# DA Mining

#### Private companies are set to mine in space – new tech and profit motives make space lucrative

Gilbert 21, (Alex Gilbert is a complex systems researcher and PhD student in Space Resources at the Colorado School of Mines, “Mining in Space is Coming”), 4-26-21, Milken Institute Review, https://www.milkenreview.org/articles/mining-in-space-is-coming // MNHS NL

Space exploration is back. after decades of disappointment, a combination of better technology, falling costs and a rush of competitive energy from the private sector has put space travel front and center. indeed, many analysts (even some with their feet on the ground) believe that commercial developments in the space industry may be on the cusp of starting the largest resource rush in history: mining on the Moon, Mars and asteroids. While this may sound fantastical, some baby steps toward the goal have already been taken. Last year, NASA awarded contracts to four companies to extract small amounts of lunar regolith by 2024, effectively beginning the [era of commercial space mining](https://payneinstitute.mines.edu/wp-content/uploads/sites/149/2020/09/Payne-Institute-Commentary-The-Era-of-Commercial-Space-Mining-Begins.pdf). Whether this proves to be the dawn of a gigantic adjunct to mining on earth — and more immediately, a key to unlocking cost-effective space travel — will turn on the answers to a host of questions ranging from what resources can be efficiently. As every fan of science fiction knows, the resources of the solar system appear virtually unlimited compared to those on Earth. There are whole other planets, dozens of moons, thousands of massive asteroids and millions of small ones that doubtless contain humungous quantities of materials that are scarce and very valuable (back on Earth). Visionaries including Jeff Bezos [imagine heavy industry moving to space](https://www.fastcompany.com/90347364/jeff-bezos-wants-to-save-earth-by-moving-industry-to-space) and Earth becoming a residential area. However, as entrepreneurs look to harness the riches beyond the atmosphere, access to space resources remains tangled in the realities of economics and governance. Start with the fact that space belongs to no country, complicating traditional methods of resource allocation, property rights and trade. With limited demand for materials in space itself and the need for huge amounts of energy to return materials to Earth, creating a viable industry will turn on major advances in technology, finance and business models. That said, there’s no grass growing under potential pioneers’ feet. Potential economic, scientific and even security benefits underlie an emerging geopolitical competition to pursue space mining. The United States is rapidly emerging as a front-runner, in part due to its ambitious Artemis Program to lead a multinational consortium back to the Moon. But it is also a leader in creating a legal infrastructure for mineral exploitation. The United States has adopted the world’s first spaceresources law, recognizing the property rights of private companies and individuals to materials gathered in space. However, the United States is hardly alone. Luxembourg and the United Arab Emirates (you read those right) are racing to codify space-resources laws of their own, hoping to attract investment to their entrepot nations with business-friendly legal frameworks. China reportedly views space-resource development as a national priority, part of a strategy to challenge U.S. economic and security primacy in space. Meanwhile, Russia, Japan, India and the European Space Agency all harbor space-mining ambitions of their own. Governing these emerging interests is an outdated treaty framework from the Cold War. Sooner rather than later, we’ll need [new agreements](https://issues.org/new-policies-needed-to-advance-space-mining/) to facilitate private investment and ensure international cooperation.

Back up for a moment. For the record, space is already being heavily exploited, because space resources include non-material assets such as orbital locations and abundant sunlight that enable satellites to provide services to Earth. Indeed, satellite-based telecommunications and global positioning systems have become indispensable infrastructure underpinning the modern economy. Mining space for materials, of course, is another matter. In the past several decades, planetary science has confirmed what has long been suspected: celestial bodies are potential sources for dozens of natural materials that, in the right time and place, are incredibly valuabl**e**. Of these, water may be the most attractive in the near-term, because — with assistance from solar energy or nuclear fission — H2O can be split into hydrogen and oxygen to make rocket propellant, facilitating in-space refueling. So-called “rare earth” metals are also potential targets of asteroid miners intending to service Earth markets. Consisting of 17 elements, including lanthanum, neodymium, and yttrium, these critical materials (most of which are today mined in China at great environmental cost) are required for electronics. And they loom as bottlenecks in making the transition from fossil fuels to renewables backed up by battery storage. The Moon is a prime space mining target. Boosted by NASA’s mining solicitation, it is likely the first location for commercial mining. The Moon has several advantages. It is relatively close, requiring a journey of only several days by rocket and creating communication lags of only a couple seconds — a delay small enough to allow remote operation of robots from Earth. Its low gravity implies that relatively little energy expenditure will be needed to deliver mined resources to Earth orbit. The Moon may look parched — and by comparison to Earth, it is. But recent probes have confirmed substantial amounts of water ice lurking in [permanently shadowed craters](http://lroc.sese.asu.edu/posts/1105) at the lunar poles. Further, it seems that solar winds have implanted significant deposits of helium-3 (a light stable isotope of helium) across the equatorial regions of the Moon. Helium-3 is a potential fuel source for second and third-generation fusion reactors that one hopes will be in service later in the century. The isotope is packed with energy (admittedly hard to unleash in a controlled manner) that might augment sunlight as a source of clean, safe energy on Earth or to power fast spaceships in this century. Between its water and helium-3 deposits, the Moon could be the resource stepping-stone for further solar system exploration. Asteroids are another near-term [mining target](https://foreignpolicy.com/2016/04/28/the-asteroid-miners-guide-to-the-galaxy-space-race-mining-asteroids-planetary-research-deep-space-industries/). There are all sorts of space rocks hurtling through the solar system, with varying amounts of water, rare earth metals and other materials on board. The asteroid belt between the orbits of Mars and Jupiter contains most of them, many of which are greater than a kilometer in diameter. Although the potential water and mineral wealth of the asteroid belt is vast, the long distance from Earth and requisite travel times and energy consumption rule them out as targets in the near term. The prospects for space mining are being driven by technological advances across the space industry. The rise of reusable rocket components and the now-widespread use of off-the-shelf parts are lowering both launch and operations costs. Once limited to government contract missions and the delivery of telecom satellites to orbit, private firms are now emerging as leaders in developing “NewSpace” activities — a catch-all term for endeavors including orbital tourism, orbital manufacturing and mini-satellites providing specialized services. The space sector, with a market capitalization of $400 billion, could grow to as much as $1 trillion by 2040 as private investment soars.

#### OST defines appropriation as occupation, use, or any other means – the aff definitely links

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Based on the premise of ‘res communis’, the magna carta of space law, the OST, illustrates outer space as “the province of all mankind”.[l] Under Article I, States are free to explore and use outer space and to access all celestial bodies “on the basis of equality and in accordance with international law.”[li] Although the OST does not explicitly mention “mining” activities, under Article II, outer space including the Moon and other celestial bodies are “not subject to national appropriation by claim of sovereignty” through use, occupation or any other means.[lii] Furthermore, the Moon Agreement, 1979, not only defines outer space as “common heritage of mankind” but also proscribes commercial exploitation of planets and asteroids by States unless an international regime is established to govern such activities for “rational management,” “equitable sharing” and “expansion of opportunities” in the use of these resources.[liii]

#### Private companies are key to space success

Ferholz 21, (Tim Ferholz covers space, the economy, and geopolitics for Quartz. He is the author of “Rock Billionaires: Elon Musk, Jeff Bezos, and the New Space Race, “NASA Has Always Needed Private Companies To Go To The Moon”), 6-24-21, Quartz, https://qz.com/2024339/nasa-has-always-needed-private-space-companies-to-go-to-the-moon/ // MNHS NL

“We got to the Moon without private contractors, if I’m not mistaken,” US rep. Jamaal Bowman [said yesterday](https://science.house.gov/hearings/a-review-of-the-presidents-fiscal-year-2022-budget-proposal-for-nasa), leading me to collapse in a frothing heap. NASA administrator Bill Nelson had a calmer response: “In the Apollo program, Mr. Congressman, we got to the Moon with American corporations.” A dozen major US companies worked closely with the US space agency to build the vehicles that took the first humans to the lunar surface. NASA scientists and engineers planned the mission and the technology needed to accomplish it, then worked with the most advanced tech firms of the day to produce rockets, capsules, landers, suits, and rovers. There’s no doubt Apollo was a big government program, but the private sector was essential. Why does this history matter? In the last decade, the US space program has made major leaps by handing more work directly to private firms. Rather than designing a new space vehicle to carry cargo or astronauts to the International Space Station and hiring someone to build it, NASA effectively told its needs to the marketplace, and accepted proposals from companies that would not only design the spacecraft, but operate them as a service. This choice launched SpaceX and a new era of private sector space in the US. The logic of this kind of partnership rests on several factors: These are tasks that have been done before, paving the way for new organizations to take them on more easily. Private firms are now willing to invest their own capital alongside the government, saving public money. They can take more risk, and use more advanced program management techniques than government-run programs. And they seem to result in more accountability for taxpayers when things go wrong: NASA shoulders the extra cost for Boeing’s long-delayed and over-budget SLS rocket, a traditional program; the same company is paying hundreds of millions of dollars to re-test its Starliner spacecraft, bought through a public-private partnership. As the US plans its return to the Moon, a debate is emerging about the role of private firms. NASA has hired them to do everything from sending robots on the lunar surface to developing the landers that will carry humans there. In the House, lawmakers like science committee chair Eddie Bernice Johnson are skeptical that companies can take on these tasks. This isn’t a crazy worry: Landing on another astronomical body is a greater challenge than flying to low-earth orbit, and there are far fewer obvious non-government customers in the lunar transit market. For now, NASA has hired Elon Musk’s SpaceX to build lunar landers. Jeff Bezos’ Blue Origin is challenging the government’s choice, delaying the whole program until at least August. The corporate tussle, and the two companies’ decision to market themselves as personal projects of their controversial billionaire founders, have led opponents to portray NASA’s partnerships as corporate handouts. But make no mistake: The alternative is still money for corporations—likely much more, and with fewer strings attached.

#### Squo private companies are willing to invest, but the plan crosses a perception barrier which destroys investment

Shaw 13 - Lauren E, J.D. from Chapman University School of Law, ”Asteroids, the New Western Frontier: Applying Principles of the General Mining Law of 1872 to Incentive Asteroid Mining”, JOURNAL OF AIR LAW AND COMMERCE, Volume 78, Issue 1, Article 2, <https://scholar.smu.edu/cgi/viewcontent.cgi?article=1307&context=jalc> // recut MNHS NL

To some, the mining of asteroids might sound like the premise of a science fiction novel' or the solution to the heartwrenching, fictional scenario depicted in the film Armageddon.2 To others, it evokes a fantastical idea that may come to fruition in a distant reality. However, impressively funded companies have plans to send spacecraft to begin prospecting on asteroids within the next two years.' The issues associated with the mining of asteroids should be addressed before these plans are set in motion. Much has been written about the issues that might arise from allowing nations to own these space bodies and the minerals they contain; one such issue is the impact on international treaties.4 However, little has been written about the applicability of preexisting mining laws-which provide a basic property right scheme for the private sector-such as the General Mining Law of 1872 (Mining Law) to the management of asteroid mining.' The literature to date on how to legally address asteroid mining is minimal.' The articles that do address it propose the creation of different systems, such as a "property rights-based system that relies on the doctrine of first possession"7 or an international authority that would regulate mining operations.' Implementing a scheme that offers ownership of extracted resources without bestowing complete sovereignty is necessary to avoid an impending legal limbo-that is, an outer space "Wild West" equivalent where there is neither certainty nor security in who owns what.9 If private sector miners of asteroids know this right already exists, they will have more incentive to extract resources.' 0 This, in turn, would increase the chances of successful missions, resulting in numerous scientific and explorative benefits, along with the potential replenishment of key elements that are becoming increasingly depleted on Earth yet are still needed for modern industry. Scientists speculate that key elements needed for modern industry, including platinum, zinc, copper, phosphorus, lead, gold, and indium, could become depleted on Earth within the next fifty to sixty years." Many of these metals, such as platinum, are chemical elements that, unlike oil or diamonds, have no synthetic alternative.12 Once the reserves on Earth are mined to complete depletion, industries will be forced to recycle the existing supply of minerals, which will result in increased costs due to increased scarcity.' 3 However, evidence is accumulating that asteroids only a few hundred thousand miles away from Earth may be composed of an abundance of natural resources-including many of the minerals being mined to depletion on Earth-that could lead to vast profits." Most of the minerals being mined on Earth, including gold, iron, platinum, and palladium, originally came from the many asteroids that hit the Earth after the crust cooled during the planet's formation.'

#### Space mining is the only way to solve climate change

Duran 21, (Paloma Duran is a journalist and industry analyst at Mexico Business News, “Is Space Mining the Best Option to Face Climate Change?”), 11-03-21, Mexico Business News, https://mexicobusiness.news/mining/news/space-mining-best-option-face-climate-change // MNHS NL

Going to net zero means that more mining is needed. Experts have said that the current supply cannot support the necessary metals demand for the green transition. As a result, new mining alternatives have gained greater relevance, among them is space mining. Several countries, including Mexico, have shown their interest in this alternative, creating a new space race. “The solar system can support a billion times greater industry than we have on Earth. When you go to vastly larger scales of civilization, beyond the scale that a planet can support, then the types of things that civilization can do are incomprehensible to us … We would be able to promote healthy societies all over the world at the same time that we would be reducing the environmental burden on the Earth,” said Dr. Phil Metzger, Planetary Scientist at the University of Central Florida. Currently, there are several attempts to address global warming and transition to a net zero carbon economy. There has been an increasing interest in renewable energy and infrastructure, which has increased demand for various minerals, especially lithium, cobalt, nickel, copper and rare earth elements. However, according to experts, the world is close to entering a metals supercycle, where demand will exceed available supply, causing prices to skyrocket. Consequently, the mining industry has sought alternatives to achieve the required supply. Options include recycling and improved mine waste management, sea mining and space mining. The latter is considered one of the alternatives with the greatest potential. However, a regulatory framework is still lacking and there is almost no experience in this regard. Despite the lack of knowledge regarding space mining, it has become a very attractive option since the planet is running out of resources. While some people believe that land-based mining is cheaper than space mining, experts believe this may change in the long term. Furthermore, within the solar system there are countless bodies rich in minerals, ores and elements that will accelerate the fight against climate change. “There will come a point when there is nothing left to mine on the surface, prompting mines to reach even further below. But even those resources are destined to run out and so we will aim toward ocean mining, which already has specific technologies that are being developed. Nevertheless, even those mines are limited as well. The mine of the future, which today may seem unlikely, will no longer be on our planet. There will be a time when space mining will be as common as an open leach mine,” Eder Lugo, Minerals Head at Siemens, told MBN. More than 150 million asteroids measuring approximately 100m are believed to be in the inner solar system alone. In addition, astronomers have also identified abundant minerals near the Earth’s space and the Main Asteroid Belt. There are three main groups into which asteroids are divided: C- type, S- type, and M- type. The last two groups are the most abundant in minerals such as gold, platinum, cobalt, zinc, tin, lead, indium, silver, copper and rare earth metals. "Energy is limited here. Within just a few hundred years, you will have to cover all of the landmass of Earth in solar cells. So, what are you going to do? Well, what I think you are going to do is you are going to move out in space … all of our heavy industry will be moved off-planet and Earth will be zoned residential and light-industrial,” said Jeff Bezos, Founder of Amazon and the Space Launch Provider Blue Origin.

#### Anthropogenic warming causes extinction --- mitigation efforts now are key

Griffin, 2015 (David, Professor of Philosophy at Claremont, “The climate is ruined. So can civilization even survive?”, CNN, 4/14/2015, <http://www.cnn.com/2015/01/14/opinion/co2-crisis-griffin/> )

Although most of us worry about other things, climate scientists have become increasingly worried about the survival of civilization. For example, Lonnie Thompson, who received the U.S. National Medal of Science in 2010, said that virtually all climatologists "are now convinced that global warming poses a clear and present danger to civilization." Informed journalists share this concern. The climate crisis "threatens the survival of our civilization," said Pulitzer Prize-winner Ross Gelbspan. Mark Hertsgaard agrees, saying that the continuation of global warming "would create planetary conditions all but certain to end civilization as we know it." These scientists and journalists, moreover, are worried not only about the distant future but about the condition of the planet for their own children and grandchildren. James Hansen, often considered the world's leading climate scientist, entitled his book "Storms of My Grandchildren." The threat to civilization comes primarily from the increase of the level of carbon dioxide (CO2) in the atmosphere, due largely to the burning of fossil fuels. Before the rise of the industrial age, CO2 constituted only 275 ppm (parts per million) of the atmosphere. But it is now above 400 and rising about 2.5 ppm per year. Because of the CO2 increase, the planet's average temperature has increased 0.85 degrees Celsius (1.5 degrees Fahrenheit). Although this increase may not seem much, it has already brought about serious changes. The idea that we will be safe from "dangerous climate change" if we do not exceed a temperature rise of 2C (3.6F) has been widely accepted. But many informed people have rejected this assumption. In the opinion of journalist-turned-activist Bill McKibben, "the one degree we've raised the temperature already has melted the Arctic, so we're fools to find out what two will do." His warning is supported by James Hansen, who declared that "a target of two degrees (Celsius) is actually a prescription for long-term disaster." The burning of coal, oil, and natural gas has made the planet warmer than it had been since the rise of civilization 10,000 years ago. Civilization was made possible by the emergence about 12,000 years ago of the "Holocene" epoch, which turned out to be the Goldilocks zone - not too hot, not too cold. But now, says physicist Stefan Rahmstorf, "We are catapulting ourselves way out of the Holocene." This catapult is dangerous, because we have no evidence civilization can long survive with significantly higher temperatures. And yet, the world is on a trajectory that would lead to an increase of 4C (7F) in this century. In the opinion of many scientists and the World Bank, this could happen as early as the 2060s. What would "a 4C world" be like? According to Kevin Anderson of the Tyndall Centre for Climate Change Research (at the University of East Anglia), "during New York's summer heat waves the warmest days would be around 10-12C (18-21.6F) hotter [than today's]." Moreover, he has said, above an increase of 4C only about 10% of the human population will survive. Believe it or not, some scientists consider Anderson overly optimistic. The main reason for pessimism is the fear that the planet's temperature may be close to a tipping point that would initiate a "low-end runaway greenhouse," involving "out-of-control amplifying feedbacks." This condition would result, says Hansen, if all fossil fuels are burned (which is the intention of all fossil-fuel corporations and many governments). This result "would make most of the planet uninhabitable by humans." Moreover, many scientists believe that runaway global warming could occur much more quickly, because the rising temperature caused by CO2 could release massive amounts of methane (CH4), which is, during its first 20 years, 86 times more powerful than CO2. Warmer weather induces this release from carbon that has been stored in methane hydrates, in which enormous amounts of carbon -- four times as much as that emitted from fossil fuels since 1850 -- has been frozen in the Arctic's permafrost. And yet now the Arctic's temperature is warmer than it had been for 120,000 years -- in other words, more than 10 times longer than civilization has existed. According to Joe Romm, a physicist who created the Climate Progress website, methane release from thawing permafrost in the Arctic "is the most dangerous amplifying feedback in the entire carbon cycle." The amplifying feedback works like this: The warmer temperature releases millions of tons of methane, which then further raise the temperature, which in turn releases more methane. The resulting threat of runaway global warming may not be merely theoretical. Scientists have long been convinced that methane was central to the fastest period of global warming in geological history, which occurred 55 million years ago. Now a group of scientists have accumulated evidence that methane was also central to the greatest extinction of life thus far: the end-Permian extinction about 252 million years ago. Worse yet, whereas it was previously thought that significant amounts of permafrost would not melt, releasing its methane, until the planet's temperature has risen several degrees Celsius, recent studies indicate that a rise of 1.5 degrees would be enough to start the melting. What can be done then? Given the failure of political leaders to deal with the CO2 problem, it is now too late to prevent terrible developments. But it may -- just may -- be possible to keep global warming from bringing about the destruction of civilization. To have a chance, we must, as Hansen says, do everything possible to "keep climate close to the Holocene range" -- which means, mobilize the whole world to replace dirty energy with clean as soon as possible.

# DA – Econ

#### The Space Economy is rapidly growing – all thanks goes to the private sector

Rana and Sharma 21 [ Damini Rana works at Delhi Public School RK Puram, Delhi, India and Mritunjay Sharma is an Advisor. JSR Volume 10 Issue 3 2021 “The New Final Frontier: A Case Study Analysis of Private Sector’s Increasing Role in the Space Industry” https://www.jsr.org/hs/index.php/path/article/view/1622 ] //aaditg

This has drawn tremendous interest from both entrepreneurs and investors, as space became not just an exciting, but also a lucrative, investment. Figure 4 shows how SpaceX’s success has since sparked a rapid increase in private investments in space. From less than US$500 million per year in 2009, private investment in space had grown to over US$5 billion per annum by 2019. [32]. Fig. 4. Cumulative private investments. The next section offers an analysis of how the space economy is expected to grow in the future and the role that private investment will continue to play in it. Future Outlook of Space Revenues and Investments The analysis and research provided above clearly indicates that the commercial sector has a much higher impact on the monetary size of the space economy than the government sector. While the government may have started space research, the growth of the space economy is now driven primarily by private sector initiatives. The space economy’s growth looks promising over the next decades, as humans look to leverage the earthoriented opportunities (communications, earth observation, etc.) in the near term and the prospects of mining, space tourism, as well as Moon & Mars expeditions in future. Several organizations have made forecasts of the space economy using slightly different starting points and future assumptions. The Science & Technology Policy Institute [17] has collated and reviewed some of these forecasts, as provided in Table 4 below. According to its report published in 2017, Morgan Stanley estimates that the global space industry could generate more than US$1 trillion in revenue by 2040 [33]. As per the report, the industry growth in the next 5-7 years is likely to be driven by the launches of LEO satellite constellations and their associated services, while growth after 2026, to a substantial extent, will be determined by what are mentioned as ‘second order impacts’ in the report – essentially this will require the New Space Economy businesses to start pulling their weight from a commercial perspective. Fig. 5. The global space economy (US$ million). It is evident that while the near-term opportunities are satellite-led and relatively well-established, new space opportunities, that is, asteroid mining, space tourism and the colonization of Mars, are novel and riskier, in terms of both economic value and timelines. Significant investments will be required before some of these are realized. Keeping this in view, a forecast was made for space industry revenues till 2040. Investments required to achieve these revenues were also assessed through quantitative regression analysis. A. Space Economy Forecast Till 2040 The historical data for space economy size used earlier in Table 1 was projected forward to forecast the size of the economy till 2040. As per Table 1, the space economy grew at 6.5% from 2005-2019, with the commercial economy growing at 7.3% and the government at 3.9%. Significant recent growth can be attributed to the need for more satellites by a rapidly digitizing world. This is a relatively low-hanging fruit for private sector exploitation. However, it is expected that with increasing scale and greater technical challenges to be overcome in non-satellite business, the growth over the next two decades may be lower than what has been witnessed over the last decade. Hence, the following assumptions have been made for the forecast. Annual growth rate of Commercial Economy: 6.5% Volume 10 Issue 3 (2021) ISSN: 2167-1907 www.JSR.org 11 Annual growth rate of Government Economy: 3% The above assumptions led to a forecast for the space economy as per Table 5 below. The above forecast suggests that the space economy will grow from US$424 billion in 2019 to US$1.4 trillion by 2040, at an annualized rate of about 6%. The size of the commercial economy by 2040 will be US$1.26 trillion, while the government economy will be US$162 billion. This indicates that the share of the government economy in the total space economy would decline from 20.5% in 2019 to 11.3% in 2040.

#### Private Space Exploration *solves* recession

Sidorov 20 [ Konstantin Sidorov is chief executive of the London Tech Club. City AM “Need a way out of recession? Look to the stars” <https://www.cityam.com/need-a-way-out-of-recession-look-to-the-stars/> 11/23/2020] //aaditg

“We choose to go to the moon in this decade and do the other things, not because they are easy, but because they are hard; because that goal will serve to organize and measure the best of our energies and skills.” These words by President John F. Kennedy are as important today as they were when he spoke in 1962. Asteroid mining may seem like something out of a sci-fi movie, and not the most obvious choice of investment, especially during a global pandemic and recession. But it is exactly these kinds of aspirations that have pushed human endeavour and technological advancement to new heights. The discoveries made along the way to achieving these sky-high goals have become integral parts of our daily lives — and could even help us out of this recession. The economics of space is now a crucial part of the market and no longer only in the realm of government endeavour. Private capital is paving the way for public partnerships. Supply chains in the “new space economy” are accelerating, startups are emerging, and clusters are forming. Old space discovery was defined by the Russian Voshod and Vostok and the US Apollo missions. We have entered a space age defined by private enterprise. Financial firms Goldman Sachs, Morgan Stanley and Bank of America Merrill Lynch have each conducted their own studies and found the space economy could reach between $1 trillion and $2.7 trillion by the 2040s. That would make it larger than the 2017 GDP of the UK. But are these astronomical figures relevant to people beyond the likes of Elon Musk, Jeff Bezos and Richard Branson? The answer is a resounding yes. The space sector is made up of a hidden infrastructure which most people do not see but is central to the technology that surrounds us. The strides humankind is making in space are integral to the day-to-day things we take for granted. Space plays an indispensable role in the global economy. The highest grossing sectors — agriculture, mining, transportation, IT, finance, and insurance — all heavily rely on systems and technology developed for space. We know that without satellite observation our navigation and mapping capacity would be significantly reduced. But that is only the start. Satellite data is being harnessed to protect critical infrastructure, and can be used to prevent disasters like the Morandi bridge collapse in Genoa by monitoring and holding critical information to better manage and maintain these types of structures. Given that there are over 80,000 ageing bridges in Canada alone, most with a design life of less than 100 years, the potential impact could be huge. The insurance industry can also be transformed by “mega constellations” — a group of artificial satellites working together as a system to provide permanent global coverage. Insurers are excited about the prospect of increased real-time data on hurricanes, especially the ability to use imagery and analytics to speed up or question claims. Amazon is rolling out plans to launch over 3,200 satellites to over 95 per cent of the Earth’s surface. The initiative is to launch a constellation of low Earth orbit satellites that will provide low-latency, high-speed broadband connectivity to the unserved communities around the world. Starlink, built by SpaceX, is launching “constellation broadband” to deliver higher-speed internet connections across the world. The volume of space spin-off industries is multiplying every year. NASA has created more than 2,000 inventions that later became widespread products and services. Innovations such as the dialysis machines, CAT scanners and freeze-dried food are all a result of space-related projects. Without investment in space exploration we would be without memory foam or GPS, while an adaptation of the spacesuit upgrade led to the creation of the Nike Air footwear. We are only going to become more dependent on space technologies as AI and the fourth industrial revolution take off. Satellite data and its deep-learning technology are being used to map and monitor solar energy assets for smart city and smart grid initiatives. The AI combines satellite data with other factors such as weather information and local government policies to provide a complete picture of the emissions and financial benefits the technology could bring. And yet, despite these strides, space exploration is still not considered a central part of our everyday lives. That needs to change. Governments must recognise its strategic importance. Consumers must realise how the space industry affects their everyday actions. Investors must consider the value of investment into the sector. Space is key to protecting our people, promoting our global influence, and providing future prosperity.

#### Recessions cause war – stats support transition wars, resource conflicts, terrorism, and diversionary wars – other authors don’t base their analysis on global studies

Royal ’10 [Jedediah, Director of Cooperative Threat Reduction at the U.S. Department of Defense, “Economic Integration, Economic Signaling and the Problem of Economic Crises”, 2010, Economics of War and Peace: Economic, Legal and Political Perspectives, ed. Goldsmith and Brauer, p. 213-215]PM

Less intuitive is how periods of economic decline may increase the likelihood of external conflict. Political science literature has contributed a moderate degree of attention to the impact of economic decline and the security and defence behaviour of interdependent slates. Research in this vein has been considered at systemic, dyadic and national levels. Several notable contributions follow. First, on the systemic level. Pollins (2008) advances Modelski and Thompson's (19%) work on leadership cycle theory, finding that rhythms in the global economy are associated with the rise and fall of a pre-eminent power and the often-bloody transition from one pre-eminent leader to the next. As such, exogenous shocks such as economic crises could usher in a redistribution of relative power (sec also Gilpin. 1981) that leads to uncertainty about power balances, increasing the risk of miscalculation (Fearon, 1995). Alternatively, even a relatively certain redistribution of power could lead to a permissive environment for conflict as a rising power may seek to challenge a declining power (Werner, 1999). Separately. Pollins (1996) also shows that global economic cycles combined with parallel leadership cycles impact the likelihood of conflict among major, medium and small powers, although he suggests that the causes and connections between global economic conditions and security conditions remain unknown. Second, on a dyadic level. Copeland's (1996. 2000) theory of trade expectations suggests that 'future expectation of trade' is a significant variable in understanding economic conditions and security behaviour of states. He argues that interdependent states are likely to gain pacific benefits from trade so long as they have an optimistic view of future trade relations. However, if the expectations of future trade decline, particularly for difficult to replace items such as energy resources, likelihood for conflict increases. as states will be inclined to use force to gain access to those resources. Crises could potentially be the trigger for decreased trade expectations either on its own or because it triggers protectionist moves by interdependent states.4 Third, others have considered the link between economic decline and external armed conflict at a national level. Blomberg and Hess (2002) find a strong correlation between internal conflict and external conflict, particularly during periods of economic downturn. They write, The linkages between internal and external conflict and prosperity are strong and mutually reinforcing. Economic conflict tends to spawn internal conflict, which in turn returns the favour. Moreover, the presence of a recession lends to amplify the extent to which international and external conflicts self-reinforce each other. (Blomberg & I less. 2002. p. 89) Economic decline has also been linked with an increase in the likelihood of terrorism (Blomberg. Hess. & Wccrapana. 2004). which has the capacity to spill across borders and lead to external tensions. Furthermore, crises generally reduce the popularity of a sitting government. "Diversionary theory' suggests that, when facing unpopularity arising from economic decline, sitting governments have increased incentives to fabricate external military conflicts to create a 'rally around the flag' effect. Wang (1996), DcRoucn (1995), and Blomberg. Mess, and Thacker (2006) find supporting evidence showing that economic decline and use of force are at least indirectly correlated. Gelpi (1997), Miller (1999), and Kisangani and Pickering (2009) suggest that the tendency towards diversionary tactics are greater for democratic states than autocratic states, due to the fact that democratic leaders are generally more susceptible to being removed from office due to lack of domestic support. DcRoucn (2000) has provided evidence showing that periods of weak economic performance in the United States, and thus weak Presidential popularity, are statistically linked to an increase in the use of force. In summary, recent economic scholarship positively correlates economic integration with an increase in the frequency of economic crises, whereas political science scholarship links economic decline with external conflict at systemic, dyadic and national levels.5 This implied connection between integration, crises and armed conflict has not featured prominently in the economic-security debate and deserves more attention. This observation is not contradictory to other perspectives that link economic interdependence with a decrease in the likelihood of external conflict, such as those mentioned in the first paragraph of this chapter. Those studies tend to focus on dyadic interdependence instead of global interdependence and do not specifically consider the occurrence of and conditions created by economic crises. As such, the view presented here should be considered ancillary to those views.

**That causes global nuclear war.**

Merlini ’11 [Cesare, was a nonresident senior fellow at the Center on the United States and Europe and is chairman of the Board of Trustees of the Italian Institute for International Affairs (IAI) in Rome, “A Post-Secular World?”, 03-30-2011, Routledge, https://www.brookings.edu/wp-content/uploads/2016/06/04\_international\_relations\_merlini.pdf]PM

Two neatly opposed scenarios for the future of the world order illustrate the range of possibilities, albeit at the risk of oversimplification. The first scenario entails the premature crumbling of the post-Westphalian system. One or more of the acute tensions apparent today evolves into an open and traditional conflict between states, perhaps even involving the use of nuclear weapons. The crisis might be triggered by a collapse of the global economic and financial system, the vulnerability of which we have just experienced, and the prospect of a second Great Depression, with consequences for peace and democracy similar to those of the first. Whatever the trigger, the unlimited exercise of national sovereignty, exclusive self-interest and rejection of outside interference would likely be amplified, emptying, perhaps entirely, the half-full glass of multilateralism, including the UN and the European Union. Many of the more likely conflicts, such as between Israel and Iran or India and Pakistan, have potential religious dimensions. Short of war, tensions such as those related to immigration might become unbearable. Familiar issues of creed and identity could be exacerbated. One way or another, the secular rational approach would be sidestepped by a return to theocratic absolutes, competing or converging with secular absolutes such as unbridled nationalism.