## 1NC- PIC

#### We endorse the entirety of the 1AC with the exception of their condemnation of mining in space

#### Private companies are key to a growing space mining sector – investors, profitability, and market demand.

Krishnan 20 [C A Krishnan, 8-6-2020, "Space mining: Just around the corner?," Week, <https://www.theweek.in/news/sci-tech/2020/08/06/Space-mining-Just-around-the-corner.html> [accessed 12-6-21] lydia

A Mars mission carrying 100 metric tons cargo in 2022 followed by a manned mission by 2024 are the immediate milestones of Elon Musk’s SpaceX plan which aims to create a self sustaining Mars city by 2050. Just a few decades back this would have sounded as fantasy, but today it looks as if this time frame may actually be bettered. Space missions are set to undergo revolutionary changes and Elon Musk’s vision and timelines are indicators of this. Space is increasingly being seen as a treasure trove of precious minerals and also a place for future human habitation beyond the earth. Global private space industry investors believe that space mining has the potential to shape and define the 21st Century. NASA estimates that the 'Asteroid belt’ holds minerals worth quintillion of dollars. American astrophysicist Neil Degrasse Tyson believes, “The first trillioners will be those who mine asteroids”. The “Main Asteroid Belt” is located between the orbits of Mars and Jupiter, about 450 to 650 million Kilometers from earth, with million asteroids in it. Over the decades, apart from Moon and Mars, governments and private agencies have been carrying out extensive research and studying asteroids for their composition, possibility of mining them and their mining value —Asteriod ‘Bennu’ has been assessed at $670 million and asteroid ‘2011 UW158’ at $ 5.7 trillion. Transportation of the mined resources for utilisation, however, poses major hurdles. A ‘BBC Future’ report by Sarah Cruddas puts the cost of shipping a ton of water into space at about $ 50 million. As per Chris Lewicki, president of Planetary Resources, an asteroid mining company, it takes more energy to escape the first 300 kilometers from the Earth than the next 300 million kilometers. Similarly, bringing back anything more than a few kilograms of samples from space to the Earth would be even more complex in terms of logistics. To start with, therefore, global space industry investors are focusing on keeping mined space resources in space itself for ‘in situ resource utilisation’. Availability of water on the Moon, Mars and asteroids offer very attractive prospects; apart from being crucial for supporting life and growing food, it also opens the possibility of using its constituents, hydrogen and oxygen, for making rocket fuel. Today, the possibility of manufacturing tools and even building habitats on Moon or Mars with the help of 3D printers using iron, nickel, cobalt, gold, platinum, and iridium etc which are available on the Moon, Mars and asteroids seem within reach. Researchers are working on using regolith, the weathered rock particles found on lunar surface for making moon bricks using 3D printers. These bricks will form the basic construction material for the first moon station and even the first moon hotel. Space industry players believe that an investment of $ 4 billion in water mining in space can generate annual revenue worth about $2.4 billion. Similarly, there is a new community of customers who are already looking for buying propellant in space. American space launch provider, United Launch Alliance (ULA), a Lockheed Martin and Boeing joint venture that provides launch rockets, has made it known that, ULA is willing to pay about $ 3000 a Kg for propellant in low earth orbit. Fast paced developments are taking place in the field of space mining technology with private players in the lead. Optical mining using concentrated sunlight, robotics, automated mining applications, advanced drilling machines etc are just a few examples. Participation of private players has reduced the investment burden and greatly enhanced the width and pace of innovation. It is believed that launch of the first asteroid mining vehicle as well as setting up of the first fuelling stations on the Moon and in low earth orbit could become a reality within a decade. Japanese mission ‘Hayabusa’ was the first to bring samples from an asteroid to earth in 2010. ‘Hayabusa - 2’ made its rendezvous with the near earth asteroid ‘162173 RYUGU’ in June 2018, left the asteroid after collecting samples in November 2019 and will be back on earth on December 6, 2020. Similarly the NASA mission OSIRIS-REx, costing about $ 1 billion, launched in 2016 is due to return to earth with samples of asteroid ‘101955 Bennu’ on September 24, 2023. The latest US space mission, ‘Perseverance’ launched on July 30, 2020 will land on Mars on February 18, 2021. It will be using a helicopter on Mars, set to be the first use of a helicopter outside the earth. Apart from collecting samples from Mars and search for signs of habitable conditions on Mars, it will also test the possibility of manufacturing molecular oxygen from the carbon dioxide-rich Mars atmosphere. Beyond the technological capability, there are, however, complex legal issues. While making fuel and water in space and its ‘in situ resource utilisation’ may pass the scrutiny, commercial exploitation of space through minerals mining, tourism, real estate etc may prove hugely contentious in terms of international legal framework for space. The current legal frameworks were adopted when space activities were entirely within the domain of national governments and were confined to research alone. But with the nature of space activities moving from purely research activities to military applications to commercial activities and with the entry of private players and a new community of consumers in space, the vintage outer space treaty has been rendered grossly inadequate; vagueness of the treaty does not cater for the ‘new types of uses’ or the ‘new users’ of space. Louis de Gouyon Matignon, in a thesis on the subject observed that “some states have already taken the absence of express prohibition as a sign that the utilisation of space resources is permissible, and both the USA and Luxembourg recently adopted national legislations expressly allowing it”. This has, however, triggered a response from the international community denouncing such unilateral initiatives and recommending a collective approach on the lines of the laws for high seas and deep sea bed. Whether a widely acceptable new space treaty comes through or not, Space mining is a reality and the early entrants are likely to retain monopoly and huge economic advantages for a very long time.

#### Space mining is key to sustain global resources -- otherwise, resource wars.

MacWhorter 16 [Kevin; J.D. Candidate, William & Mary Law School, "Sustainable Mining: Incentivizing Asteroid Mining in the Name of Environmentalism", William & Mary Environmental Law and Policy Review, Vol 40, Issue 2, Article 11, <https://scholarship.law.wm.edu/cgi/viewcontent.cgi?referer=https://www.google.com/&httpsredir=1&article=1653&context=wmelpr>] brett

A. Rare Element Mining on Earth

In the next sixty years, scientists predict that certain elements crucial to modern industry such as platinum, zinc, copper, phosphorous, lead, gold, and indium could be exhausted on Earth. 12 Many of these have no synthetic alternative, unlike chemical elements such as oil or diamonds.13 Liquid-crystal display (LCD) televisions, cellphones, and laptops are among the various consumer technologies that use precious metals.14Further, green technologies including wind turbines, solar panels, and catalytic converters require these rare elements. 15 As demand rises for both types of technologies, and as reserves of rare metals fall, prices skyrocket.16 Demand for nonrenewable resources creates conflict, and consumerism in rich countries results in harsh labor treatment for poorer countries.17

In general, the mining industry is extremely destructive to Earth’s environment.18 In fact, depending on the method employed, mining can destroy entire ecosystems by polluting water sources and contributing to deforestation.19 It is by its nature an unsustainable practice, because it involves the extraction of a finite and non-renewable resource.20 Moreover, by extracting tiny amounts of metals from relatively large quantities of ore, the mining industry contributes the largest portion of solid wastes in the world.21 The Environmental Protection Agency (EPA) describes the industry as the source of more toxic and hazardous waste than any other industrial sector [in the United States], costing billions of dollars to address the public health and environmental threats to communities. 22 Poor regulations and oxymoronic corporate definitions of sustainability, however, make it unclear as to just how much waste the industry actually produces.23

Platinum provides an excellent case study of the issue, because it is an extremely rare and expensive metal—an ore expected to exist in vast quantities in asteroids.24 Further, production of platinum has increased sharply in the past sixty years in order to keep up with growing demand for use in new technologies.25 In fact, despite their high costs, platinum group metals are so useful that [one] of [four] industrial goods on Earth require them in production. 26 Scholars do not expect demand to slow any time soon.27 Among other technologies, industries use platinum in products such as catalytic converters, jewelry production, various catalysts for chemical processing, and hydrogen fuel cells.28 While there is no consensus on how far the Earth’s reserves of platinum will take humanity, many scientists agree that platinum ore reserves will deplete in a relatively short amount of time.29

With the rate of mining at an all-time high,30 it is increasingly clear that historical patterns of mineral resources and development cannot simply be assumed to continue unaltered into the future. 31 The platinum mining industry, however, has a strong incentive to increase its rate of extraction as profits grow with the rate of demand. Without any alternative, this destructive practice will continue into the future.32

So-called platinum-group metal (PGM) ores are mined through underground or open cut techniques.33 Due to these practices, all but a very small fraction of the mined platinum ore is disposed of as solid waste.34 The environmental consequences of platinum production are thus quite significant, but like the mining industry in general, the amount of waste is typically under-reported.35

While this is due to high production levels at the moment, those levels will only increase given the estimated future demand of platinum.36 In spite of the negative consequences, mining continues unabated because it is economically important to many areas.37 The future environmental costs provide a major challenge in creating a sustainable system. Relegating at least some mining companies to near-Earth asteroids would reduce the negative effects of future mining levels on Earth. The economic benefits of mining need not be sacrificed for the sake of the environment.38

#### Terrestrial resource scarcity goes nuclear---we outweigh on timeframe, just the prospect of shortages triggers escalation.

Klare 13 [Michael T., The Nation’s defense correspondent, is professor emeritus of peace and world-security studies at Hampshire College and senior visiting fellow at the Arms Control Association in Washington, D.C. His newest book, All Hell Breaking Loose: The Pentagon’s Perspective on Climate Change, will be published this fall. 2013. “How Resource Scarcity and Climate Change Could Produce a Global Explosion,” <https://www.thenation.com/article/archive/how-resource-scarcity-and-climate-change-could-produce-global-explosion/>] brett

Brace yourself. You may not be able to tell yet, but according to global experts and the US intelligence community, the earth is already shifting under you. Whether you know it or not, you’re on a new planet, a resource-shock world of a sort humanity has never before experienced.

Two nightmare scenarios—a global scarcity of vital resources and the onset of extreme climate change—are already beginning to converge and in the coming decades are likely to produce a tidal wave of unrest, rebellion, competition and conflict. Just what this tsunami of disaster will look like may, as yet, be hard to discern, but experts warn of “water wars” over contested river systems, global food riots sparked by soaring prices for life’s basics, mass migrations of climate refugees (with resulting anti-migrant violence) and the breakdown of social order or the collapse of states. At first, such mayhem is likely to arise largely in Africa, Central Asia and other areas of the underdeveloped South, but in time, all regions of the planet will be affected.

To appreciate the power of this encroaching catastrophe, it’s necessary to examine each of the forces that are combining to produce this future cataclysm.

Resource Shortages and Resource Wars

Start with one simple given: the prospect of future scarcities of vital natural resources, including energy, water, land, food and critical minerals. This in itself would guarantee social unrest, geopolitical friction and war.

It is important to note that absolute scarcity doesn’t have to be on the horizon in any given resource category for this scenario to kick in. A lack of adequate supplies to meet the needs of a growing, ever more urbanized and industrialized global population is enough. Given the wave of extinctions that scientists are recording, some resources—particular species of fish, animals and trees, for example—will become less abundant in the decades to come, and may even disappear altogether. But key materials for modern civilization like oil, uranium and copper will simply prove harder and more costly to acquire, leading to supply bottlenecks and periodic shortages.

Oil—the single most important commodity in the international economy—provides an apt example. Although global oil supplies may actually grow in the coming decades, many experts doubt that they can be expanded sufficiently to meet the needs of a rising global middle class that is, for instance, expected to buy millions of new cars in the near future. In its 2011 World Energy Outlook, the International Energy Agency claimed that an anticipated global oil demand of 104 million barrels per day in 2035 will be satisfied. This, the report suggested, would be thanks in large part to additional supplies of “unconventional oil” (Canadian tar sands, shale oil and so on), as well as 55 million barrels of new oil from fields “yet to be found” and “yet to be developed.”

However, many analysts scoff at this optimistic assessment, arguing that rising production costs (for energy that will be ever more difficult and costly to extract), environmental opposition, warfare, corruption and other impediments will make it extremely difficult to achieve increases of this magnitude. In other words, even if production manages for a time to top the 2010 level of 87 million barrels per day, the goal of 104 million barrels will never be reached and the world’s major consumers will face virtual, if not absolute, scarcity.

Water provides another potent example. On an annual basis, the supply of drinking water provided by natural precipitation remains more or less constant: about 40,000 cubic kilometers. But much of this precipitation lands on Greenland, Antarctica, Siberia and inner Amazonia where there are very few people, so the supply available to major concentrations of humanity is often surprisingly limited. In many regions with high population levels, water supplies are already relatively sparse. This is especially true of North Africa, Central Asia and the Middle East, where the demand for water continues to grow as a result of rising populations, urbanization and the emergence of new water-intensive industries. The result, even when the supply remains constant, is an environment of increasing scarcity.

Wherever you look, the picture is roughly the same: supplies of critical resources may be rising or falling, but rarely do they appear to be outpacing demand, producing a sense of widespread and systemic scarcity. However generated, a perception of scarcity—or imminent scarcity—regularly leads to anxiety, resentment, hostility and contentiousness. This pattern is very well understood, and has been evident throughout human history.

In his book Constant Battles, for example, Steven LeBlanc, director of collections for Harvard’s Peabody Museum of Archaeology and Ethnology, notes that many ancient civilizations experienced higher levels of warfare when faced with resource shortages brought about by population growth, crop failures or persistent drought. Jared Diamond, author of the bestseller Collapse, has detected a similar pattern in Mayan civilization and the Anasazi culture of New Mexico’s Chaco Canyon. More recently, concern over adequate food for the home population was a significant factor in Japan’s invasion of Manchuria in 1931 and Germany’s invasions of Poland in 1939 and the Soviet Union in 1941, according to Lizzie Collingham, author of The Taste of War.

Although the global supply of most basic commodities has grown enormously since the end of World War II, analysts see the persistence of resource-related conflict in areas where materials remain scarce or there is anxiety about the future reliability of supplies. Many experts believe, for example, that the fighting in Darfur and other war-ravaged areas of North Africa has been driven, at least in part, by competition among desert tribes for access to scarce water supplies, exacerbated in some cases by rising population levels.

“In Darfur,” says a 2009 report from the UN Environment Programme on the role of natural resources in the conflict, “recurrent drought, increasing demographic pressures, and political marginalization are among the forces that have pushed the region into a spiral of lawlessness and violence that has led to 300,000 deaths and the displacement of more than two million people since 2003.”

Anxiety over future supplies is often also a factor in conflicts that break out over access to oil or control of contested undersea reserves of oil and natural gas. In 1979, for instance, when the Islamic revolution in Iran overthrew the Shah and the Soviets invaded Afghanistan, Washington began to fear that someday it might be denied access to Persian Gulf oil. At that point, President Jimmy Carter promptly announced what came to be called the Carter Doctrine. In his 1980 State of the Union Address, Carter affirmed that any move to impede the flow of oil from the Gulf would be viewed as a threat to America’s “vital interests” and would be repelled by “any means necessary, including military force.”

In 1990, this principle was invoked by President George H.W. Bush to justify intervention in the first Persian Gulf War, just as his son would use it, in part, to justify the 2003 invasion of Iraq. Today, it remains the basis for US plans to employ force to stop the Iranians from closing the Strait of Hormuz, the strategic waterway connecting the Persian Gulf to the Indian Ocean through which about 35 percent of the world’s seaborne oil commerce passes.

Recently, a set of resource conflicts have been rising toward the boiling point between China and its neighbors in Southeast Asia when it comes to control of offshore oil and gas reserves in the South China Sea. Although the resulting naval clashes have yet to result in a loss of life, a strong possibility of military escalation exists. A similar situation has also arisen in the East China Sea, where China and Japan are jousting for control over similarly valuable undersea reserves. Meanwhile, in the South Atlantic Ocean, Argentina and Britain are once again squabbling over the Falkland Islands (called Las Malvinas by the Argentinians) because oil has been discovered in surrounding waters.

By all accounts, resource-driven potential conflicts like these will only multiply in the years ahead as demand rises, supplies dwindle and more of what remains will be found in disputed areas. In a 2012 study titled Resources Futures, the respected British think-tank Chatham House expressed particular concern about possible resource wars over water, especially in areas like the Nile and Jordan River basins where several groups or countries must share the same river for the majority of their water supplies and few possess the wherewithal to develop alternatives. “Against this backdrop of tight supplies and competition, issues related to water rights, prices, and pollution are becoming contentious,” the report noted. “In areas with limited capacity to govern shared resources, balance competing demands, and mobilize new investments, tensions over water may erupt into more open confrontations.”

## 1NC- Util

#### Extinction must outweigh – moral uncertainty demands we preserve the conditions for life, even a tiny risk outweighs, and future gains in quality of life ensure it’s a prior question

Todd 17 [Ben has a 1st from Oxford in Physics and Philosophy, has published in Climate Physics, once kick-boxed for Oxford, and speaks Chinese, badly. "The case for reducing extinction risk." <https://80000hours.org/articles/extinction-risk/>] brett

In this new age, what should be our biggest priority as a civilisation? Improving technology? Helping the poor? Changing the political system? Here’s a suggestion that’s not so often discussed: our first priority should be to survive. So long as civilisation continues to exist, we’ll have the chance to solve all our other problems, and have a far better future. But if we go extinct, that’s it. Why isn’t this priority more discussed? Here’s one reason: many people don’t yet appreciate the change in situation, and so don’t think our future is at risk. Social science researcher Spencer Greenberg surveyed Americans on their estimate of the chances of human extinction within 50 years. The results found that many think the chances are extremely low, with over 30% guessing they’re under one in ten million.3 We used to think the risks were extremely low as well, but when we looked into it, we changed our minds. As we’ll see, researchers who study these issues think the risks are over one thousand times higher, and are probably increasing. These concerns have started a new movement working to safeguard civilisation, which has been joined by Stephen Hawking, Max Tegmark, and new institutes founded by researchers at Cambridge, MIT, Oxford, and elsewhere. In the rest of this article, we cover the greatest risks to civilisation, including some that might be bigger than nuclear war and climate change. We then make the case that reducing these risks could be the most important thing you do with your life, and explain exactly what you can do to help. If you would like to use your career to work on these issues, we can also give one-on-one support. Reading time: 25 minutes How likely are you to be killed by an asteroid? An overview of naturally occurring existential risks A one in ten million chance of extinction in the next 50 years — what many people think the risk is — must be an underestimate. Naturally occurring existential risks can be estimated pretty accurately from history, and are much higher. If Earth was hit by a 1km-wide asteroid, there’s a chance that civilisation would be destroyed. By looking at the historical record, and tracking the objects in the sky, astronomers can estimate the risk of an asteroid this size hitting Earth as about 1 in 5000 per century.4 That’s higher than most people’s chances of being in a plane crash (about one in five million per flight), and already about 1000-times higher than the one in ten million risk that some people estimated.5 Some argue that although a 1km-sized object would be a disaster, it wouldn’t be enough to cause extinction, so this is a high estimate of the risk. But on the other hand, there are other naturally occurring risks, such as supervolcanoes.6 All this said, natural risks are still quite small in absolute terms. An upcoming paper by Dr. Toby Ord estimated that if we sum all the natural risks together, they’re very unlikely to add up to more than a 1 in 300 chance of extinction per century.7 Unfortunately, as we’ll now show, the natural risks are dwarfed by the human-caused ones. And this is why the risk of extinction has become an especially urgent issue. A history of progress, leading to the start of the most dangerous epoch in human history If you look at history over millennia, the basic message is that for a long-time almost everyone was poor, and then in the 18th century, that changed.8 Large economic growth created the conditions in which now face anthropogenic existential risks This was caused by the industrial revolution — perhaps the most important event in history. It wasn’t just wealth that grew. The following chart shows that over the long-term, life expectancy, energy use and democracy have all grown rapidly, while the percentage living in poverty has dramatically decreased.9 Chart prepared by Luke Muehlhauser in 2017. Literacy and education levels have also dramatically increased: Image source. People also seem to become happier as they get wealthier. In The Better Angels of Our Nature, Steven Pinker argues that violence is going down.10 Individual freedom has increased, while racism, sexism and homophobia have decreased. Many people think the world is getting worse,11 and it’s true that modern civilisation does some terrible things, such as factory farming. But as you can see in the data, many important measures of progress have improved dramatically. More to the point, no matter what you think has happened in the past, if we look forward, improving technology, political organisation and freedom gives our descendants the potential to solve our current problems, and have vastly better lives.12 It is possible to end poverty, prevent climate change, alleviate suffering, and more. But also notice the purple line on the second chart: war-making capacity. It’s based on estimates of global military power by the historian Ian Morris, and it has also increased dramatically. Here’s the issue: improving technology holds the possibility of enormous gains, but also enormous risks. Each time we discover a new technology, most of the time it yields huge benefits. But there’s also a chance we discover a technology with more destructive power than we have the ability to wisely use. And so, although the present generation lives in the most prosperous period in human history, it’s plausibly also the most dangerous. The first destructive technology of this kind was nuclear weapons. Nuclear weapons: a history of near-misses Today we all have North Korea’s nuclear programme on our minds, but current events are just one chapter in a long saga of near misses. We came near to nuclear war several times during the Cuban Missile crisis alone.13 In one incident, the Americans resolved that if one of their spy planes were shot down, they would immediately invade Cuba without a further War Council meeting. The next day, a spy plane was shot down. JFK called the council anyway, and decided against invading. An invasion of Cuba might well have triggered nuclear war; it later emerged that Castro was in favour of nuclear retaliation even if “it would’ve led to the complete annihilation of Cuba”. Some of the launch commanders in Cuba also had independent authority to target American forces with tactical nuclear weapons in the event of an invasion. In another incident, a Russian nuclear submarine was trying to smuggle materials into Cuba when they were discovered by the American fleet. The fleet began to drop dummy depth charges to force the submarine to surface. The Russian captain thought they were real depth charges and that, while out of radio communication, the third world war had started. He ordered a nuclear strike on the American fleet with one of their nuclear torpedoes. Fortunately, he needed the approval of other senior officers. One, Vasili Arkhipov, disagreed, preventing war. Thanks to Vasili Arkhipov, we narrowly averted a global catastrophic risk from nuclear weapons Thank you Vasili Arkhipov. Putting all these events together, JFK later estimated that the chances of nuclear war were “between one in three and even”.14 There have been plenty of other close calls with Russia, even after the Cold War, as listed on this nice Wikipedia page. And those are just the ones we know about. Nuclear experts today are just as concerned about tensions between India and Pakistan, which both possess nuclear weapons, as North Korea.15 The key problem is that several countries maintain large nuclear arsenals that are ready to be deployed in minutes. This means that a false alarm or accident can rapidly escalate into a full-blown nuclear war, especially in times of tense foreign relations. Would a nuclear war end civilisation? It was initially thought that a nuclear blast might be so hot that it would ignite the atmosphere and make the Earth uninhabitable. Scientists estimated this was sufficiently unlikely that the weapons could be “safely” tested, and we now know this won’t happen. In the 1980s, the concern was that ash from burning buildings would plunge the Earth into a long-term winter that would make it impossible to grow crops for decades.16 Modern climate models suggest that a nuclear winter severe enough to kill everyone is very unlikely, though it’s hard to be confident due to model uncertainty.17 Even a “mild” nuclear winter, however, could still cause mass starvation.18 For this and other reasons, a nuclear war would be extremely destabilising, and it’s unclear whether civilisation could recover. How likely is a nuclear war to permanently end civilisation? It’s very hard to estimate, but it seems hard to conclude that the chance of a civilisation-ending nuclear war in the next century isn’t over 0.3%. That would mean the risks from nuclear weapons are greater than all the natural risks put together. (Read more about nuclear risks.) This is why the 1950s marked the start of a new age for humanity. For the first time in history, it became possible for a small number of decision-makers to wreak havoc on the whole world. We now pose the greatest threat to our own survival — that makes today the most dangerous point in human history. And nuclear weapons aren’t the only way we could end civilisation. How big is the risk of run-away climate change? In 2015, President Obama said in his State of the Union address that:19 “No challenge  poses a greater threat to future generations than climate change” Climate change is certainly a major risk to civilisation. The graph below shows estimates of climate sensitivity. Climate sensitivity is how much warming to expect in the long-term if CO2 concentrations double, which is roughly what’s expected within the century. Does climate change pose an existential risk? Wagner and Weitzman predict a greater than 10% chance of greater than 6 degrees celsius of warming. Image source The most likely outcome is 2-4 degrees of warming, which would be bad, but survivable. However, these estimates give a 10% chance of warming over 6 degrees, and perhaps a 1% chance of warming of 9 degrees. That would render large fractions of the Earth functionally uninhabitable, requiring at least a massive reorganisation of society. It would also probably increase conflict, and make us more vulnerable to other risks. (If you’re sceptical of climate models, then you should increase your uncertainty, which makes the situation more worrying.) So, it seems like the chance of a massive climate disaster created by CO2 is perhaps similar to the chance of a nuclear war. Researchers who study these issues think nuclear war seems more likely to result in outright extinction, due to the possibility of nuclear winter, which is why we think nuclear weapons pose an even greater risk than climate change. That said, climate change is certainly a major problem, which should raise our estimate of the risks even higher. (Read more about run-away climate change.) What new technologies might be as dangerous as nuclear weapons? The invention of nuclear weapons led to the anti-nuclear movement just a decade later in the 1960s, and the environmentalist movement soon adopted the cause of fighting climate change. What’s less appreciated is that new technologies will present further catastrophic risks. This is why we need a movement that is concerned with safeguarding civilisation in general. Predicting the future of technology is difficult, but because we only have one civilisation, we need to try our best. Here are some candidates for the next technology that’s as dangerous as nuclear weapons. In 1918-1919, over 3% of the world’s population died of the Spanish Flu.20 If such a pandemic arose today, it might be even harder to contain due to rapid global transport. What’s more concerning, though, is that it may soon be possible to genetically engineer a virus that’s as contagious as the Spanish Flu, but also deadlier, and which could spread for years undetected. That would be a weapon with the destructive power of nuclear weapons, but far harder to prevent from being used. Nuclear weapons require huge factories and rare materials to make, which makes them relatively easy to control. Designer viruses might be possible to create in a lab with a couple of biology PhDs. In fact, in 2006, The Guardian was able to receive segments of the extinct smallpox virus by mail order.21 Some terrorist groups have expressed interest in using indiscriminate weapons like these. (Read more about pandemic risks.) In fact, in 2006, The Guardian was able to receive segments of the extinct smallpox virus by mail order. Relevant experts suggest synthetic pathogens could potentially pose a global catastrophic risk. Who ordered the smallpox? Credit: The Guardian Another new technology with huge potential power is artificial intelligence. The reason that humans are in charge and not chimps is purely a matter of intelligence. Our large and powerful brains give us incredible control of the world, despite the fact that we are so much physically weaker than chimpanzees. So then what would happen if one day we created something much more intelligent than ourselves? In 2017, 350 researchers who have published peer-reviewed research into artificial intelligence at top conferences were polled about when they believe that we will develop computers with human-level intelligence: that is, a machine that is capable of carrying out all work tasks better than humans. The median estimate was that there is a 50% chance we will develop high-level machine intelligence in 45 years, and 75% by the end of the century.22 Graph of expert prediction from Grace et al: The median estimate was that there is a 50% chance we will develop high-level machine intelligence in 45 years These probabilities are hard to estimate, and the researchers gave very different figures depending on precisely how you ask the question.23 Nevertheless, it seems there is at least a reasonable chance that some kind of transformative machine intelligence is invented in the next century. Moreover, greater uncertainty means that it might come sooner than people think rather than later. What risks might this development pose? The original pioneers in computing, like Alan Turing and Marvin Minsky, raised concerns about the risks of powerful computer systems,24 and these risks are still around today. We’re not talking about computers “turning evil”. Rather, one concern is that a powerful AI system could be used by one group to gain control of the world, or otherwise be mis-used. If the USSR had developed nuclear weapons 10 years before the USA, the USSR might have become the dominant global power. Powerful computer technology might pose similar risks. Another concern is that deploying the system could have unintended consequences, since it would be difficult to predict what something smarter than us would do. A sufficiently powerful system might also be difficult to control, and so be hard to reverse once implemented. These concerns have been documented by Oxford Professor Nick Bostrom in Superintelligence and by AI pioneer Stuart Russell. Most experts think that better AI will be a hugely positive development, but they also agree there are risks. In the survey we just mentioned, AI experts estimated that the development of high-level machine intelligence has a 10% chance of a “bad outcome” and a 5% chance of an “extremely bad” outcome, such as human extinction.22 And we should probably expect this group to be positively biased, since, after all, they make their living from the technology. Putting the estimates together, if there’s a 75% chance that high-level machine intelligence is developed in the next century, then this means that the chance of a major AI disaster is 5% of 75%, which is about 4%. (Read more about risks from artificial intelligence.) People have raised concern about other new technologies, such as other forms of geo-engineering and atomic manufacturing, but they seem significantly less imminent, so are widely seen as less dangerous than the other technologies we’ve covered. You can see a longer list of existential risks here. What’s probably more concerning is the risks we haven’t thought of yet. If you had asked people in 1900 what the greatest risks to civilisation were, they probably wouldn’t have suggested nuclear weapons, genetic engineering or artificial intelligence, since none of these were yet invented. It’s possible we’re in the same situation looking forward to the next century. Future “unknown unknowns” might pose a greater risk than the risks we know today. Each time we discover a new technology, it’s a little like betting against a single number on a roulette wheel. Most of the time we win, and the technology is overall good. But each time there’s also a small chance the technology gives us more destructive power than we can handle, and we lose everything. Each new technology we develop has both unprecedented potential and perils. Image source. What’s the total risk of human extinction if we add everything together? Many experts who study these issues estimate that the total chance of human extinction in the next century is between 1 and 20%. For instance, an informal poll in 2008 at a conference on catastrophic risks found they believe it’s pretty likely we’ll face a catastrophe that kills over a billion people, and estimate a 19% chance of extinction before 2100.25 Risk At least 1 billion dead Human extinction Number killed by molecular nanotech weapons. 10% 5% Total killed by superintelligent AI. 5% 5% Total killed in all wars (including civil wars). 30% 4% Number killed in the single biggest engineered pandemic. 10% 2% Total killed in all nuclear wars. 10% 1% Number killed in the single biggest nanotech accident. 1% 0.5% Number killed in the single biggest natural pandemic. 5% 0.05% Total killed in all acts of nuclear terrorism. 1% 0.03% Overall risk of extinction prior to 2100 n/a 19% These figures are about one million times higher than what people normally think. In our podcast episode with Will MacAskill we discuss why he puts the risk of extinction this century at around 1%. In his his book The Precipice: Existential Risk and the Future of Humanity, Dr Toby Ord gives his guess at our total existential risk this century as 1 in 6 — a roll of the dice. Listen to our episode with Toby. What should we make of these estimates? Presumably, the researchers only work on these issues because they think they’re so important, so we should expect their estimates to be high (“selection bias”). But does that mean we can dismiss their concerns entirely? Given this, what’s our personal best guess? It’s very hard to say, but we find it hard to confidently ignore the risks. Overall, we guess the risk is likely over 3%. Why helping to safeguard the future could be the most important thing you can do with your life How much should we prioritise working to reduce these risks compared to other issues, like global poverty, ending cancer or political change? At 80,000 Hours, we do research to help people find careers with positive social impact. As part of this, we try to find the most urgent problems in the world to work on. We evaluate different global problems using our problem framework, which compares problems in terms of: Scale – how many are affected by the problem Neglectedness -how many people are working on it already Solvability – how easy it is to make progress If you apply this framework, we think that safeguarding the future comes out as the world’s biggest priority. And so, if you want to have a big positive impact with your career, this is the top area to focus on. In the next few sections, we’ll evaluate this issue on scale, neglectedness and solvability, drawing heavily on Existential Risk Prevention as a Global Priority by Nick Bostrom and unpublished work by Toby Ord, as well as our own research. First, let’s start with the scale of the issue. We’ve argued there’s likely over a 3% chance of extinction in the next century. How big an issue is this? One figure we can look at is how many people might die in such a catastrophe. The population of the Earth in the middle of the century will be about 10 billion, so a 3% chance of everyone dying means the expected number of deaths is about 300 million. This is probably more deaths than we can expect over the next century due to the diseases of poverty, like malaria.26 Many of the risks we’ve covered could also cause a “medium” catastrophe rather than one that ends civilisation, and this is presumably significantly more likely. The survey we covered earlier suggested over a 10% chance of a catastrophe that kills over 1 billion people in the next century, which would be at least another 100 million deaths in expectation, along with far more suffering among those who survive. So, even if we only focus on the impact on the present generation, these catastrophic risks are one of the most serious issues facing humanity. But this is a huge underestimate of the scale of the problem, because if civilisation ends, then we give up our entire future too. Most people want to leave a better world for their grandchildren, and most also think we should have some concern for future generations more broadly. There could be many more people having great lives in the future than there are people alive today, and we should have some concern for their interests. There’s a possibility that human civilization could last for millions of years, so when we consider the impact of the risks on future generations, the stakes are millions of times higher — for good or evil. As Carl Sagan wrote on the costs of nuclear war in Foreign Affairs: A nuclear war imperils all of our descendants, for as long as there will be humans. Even if the population remains static, with an average lifetime of the order of 100 years, over a typical time period for the biological evolution of a successful species (roughly ten million years), we are talking about some 500 trillion people yet to come. By this criterion, the stakes are one million times greater for extinction than for the more modest nuclear wars that kill “only” hundreds of millions of people. There are many other possible measures of the potential loss–including culture and science, the evolutionary history of the planet, and the significance of the lives of all of our ancestors who contributed to the future of their descendants. Extinction is the undoing of the human enterprise. We’re glad the Romans didn’t let humanity go extinct, since it means that all of modern civilisation has been able to exist. We think we owe a similar responsibility to the people who will come after us, assuming (as we believe) that they are likely to lead fulfilling lives. It would be reckless and unjust to endanger their existence just to make ourselves better off in the short-term. It’s not just that there might be more people in the future. As Sagan also pointed out, no matter what you think is of value, there is potentially a lot more of it in the future. Future civilisation could create a world without need or want, and make mindblowing intellectual and artistic achievements. We could build a far more just and virtuous society. And there’s no in-principle reason why civilisation couldn’t reach other planets, of which there are some 100 billion in our galaxy.27 If we let civilisation end, then none of this can ever happen. We’re unsure whether this great future will really happen, but that’s all the more reason to keep civilisation going so we have a chance to find out. Failing to pass on the torch to the next generation might be the worst thing we could ever do. So, a couple of percent risk that civilisation ends seems likely to be the biggest issue facing the world today. What’s also striking is just how neglected these risks are. Why these risks are some of the most neglected global issues Here is how much money per year goes into some important causes:28 Cause Annual targeted spending from all sources (highly approximate) Global R&D $1.5 trillion Luxury goods $1.3 trillion US social welfare $900 billion Climate change >$300 billion To the global poor >$250 billion Nuclear security $1-10 billion Extreme pandemic prevention $1 billion AI safety research $10 million As you can see, we spend a vast amount of resources on R&D to develop even more powerful technology. We also expend a lot in a (possibly misguided) attempt to improve our lives by buying luxury goods. Far less is spent mitigating catastrophic risks from climate change. Welfare spending in the US alone dwarfs global spending on climate change. But climate change still receives enormous amounts of money compared to some of these other risks we’ve covered. We roughly estimate that the prevention of extreme global pandemics receives under 300 times less, even though the size of the risk seems about the same. Research to avoid accidents from AI systems is the most neglected of all, perhaps receiving 100-times fewer resources again, at around only $10m per year. You’d find a similar picture if you looked at the number of people working on these risks rather than money spent, but it’s easier to get figures for money. If we look at scientific attention instead, we see a similar picture of neglect (though, some of the individual risks receive significant attention, such as climate change): Existential risk research receives less funding than dung beetle research. Credit: Nick Bostrom Our impression is that if you look at political attention, you’d find a similar picture to the funding figures. An overwhelming amount of political attention goes on concrete issues that help the present generation in the short-term, since that’s what gets votes. Catastrophic risks are far more neglected. Then, among the catastrophic risks, climate change gets the most attention, while issues like pandemics and AI are the most neglected. This neglect in resources, scientific study and political attention is exactly what you’d expect to happen from the underlying economics, and are why the area presents an opportunity for people who want to make the world a better place. First, these risks aren’t the responsibility of any single nation. Suppose the US invested heavily to prevent climate change. This benefits everyone in the world, but only about 5% of the world’s population lives in the US, so US citizens would only receive 5% of the benefits of this spending. This means the US will dramatically underinvest in these efforts compared to how much they’re worth to the world. And the same is true of every other country. This could be solved if we could all coordinate — if every nation agreed to contribute its fair share to reducing climate change, then all nations would benefit by avoiding its worst effects. Unfortunately, from the perspective of each individual nation, it’s better if every other country reduces their emissions, while leaving their own economy unhampered. So, there’s an incentive for each nation to defect from climate agreements, and this is why so little progress gets made (it’s a prisoner’s dilemma). And in fact, this dramatically understates the problem. The greatest beneficiaries of efforts to reduce catastrophic risks are future generations. They have no way to stand up for their interests, whether economically or politically. If future generations could vote in our elections, then they’d vote overwhelmingly in favour of safer policies. Likewise, if future generations could send money back in time, they’d be willing to pay us huge amounts of money to reduce these risks. (Technically, reducing these risks creates a trans-generational, global public good, which should make them among the most neglected ways to do good.) Our current system does a poor job of protecting future generations. We know people who have spoken to top government officials in the UK, and many want to do something about these risks, but they say the pressures of the news and election cycle make it hard to focus on them. In most countries, there is no government agency that naturally has mitigation of these risks in its remit. This is a depressing situation, but it’s also an opportunity. For people who do want to make the world a better place, this lack of attention means there are lots high-impact ways to help. What can be done about these risks? We’ve covered the scale and neglectedness of these issues, but what about the third element of our framework, solvability? It’s less certain that we can make progress on these issues than more conventional areas like global health. It’s much easier to measure our impact on health (at least in the short-run) and we have decades of evidence on what works. This means working to reduce catastrophic risks looks worse on solvability. However, there is still much we can do, and given the huge scale and neglectedness of these risks, they still seem like the most urgent issues. We’ll sketch out some ways to reduce these risks, divided into three broad categories: 1. Targeted efforts to reduce specific risks One approach is to address each risk directly. There are many concrete proposals for dealing with each, such as the following: Many experts agree that better disease surveillance would reduce the risk of pandemics. This could involve improved technology or better collection and aggregation of existing data, to help us spot new pandemics faster. And the faster you can spot a new pandemic, the easier it is to manage. There are many ways to reduce climate change, such as helping to develop better solar panels, or introducing a carbon tax. With AI, we can do research into the “control problem” within computer science, to reduce the chance of unintended damage from powerful AI systems. A recent paper, Concrete problems in AI safety, outlines some specific topics, but only about 20 people work full-time on similar research today. In nuclear security, many experts think that the deterrence benefits of nuclear weapons could be maintained with far smaller stockpiles. But, lower stockpiles would also reduce the risks of accidents, as well as the chance that a nuclear war, if it occurred, would end civilisation. We go into more depth on what you can do to tackle each risk within our problem profiles: AI safety Pandemic prevention Nuclear security Run-away climate change We don’t focus on naturally caused risks in this section, because they’re much less likely and we’re already doing a lot to deal with some of them. Improved wealth and technology makes us more resilient to natural risks, and a huge amount of effort already goes into getting more of these. 2. Broad efforts to reduce risks Rather than try to reduce each risk individually, we can try to make civilisation generally better at managing them. The “broad” efforts help to reduce all the threats at once, even those we haven’t thought of yet. For instance, there are key decision-makers, often in government, who will need to manage these risks as they arise. If we could improve the decision-making ability of these people and institutions, then it would help to make society in general more resilient, and solve many other problems. Recent research has uncovered lots of ways to improve decision-making, but most of it hasn’t yet been implemented. At the same time, few people are working on the issue. We go into more depth in our write-up of improving institutional decision-making. Another example is that we could try to make it easier for civilisation to rebound from a catastrophe. The Global Seed Vault is a frozen vault in the Arctic, which contains the seeds of many important crop varieties, reducing the chance we lose an important species. Melting water recently entered the tunnel leading to the vault due, ironically, to climate change, so could probably use more funding. There are lots of other projects like this we could do to preserve knowledge. Similarly, we could create better disaster shelters, which would reduce the chance of extinction from pandemics, nuclear winter and asteroids (though not AI), while also increasing the chance of a recovery after a disaster. Right now, these measures don’t seem as effective as reducing the risks in the first place, but they still help. A more neglected, and perhaps much cheaper option is to create alternative food sources, such as those that be produced without light, and could be quickly scaled up in a prolonged winter. Since broad efforts help even if we’re not sure about the details of the risks, they’re more attractive the more uncertain you are. As you get closer to the risks, you should gradually reallocate resources from broad to targeted efforts (read more). We expect there are many more promising broad interventions, but it’s an area where little research has been done. For instance, another approach could involve improving international coordination. Since these risks are caused by humanity, they can be prevented by humanity, but what stops us is the difficulty of coordination. For instance, Russia doesn’t want to disarm because it would put it at a disadvantage compared to the US, and vice versa, even though both countries would be better off if there were no possibility of nuclear war. However, it might be possible to improve our ability to coordinate as a civilisation, such as by improving foreign relations or developing better international institutions. We’re keen to see more research into these kinds of proposals. Mainstream efforts to do good like improving education and international development can also help to make society more resilient and wise, and so also contribute to reducing catastrophic risks. For instance, a better educated population would probably elect more enlightened leaders (cough), and richer countries are, all else equal, better able to prevent pandemics — it’s no accident that Ebola took hold in some of the poorest parts of West Africa. But, we don’t see education and health as the best areas to focus on for two reasons. First, these areas are far less neglected than the more unconventional approaches we’ve covered. In fact, improving education is perhaps the most popular cause for people who want to do good, and in the US alone, receives 800 billion dollars of government funding, and another trillion dollars of private funding. Second, these approaches have much more diffuse effects on reducing these risks — you’d have to improve education on a very large scale to have any noticeable effect. We prefer to focus on more targeted and neglected solutions.

#### Anticipating nuclear extinction breeds empathy and entangled care. Distancing ourselves from considering extinction reifies detached elitism.

Offord, 17—Faculty of Humanities, School of Humanities Research and Graduate Studies, Bentley Campus (Baden, “BEYOND OUR NUCLEAR ENTANGLEMENT,” Angelaki, 22:3, 17-25, dml) [ableist language modifications denoted by brackets]

You are steered towards overwhelming and inexplicable pain when you consider the nuclear entanglement that the species Homo sapiens finds itself in. This is because the fact of living in the nuclear age presents an existential, aesthetic, ethical and psychological challenge that defines human consciousness. Although an immanent threat and ever-present danger to the very existence of the human species, living with the possibility of nuclear war has infiltrated the matrix of modernity so profoundly as to paralyse [shut down] our mind-set to respond adequately. We have chosen to ignore the facts at the heart of the nuclear program with its dangerous algorithm; we have chosen to live with the capacity and possibility of a collective, pervasive and even planetary-scale suicide; and the techno-industrial-national powers that claim there is “no immediate danger” ad infinitum.8

This has led to one of the key logics of modernity's insanity. As Harari writes: “Nuclear weapons have turned war between superpowers into a mad act of collective suicide, and therefore forced the most powerful nations on earth to find alternative and peaceful ways to resolve conflicts.”9 This is the nuclear algorithm at work, a methodology of madness. In revisiting Jacques Derrida in “No Apocalypse, Not Now (Full Speed Ahead, Seven Missiles, Seven Missives),”10 who described nuclear war as a “non-event,” it is clear that the pathology of the “non-event” remains as active as ever even in the time of Donald Trump and Kim Jong-un with their stichomythic nuclear posturing.

The question of our times is whether we have an equal or more compelling capacity and willingness to end this impoverished but ever-present logic of pain and uncertainty. How not simply to bring about disarmament, but to go beyond this politically charged, as well as mythological and psychological nuclear algorithm? How to find love amidst the nuclear entanglement; the antidote to this entanglement? Is it possible to end the pathology of power that exists with nuclear capacity? Sadly, the last lines of Nitin Sawhney's “Broken Skin” underscore this entanglement:

Just 5 miles from India's nuclear test site

Children play in the shade of the village water tank

Here in the Rajasthan desert people say

They're proud their country showed their nuclear capability.11

As an activist scholar working in the fields of human rights and cultural studies, responding to the nuclear algorithm is an imperative. Your politics, ethics and scholarship are indivisible in this cause. An acute sense of care for the world, informed by pacifist and non-violent, de-colonialist approaches to knowledge and practice, pervades your concern. You are aware that there are other ways of knowing than those you are familiar and credentialed with. You are aware that you are complicit in the prisons that you choose to live inside,12 and that there is no such thing as an innocent bystander. You use your scholarship to shake up the world from its paralysis, abjection and amnesia; to unsettle the epistemic and structural violence that is ubiquitous to neoliberalism and its machinery; to create dialogic and learning spaces for the work of critical human rights and critical justice to take place. All this, and to enable an ethics of intervention through understanding what is at the very heart of the critical human rights impulse, creating a “dialogue for being, because I am not without the other.”13

Furthermore, as a critical human rights advocate living in a nuclear armed world, your challenge is to reconceptualise the human community as Ashis Nandy has argued, to see how we can learn to co-exist with others in conviviality and also learn to co-survive with the non-human, even to flourish. A dialogue for being requires a leap into a human rights frame that includes a deep ecological dimension, where the planet itself is inherently involved as a participant in its future. This requires scholarship that “thinks like a mountain.”14 A critical human rights approach understands that it cannot be simply human-centric. It requires a nuanced and arresting clarity to present perspectives on co-existence and co-survival that are from human and non-human viewpoints.15

Ultimately, you realise that your struggle is not confined to declarations, treaties, legislation, and law, though they have their role. It must go further to produce “creative intellectual exchange that might release new ethical energies for mutually assured survival.”16 Taking an anti-nuclear stance and enabling a post-nuclear activism demands a revolution within the field of human rights work. Recognising the entanglement of nuclearism with the Anthropocene, for one thing, requires a profound shift in focus from the human-centric to a more-than-human co-survival. It also requires a fundamental shift in understanding our human culture, in which the very epistemic and rational acts of sundering from co-survival with the planet and environment takes place. In the end, you realise, as Raimon Panikkar has articulated, “it is not realistic to toil for peace if we do not proceed to a disarmament of the bellicose culture in which we live.”17 Or, as Geshe Lhakdor suggests, there must be “inner disarmament for external disarmament.”18 In this sense, it is within the cultural arena, our human society, where the entanglement of subjective meaning making, nature and politics occurs, that we need to disarm.

It is 1982, and you are reading Jonathan Schell's The Fate of the Earth on a Sydney bus. Sleeping has not been easy over the past few nights as you reluctantly but compulsively read about the consequences of nuclear war. For some critics, Schell's account is high polemic, but for you it is more like Rabindranath Tagore: it expresses the suffering we make for ourselves. What you find noteworthy is that although Schell's scenario of widespread destruction of the planet through nuclear weaponry, of immeasurable harm to the bio-sphere through radiation, is powerfully laid out, the horror and scale of nuclear obliteration also seems surreal and far away as the bus makes its way through the suburban streets.

A few years later, you read a statement from an interview with Paul Tibbets, the pilot of “Enola Gay,” the plane that bombed Hiroshima. He says, “The morality of dropping that bomb was not my business.”19 This abstraction from moral responsibility – the denial of the implications on human life and the consequences of engagement through the machinery of war – together with the sweeping amnesia that came afterwards from thinking about the bombing of Hiroshima, are what make you become an environmental and human rights activist. You realise that what makes the nuclear algorithm work involves a politically engineered and deeply embedded insecurity-based recipe to elide the nuclear threat from everyday life. The spectre of nuclear obliteration, like the idea of human rights, can appear abstract and distant, not our everyday business. You realise that within this recipe is the creation of a moral tyranny of distance, an abnegation of myself with the other. One of modernity's greatest and earliest achievements was the mediation of the self with the world. How this became a project assisted and shaped through the military-industrial-technological-capitalist complex is fraught and hard to untangle. But as a critical human rights scholar you have come to see through that complex, and you put energies into challenging that tyranny of distance, to activate a politics, ethics and scholarship that recognises the other as integral to yourself. Ultimately, even, to see that the other is also within.20

#### TJFs -- Prioritize utilitarianism with a focus on existential risk in the context of debates about outer space.

Baum 16 [Seth, @ Global Catastrophic Risk Institute, In “The Ethics of Space Exploration”, ed. James S.J. Schwartz & Tony Milligan, Springer, 2016, pages 109-123. This version 29 July 2016. <https://sethbaum.com/ac/2016_SpaceEthics.pdf>] brett

A basic conclusion of this paper is that consequentialists should pay attention to outer space. This is because outer space can be the location of immense consequences (via space colonization) and because outer space scenarios can force us to rethink our consequentialist ethics (via ETI encounter).

Attention to outer space prompts us to recognize the big picture. This holds for consequentialist ethics as much as it does for anything else. Only by thinking through the possibilities of outer space can we understand how our lives could matter in the grand scheme of things. And the fact of the matter is that our lives can matter immensely. We can set the pieces in motion for an immense cosmic civilization. We can help prevent civilization-ending global catastrophe so as to enable future space colonization. And we can determine whether or not to try messaging to ETI.

Should we do these things? Answering this all-important question requires ethics. Therefore, just as consequentialists should pay attention to outer space, so too should outer space analysts pay attention to consequentialism, and indeed to ethics in general. Defensible forms of consequentialism will generally conclude that (1) humanity today should focus on avoiding global catastrophe, (2) space colonization should proceed with caution, but ultimately should proceed at immense scale, and (3) high-power/long-duration METI should not be conducted until more effort is put to assessing whether the consequences are likely to be good.

The ethical arguments and empirical analyses in this paper are quite brief and are not the final word on the subject. I have said little in defense of consequentialism and my preferred form of it. The analyses of space colonization and ETI encounter are likewise at best only approximate and leaving much for future work. Some of it is due to space constraints in this paper, but much of it is due to the fact that the research simply has not yet been performed. Outer space consequentialism could make for a fruitful line of inquiry.

The merits of this line of inquiry are diminished by the conclusion to focus on avoiding global catastrophe. Any global catastrophe would preclude the possibility of future research on all topics, including outer space consequentialism. Likewise, any hopes of resolving the ethical dilemmas and empirical uncertainties depend on us surviving long enough to do the research. An argument can thus be made against any work on outer space in favor of work on the global catastrophic risks. My own view is that work on outer space should be pursued mainly to the extent that it is instrumentally valuable towards reducing the global catastrophic risks. To that end it can be quite instrumentally valuable. Outer space can offer great motivation due to its immense opportunities, and it can be deeply inspirational due to its beauty and wonder and the big-picture perspective it offers. While attention to outer space should not distract humanity from the urgent threats that it faces, some attention is very much worthwhile.

## Case

#### Frame the 1AC through solvency, not impacts – any attempt to filter offense through the RotB or the speech act of the aff is an arbitrary goalpost that only serves to insulate it from criticism and nuanced testing – forcing us to negate the efficacy of personal strategies is at best impossible and at worst violent– no warrant for how the aff spills up to impact structures of politics writ large or out of debate means you vote neg on presumption.

#### Capitalism is antiracist.

Paul F. deLespinasse 20. Professor Emeritus of Political Science and Computer Science at Adrian College. “Capitalism no friend to racism”. https://www.gazettetimes.com/news/local/paul-f-delespinasse-capitalism-no-friend-to-racism/article\_85bac3a8-805b-587d-9725-0e10f09547a8.amp.html

Some people argue that eliminating racism requires getting rid of capitalism. But racism existed before capitalism developed. Since racism exists in non-capitalist societies, capitalism can't be blamed for it.

True, in some ways capitalism is friendly to racism.

Capitalism combines mostly free markets with predominantly private ownership of the means of production, except for land and other natural resources. (Privately owned natural resources aren't essential characteristics and must probably be abandoned if capitalism is to survive. The alternative isn't governmental ownership of natural resources, but ownership by the public, with government acting as a trustee for it.)

In a market economy people are free to enter into voluntary associations, created by mutual consent, to exchange or transfer inducements. People can hire and be hired, buy and sell, mostly at mutually agreed-upon prices.

Mutual consent being required, racists can refuse to enter voluntary associations with members of the target race. They can refuse to hire them, sell to them or buy from them.

Racism is rooted in stereotyping, assuming that "when you have seen one (person of a certain race), you have seen them all." Since all individuals are unique, stereotyping is stupid, but freedom includes freedom to act stupidly.

To this extent capitalism is racism's ally. But there is another side to this story.

Although capitalism's freedom allows people to indulge their prejudices, it makes them pay for doing so. Their economic interest would be to hire the best available people without considering their race and to sell to all willing customers. Not doing this reduces their income.

Since buyers and sellers want to make the best deals possible, capitalism pushes society away from racist behavior even though it won't immediately eliminate racist thinking. A notable example was a well-known bigot who owned a sports team and hired black athletes because she wanted her team to win.

Racist thinking, though, should be undermined by capitalism's encouragement of voluntary associations between people of different races. Personal relations can undermine people's tendency to think in terms of stereotypes.

The American South was not capitalistic before the Civil War. Slaves did not give their consent to be associated with their owners. Their association was involuntary, not voluntary. They were kept in bondage by sanctions —government's power of the sword.

Capitalism didn't come to the South even after the Civil War. Once the attempted "reconstruction" reforms ended, state governments prevented the normal anti-racist capitalistic tendencies from working. Segregation made it illegal for white people and black people to enter into many kinds of voluntary associations with one another, to work together, to go to school together, even to marry. The fact that governments enacted such legislation indicates their fear that people otherwise would associate with those of different races.

These restrictions clearly violated the basic essence of capitalism: freedom of voluntary association by mutual consent of the parties. Racist societies are not expressions of capitalism, but its contradiction.

And they violated a fundamental requirement of good government: the rule of law. Genuine laws must be general rules of action and cannot impose sanctions on people on the basis of their race.

Some more recent legislation attempting to force bigots to stop discriminating on the basis of race also contradicts the basic capitalistic principle. How can people be forced to enter voluntary associations without their consent when such associations, by definition, require mutual consent?

It is no wonder that today's very well-intended antidiscrimination law is such a conceptual mess. (Open accommodation — first come, first served — laws, however, seem to work well.)

Although capitalism enables bigots to discriminate, it makes them pay an economic price in the form of lost business and lost opportunities to employ the best people. Economic interest tends to pull people together.

Capitalism and racism are basically deadly enemies.

#### Getting rid of capitalism worsens racial oppression.

Jim Lindgren 18. Professor of Law at Northwestern University. "Can There Be Capitalism Without Racism? – Reason.com". No Publication. 8-20-2018. https://reason.com/volokh/2018/08/20/can-there-be-capitalism-without-racism/?amp

The website Campus Reform points to a multi-year academic program, Racial Capitalism, hosted at the UC-Davis Humanities Institute that explores the links between racism and capitalism (tip to Glenn Reynolds). Among the questions that were asked at the event launching the program are:

1. "Which came first, capitalism or racism?"
2. "Can there be capitalism without racism?"
3. "Is capitalism always racial?"

IMO, the answers to these questions are fairly obvious:

1. Racism came first. Every inhabited continent had slaves, and ethnic out-groups were among the most likely to be enslaved. It is the abolition of slavery that is particularly Western, as Orlando Patterson explains his books Freedom and Slavery and Social Death.
2. (and 3.) If there can be any economic system without racism (I suppose it depends on how high one's standards are), then capitalism is not always racist and there can be capitalism without racism. Capitalism is easier to square with a reduction in racism than most ideologies because (a) it is individualistic, (b) it is not built on envy for despised groups, and (c) in the United States at least, pro-capitalists tend to be less racist personally than anti-capitalists.

Indeed, in the general public it is the opposition to capitalism and the desire for redistribution that are positively associated with racism and intolerance.

I explore this relationship in "Redistribution and Racism, Tolerance and Capitalism," which analyzes data from 20 nationally representative surveys of the general public.

Abstract

In debates over the roles of law and government in promoting the equality of income or in redistributing the fruits of capitalism, widely different motives are attributed to those who favor or oppose capitalism or income redistribution. According to one view, largely accepted in the academic social psychology literature (Jost et al., 2003), opposition to income redistribution and support for capitalism reflect an orientation toward social dominance, a desire to dominate other groups. According to another view that goes back at least to the nineteenth century origins of Marxism, anti-capitalism and a support for greater legal efforts to redistribute income reflect envy for the property of others and a frustration with one's lot in a capitalist system.

In this paper I expand and test the first (social dominance) thesis using twenty nationally representative General Social Surveys conducted by the National Opinion Research Center between 1977 and 2010, involving over 21,000 respondents. I first show that respondents who express traditionally racist views (on segregation, interracial marriage, and inborn racial abilities) tend to support greater income redistribution. Traditional racists also express less positive views toward free-market capitalism and its consequences, tending to want the government to guarantee jobs for everyone and to fix prices, wages, and profits. Next, I report a similar pattern for those who express intolerance for unpopular groups on the fifteen Stouffer tolerance questions (regarding racists, homosexuals, communists, extreme militarists, and atheists). Those who express less tolerance for unpopular groups tend to favor income redistribution and to be less supportive of capitalism and its discontents. Using full latent variable structural equation modeling shows similar results. The data are broadly inconsistent with the standard belief in the social psychology literature that pro-capitalist and anti-redistributionist views are positively associated with racism and intolerance.

I then explore an alternative hypothesis, showing that, compared to anti-redistributionists, strong redistributionists have much higher odds of reporting anger, sadness, loneliness, outrage, and other negative emotions. Similarly, anti-redistributionists had much higher odds of reporting being happy or at ease. Last, both redistributionists and anti-capitalists expressed lower overall happiness, less happy marriages, and lower satisfaction with their financial situations and with their jobs or housework. Further, in several General Social Surveys anti-redistributionists were generally more likely to report altruistic behavior than those who favored a stronger policy of government redistribution of income.

In addition, in a 1996 survey:

Not only do redistributionists report more anger, but they report that their anger lasts longer. Further, when asked about the last time they were angry, strong redistributionists were more than twice as likely as strong opponents of leveling to admit that they responded to their anger by plotting revenge.

The more interesting question (than whether you can have capitalism without racism) is whether you can have socialism without racism. The answer is yes, but the reason is an enlightening one.

In the long run, a robust socialism (that dominates most of the economy) tends to lead to the scapegoating

of demonized out-groups, because there must be someone to blame for economic failure. Thus, the Soviet Union began with hating the Kulaks and the ownership class more generally, but once these were destroyed, they needed someone else to blame. Though it took many decades, the Soviet Union went beyond targeting "counter-revolutionaries" to add Jews to the list. So the demonized out-groups under socialism don't have to be defined by race or ethnicity; they could instead be defined by economic class, religion, or nationality. Accordingly, socialism doesn't have to be racist, but when it dominates the economy almost inevitably there must be some group to despise.

It would be good if the academy in general–and the UC-Davis Racial Capitalism program in particular–were ideologically diverse enough to reflect some of the substantial evidence from the last few decades on the relationship of capitalism and racism in the views of the general public, evidence that tends to point to a negative association between racism and support for capitalism.

#### The system is sustainable, and conditions are improving.

Schrager **‘**20 [Allison; Winter 2020; Ph.D. in Economics from Columbia University, Senior Fellow at the Manhattan Institute; "Why Socialism Won't Work," https://foreignpolicy.com/2020/01/15/socialism-wont-work-capitalism-still-best/]

WITH INCREASINGLY UBIQUITOUS IPHONES, internet, central air conditioning, flat-screen TVs, and indoor plumbing, few in the developed world would want to go back to life 100, 30, or even 10 years ago. Indeed, around the world, the last two centuries have brought vast improvements in material living standards; billions of people have been lifted from poverty, and life expectancy across income levels has broadly risen. Most of that progress came from capitalist economies.

Yet those economies are not without their problems. In the United States and the United Kingdom, the gap between the rich and poor has become intolerably large as business owners and highly educated workers in urban areas have become richer while workers' wages in rural areas have stagnated. In most rich countries, more trade has brought a bigger, better variety of goods, but it has also displaced many jobs.

With social instability in the form of mass protests, Brexit, the rise of populism, and deep polarization knocking at the capitalist economies' doors, much of the progress of the last several decades is in peril. For some pundits and policymakers, the solution is clear: socialism, which tends to be cited as a method for addressing everything from inequality and injustice to climate change.

Yet the very ills that socialists identify are best addressed through innovation, productivity gains, and better rationing of risk. And capitalism is still far and away the best, if not only, way to generate those outcomes.

TODAY'S SOCIALISM IS DIFFICULT TO DEFINE. Traditionally, the term meant total state ownership of capital, as in the Soviet Union, North Korea, or Maoist China. Nowadays, most people don't take such an extreme view. In Europe, social democracy means the nationalization of many industries and very generous welfare states. And today's rising socialists are rebranding the idea to mean an economic system that delivers all the best parts of capitalism (growth and rising living standards) without the bad (inequality, economic cycles).

But no perfect economic system exists; there are always trade-offs--in the most extreme form between total state ownership of capital and unfettered markets without any regulation or welfare state. Today, few would opt for either pole; what modern socialists and capitalists really disagree on is the right level of government intervention.

Modern socialists want more, but not complete, state ownership. They'd like to nationalize certain industries. In the United States, that's health care--a plan supported by Democratic presidential candidates Elizabeth Warren (who does not call herself a socialist) and Bernie Sanders (who wears the label proudly). In the United Kingdom, Labour Party leader Jeremy Corbyn, who was trounced at the polls in mid-December, has set his sights on a longer list of industries, including the water, energy, and internet providers.

Other items on the socialist wish list may include allowing the government to be the primary investor in the economy through massive infrastructure projects that aim to replace fossil fuels with renewables, as Green New Deal socialists have proposed. They've also floated plans that would make the government the employer of a majority of Americans by offering guaranteed well-paid jobs that people can't be fired from. And then there are more limited proposals, including installing more workers on the boards of private companies and instituting national rent controls and high minimum wages.

For their part, modern capitalists want some, but less, state intervention. They are skeptical of nationalization and price controls; they argue that today's economic problems are best addressed by harnessing private enterprise. In the United States, they've argued for more regulation and progressive taxation to help ease inequality, incentives to encourage private firms to use less carbon, and a more robust welfare state through tax credits. Over the past 15 years, meanwhile, capitalist Europeans have instituted reforms to improve labor market flexibility by making it easier to hire and fire people, and there have been attempts to reduce the size of pensions.

No economic system is perfect, and the exact right balance between markets and the state may never be found. But there are good reasons to believe that keeping capital in the hands of the private sector, and empowering its owners to make decisions in the pursuit of profit, is the best we've got.

ONE REASON TO TRUST MARKETS is that they are better at setting prices than people. If you set prices too high, many a socialist government has found, citizens will be needlessly deprived of goods. Set them too low, and there will be excessive demand and ensuing shortages. This is true for all goods, including health care and labor. And there is little reason to believe that the next batch of socialists in Washington or London would be any better at setting prices than their predecessors. In fact, government-run health care systems in Canada and European countries are plagued by long wait times. A 2018 Fraser Institute study cites a median wait time of 19.8 weeks to see a specialist physician in Canada. Socialists may argue that is a small price to pay for universal access, but a market-based approach can deliver both coverage and responsive service. A full government takeover isn't the only option, nor is it the best one.

Beyond that, markets are also good at rationing risk. Fundamentally, socialists would like to reduce risk--protect workers from any personal or economywide shock. That is a noble goal, and some reduction through better functioning safety nets is desirable. But getting rid of all uncertainty--as state ownership of most industries would imply--is a bad idea. Risk is what fuels growth. People who take more chances tend to reap bigger rewards; that's why the top nine names on the Forbes 400 list of the richest Americans are not heirs to family dynasties but are self-made entrepreneurs who took a leap to build new products and created many jobs in the process.

Some leftist economists like Mariana Mazzucato argue that governments might be able to step in and become laboratories for innovation. But that would be a historical anomaly; socialist-leaning governments have typically been less innovative than others. After all, bureaucrats and worker-corporate boards have little incentive to upset the status quo or compete to build a better widget. And even when government programs have spurred innovation--as in the case of the internet--it took the private sector to recognize the value and create a market.

And that brings us to a third reason to believe in markets; productivity. Some economists, such as Robert Gordon, have looked to today's economic problems and suggested that productivity growth--the engine that fueled so much of the progress of the last several decades--is over. In this telling, the resources, products, and systems that underpin the world's economy are all optimized, and little further progress is possible.

But that is hard to square with reality. Innovation helps economies do more with fewer resources--increasingly critical to addressing climate change, for example--which is a form of productivity growth. And likewise, many of the products and technologies people rely on every day did not exist a few years ago. These goods make inaccessible services more available and are changing the nature of work, often for the better. Such gains are made possible by capitalist systems that encourage invention and growing the pie, not by socialist systems that are more concerned with how the existing pie is cut. It is far too soon, in other words, to write off productivity.

Here, it is worth considering the lessons of a previous productivity boom: the Industrial Revolution. As the economist Joel Mokyr has shown, it took new innovations like the steam engine more than 100 years to appear in productivity estimates. The same could be happening today with smartphones and the internet. Meanwhile, even as that upheaval transformed the human experience, creating a more comfortable existence for most everyone, it was also messy and disruptive. The early part of that innovative cycle--like others since--displaced existing workers while the gains flowed to the owners of capital first, causing social instability.

#### Opposition to the state fails.

**DeBoer ’16** [Fredrik; March 15th; Ph.D. from Purdue University; Fredrikdeboer, “c’mon, guys,” http://fredrikdeboer.com/2016/03/15/cmon-guys/]

I could be wrong about the short-term dangers, and the stakes are incredibly high. But in the end we’re left with the same old question: what tactics will actually work to secure a better world?

In a sharp, sober piece about the meaning of left-wing political violence in the 1970s, Tim Barker writes “If you can’t acknowledge radical violence, radicals are reduced to mere victims of repression, rather than political actors who made definite tactical choices under given political circumstances.” The problem, as Barker goes on to imply, is those tactical choices: in today’s America they will essentially never break on the side of armed opposition against the state. The government knows everything about you, I’m sorry to say, your movements and your associations and the books you read and the things you buy and what you’re saying to the people you communicate with. That’s simply on the level of information before we even get to the state’s incredible capacity to inflict violence.

Look, the world has changed. The relative military capacity of regular people compared to establishment governments has changed, especially in fully developed, technology-enabled countries like the United States. The Czar had his armies, yes, but the Czar’s armies depended on manpower above and beyond everything else. The fighting was still mostly different groups of people with rifles shooting at each other. If tomorrow you could rally as many people as the Bolsheviks had at their revolutionary peak, you’re still left in a world of F-15s, drones, and cluster bombs. And that’s to say nothing of the fact that establishment governments in the developed world can rely on the numbing agents of capitalist luxuries and the American dream to damper revolutionary enthusiasm even among the many millions who have been marginalized and impoverished. This just isn’t 1950s Cuba, guys. It’s just not. In a very real way, modern technology effectively lowers the odds of armed political revolution in a country like the United States to zero, and so much the worse for us.

This isn’t fatalism. It doesn’t mean there’s no hope. It means that there is little alternative to organization, to changing minds through committed political action and using the available nonviolent means to create change: a concert of grassroots organizing, labor tactics, and partisan politics. Those things aren’t exactly likely to work, either, but they’re a hell of a lot more plausible than us dweebs taking the Pentagon. Bernie Sanders isn’t really a socialist, but he’s a social democrat that moves the conversation to the left, and if people are dedicated and committed to organizing, the local, state, and national candidates he inspires will move it further to the left still. You got any better suggestions?

Listen, commie nerds. My people. I love you guys. I really do. And I want to build a better world. Not incrementally, either, but with the kind of sweeping and transformative change that is required to fix a world of such deep injustice. But seriously: none of us are ever going to take to the barricades. And it’s a good thing, too, because we’d probably find a way to shoot in the wrong direction. I can’t dribble a basketball without falling down. American socialism is largely made up of bookish dreamers. I love those people but they’re not for fighting. And even if you have a particular talent for combat, you’re looking at fighting the combined forces of Google, Goldman Sachs, and the defense industry. Violence is hard. Soldiering is hard. In an era of the NSA and military robots, it’s really, really hard. “Should we condone revolutionary violence?” is dorm room, pass-the-bong conversation fodder, of precisely the moral and intellectual weight of “should we torture a guy if we know there’s a bomb and we know he knows where it is and we know we can stop it if we do?” It’s built on absurd hypotheticals, propped up by the power of anxious machismo, and undertaken to no practical political end. It’s understandable. I get it, I really do. But it’s got nothing to do with us. The only way forward is the grubby, unsexy work of building coalitions and asking people to climb on board

#### 1] Tech Innovation drives dematerialization that makes Cap Sustainable

McAfee 19, Andrew. More from Less: The Surprising Story of How We Learned to Prosper Using Fewer Resources—and What Happens Next. Scribner, 2019. Props to DML for finding. (Cofounder and codirector of the MIT Initiative on the Digital Economy at the MIT Sloan School of Management, former professor at Harvard Business School)//Elmer

The decreases in resource use, pollution, and other exploitations of the earth cataloged in the preceding chapters are great news. But are they going to last? It could be that we're just living in a pleasant interlude between the Industrial Era and another rapacious period during which we massively increase our footprint on our planet and eventually cause a giant Malthusian crash. It could be, but I don't think so. Instead, I think we're going to take better care of our planet from now on. I'm confident that the Second Machine Age will mark the time in our history when we started to progressively and permanently tread more lightly on the earth, taking less from it and generally caring for it better, even as we humans continue to become more numerous and prosperous. The work of Paul Romer, who shared the 2018 Nobel Prize in economics, is one of the sources of this confidence. Growth Mindset Romer's largest contribution to economics was to show that **it's best not to think of new technologies as something that companies buy and bring in from the outside, but instead as something they create themselves** (the title of his most famous paper, published in 1990, is "Endogenous Technological Change"). These technologies are like designs or recipes; as Romer put it, they’re "the instructions that we follow for combining raw materials." This is close to the definitions of technology presented in chapter 7. Why do companies invent and improve technologies? Simply, to generate profits. They come up with instructions, recipes, and blueprints that will let them grow revenues or shrink costs. As we saw repeatedly in chapter 7, capitalism provides ample incentive for this kind of tech progress. So far, all this seems like a pretty standard argument for how the first two horsemen work together. Romer's brilliance was to highlight the importance of two key attributes of the technological ideas companies come up with as they pursue profits. The first is that they're nonrival, meaning that they can be used by more than one person or company at a time, and that they don't get used up. This is obviously not the case for most resources made out of atoms—I can't also use the pound of steel that you've just incorporated into the engine of a car—but it is the case for ideas and instructions. The Pythagorean theorem, a design for a steam engine, and a recipe for delicious chocolate chip cookies aren't ever going to get "used up" no matter how much they're used. The second important aspect of corporate technologies is that they're partially excludable. This means that companies can kind of prevent others from using them. They do this by keeping the technologies secret (such as the exact recipe for Coca-Cola), filing for patents and other intellectual-property protection, and so on. However, none of these measures is perfect (hence the words partially and kind of). Trade secrets leak. Patents expire, and even before they expire, they must describe the invention they're claiming and so let others study it. Partial excludability is a beautiful thing. It provides strong incentives for companies to create useful, profit-enhancing new technologies that they alone can benefit from for a time, yet it also ensures that the **new techs will eventually "spill over**"—that with time they’ll diffuse and get adopted by more and more companies, even if that's not what their originators want. Romer equated tech progress to the production by companies of nonrivalrous, partially excludable ideas and showed that these ideas cause an economy to grow. What's more, he also demonstrated that this **idea-fueled growth** doesn't have to slow down with time. It's **not constrained by** the size of the **labor** force, the amount of natural **resources**, or other such factors. Instead, economic growth is limited only by the idea-generating capacity of the people within a market. Romer called this capacity "human capital" and said at the end of his 1990 paper, "The most interesting positive implication of the model is that an economy with a larger total stock of human capital will experience faster growth." This notion, which has come to be called "increasing returns to scale," is as powerful as it is counterintuitive. Most formal models of economic growth, as well as the informal mental ones most of us walk around with, feature decreasing returns—growth slows down as the overall economy gets bigger. This makes intuitive sense; it just feels like it would be easier to experience 5 percent growth in a $1 billion economy than a $1 trillion one. But Romer showed that as long as that economy continued to add to its human capital—the overall ability of its people to come up with new technologies and put them to use—it could actually grow faster even as it grew bigger. This is because the stock of useful, nonrivalrous, nonexcludable ideas would keep growing. As Romer convincingly showed, economies run and grow on ideas. The Machinery of Prosperity Romer's ideas should leave us optimistic about the planetary benefits of digital tools—hardware, software, and networks—for three main reasons. First, countless examples show us how good these tools are at fulfilling the central role of technology, which is to provide "instructions that we follow for combining raw materials." Since raw materials cost money, profit-maximizing companies are particularly keen to find ways to use fewer of them. So they use digital tools to come up with beer cans that use less aluminum, car engines that use less steel and less gas, mapping software that removes the need for paper atlases, and so on and so on. None of this is done solely for the good of the earth—it's done for the pursuit of profit that's at the heart of capitalism—yet it benefits the planet by, as we've seen, causing us to take less from it. Digital tools are technologies for creating technologies, the most prolific and versatile ones we've ever come up with. They're machines for coming up with ideas. Lots of them. The same piece of computer-aided design software can be used to create a thinner aluminum can or a lighter and more fuel-efficient engine. A drone can be used to scan farmland to see if more irrigation is needed, or to substitute for a helicopter when filming a movie. A smartphone can be used to read the news, listen to music, and pay for things, all without consuming a single extra molecule. In the Second Machine Age, the global stock of digital tools is increasing much more quickly than ever before. It's being used in countless ways by profit-hungry companies to combine raw materials in ways that use fewer of them. In advanced economies such as America's, the cumulative impact of this combination of capitalism and tech progress is clear: **absolute dematerialization** of the economy and society, **and thus a smaller footprint on our planet**. The second way Romer's ideas about technology and growth are showing up at present is via decreased excludability. Pervasive digital tools are making it much easier for good designs and recipes to spread around the world. While this is often not what a company wants—it wants to exclude others from its great cost-saving idea— excludability is not as easy as it used to be. This isn't because of weaker patent protection, but instead because of stronger digital tools. Once one company shows what's possible, others use hardware, software, and networks to catch up to the leader. Even if they can't copy exactly because of intellectual-property restrictions, they can use digital tools to explore other means to the same end. So, many farmers learn to get higher yields while using less water and fertilizer, even though they combine these raw materials in different ways. Steve Jobs would certainly have preferred for Apple to be the only provider of smartphones after it developed the iPhone, but he couldn't maintain the monopoly no matter how many patents and lawsuits he filed. Other companies found ways to combine processors, memory, sensors, a touch screen, and software into phones that satisfied billions of customers around the world. The operating system that powers most non-Apple smartphones is Android, which is both free to use and freely modifiable. Google's parent company, Alphabet, developed and released Android without even trying to make it excludable; the explicit goal was to make it as widely imitable as possible. This is an example of the broad trend across digital industries of giving away valuable technologies for free. The Linux operating system, of which Android is a descendant, is probably the best-known example of free and open-source software, but there are many others. The online software repository GitHub maintains that it's "the largest open source community in the world" and hosts millions of projects. The Arduino community does something similar for electronic hardware, and the Instructables website contains detailed instructions for making equipment ranging from air-particle counters to machine tools, all with no intellectual-property protection. Contributors to efforts such as these have a range of motivations (Alphabet's goals with Android were far from purely altruistic—among other things, the parent of Google wanted to achieve a quantum leap in mobile phone users around the world, who would avail themselves of Google Search and services such as YouTube), but they're all part of the trend of technology without excludability, which is great news for growth. As we saw in chapter 10, smartphone use and access to the Internet are increasing quickly across the planet. This means that people no longer need to be near a decent library or school to gain knowledge and improve their abilities. Globally, people are taking advantage of the skill-building opportunities of new technologies. This is the third reason that the spread of digital tools should make us optimistic about future growth: these tools are helping human capital grow quickly. The free Duolingo app, for example, is now the world's most popular way to learn a second language. Of the nearly 15 billion Wikipedia page views during July of 2018, half were in languages other than English. Google's chief economist, Hal Varian, points out that hundreds of millions of how-to videos are viewed every day on YouTube, saying, "We never had a technology before that could educate such a broad group of people anytime on an as-needed basis for free." Romer's work leaves me hopeful because it shows that it's our ability to build human capital, rather than chop down forests, dig mines, or burn fossil fuels that drives growth and prosperity. His model of how economies grow also reinforces how well capitalism and tech progress work together, which is a central point of this book. The surest way to boost profits is to cut costs, and modern technologies, especially digital ones, offer unlimited ways to combine and recombine materials—to swap, slim, optimize, and evaporate—in cost-reducing ways. **There's no reason to expect that the two horsemen of capitalism and tech progress will stop** riding together anytime soon. Quite the contrary. Romer's insights reveal that they're likely to gallop faster and farther as economies grow. Our Brighter, Lighter Future The world still has billions of desperately poor people, but they won't remain that way. All available evidence strongly suggests that most will become much wealthier in the years and decades ahead. As they earn more and consume more, what will be the impact on the planet? The history and economics of the Industrial Era lead to pessimism on this important question. Resource use increased in lockstep with economic growth throughout the two centuries between James Watt's demonstration of his steam engine and the first Earth Day. Malthus and Jevons seemed to be right, and it was just a question of when, not if, we'd run up against the hard planetary limits to growth. But in America and other rich countries something strange, unexpected, and wonderful happened: we started getting more from less. We decoupled population and economic growth from resource consumption, pollution, and other environmental harms. Malthus's and Jevons's ideas gave way to Romer's, and the world will never be the same. This means that instead of worrying about the world's poor becoming richer, we should instead be helping them upgrade economically as much and as quickly as possible. Not only is it the morally correct thing to do, it's also the smart move for our planet. As today’s poor countries get richer, their institutions will improve and most will eventually go through what Ricardo Hausmann calls "the capitalist makeover of production." This makeover doesn't enslave people, nor does it befoul the earth. As today’s poor get richer, they'll consume more, but they'll also consume much differently from earlier generations. They won't read physical newspapers and magazines. They'll get a great deal of their power from renewables and (one hopes) nuclear because these energy sources will be the cheapest. They’ll live in cities, as we saw in chapter 12; in fact, they already are. They'll be less likely to own cars because a variety of transportation options will be only a few taps away. Most important, they'll come up with ideas that keep the growth going, and that benefit both humanity and the planet we live on. Predicting exactly how technological progress will unfold is much like predicting the weather: feasible in the short term, but impossible over a longer time. Great uncertainty and complexity prevent precise forecasts about, for example, the computing devices we’ll be using thirty years from now or the dominant types of artificial intelligence in 2050 and beyond. But even though we can't predict the weather long term, we can accurately forecast the climate. We know how much warmer and sunnier it will be on average in August than in January, for example, and we know that global average temperatures will rise as we keep adding greenhouse gases to the atmosphere. Similarly, we can predict the "climate" of future technological progress by starting from the knowledge that it will be heavily applied in the areas where it can affect capitalism the most. As we've seen over and over, tech progress supplies opportunities to trim costs (and improve performance) via dematerialization, and capitalism provides the motive to do so. As a result, the Second Enlightenment will continue as we move deeper into the twenty-first century. I'm confident that it will accelerate as digital technologies continue to improve and multiply and global competition continues to increase. We’ll see some of the most striking examples of slim, swap, evaporate, and optimize in exactly the places where the opportunities are biggest. Here are a few broad predictions, spanning humanity's biggest industries. Manufacturing. Complex parts will be made not by the techniques developed during the Industrial Era, but instead by three- dimensional printing. This is already the case for some rocket engines and other extremely expensive items. **As 3-D printing** improves and becomes cheaper, it will spread to automobile engine blocks, manifolds and other complicated arrangements of pipes, airplane struts and wings, and countless other parts. Because 3-D printing **generates virtually no waste** and doesn't require massive molds, it accelerates dematerialization.

#### 2] Growth leads to Innovation that solves warming

Liebreich 18 Michael Liebreich 18, Visiting Professor at Imperial College’s Energy Future Lab, “The Secret of Eternal Growth,” 10/29/18, <http://ifreetrade.org/article/the_secret_of_eternal_growth_the_physics_behind_pro_growth_environmentalism> //Elmer

The earth, however, is not an isolated system. It may be nearly closed, exchanging limited matter across the planetary boundary, but it is far from isolated, as it receives a huge daily flux of energy from the sun and radiates almost as much away to space. In his book, Georgescu-Roegen even acknowledged the existence of huge solar energy fluxes, but that didn’t stop him from basing his seminal work on a scientific error. Later in his career, after ruefully acknowledging his mistake, he invented a Fourth Law of Thermodynamics, claiming that “material entropy” would forever prevent materials from being perfectly recycled. Pure fake science. Around the same time as Georgescu-Roegen was making up thermodynamic laws, a group of concerned environmentalists calling themselves the Club of Rome invited one of the doyens of the new field of computer modelling, Jay Forrester, to create a simulation of the world economy and its interaction with the environment. In 1972 his marvellous black box produced another best-seller, Limits to Growth (iv), which purported to prove that almost every combination of economic parameters ended up not just with growth slowing, but with an overshoot and collapse. This finding, so congenial to the model’s commissioners, stemmed entirely from errors in its structure, as pointed out by a then fresh-faced young economics professor at Yale, William Nordhaus. A third foundational work in the degrowth canon is Steady State Economics (v) by Herman Daly, later Senior Economist in the Environment Department of the World Bank. In it he explains that “the economy is an open subsystem of a finite and nongrowing ecosystem. Any subsystem of a finite nongrowing system must itself at some point also become nongrowing.” It’s a repeat of Georgescu-Roegen’s error. Daly must have known it too, since he noted that six days’ worth of radiation from the sun contained more useful energy (or exergy, to give it its correct name) than that embodied in all the fossil fuel reserves known at the time. The point here is not that solar power is the key to endless growth, though it could well be - nuclear fission and fusion are other strong contenders. The point is that when you scratch the surface of any of the seminal tracts of the degrowth movement, you find they are based on the same fake science, right through to the present day. Jeremy Rifkin’s 1980 Entropy: a New World View (vi) states that “here on earth material entropy is continually increasing and must ultimately reach a maximum”. In 2009, Professor Tim Jackson, the favourite anti-capitalist of the TED generation, published Prosperity Without Growth (vii). In it he pays homage to Daly’s “pioneering case for a ‘steady state economy’” and cheerfully recommends it to students hungering for alternative wisdom – either not understanding or not caring that it is based on a fallacy. This matters because, for all that the neo-liberal world economy has delivered extraordinary improvements in living standards – in life span, levels of education, infant survival, maternal health, poverty reduction, leisure, and so on (viii) – it is currently failing to address severe, systemic environmental challenges, first and foremost among them climate change. Unless the free-trade, pro-growth, pro-trade right offers a coherent plan, it is ceding the argument to the degrowth, anti-capitalist, anti-trade left. Climate change is real, serious, and urgent. That recent IPCC 1.5°C report is based on rigorous research. Of course climate change is being co-opted by the “Academic Grievance Studies” brigade (ix), but that doesn’t make the underlying physical science less real. As the world continues to burn through its remaining carbon budget, as temperatures continue to rise, as the ‘signal’ of climate damage becomes clearer against the background ‘noise’ of weather, the demand for dramatic action will only increase. Limiting the impact of climate change will require the application of technology, both new and yet-to-be-developed, on a heroic scale. Destroying the ability of the world economy to deliver these solutions is the very opposite of what we should be doing. And that is where Nordhaus and Romer come in. Romer’s great contribution was to identify the contribution of knowledge to economic growth. Before his Endogenous Growth Theory, no one could explain differences in growth rates of as much as 10 percent between countries at a similar stage of development. Romer’s work is the perfect riposte to those who think that economic growth is the same thing as ever-increasing physical material use and pollution; it is also the perfect riposte to those who believe that extractive industries can ever deliver long-term wealth and those who believe the same of agricultural subsidies and import tariffs. Nordhaus, for his part, was the creator of the first Integrated Assessment Models, bringing together the physics of climate change, its economic impact, and the functioning of the economy. He was also the first person to suggest that attaching a cost to emissions – low at first but rising – would squeeze greenhouse gases out of the economy. Nordhaus is no climate fundamentalist, famously diverging from the view propounded in the Stern Review, that the world needs super-high carbon taxes immediately. Nordhaus accepted that environmental challenges and climate change will act as a drag on the economy but, unlike others before him, he quantified the drag and showed that it is highly unlikely to reverse economic growth. Nordhaus and Romer are not the only Nobel Prize-winners whose work suggests that an open, liberal, trade-friendly economy – though one pricing in externalities – will do a better job of addressing climate change and other environmental problems than stalling or reversing economic growth. Simon Kuznets, who won the 1971 Nobel Prize for Economics (x), described how a variable can get worse in the early phases of a country’s development, and then improve as growth continues. He focused mainly on inequality, but the Environmental Kuznets Curves has been shown to govern most forms of local pollution. Ilya Prigogine won the 1977 Nobel Prize in Chemistry for his research into non-equilibrium “dissipative” structures – how a flow of energy across closed system can drive the creation of “order out of chaos” (xi). This is a real scientific expert on entropy proving that the economy can grow for as long as there is still a sun in the sky (which would give us about another five billion years).

#### 3] Capitalism improves Quality of Life – ever stat flow Aff.

Pinker 18 (Stephen, professor of psychology at Harvard, “Enlightenment Now: The Case for Reason, Science, Humanism, and Progress, EM)//Re-cut by Elmer \*\*Modified for gendered language

In the stacked layer graph in figure 8-5, the thickness of the bottom slab represents the number of people living in extreme poverty, the thickness of the top slab represents the number not living in poverty, and the height of the stack represents the population of the world. It shows that the number of poor people declined just as the number of all people exploded, from 3.7 billion in 1970 to 7.3 billion in 2015. (Max Roser points out that if news outlets **truly reported** the changing state of the world, they could have run the headline NUMBER OF PEOPLE IN EXTREME POVERTY FELL BY 137,000 SINCE YESTERDAY every day for the last twenty-five years.) We live in a world not just with a smaller proportion of extremely poor people but with a smaller number of them, and with 6.6 billion people who are not extremely poor. Figure 8-5: Extreme poverty (number), 1820–2015 Sources: Our World in Data, Roser & Ortiz-Ospina 2017, based on data from Bourguignon & Morrison 2002 (1820–1992) and the World Bank 2016g (1981–2015). Most surprises in history are unpleasant surprises, but this news came as a pleasant shock even to the optimists. In 2000 the United Nations laid out eight Millennium Development Goals, their starting lines backdated to 1990.25 At the time, cynical observers of that underperforming organization dismissed the targets as aspirational boilerplate. Cut the global poverty rate in half, lifting a billion people out of poverty, in twenty-five years? Yeah, yeah. But the world reached the goal five years ahead of schedule. Development experts are still rubbing their eyes. Deaton writes, “This is perhaps the most important fact about wellbeing in the world since World War II.”26 The economist Robert Lucas (like Deaton, a Nobel laureate) said, “The consequences for human welfare involved [in understanding rapid economic development] are simply staggering: once one starts to think about them, it is hard to think about anything else.”27 Let’s not stop thinking about tomorrow. Though it’s always dangerous to extrapolate a historical curve, what happens when we try? If we align a ruler with the World Bank data in figure 8-4, we find that it crosses the x-axis (indicating a poverty rate of 0) in 2026. The UN gave itself a cushion in its 2015 Sustainable Development Goals (the successor to its Millennium Development Goals) and set a target of “ending extreme poverty for all people everywhere” by 2030.28 Ending extreme poverty for all people everywhere! May I live to see the day. (Not even Jesus was that optimistic: he told a supplicant, “The poor you will always have with you.”) Of course that day is a ways off. Hundreds of millions of people remain in extreme poverty, and getting to zero will require a greater effort than just extrapolating along a ruler. Though the numbers are dwindling in countries like India and Indonesia, they are increasing in the poorest of the poor countries, like Congo, Haiti, and Sudan, and the last pockets of poverty will be the hardest to eliminate.29 Also, as we approach the goal we should move the goalposts, since not-so-extreme poverty is still poverty. In introducing the concept of progress I warned against confusing hard-won headway with a process that magically takes place by itself. The point of calling attention to progress is not self-congratulation but identifying the causes so we can do more of what works. And since we know that something has worked, it’s unnecessary to keep depicting the developing world as a basket case to shake people out of their apathy—with the danger that they will think that additional support would just be throwing money down a rat hole.30 So what is the world doing right? As with most forms of progress, a lot of good things happen at once and reinforce one another, so it’s hard to identify a first domino. Cynical explanations, such as that the enrichment is a one-time dividend of a surge in the price of oil and other commodities, or that the statistics are inflated by the rise of populous China, have been examined and dismissed. Radelet and other development experts point to five causes.31 “In 1976,” Radelet writes, “Mao single-handedly and dramatically changed the direction of global poverty with one simple act: he died.”32 Though China’s rise is not exclusively responsible for the Great Convergence, the country’s sheer bulk is bound to move the totals around, and the explanations for its progress apply elsewhere. The death of Mao Zedong is emblematic of three of the major causes of the Great Convergence. The first is the decline of communism (together with intrusive socialism). For reasons we have seen, market economies can generate wealth prodigiously while totalitarian planned economies **impose scarcity, stagnation, and often famine**. Market economies, in addition to reaping the benefits of specialization and providing incentives for people to produce things that other people want, solve the problem of coordinating the efforts of hundreds of millions of people by using prices to propagate information about need and availability far and wide, a computational problem that no planner is brilliant enough to solve from a central bureau.33 A shift from collectivization, centralized control, government monopolies, and suffocating permit bureaucracies (what in India was called “the license raj”) to open economies took place on a number of fronts beginning in the 1980s. They included Deng Xiaoping’s embrace of capitalism in China, the collapse of the Soviet Union and its domination of Eastern Europe, and the liberalization of the economies of India, Brazil, Vietnam, and other countries. Though intellectuals are apt to do a spit take when they read a defense of capitalism, its economic benefits are so obvious that they don’t need to be shown with numbers. They can literally be seen from space. A satellite photograph of Korea showing the capitalist South aglow in light and the Communist North a pit of darkness vividly illustrates the contrast in the wealth-generating capability between the two economic systems, holding geography, history, and culture constant. Other matched pairs with an experimental group and a control group lead to the same conclusion: West and East Germany when they were divided by the Iron Curtain; Botswana versus Zimbabwe under Robert Mugabe; Chile versus Venezuela under Hugo Chávez and Nicolás Maduro—the latter a once-wealthy, oil-rich country now suffering from widespread hunger and a critical shortage of medical care.34 It’s important to add that the market economies which blossomed in the more fortunate parts of the developing world were not the laissez-faire anarchies of right-wing fantasies and left-wing nightmares. To varying degrees, their governments invested in education, public health, infrastructure, and agricultural and job training, together with social insurance and poverty-reduction programs.35 Radelet’s second explanation of the Great Convergence is leadership. Mao imposed more than communism on China. He was a mercurial megalomaniac who foisted crackbrained schemes on the country, such as the Great Leap Forward (with its gargantuan communes, useless backyard smelters, and screwball agronomic practices) and the Cultural Revolution (which turned the younger generation into gangs of thugs who terrorized teachers, managers, and descendants of “rich peasants”).36 During the decades of stagnation from the 1970s to the early 1990s, many other developing countries were commandeered by psychopathic strongmen with ideological, religious, tribal, paranoid, or self-aggrandizing agendas rather than a mandate to enhance the well-being of their citizens. Depending on their sympathy or antipathy for communism, they were propped up by the Soviet Union or the United States under the principle “He may be a son of a bitch, but he’s our son of a bitch.”37 The 1990s and 2000s saw a spread of democracy (chapter 14) and the rise of levelheaded, humanistic leaders—not just national statesmen like Nelson Mandela, Corazon Aquino, and Ellen Johnson Sirleaf but local religious and civil-society leaders acting to improve the lives of their compatriots.38 A third cause was the end of the Cold War. It not only pulled the rug out from under a number of tinpot dictators but snuffed out many of the civil wars that had racked developing countries since they attained independence in the 1960s. Civil war is both a humanitarian disaster and an economic one, as facilities are destroyed, resources are diverted, children are kept out of school, and managers and workers are pulled away from work or killed. The economist Paul Collier, who calls war “development in reverse,” has estimated that a typical civil war costs a country $50 billion.39 A fourth cause is globalization, in particular the explosion in trade made possible by container ships and jet airplanes and by the liberalization of tariffs and other barriers to investment and trade. Classical economics and common sense agree that a larger trading network should make everyone, on average, better off. As countries specialize in different goods and services, they can produce them more efficiently, and it doesn’t cost them much more to offer their wares to billions of people than to thousands. At the same time buyers, shopping for the best price in a global bazaar, can get more of what they want. (Common sense is less likely to appreciate a corollary called comparative advantage, which predicts that, on average, everyone is better off when each country sells the goods and services that it can produce most efficiently even if the buyers could produce them still more efficiently themselves.) Notwithstanding the horror that the word elicits in many parts of the political spectrum, globalization, development analysts agree, has been a bonanza for the poor. Deaton notes, “Some argue that globalization is a neoliberal conspiracy designed to enrich a very few at the expense of many. If so, that conspiracy was a disastrous failure—or at least, it helped more than a billion people as an unintended consequence. If only unintended consequences always worked so favorably.”40 To be sure, the industrialization of the developing world, like the Industrial Revolution two centuries before it, has produced working conditions that are harsh by the standards of modern rich countries and have elicited bitter condemnation. The Romantic movement in the 19th century was partly a reaction to the “dark satanic mills” (as William Blake called them), and since that time a loathing of industry has been a sacred value of C. P. Snow’s Second Culture of literary intellectuals.41 Nothing in Snow’s essay enraged his assailant F. R. Leavis as much as this passage: It is all very well for us, sitting pretty, to think that material standards of living don’t matter all that much. It is all very well for one, as a personal choice, to reject industrialization—do a modern Walden if you like, and if you go without much food, see most of your **children die in infancy, despise** the comforts of **literacy**, **accept twenty years off your own life**, then I respect you for the strength of your aesthetic revulsion. But I don’t respect you in the slightest if, even passively, you try to impose the same choice on others who are not free to choose. In fact, we know what their choice would be. For, with singular unanimity, in any country where they have had the chance, the poor have walked off the land into the factories as fast as the factories could take them.42 As we have seen, Snow was accurate in his claims about advances in life and health, and he was also right that the appropriate standard in considering the plight of the poor in industrializing countries is the set of alternatives available to them where and when they live. Snow’s argument is being echoed fifty years later by development experts such as Radelet, who observes that “while working on the factory floor is often referred to as sweatshop labor, it is often better than the grand[parent] of all sweatshops: working in the fields as an agricultural day laborer.” When I lived in Indonesia in the early 1990s, I arrived with a somewhat romanticized view of the beauty of people working in rice paddies, together with reservations about the rapidly growing factory jobs. The longer I was there, the more I recognized how incredibly difficult it is to work in the rice fields. It’s a backbreaking grind, with people eking out the barest of livings by bending over for hours in the hot sun to terrace the fields, plant the seeds, pull the weeds, transplant the seedlings, chase the pests, and harvest the grain. Standing in the pools of water brings leeches and the constant risk of malaria, encephalitis, and other diseases. And, of course, it is hot, all the time. So, it was not too much of a surprise that when factory jobs opened offering wages of $2 a day, hundreds of people lined up just to get a shot at applying.43 The benefits of industrial employment can go beyond material living standards. For the women who get these jobs, it can be a liberation. In her article “The Feminist Side of Sweatshops,” Chelsea Follett (the managing editor of HumanProgress) recounts that factory work in the 19th century offered women an escape from the traditional gender roles of farm and village life, and so was held by some men at the time “sufficient to damn to infamy the most worthy and virtuous girl.” The girls themselves did not always see it that way. A textile mill worker in Lowell, Massachusetts, wrote in 1840: We are collected . . . to get money, as much of it and as fast as we can. . . . Strange would it be, if in money-loving New England, one of the most lucrative female employments should be rejected because it is toilsome, or because some people are prejudiced against it. Yankee girls have too much independence for that.44 Here again, experiences during the Industrial Revolution prefigure those in the developing world today. Kavita Ramdas, the head of the Global Fund for Women, said in 2001 that in an Indian village “all there is for a woman is to obey her husband and relatives, pound millet, and sing. If she moves to town, she can get a job, start a business, and get education for her children.”45 An analysis in Bangladesh confirmed that the women who worked in the garment industry (as my grandparents did in 1930s Canada) enjoyed rising wages, later marriage, and fewer and better-educated children.46 Over the course of a generation, slums, barrios, and favelas can morph into suburbs, and the working class can become middle class.47 To appreciate the long-term benefits of industrialization one does not have to accept its cruelties. One can imagine an alternative history of the Industrial Revolution in which modern sensibilities applied earlier and the factories operated without children and with better working conditions for the adults. Today there are doubtless factories in the developing world that could offer as many jobs and still turn a profit while treating their workers more humanely. Pressure from trade negotiators and consumer protests has measurably improved working conditions in many places, and it is a natural progression as countries get richer and more integrated into the global community (as we will see in chapters 12 and 17 when we look at the history of working conditions in our own society).48 Progress consists not in accepting every change as part of an indivisible package—as if we had to make a yes-or-no decision on whether the Industrial Revolution, or globalization, is a good thing or bad thing, exactly as each has unfolded in every detail. Progress consists of unbundling the features of a social process as much as we can to maximize the human benefits while minimizing the harms. The last, and in many analyses the most important, contributor to the Great Convergence is science and technology.49 Life is getting cheaper, in a good way. Thanks to advances in know-how, an hour of labor can buy more food, health, education, clothing, building materials, and small necessities and luxuries than it used to. Not only can people eat cheaper food and take cheaper medicines, but children can wear cheap plastic sandals instead of going barefoot, and adults can hang out together getting their hair done or watching a soccer game using cheap solar panels and appliances. As for good advice on health, farming, and business: it’s better than cheap; it’s free. Today about half the adults in the world own a smartphone, and there are as many subscriptions as people. In parts of the world without roads, landlines, postal service, newspapers, or banks, mobile phones are more than a way to share gossip and cat photos; they are a major generator of wealth. They allow people to transfer money, order supplies, track the weather and markets, find day labor, get advice on health and farming practices, even obtain a primary education.50 An analysis by the economist Robert Jensen subtitled “The Micro and Mackerel Economics of Information” showed how South Indian small fishermen increased their income and lowered the local price of fish by using their mobile phones at sea to find the market which offered the best price that day, sparing them from having to unload their perishable catch on fish-glutted towns while other towns went fishless.51 In this way mobile phones are allowing hundreds of millions of small farmers and fishers to become the omniscient rational actors in the ideal frictionless markets of economics textbooks. According to one estimate, every cell phone adds $3,000 to the annual GDP of a developing country.52 The beneficent power of knowledge has rewritten the rules of global development. Development experts differ on the wisdom of foreign aid. Some argue that it does more harm than good by enriching corrupt governments and competing with local commerce.53 Others cite recent numbers which suggest that intelligently allocated aid has in fact done tremendous good.54 But while they disagree on the effects of donated food and dollars, all agree that donated technology—medicines, electronics, crop varieties, and best practices in agriculture, business, and public health—has been an unalloyed boon. (As Jefferson noted, he who receives an idea from me receives instruction without lessening mine.) And for all the emphasis I’ve placed on GDP per capita, the value of knowledge has made that measure less relevant to what we really care about, quality of life. If I had squeezed a line for Africa into the lower right corner of figure 8-3, it would look unimpressive: the line would curve upward, to be sure, but without the exponential blastoff of the lines for Europe and Asia. Charles Kenny emphasizes that the actual progress of Africa belies the shallow slope, because health, longevity, and education are so much more affordable than they used to be. Though in general people in richer countries live longer (a relationship called the Preston curve, after the economist who discovered it), the whole curve is being pushed upward, as everyone is living longer regardless of income.55 In the richest country two centuries ago (the Netherlands), life expectancy was just forty, and in no country was it above forty-five. Today, life expectancy in the poorest country in the world (the Central African Republic) is fifty-four, and in no country is it below forty-five.56 Though it’s easy to sneer at national income as a shallow and materialistic measure, it correlates with every indicator of human flourishing, as we will repeatedly see in the chapters to come. Most obviously, GDP per capita correlates with longevity, health, and nutrition.57 Less obviously, it correlates with higher ethical values like peace, freedom, human rights, and tolerance.58 Richer countries, on average, fight fewer wars with each other (chapter 11), are less likely to be riven by civil wars (chapter 11), are more likely to become and stay democratic (chapter 14), and have greater respect for human rights (chapter 14—on average, that is; Arab oil states are rich but repressive). The citizens of richer countries have greater respect for “emancipative” or liberal values such as women’s equality, free speech, gay rights, participatory democracy, and protection of the environment (chapters 10 and 15). Not surprisingly, as countries get richer they get happier (chapter 18); more surprisingly, as countries get richer they get smarter (chapter 16).59 In explaining this Somalia-to-Sweden continuum, with poor violent repressive unhappy countries at one end and rich peaceful liberal happy ones at the other, correlation is not causation, and other factors like education, geography, history, and culture may play roles.60 But when the quants try to tease them apart, they find that economic development does seem to be a major mover of human welfare.61 In an old academic joke, a dean is presiding over a faculty meeting when a genie appears and offers him one of three wishes—money, fame, or wisdom. The dean replies, “That’s easy. I’m a scholar. I’ve devoted my life to understanding. Of course I’ll take wisdom.” The genie waves his hand and vanishes in a puff of smoke. The smoke clears to reveal the dean with his head in his hands, lost in thought. A minute elapses. Ten minutes. Fifteen. Finally a professor calls out, “Well? Well?” The dean mutters, “I should have taken the money.”