power would not require strong property rights. "The United States, China, India and Japan all have projects at various stages of development that would see robots assemble solar arrays that could provide the Earth with massive amounts of clean and renewable energy delivered wirelessly." Peter Shadbolt, *Space-Based Solar Power: The Energy of the Future?*, CNN, Dec. 18, 2014, <http://www.cnn.com/2014/12/18/tech/innovation/space-based-solar-power/>.

87. When rapid change in policies and technologies is likely, "[i]t would clearly be premature and even presumptuous to attempt to provide a menu of policies for regulation and antitrust activity." David B. Audretsch, William J. Baumol, & Andrew E. Burke, *Competition Policy in Dynamic Markets*, 19 INT. J. IND. ORGAN. 613, 630 (2001).

exploration approach. Alternative energy efforts may be different from tourism and tourism from government contracts.

Japan's space elevators epitomize the natural monopoly effect. A specific country may choose one supplier of its space elevator needs and find the greatest cost efficiencies. In point of fact, the world as a whole may find that is true. There needs to be quick responses to any anticompetitive actions, though. If a space elevator company acts in a way that hinders the market, it should face both civil and criminal charges.

Similarly, antitrust law must remain flexible in the area of rocket launches. Even though the market is in its infancy, the private sector has high demand for space launches, and if the United States federal government were the only supplier, there would be too great of a mismatch.⁸⁸ Space launches will likely become the greatest individual market of space exploration as a whole. Every aspect of space exploration necessarily starts with a launch. There will be plenty of room for space launch companies in the market.

Regardless of antitrust law, private companies will only pursue that which is profitable.⁸⁹ Former Supreme Court Justice William J Brennan, Jr. believed that even if space law is not needed, it is important to continue to strive in exploration.⁹⁰ There are some aspects of space exploration that are not currently profitable.⁹¹ The problem with market-driven capitalism, however, is that in fields with great amounts of research and development that are necessary, by the time the product is needed and profitable the research and development has not been completed. The government's involvement in space exploration should not be viewed as the most

88. "Given the mismatch between government supply and commercial demand, privately funded ventures offer a golden key to unlocking the vast potential of space related commerce." Jonathon Thomas, *Privatization of Space Ventures: Proposing a Proven Regulatory Theory for Future Extraterrestrial Appropriation*, 1 *BYU INT'L L. & MAN. REV.* 191, 193 (2005), available at <http://digitalcommons.law.byu.edu/cgi/viewcontent.cgi?article=1006&context=ilmr>.

89. "Businesses seek lucrative ventures; if humankind wishes to appropriate space, space appropriation must also be lucrative." *Id.* at 206.

90. It is reported that Associate Justice William J. Brennan, Jr. said the following: "I won't see the day when a code of laws for space communities will become an urgent necessity. Perhaps few of you may see that day. But we can be glad that responsible quarters are beginning to give thought to the law and space communities. For, to repeat former President Reagan's admonition, 'America must lead the effort to colonize space, because in the next century leadership on Earth will come to the nation that shows the greatest leadership in Space.'" William J. Brennan, Jr., *Space Colonization and the Law*, 3 *HARV. J.L. & TECH.* 7, 12 (1990), <http://jolt.law.harvard.edu/articles/pdf/v03/03HarvJLTech001.pdf>.

90. Audretsch, *supra* note 87.

91. One of the best examples of unprofitable space exploration is the actual *exploration*. While resource extraction and tourism could all lead to revenue, the actual exploration of space cannot be profitable—by definition—because the organization doing the exploring has no income.

efficient method because of a natural monopoly—that is not undeniably true at this point. The government’s involvement in space exploration should be considered necessary because of the importance of investing in space exploration before it is economically feasible for private companies to do so.⁹² Businesses are not at a point that would allow them to invest in space exploration to a significant level.⁹³

It does not make sense for NASA to poorly duplicate the efforts of private space companies. Capitalists staunchly reject the notion that government intervention makes sense in a field like space exploration, especially one that is ripe with potential incentives. This might not be the whole story, though. It should be noted that the United States federal government invested willingly into space exploration and landed humans on the moon decades ago, a feat that no private company (or government) has accomplished since. This could be because of the potential incentive ambiguity regarding the moon, or it could be that it is not yet economical for private companies to invest in that type of product currently. Regardless, it is easy to understand the capitalists’ viewpoint that it is inefficient to have government funding for a project that is merely attempting to keep up with private projects. It makes a great deal of sense, though, for government spending to develop the technology that private companies will need to rely on for decades to come. India has no private space exploration companies but made it to the moon cheaper than anyone else. It was able to rely on the technology developed by other countries

92.

While economists usually talk about things that are not done at all (or done inadequately) by the private sector as “public goods,” investments in “big” public goods like the UK national health service, or the investments that led to new technologies behind putting a “man on the moon”, required even more than fixing the “public good” problem. They required the willingness and ability to dream up big “missions.

Mariana Mazzucato, *Let’s Rethink the Idea of the State: It Must Be a Catalyst for Big, Bold Ideas*, THE GUARDIAN, Dec. 15, 2013, <http://www.theguardian.com/commentisfree/2013/dec/15/george-osborne-public-spending-taxpayers-money>.

93.

For all that the Communist Manifesto breathlessly extolled the revolutionary spirit of capital—‘constant revolutionising of production, uninterrupted disturbance of all social conditions . . . all that is solid melts into air’—businesses are really quite conservative. They aren’t going to invest unless they’re reasonably sure of a profit, even if the result is sluggish growth and flatlining innovation. . . . it falls to states to undertake the risky investments that pay off in the technology that makes, for example, iPhones possible. The point here is that, if it were left to private sector enterprise, we would never have seen a human foot touch down on the moon’s surface.

Richard Seymour, *Why Outer Space Really Is the Final Frontier for Capitalism*, THE GUARDIAN, Dec. 20, 2013, <http://www.theguardian.com/commentisfree/2013/dec/20/outer-space-final-frontier-capitalism-mine-moon>.

over decades of space exploration. This is an excellent model to continue. Private companies in space exploration do not have the incentives to make the giant leaps in research. The companies do have the incentive to lower costs and innovate existing technologies to be more efficient.

Antitrust law surrounding space exploration will also need to be adept at preventing patent rights hindering potential innovation.⁹⁴ Some companies specialize in the exploitation of patent laws.⁹⁵ In a high-innovation field like space exploration, the potential for patent trolls is very high.⁹⁶

CONCLUSION: "I'M LEAVING ON A JET PLANE"

The most important goal that antitrust law needs to have is innovation.⁹⁷ Countries must work to ensure that they adequately

94. While the typical argument for patent rights is that they provide an incentive for innovation by clearly allowing the inventor to reap the full monetary benefits of the product—without the patent, crafty companies could reverse engineer products at a fraction of the total price of research and development that went into the development of the product in the first place—it is possible that companies could file too many patents in an effort to make money solely from winning lawsuits rather than actually utilizing the patent. “[I]n a world in which innovation is the firm’s prime competitive weapon, that weapon can sometimes be misused. Firms can, for example, engage in pre-emptive innovation and patenting in order to make it more difficult for entrants or even current rivals to provide viable innovations of their own.” Audretsch, *supra* note 87.

95. “Buyers of patents frequently include ‘patent trolls,’ which, like the Federal Trade Commission, we call Patent Assertion Entities or ‘PAEs’. . . . Operating Company transfers of patents to PAE proxies can raise competitive concerns. Through transfers that evade constraints on their own ability to enforce patents, Operating Companies can harness PAEs to raise rivals’ costs. . . . Operating Companies can combine these elements to hinder rivals, for example by parceling out pieces of a portfolio of standard-essential patents to PAEs through contracts that create incentives for PAE transferees to aggressively target competitors.” Mark S. Popofsky & Michael D. Laufert, *Patent Assertion Entities and Antitrust: Operating Company Patent Transfers*, THE ANTITRUST SOURCE (Apr. 2013), <http://www.ropesgray.com/files/upload/Antitrust-Attacks-on-Patent-Assertion-Entities.PDF>.

96. “[I]n a world in which innovation is the firm’s prime competitive weapon, that weapon can sometimes be misused. Firms can, for example, engage in pre-emptive innovation and patenting in order to make it more difficult for entrants or even current rivals to provide viable innovations of their own.” Audretsch, *supra* note 87, at 631.

97. “The basic attribute that differentiates the dynamic approach to competition policy is a focus on innovation rather than prices and profits and on flexibility in resource utilisation rather than static efficiency in their assignment at a given moment.” *Id.* at 630.

incentivize innovation.⁹⁸ Countries will likely find that even if privatization and strong antitrust policies seem desirable, governments should still invest in space exploration.

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98.

However, where innovation rather than price is the prime means by which welfare can be increased the desirability of preventing coordination is not so clear. Theory suggests that a primary disincentive for investment in innovation is its substantial spillovers, the fact that a considerable proportion of the benefits of an innovation often go to others than those who have produced it. This is particularly likely to inhibit the innovation process when competitors are among the prime beneficiaries.

Id.

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