## 1AC

### 1AC – Harmonization

#### Conflicting federal antitrust standards on standard essential patents (SEPs) cause DOJ-FTC turf wars – drives industrial and international uncertainty which wrecks harmonization, and decimates growth

McGinnis and Sun, 21 – John O. McGinnis, Professor at Northwestern University and Linda Sun, Associate at Wilmer Pickering Hale & Dorr LLP and J.D. 2020 at Northwestern Pritzker School of Law, Winter, “Unifying Antitrust Enforcement for the Digital Age,” *78 Wash. & Lee L. Rev. 305*, p. Nexis – Iowa

1. Standard-Essential Patents: A Case Study in Incoherence

Turf battles aside, the FTC and the DOJ have promoted directly opposing policies regarding the application of antitrust law to technology.138 The contentious disagreement on the important issue of standard-essential patents shows the divergent treatment and uncertainty already generated by dual enforcement. The FTC believes violation of a SEP licensing agreement is potentially an antitrust violation.139 Standard-setting organizations often require patent holders to license SEPs for free or on fair, reasonable, and non-discriminatory (FRAND) terms.140 The FTC argues that a violation of these licensing terms can violate antitrust laws by enabling a patent holder to “parlay the standardization of its technology into a monopoly in standard-compliant products.”141 The DOJ disagrees, because it believes “it is not the duty or the proper role of antitrust law to referee what unilateral behavior is reasonable for patent holders in this context.”142 The DOJ argues that patent holders enjoy a government-granted monopoly over the item under patent.143 Thus, a violation of a SEP licensing agreement may raise an issue of contract law or other common law right, but not antitrust.144

SEPs are vital to technological innovation and economic growth, with billions of dollars at stake.145 To understand the importance of SEPs to technology, one must first understand the importance of a standard. A standard is a uniform practice around which a technology develops.146 For example, a standard could describe a specific design of a charging port. Once the standard is set, multiple devices, from cell phones to speakers, can be designed to work with that standard charging port. Standards enable uniformity and operability across manufacturers, devices, or platforms.147 We interact with and depend on countless technology standards such as USB, Bluetooth, HTML, and 3G in our everyday life. Their importance cannot be overstated: they provide the foundation for the development and implementation of technology.148

Despite their benefits, standards also present a dilemma: they are most beneficial when there is widespread adoption.149 But most entities, from companies to countries, want to have their own individual designs become standard so as to gain a competitive advantage.150 Thus, there must be some process that encourages collaboration and consensus even among competitors.151

Such collaboration is facilitated by a standards development organization (SDO) or standard setting organization (SSO), which creates, revises, and coordinates technical standards.152 Standards development organizations have rules and criteria to prevent a single interest from dominating the definition of a standard.153 Their rules govern how they approach patented technologies.154 For example, an SDO may require that only unpatented technologies can be adopted as standard. Thus, in deciding what charging port will be the industry standard, the SDO would reject any charging ports that were patented. While this is, in a sense, a procompetitive solution—no entity would have a monopoly over the standard technology that was decided upon—it is largely unrealistic in today’s world where most useful and current inventions are patented. Adopting an unpatented technology that is outdated as standard defeats the purpose of a standard, which is to facilitate the development and adoption of innovative technology.155

As a result, SDOs must contend with standard-essential patents (SEPs), patents that are necessary for the implementation of a standardized technology.156 SDOs typically require that if a proposed standard is encumbered by patents, those patents must be licensed on “fair, reasonable, and non-discriminatory” (FRAND) terms to those seeking to utilize the technology.157 This requirement is thought to facilitate the adoption of the standard in the industry while providing fair terms to all parties involved.158 Because standards are critical to almost everything that touches technology, standard-essential patents are as well. When a patent is essential to a standard, there is no way to comply with the standard without infringing or licensing the patent.159 A dispute over a single SEP can prevent a company from making its product compatible with the internet, computers, or mobile devices.160 For example, a typical cellphone charging port has SEPs that cover every part of its design, from the electronic circuitry to communication protocols. Methods that enable a mobile phone to stay connected to a 4G/LTE network are covered by a multitude of SEPs that are essential to the 4G/LTE standard.161 Qualcomm owns SEPs essential to widely adopted cellular communication standards such as CDMA and LTE.162

A competition problem arises when, despite any agreement made at the time a standard was chosen, SEPs are later not licensed at fair, reasonable, and non-discriminatory terms. When the owner of a SEP bars a competitor from utilizing a SEP and therefore a standard technology, this decision deals a huge blow to the competitor. The FTC believes that when a SEP-owner violates an agreement to license the SEP on fair, reasonable, and non-discriminatory terms, this is an anticompetitive action in violation of antitrust laws.163 In FTC v. Qualcomm,164 the FTC pursued action against Qualcomm under Section 5 of the FTC Act for refusing to license its SEPs to competitors.165

In contrast, the DOJ has taken the stance that SEP owners refusing to license on FRAND terms is not an anticompetitive antitrust violation.166 It is simply a patent owner exercising his or her earned right to exclude competitors. As dictated under patent law doctrine, a patent owner has the right to prevent anyone from utilizing his or her patented technology.167 Going forward, it is uncertain whether the government will pursue antitrust enforcement actions related to the licensing of SEPs.168

This disagreement between the DOJ and the FTC rippled out to cause concern in the legislative branch. Because of the DOJ’s disagreement with the FTC, Senators wrote to the DOJ urging the agency to clarify its policy and provide guidance to stakeholders.169 The uncertainty created by this bifurcated approach creates dissatisfaction in Congress and so undermines support for these agencies among those who control their funding.170

The disagreement between the DOJ and FTC has international implications as well. Divergence in treatment of FRAND agreements among countries already causes difficulties for companies operating under different national standards in the global economy.171 These international challenges are further exacerbated by the different policies of the two domestic antitrust enforcement agencies of the United States, still the most important commercial nation in the world.172 Companies are subject to potentially conflicting standards depending not only on the national identity of the enforcement agency but also on the identity of the agency with the United States. International harmonization becomes more difficult if the United States has internal disagreements. Therefore, the case of SEPs shows how dual enforcement has created uncertainty in the industry, in Congress, and internationally.

B. Dual Enforcement Causes Inefficiencies and Inconsistent Outcomes

Technology did not create, but only exacerbates long-standing problems of dual antitrust enforcement. In this subpart we briefly offer more general arguments against joint enforcement by the FTC and Antitrust Division. It wastes resources, and even in non-technological areas, it creates uncertainty. 173 Both waste and uncertainty are compounded by turf wars, as exemplified by conflicts over mergers. 174

Moreover, Congress never intended for a system of full dual enforcement. 175 Thus, eliminating it would not undermine a fully deliberated scheme. Single enforcement would additionally bring the United States in conformity with industrialized nations worldwide, which generally have a single antitrust enforcer. 176 Finally, we respond to the argument that single agency enforcement would not improve matters much because private actors can enforce antitrust. 177 Private enforcers are subject to heavy restrictions and do not have the same ability to direct antitrust policy as the agencies do.

#### **We’re at an accelerated breaking point**

McGinnis and Sun, 21 – John O. McGinnis, Professor at Northwestern University and Linda Sun, Associate at Wilmer Pickering Hale & Dorr LLP and J.D. 2020 at Northwestern Pritzker School of Law, Winter, “Unifying Antitrust Enforcement for the Digital Age,” *78 Wash. & Lee L. Rev. 305*, p. Nexis – Iowa

Dual antitrust enforcement by the DOJ and the FTC has always created some problems of waste and uncertainty by maintaining overlapping centers of interpretive authority. 402 But technology has made these costs intolerable and added others. Because there are so many difficult questions about how to apply antitrust law to emerging technology, different enforcement agencies confuse companies key to our economic growth as these agencies try to figure out the correct way forward. In the important case of standard-essential patents, the confusion is already rampant, as the DOJ and FTC are locked in fundamental conflict.

#### The US sheltering SEP monopolies from antitrust splinters coordination. Anti-trust prohibitions via SSOs are the best way to harmonize global standards

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In the last decade, the licensing of standard essential patents (SEPs) on fair, reasonable and non-discriminatory (FRAND) terms has been a thorny issue for SEP holders in the US and Europe on the one hand, and major SEP implementers in major Asian economies on the other, such as Japan, Korea, the PRC, Taiwan and even India. With the rise of the Fourth Industrial Revolution, driven by the Internet of Things (IoT), 5G, driverless vehicles, and artificial intelligence (AI), which relies even more on interconnectivity, more and more new standards and SEPs will emerge, and the issue of FRAND licensing of SEPs will be even hotter.

The situation is further exacerbated by national courts’ issuance of anti-suit/enforcement injunctions and even anti-anti-suit/enforcement injunctions. Since Microsoft v. Motorola in 2012, US courts have applied anti-suit injunctions broadly to prohibit litigants from initiating or continuing parallel SEP-related litigation in another jurisdiction. For example, in June 2015 the Northern District Court of California granted InterDigital’s motion for a preliminary injunction requiring Pegatron (a Taiwanese company) to dismiss its suit in Taiwan, and again in April 2018 it issued an anti-enforcement injunction in the Huawei v. Samsung case to enjoin Huawei from enforcing an injunction on Chinese SEPs entered by the Shenzhen Intermediate People’s Court. The England and Wales High Court also held that an anti-suit injunction could be permissible in Conversant (Singaporean company) v. Huawei and ZTE in 2018. Recently, after the Chinese Supreme People’s Court issued within two days an anti-enforcement injunction against Conversant in August 2020, prohibiting it from enforcing a decision rendered by the Dusseldorf District Court, the Wuhan Intermediate People’s Court has taken the whole world by surprise. It issued in September 2020 a global anti-suit injunction against InterDigital in its suit with Xiaomi (Chinese company) and then issued in March 2021 against Ericson in its suit with Samsung (Korean company) a global anti-suit (excluding even other Chinese courts) and anti-administrative complaint injunction.

As a response, the international community has started to look for alternatives. For example, since November 2015, the Munich IP Dispute Resolution Forum has worked on the role of Alternative Dispute Resolution (ADR) in solving disputes surrounding FRAND licensing of SEPs and proposed the “FRAND ADR Case Management Guidelines” in May 2018. The European Commission (EC) in its 2020 IP Action Plan vows to “improve transparency and predictability in SEP licensing via encouraging industry-led initiatives, in the most affected sectors, combined with possible reforms, including regulatory if and where needed, aiming to clarify and improve the SEPs framework and offer effective transparency tools,” to facilitate licensing and sharing of IP. Seemingly, ADR is one of the industry-led initiatives the EC has in mind.

However, ADR has its drawbacks, at least from the perspective of Asian industries, and can only work under a new construction.

One big drawback of ADR is that there is already an arbitration clause in almost every SEP license, which is almost always imposed by SEP holders and almost always designates the home turf of SEP holders or the headquarters of Standard Setting Organizations (SSOs) as the place for arbitration, which are almost always non-Asian. The result of such arbitration tends to take a formalistic and pure contract law approach to interpret SEP licenses; as Lord Justice Birss has said “it is not necessary to rely on competition law to enforce the FRAND undertaking.” Arbitrators will almost certainly ignore the dominant market power possessed by SEP licensors and its abuse. That is the reason why I have suggested that competition authorities in major Asian economies should promulgate guidelines to demand that SEP licensors limit the scope of arbitration to pure contractual disputes, and exclude those related to anti-trust from arbitration. The lack of competition law consideration during arbitration will not be mitigated by simply reminding that ideal candidates for arbitrators “would have specific expertise in the field of standardization and related competition law issues” as proposed by the FRAND ADR Case Management Guidelines. There are few such people, if any at all, and they will hardly be chosen by SEP holders.

The second drawback is that arbitration taking place elsewhere will preempt local antitrust law suits in major Asian economies, which have offered some practical help to SEP implementers. In the last decade, some standards for FRAND licensing of SEPs under antitrust laws have converged in major Asian jurisdictions. There are three Nos and one Yes. “No” to bundling non-SEPs with SEPs, “No” to continual payment of royalties after the expiration of SEPs, “No” to royalty-free cross-licensing, and “Yes” to the provisioning of patent lists by SEP holders. Failure to uphold the three Nos and one Yes by SEP holders could lead to antitrust issues of abuse of dominance by the SEP holders in these Asian jurisdictions.

The three Nos and one Yes standards take a per se illegal approach and might seem rigid. However, they provide bright-line rules and as a result certainty to SEP implementers in Asia. In addition, they mirror or resemble some of the “Nine No-Nos” that reigned in the US from 1970 to 1995, especially “No” mandatory package licenses and “No” royalty provisions not reasonably related to the licensee's sales. It took the US 25 years to transition to the Antitrust Guidelines for the Licensing of Intellectual Property, which looks at these issues from the perspectives of rule of reason. The three Nos and one Yes standards should therefore be treated with equal understanding and tolerance, as Asian economies might need time to evolve according to their changing conditions and mindsets. Why would Asian SEP implementers agree to throw away that level of antitrust law safeguard by embracing arbitration unconditionally?

On top of that, it is worth noting that oftentimes these three Nos and one Yes standards have also been accepted in the form of consented corrective measures and concrete undertakings made by SEP holders to different Asian competition authorities. Since the SEP holders are global conglomerates and operate internationally, these standards could have the potential of transcending national borders to become global standards. Otherwise, they would be “discriminatory” towards businesses located in other jurisdictions. If we were to promote arbitration beyond Asia, should these antitrust standards be not arbitrable?

The third drawback of ADR is that it lacks the positive externality of a litigation. Its results will not be published, and no teaching and research on and oversight over the licensing of SEPs will be possible. Relevant knowledge will not be accumulated for and disseminated to the public. The FRAND ADR Case Management Guidelines take notice of this concern and suggest that “public policy considerations have to be balanced with confidentiality as an established ADR-principle” and “at least the methods and principles adopted by the parties and the arbitral tribunal in the determination of FRAND terms and conditions should be made public.” Whether this will be acceptable to and practicable for ADR institutions remains highly uncertain.

On the contrary, arbitration by SSOs offers the most viable solution and can best avoid the above drawbacks. For three reasons FRAND licensing of SEPs needs ex ante regulation: increasing litigation worldwide indicates massive market failure; SEPs equal monopoly or joint monopoly; and SSOs from the private sector are replacing sovereign states in the development and adoption of new technical standards. The ex ante regulation is through light-handed control over the self-regulation by SSOs. SSOs are closest to all participants in the market, have professional knowledge about the standards and their major contributors, are not limited by national boundaries, and are therefore best positioned to tackle the problem at the roots.

In other words, SSOs should be asked by regulators to provide safeguards for the smooth implementation of the standards embodied in SEPs. Specifically, SSOs should conduct the essentiality check on the declared SEPs, be the depository of FRAND-compliant royalty rates that their members have signed, which will enable SSOs to concretize FRAND-compliant terms, and provide arbitration service to SEP owners and implementers. To be more feasible, SSOs should take the need for collective management of SEPs seriously. They can learn from the examples of the extended collective management of copyright by forming an umbrella organization to coordinate different arbitration cases to avoid royalty stacking and enhance transparency. That way, a global arbitration, as envisioned by Lord Justice Arnold, can be better achievable.

No single national competition agency can deal with all SSOs. Therefore, concerted action across national competition agencies is a must. Given that almost all SSOs are headquartered in the EU and US, and both the USFTC and EC have dealt with SSOs-related issues, coordination between the two would be a good start. More challenging, though, is to integrate competition authorities of other jurisdictions. It is only fair and appropriate to include at least the competition agencies of Taiwan, South Korea and the PRC, as they have dealt with FRAND licensing of SEPs issues, and their economies are leading the ICT industries. These five competition agencies can form a consortium to oversee the self-regulation of SSOs, including the arbitration service, in a way that best addresses the three drawbacks associated with traditional arbitration.

#### **Unified antitrust enforcement of SEP monopolies is make or break for growth**

McGinnis and Sun, 21 – John O. McGinnis, Professor at Northwestern University and Linda Sun, Associate at Wilmer Pickering Hale & Dorr LLP and J.D. 2020 at Northwestern Pritzker School of Law, Winter, “Unifying Antitrust Enforcement for the Digital Age,” *78 Wash. & Lee L. Rev. 305*, p. Nexis – Iowa

1. The Need for Certainty in Antitrust Regulation of Technology

A unified approach to antitrust regulation is especially important when it comes to the technology industry for three reasons. First, the rapidly growing technology industry is at the center of the U.S. economy: in 2018, the internet sector accounted for $2.1 trillion of the economy and 10 percent of the GDP. 48 Uncertainty about antitrust rules created by dual enforcement hinders economic growth.

Second, technological industries are especially sensitive to shifts in antitrust policy because antitrust actions can change the trajectory of fast-changing industries. For instance, the DOJ's antitrust enforcement action against the Bell System broke up the monopoly in telephony. 49 One court later summarized the effect as "an unprecedented flowering of innovation" in the telecom industry. 50 Agency antitrust action also played a large role in the growth of software, browser, and [\*318] web company competition. 51 In anticipation of a Justice Department antitrust suit, 52 IBM unbundled its software and hardware products in the 1960s, 53 dramatically changing the software market. Nearly overnight, software went from a typically free good to a commercial product. 54 Governmental antitrust enforcement is additionally credited for Microsoft's 1997 investment in its rival company Apple, which saved the then-nascent company from the brink of bankruptcy. 55 Microsoft likely acted in self-preservation because it faced antitrust scrutiny that came to a head in a DOJ suit the year after. 56 The [\*319] Microsoft settlement itself is "credited with giving web companies like Google--and browsers like Google Chrome . . . space to grow." 57 These actions changed the technological landscape, and future antitrust decisions regarding technology companies will have just as significant of an impact, if not more.

Moreover, antitrust policy is very important to the research and development that is the heart of innovation in tech, particularly as more research and development has moved from the public sector to the private sector. 58 Private companies are affected more directly by antitrust policies. 59 Even the financing of technology is dependent on antitrust law. Today, as discussed in more detail below, 60 the primary reason a tech start-up receives funding from investors is its acquisition potential; merger and acquisition policies play a significant role. 61 Once again, certainty here is important for investors, and [\*320] possible and actual conflicts between DOJ and the FTC reduce certainty.

Third, a unified approach to antitrust has become more important because the antitrust issues affecting tech are particularly complex; it is difficult to determine how best to apply antitrust law to emerging technologies. 62This challenge makes it more likely that DOJ and the FTC will proceed on different theories, increasing uncertainty. For instance, antitrust scholars and regulators have struggled to apply the traditional small but significant non-transitory increase in prices (SSNIP) test to zero-price tech markets. 63 The SSNIP test, used by both the FTC and DOJ, defines a relevant antitrust market as the "smallest grouping of products for which a hypothetical monopolist could profitably impose a 5% price increase." 64 However, many technology platforms offer their products at no monetary cost to customers. The lack of measurable price renders the SSNIP test difficult to operationalize. 65 This complexity makes it more likely that the DOJ and the FTC will apply the test differently, resulting in uneven and unfair outcomes. SSNIP is only one of many areas of debate regarding how antitrust is to be applied to technology.

#### Growth prevents extinction and the collapse of the rules-based order

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Broadly shared economic prosperity is a bedrock of America’s economic and political strength—both domestically and in the international arena. A strong and equitable recovery from the economic crisis created by COVID-19 would be a powerful testament to the resilience of the American system and its ability to create prosperity at a time of seismic change and persistent global crisis. Such a recovery could attack the profound economic inequities that have developed over the past several decades. Without bold action to help all workers access good jobs as the economy returns, the United States risks undermining the legitimacy of its institutions and its international standing. The outcome will be a key determinant of America’s national security for years to come.

An equitable recovery requires a national commitment to help all workers obtain good jobs—particularly the two-thirds of adults without a bachelor’s degree and people of color who have been most affected by the crisis and were denied opportunity before it. As the nation engages in a historic debate about how to accelerate economic recovery, ambitious public investment is necessary to put Americans back to work with dignity and opportunity. We need an intentional effort to make sure that the jobs that come back are good jobs with decent wages, benefits, and mobility and to empower workers to access these opportunities in a profoundly changed labor market.

To achieve these goals, American policy makers need to establish job growth strategies that address urgent public needs through major programs in green energy, infrastructure, and health. Alongside these job growth strategies, we need to recognize and develop the talents of workers by creating an adult learning system that meets workers’ needs and develops skills for the digital economy. The national security community must lend its support to this cause. And as it does so, it can bring home the lessons from the advances made in these areas in other countries, particularly our European allies, and consider this a realm of international cooperation and international engagement.

Shared Economic Prosperity Is a National Security Asset

A strong economy is essential to America’s security and diplomatic strategy. Economic strength increases our influence on the global stage, expands markets, and funds a strong and agile military and national defense. Yet it is not enough for America’s economy to be strong for some—prosperity must be broadly shared. Widespread belief in the ability of the American economic system to create economic security and mobility for all—the American Dream— creates credibility and legitimacy for America’s values, governance, and alliances around the world.

After World War II, the United States grew the middle class to historic size and strength. This achievement made America the model of the free world—setting the stage for decades of American political and economic leadership. Domestically, broad participation in the economy is core to the legitimacy of our democracy and the strength of our political institutions. A belief that the economic system works for millions is an important part of creating trust in a democratic government’s ability to meet the needs of the people.

The COVID-19 Crisis Puts Millions of American Workers at Risk

For the last several decades, the American Dream has been on the wane. Opportunity has been increasingly concentrated in the hands of a small share of workers able to access the knowledge economy. Too many Americans, particularly those without four-year degrees, experienced stagnant wages, less stability, and fewer opportunities for advancement.

Since COVID-19 hit, millions have lost their jobs or income and are struggling to meet their basic needs—including food, housing, and medical care.1 The crisis has impacted sectors like hospitality, leisure, and retail, which employ a large share of America’s most economically vulnerable workers, resulting in alarming disparities in unemployment rates along education and racial lines. In August, the unemployment rate for those with a high school degree or less was more than double the rate for those with a bachelor’s degree.2 Black and Hispanic Americans are experiencing disproportionately high unemployment, with the gulf widening as the crisis continues.3

The experience of the Great Recession shows that without intentional effort to drive an inclusive recovery, inequality may get worse: while workers with a high school education or less experienced the majority of job losses, nearly all new jobs went to workers with postsecondary education. Inequalities across racial lines also increased as workers of color worked in the hardest-hit sectors and were slower to recover earnings and income than White workers.4

The Case for an Inclusive Recovery

A recovery that promotes broad economic participation, renewed opportunity, and equity will strengthen American moral and political authority around the world. It will send a strong message about the strength and resilience of democratic government and the American people’s ability to adapt to a changing global economic landscape. An inclusive recovery will reaffirm American leadership as core to the success of our most critical international alliances, which are rooted in the notion of shared destiny and interdependence. For example, NATO, which has been a cornerstone of U.S. foreign policy and a force of global stability for decades, has suffered from American disengagement in recent years. A strong American recovery—coupled with a renewed openness to international collaboration—is core to NATO’s ability to solve shared geopolitical and security challenges. A renewed partnership with our European allies from a position of economic strength will enable us to address global crises such as climate change, global pandemics, and refugees. Together, the United States and Europe can pursue a commitment to investing in workers for shared economic competitiveness, innovation, and long-term prosperity.

The U.S. has unique advantages that give it the tools to emerge from the crisis with tremendous economic strength— including an entrepreneurial spirit and the technological and scientific infrastructure to lead global efforts in developing industries like green energy and biosciences that will shape the international economy for decades to come.

#### **Rules-based order caps escalation and is try or die for a range of existential risks**

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This international system, while not perfect, has proven to be more successful than any in human history at providing security, economic prosperity, and freedom. The evidence of this is apparent in the numbers. Before 1945, major powers frequently engaged in direct warfare on a massive scale, as in the Napoleonic Wars, World War I, and World War II. Since 1945, however, there have been zero great-power wars. As shown in Figure 1, the percentage of people killed in armed conflict has drastically declined in the post-World War II era. Armed conflict killed an average of 1–2 percent of the human population from 1600 to 1945. During the Cold War, an average of 0.4 percent of the world’s population perished due to war. Since the year 2000, less than one one-hundredth of 1 percent of people have died this way.8 Under a rules-based system, the world has continued to make progress in reducing deaths from all kinds of war, including often-intractable civil conflicts.9 Turning to economic prosperity, the global gross domestic product (GDP) per capita in 1945 was $4,079.10 Today it is $11,570.11 This drastic increase in global living standards is evident in Figure 2. The share of the global population living in poverty has dramatically decreased. In 1929, the number of people living in extreme poverty (defined as earning less than 1.90 international dollars per day) was 1.35 billion, almost two-thirds of the world population at the time. In 2015, that figure was 733.48 million, or slightly less than 10 percent of the world population.12 China itself has been one of the biggest beneficiaries of this system, as geopolitical stability in Asia and integration into the global economy helped to lift four hundred million Chinese out of poverty. In the realm of good governance, the number of democracies has substantially increased. With the end of World War II and decolonization, the number of democracies increased from seventeen to forty-eight between 1945 and 1989.13 That number further skyrocketed at the end of the Cold War, as countries formerly behind the Iron Curtain rushed to join the West. In the year 1900, there were twelve democracies in the world. Today there are ninety-six.14 The percentage of the world’s population living under democratic governments has also increased from about 12 percent in 1900 to more than 55 percent today.15 This trend is visible in Figure 3. To be sure, these outcomes are the result of an enormous and interconnected range of factors. International-relations scholars, for example, believe that nuclear deterrence and the absence of a multipolar distribution of power also contributed to great-power peace.16 In addition, globalization and economic development have been fueled by new technological developments. Further, global norms on democratic governance and human rights have come a long way since the early twentieth century.17 Still, it is doubtful whether this dramatic improvement in the human condition could have been achieved in the absence of the rules-based international system. Moreover, many of these other driving forces are themselves constitutive of, if not partially the result of, that system. Global bipolarity, and then unipolarity with the United States at its center, was critical for the postwar development of a rules-based system, which may not have been possible in a more multipolar distribution of international power, or with a non-democratic hegemon at the system’s apex. The splitting of the atom could have resulted in widespread nuclear-weapons proliferation and nuclear use had it not been for the NPT and extended US nuclear deterrence in Europe and Asia.18 The most important technological advances for globalization, including the Internet, occurred and flourished in the free world, defended by the United States and its democratic allies and partners.19 Finally, the United States and its democratic partners, along with nongovernmental organizations and individuals operating in these states, were the most important norm entrepreneurs propagating global norms around issues of good governance, democracy, and human rights. In sum, the rules-based international system that has been the defining feature of global order for the past seventy years has coincided with—and was almost certainly essential in bringing about—the most secure, prosperous, and well-governed world humanity has ever known. Despite this record of unprecedented and enduring success, the rules-based international system is currently besieged by a number of challenges unleashed by rapid and dramatic global change. Understanding the current strategic context, including global trends and threats both external and internal to the system’s democratic core, is a necessary first step toward devising a strategy to revitalize, adapt, and defend a rules-based international system. Global Trends The system is currently buffeted by several worldwide trends, including global shifts in the balance of power, the emergence of disruptive technology, the threat of nuclear proliferation, the rise of nonstate actors, and the consequences of climate change. Global Diffusion of Power. The international distribution of power, as defined by relative economic weight, is shifting away from the founders of the post-World War II system to other emerging economies. As recently as the 1990s, nearly 70 percent of global economic activity occurred in Europe and the Americas. By the 2040s, that number is expected to drop to roughly 40 percent. At the same time, the Asian share of global GDP will increase from 32 percent at present to 53 percent in 2050, meaning that, by that time, the majority of all economic activity on Earth will occur in Asia.20 While the United States remains the world’s most powerful state militarily and economically, it is declining relative to other rising powers, particularly China. When corrected for purchasing-power parity (PPP), China’s GDP has already surpassed the United States. The better metric for international power and influence, however, is real GDP; here, too, the US advantage is narrowing, but more slowly.21 At the conclusion of World War II, the United States possessed roughly 50 percent of global GDP.22 From the 1970s through today, that number has held steady at roughly 25 percent.23 Despite a common misperception, the United States’ share of global power is not declining in absolute terms. Rather, other powers—especially China—are rising. China’s share of global GDP rose from 4.6 percent in the 1990s to 15 percent today.24 Many economists predict that China could surpass the United States as the world’s largest economy by 2030. It is noteworthy, however, that in 2009, economists predicted that this transition would happen by 2020. That date has been pushed back a decade as Chinese growth has slowed. Future projections depend entirely on assumptions about growth rates in the United States and China that cannot be known with certainty. Still, most economists expect that China will, at some point, surpass the United States as the world’s largest economy. China is joined by other emerging economies with rapid growth rates, including India, Indonesia, and others. US allies, including Japan, Germany, and the United Kingdom, remain among the wealthiest nations on Earth, but their share of global power is also declining relative to the rise of the rest. This shift is significant because international orders function best when their formal attributes at least roughly reflect the underlying balance of power. While only one measure of global influence, economic power is central given the leverage it provides over trade and investment, and the resources it offers to sustain military and security advantages. It is also important to point out, however, that the United States and its formal treaty allies continue to possess a preponderance of power in the international system. As Figure 4 shows, the United States and its formal allies currently produce 59 percent of global GDP. When including other countries considered to be “democracies” by the widely used Polity scores, that number rises to 75 percent of global GDP. Democracies continue to retain global influence because more countries have transitioned to democracy since the end of the Cold War, and overall economic growth in democratic countries has outpaced that in autocratic states since 1991. The major shift since the dawn of the post-Cold War world, therefore, is not that the power of the United States and its democratic allies and partners has declined substantially. The major difference is that the share possessed by autocratic challengers, especially China, has grown. As Figure 4 shows, the world is approaching a more bipolar distribution of power, with more wealth concentrated in the democracies and in a grouping of autocratic challengers led by China. This means that, if they are able to work together more cohesively, the United States and its democratic allies and partners still have the power and influence necessary to significantly shape international outcomes. Moreover, if they are able to expand their ranks to court other nonaligned democracies like India, Indonesia, and Mexico, their influence on the international system can be even more decisive. Disruptive Technologies. New technologies—including artificial intelligence (AI), robotics, quantum computing, and biotech, among others—are being developed at an exponential pace, and have the promise to transform society. They will determine how people live and function in the twenty-first century, significantly shaping the global economy, international security, and the course of geopolitics. Throughout history, progress has been built on technological innovation, ranging from Thomas Edison’s light bulb to Henry Ford’s assembly line to the silicon chip, the personal computer, and the Internet. While new technology promises improved productivity and quality of life, it will bring serious downside risks, including economic dislocation and weapons proliferation. AI, for example, is already being widely adopted in the private sector to achieve great efficiencies and cost savings.25 At the same time, automation threatens to put millions out of work as jobs once performed by humans are replaced by machines. Moreover, AI is also being introduced into national militaries. A logical next step is fully autonomous weapons that can select and engage targets without a human in the decision-making loop. Some warn that these “killer robots” introduce many ethical and security risks, including the fear that they may turn on their creators and threaten humans’ very existence or, indeed, what it means to be human.26 Henry Kissinger warns, “We are in danger of losing the capacity that has been the essence of human cognition.”27 The existing international system was designed to deal with the most important dual-use technologies of the twentieth century, such as nuclear power, but it must be updated to deal with the technologies of the twenty-first century. As with nuclear energy, the international community needs an entirely new set of international norms, standards, and agreements for responsible uses of new technologies that mitigate their downside risks, while maximizing their upside potential. Since the time of Edison, the United States has been the world’s most innovative country, but it is at risk of losing that title to China and other countries that aim for the first-mover advantage in the next round of technological breakthroughs. Throughout history, technological progress and international leadership have gone hand in hand. Think of roads and aqueducts in ancient Rome, the steam engine in nineteenth-century Great Britain, and the Internet in the United States. If China or another country takes the lead in the new tech arms race, Beijing may be in a better position to rewrite the international system’s rules. Nuclear Proliferation. Even as the world grapples with the technological challenges of the twenty-first century, century-old technological challenges remain. The NPT may be the most successful treaty in history, but its future is uncertain. North Korea has become the only country in history to sign the treaty, withdraw, and build nuclear weapons. If North Korea is allowed to become an accepted nuclear-weapons state, it would pose a severe threat to international peace and security. Other members of the treaty may also reconsider their nuclear options. In particular, South Korea and Japan may be at risk of pursuing nuclear-weapons programs if the program in Pyongyang continues to advance and the United States is unwilling or unable to provide Seoul and Tokyo with adequate security assurances. Iran’s nuclear program was allowed to operate within strict limits according to the terms of the Joint Comprehensive Plan of Action (JCPOA), but the US withdrawal from that agreement may lead Tehran to accelerate its nuclear program or dash to achieve a nuclear weapon. A bomb in Iran could also instigate further regional nuclear proliferation.28 Officials in Saudi Arabia, for example, have declared that if Iran acquires nuclear weapons, Riyadh will follow suit. A proliferation cascade in East Asia or the Middle East would undermine the global nonproliferation regime and fuel regional insecurity. Moreover, new technologies such as additive manufacturing may make it easier for future proliferators to build nuclear-weapons programs, and harder for the international community to catch and stop them.29 The additional spread of a weapon that remains the ultimate instrument of military force could threaten the global security and stability necessary for the smooth functioning of the rules-based international system. Ecological Disaster. As with nuclear war, an ecological disaster could constitute a direct threat to humanity’s very existence. While states have made efforts to address climate change caused by carbon emissions, including in the Paris Climate Agreement, these steps will not be sufficient to keep emissions below the target levels set by leading scientific panels. Higher average global temperatures are leading to rising sea levels, drought, an increased frequency of violent storms, and forced migrations, all of which are threatening vulnerable societies, undermining already-weak national governments, and contributing to conflicts over natural resources.

#### Resolving dual enforcement solves patent holdup, international signaling, and durable global interoperability

Alanko, 20 – Anita, Patent examiner at the United States Patent and Trademark Office and J.D. from The Catholic University of America, Columbus School of Law. “The New Madison Approach to Antitrust Law and Intellectual Property Law,” *28 Cath. U. J. L. & Tech. 219*, Spring, p. Nexis – Iowa

The DOJ-FTC have already issued joint "Antitrust Guidelines for the Licensing of Intellectual Property" in 2017 to guide the public about when anticompetitive conduct can be found in the licensing of intellectual property. 265 The guidelines state that intellectual property is considered the same as any other form of property for the antitrust analysis. 266 While patents can confer market power, market power does not violate antitrust law if that power derives from "a superior product, business acumen, or historic accident." 267 The guidelines describe the markets affected by licensing, and general principles and their application in evaluating license agreements using the rule of reason. 268 With respect to the fourth element of the New Madison Approach, the guidelines state, "Nor does such market power impose on the intellectual property owner an obligation to license the use of that property to others." 269 However, as discussed above, this is not a necessary result and exceptions may be possible. 270 Furthermore, the guidelines do not directly address standard-essential patents within the context of standard-setting organizations. As technology progresses and SSOs become more prevalent, clear policy is needed.

In response to the debate and withdrawal from the 2013 Joint Policy Statement, the USPTO, the National Institute of Standards and Technology [\*251] ("NIST"), and the DOJ Antitrust Division issued a new 2019 Policy Statement. 271 Good-faith negotiations between patent owners and licensees are expected, but injunctions should be available for patent infringement as the facts warrant, with no special rules for standard essential patents. 272 The 2019 Policy Statement reiterates that a balanced approach, accounting for all remedies, will preserve competition and provide incentives to innovate. 273A USPTO press release quotes Under Secretary of Commerce for Intellectual Property and Director of the USPTO Andrei Iancu stating, "The new joint statement effectively takes the government's thumb off the scale" and is meant to "incentivize technological development and growth of standards-based industries." 274

This is a fair debate, but the enforcement agencies are in a unique position to drive the discussion towards the best solution. A faithful effort now to gather public input will help ensure that any guidelines and policy statements are likely to be accepted. 275 That way, policy and guidelines can remain valuable and withstand the test of time. 276

By coming together with the DOJ, stakeholders can send a strong statement to the world that the patent system is strong and open to all inventors in the world. The role of antitrust law in the patent system must be clear. It is not one to be shuttered away but approached on a case-by-case basis, as the facts and circumstances demand.

America's inventors and those who invest in patented technology in America deserve clarity, a strong intellectual property system, and a strong antitrust system. Antitrust enforcers, innovators, and implementers can and must all work together to better our society.

IV. CONCLUSION

Intellectual property law and antitrust law can work together to promote innovation that increases consumer welfare. However, antitrust law should not [\*252] be short-sighted and look for short term rewards. Having a variety of remedies available, including injunctions, ensures that parties will negotiate in good faith and abide by their commitments over time. The New Madison Approach is a necessary debate; further discussion and analysis will ensure that policy and guidelines that stand the test of time can be developed. Innovation is necessary at the cutting edge, creating new products in an unpredictable time frame. This demands flexibility to ensure that the society can reap the greatest benefit possible. Antitrust law should also address patent hold-up and hold-out, injunctions, and unilateral refusal to license with clear policy. Ultimately, society will reap the benefits of an appropriate approach to these bodies of law.

### 1AC – Telecommunications

#### FRAND unraveling now – stricter antitrust application is key to prevent ex post monopolies prevents collapse of wireless telecommunications and US leadership

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Antitrust best achieves its purpose when it takes markets as it finds them, and then protects them from threats to competition. The antitrust tribunal must understand the market before it and the rationales and effects of its various rules. Then it considers whether a challenged restraint might operate anticompetitively so as to cause unnecessary consumer harm. For more than a century, antitrust jurisprudence has approached markets in this way. For example, Justice Brandeis’s opinion in the Board of Trade case3 began by describing the Board’s operation as a market. From that point the Court’s job was to ascertain whether the challenged rule operated anticompetitively to undermine this purpose.4 In the NCAA case nearly seventy years later it did the same thing—acknowledging the valuable market created by this joint venture of colleges to promote amateur intercollegiate athletics. It condemned a restraint on competition that reduced output and harmed consumers and was not central to the NCAA’s purpose.5 The list of cases in which the Supreme Court has followed this template so as to protect the competitive integrity of standard setting or other collaborative market processes is long.6 In a particularly myopic decision involving the FRAND process, the Ninth Circuit made no attempt to understand that process or how the antitrust laws could be used to protect it from anticompetitive restraints.7 That was not entirely the court’s fault. Part of the blame lies with the Antitrust Division of the Justice Department, which intervened in the proceeding and seemed more intent on protecting Qualcomm than the competitive integrity of the FRAND process.8 While the FRAND process has been highly productive, it is also fragile. Firms are tempted to make commitments at the beginning when the incentive to join is large, but renege on them later when they can profit by doing so. At least in this particular case, private FRAND enforcement had not worked very well. Qualcomm had been able to violate FRAND commitments in order to exclude rivals and obtain higher royalties than FRAND would permit, largely with impunity. Other firms will very likely follow Qualcomm’s lead. If that happens the FRAND system will fall apart, doing irreparable injury to the modern wireless telecommunications network or, at the very least, diminishing the leadership role of the United States in preserving effective network competition. While governments can be heavily involved in standard setting,9 the implementation of technical standards in information technologies is largely the work of private actors. Government involvement is limited mainly to enforcement of contract, intellectual property, or antitrust law. As private actors, those involved in standard setting or compliance are fully subject to the federal antitrust laws. This Article addresses one question: when is an SSO participant’s violation of a FRAND commitment an antitrust violation, and if it is, of what kind and what are the implications for remedies? It warns against two extremes. One is thinking that any violation of a FRAND commitment is an antitrust violation as well. In the first instance FRAND obligations are contractual, and most breaches of contract do not violate any antitrust law. The other extreme is thinking that, because a FRAND violation is a breach of contract, it cannot also be an antitrust violation. The question of an antitrust violation does not depend on whether the conduct breached a particular agreement but rather on whether it caused competitive harm. This can happen because the conduct restrained trade under section 1 of the Sherman Act, was unreasonably exclusionary under section 2 of the Sherman Act, or amounted to an anticompetitive condition or understanding as defined by section 3 of the Clayton Act.10 The end goal is to identify practices that harm competition, thereby injuring consumers. The Ninth Circuit’s Qualcomm decision will make antitrust violations in the context of FRAND licensing much more difficult to prove, even in cases where anticompetitive behavior and consumer harm seem clear.11 Indeed, in this case the court itself acknowledged the harm to consumers but appeared to think that they were not entitled to protection.12 If this decision stands, FRAND obligations will to a larger extent have to be settled through private litigation and the federal antitrust enforcement agencies will have a diminished role. Anticompetitive behavior by one firm that is not effectively disciplined will lead others to do the same thing. Not only did the Ninth Circuit reject application of the antitrust laws in this case, it also appeared to repudiate antitrust’s consumer welfare principle, saying: . . . [T]he district court correctly defined the relevant markets as “the market for CDMA modem chips and the market for premium LTE modem chips.” Nevertheless, its analysis of Qualcomm’s business practices and their anticompetitive impact looked beyond these markets to the much larger market of cellular services generally. Thus, a substantial portion of the district court’s ruling considered alleged economic harms to OEMs—who are Qualcomm’s customers, not its competitors—resulting in higher prices to consumers. These harms, even if real, are not “anticompetitive” in the antitrust sense— at least not directly—because they do not involve restraints on trade or exclusionary conduct in “the area of effective competition.”13 The quotation is from the Supreme Court’s decision in Ohio v. American Express Co.,14 where the Supreme Court said only that a relevant market is “the area of effective competition.” The Ninth Circuit panel apparently believed that antitrust harm could occur only to producers inside the relevant market, which typically excludes most customers. The Ninth Circuit did not quote the Supreme Court’s decision one year later in Apple v. Pepper,15 that “Ever since Congress overwhelmingly passed and President Benjamin Harrison signed the Sherman Act in 1890, ‘protecting consumers from monopoly prices” has been “the central concern of antitrust.’”16 The very reason we condemn restraints under the antitrust laws is because they result in lower output and higher prices, harming consumers. The Ninth Circuit panel appeared to believe that higher prices for OEMs—that is, the manufacturer customers who purchase chips for inclusion in their devices— is not the kind of injury that concerns the antitrust laws. Rather, it must be harm to competitors. Customers are often, even typically, not producers in the relevant market. Nevertheless, they are clearly antitrust’s protected class. For example, while exclusive dealing in the first instance might deny selling opportunities to a rival producer, we condemn it because it threatens price increases to their buyers and those who purchase from them. Indeed, the reason we have market power requirements in antitrust cases in the first place is to distinguish harms to rivals that are likely to result in market price increases from those that are not. Competitor exclusion in a competitive market is not an antitrust violation because, while it injures the competitor is does no consumer harm. That is the all-important difference between business torts and antitrust law. Patent holders who participate in SSOs generally agree to provide timely disclosure of their patents or patent applications that are reasonably expected to read on the participants’ technology. 17 They also agree in advance to license their patents thought to be essential to the standard on FRAND terms.18 The Patent Act itself does not impose this obligation. Patentees who are not involved in SSOs have no obligation other than market pressures to submit their patents to a standard or engage in FRAND licensing.19 In networked technologies, however, these market pressures can be substantial. For example, if a patentee refuses to commit its patented technology to an industry standard, the SSO is likely to adopt a different standard that is not believed to infringe those patents.20 Or if a patentee refuses to commit to license a patent to all comers on a nondiscriminatory basis, then the SSO may respond by seeking an alternative standard.21 These actions are driven by the SSO’s goal of competitive creation of a technology when interoperability among diverse producers is a necessary component. Just as any producer, firms involved in the implementation of networked technology seek to minimize their costs by avoiding unnecessary or unnecessarily costly patents. Such avoidance is a socially valuable form of cost minimization. The FRAND obligation generally requires patentees to license freely to all qualified participants, whether or not they are competitors of the patent holder.22 Further, they must settle royalty disputes in a reasonable manner—if necessary, through a third party, such as a court or arbitrator.23 If reference to an arbitrator is contractually specified, such agreements may also be subject to compulsory arbitration under the Federal Arbitration Act.24 The FRAND system facilitates competition by assuring new firms as well as existing ones that they will be able to operate on the networked technology. Royalties to the owners of these patents are generally measured by the value that the contributed patent makes to the standard.25 Importantly, tribunals seek to measure these values “ex ante,” or prior to the patent’s adoption into a standard and at a time when there is a fuller range of competitive alternatives.26 Once the standard is adopted and implementers have incorporated it into their own technologies, a standard essential patent is likely to be in a much stronger position, approaching monopoly in some cases.27 Patents that are committed in this way are described as “standard essential patents” (SEPs), or as being “FRAND encumbered.”28 Qualcomm was able to evade this “ex ante” requirement by insisting on purchaser acceptance of a license on its own terms before it would sell chips.29 Having a patent declared standard essential can increase its value considerably, mainly because the promise of a license at a reasonable rate steers developmental decision making in favor of that particular technology. When a firm makes a commitment to develop its products under a particular standard, it wants assurance that it will have a durable right to operate under that standard at reasonable royalty rates. This process naturally leads to the creation of considerable path dependence in standards. It encourages firms to develop their own technology in ways that ensure interoperability but that can be costly to reverse after the fact.30 This phenomenon of increased value for SEPs also motivates patent owning firms to “over-claim”—that is, to assert that patents are standard essential when subsequent litigation or evaluation determines that they are not. While FRAND agreements require participants to declare relevant patents thought to be essential, the rate of actual declaration far exceeds any rational boundary. As many as one-third to more than half of declared SEPs are very likely not essential to the standard for which they were declared,31 and allegations about the practice of over-declaring are currently being litigated as potential antitrust violations.32 In fact, overall infringement rates for SEP patents are not materially different from those for non-SEP patents.33 A declaration of non-infringement means that, although the patent might be valid, it does not in fact read on the defendant’s particular device or process. In effect, the patent is not a part of the defendant’s technology, and thus cannot be essential. The problem is exacerbated by the fact that, for the most part, SSOs have no process up front for reviewing or questioning individual participants’ declarations that a patent they are offering is in fact both valid and standard essential.34 Ex ante, a patent may offer one of many alternative technological paths to a certain goal. However, ex post, after a standard has been adopted and others have developed their technologies in reliance, the range of acceptable alternatives can decrease dramatically. As a result, the patent whose path is adopted becomes much more valuable.35 In that case, a firm’s ability to evade the FRAND obligation by charging selectively higher royalties to some licensees or conditioning licenses on the purchase of other technology can be extremely lucrative for the patentee but costly to implementers of the standard and disruptive of the SSO’s developmental goals.36 In its Qualcomm decision noted above, the Ninth Circuit did not indicate any awareness of these motivations or their potential for harm.37 In general, the goal of FRAND is to make patents available to participants at a price equivalent to what the patent would have been worth in the more competitive market prior to the time it was declared essential. The relevant question is what was the value of the patent’s contribution to the standard at a time when competitive alternatives may have been available, as opposed to a later time when other firms have dedicated themselves to the standard?38 This approach is simply a variant of the proposition that even a monopoly market can be made competitive if we require competing firms to bid for the opportunity to be the monopolist.39 Even though a natural monopoly entity such as a public utility has the market power of any monopolist, someone must still choose who gets to be the monopolist.40 The winner will be the firm that promises the most competitive behavior, provided that it can be held to that commitment. Once the auction is over and the winner has been selected, however, it will have an incentive to renege on its auction promise and charge whatever price its newly acquired monopoly status provides. FRAND creates similar incentives, as the Qualcomm case illustrates. Alternative proposals to the effect that the FRAND patentee and the licensee should split the difference between value to the patentee and value to the implementer41 improperly take an ex post rather than ex ante view of value and asks the royalty tribunal to divide evenly the difference between the seller’s (patentee’s) willingness to accept and the buyer’s (licensee’s) willingness to pay after FRAND status has been established. That may be a useful way of thinking about price in a bilateral monopoly,42 but only after the bilateral monopoly has formed. The competitive solution is to give the seller the price it would have obtained in a competitive market, which is manifestly not an even division of the surplus. Rather, it is a competitive return to the seller.43

#### US tech leadership via collaboration and the IOT is try or die for confronting several existential risks

Khan, 19 – Dr. Mehmood Khan is chair of the U.S. Council on Competitiveness and Vice Chairman and Chief Scientific Officer for Global Research & Development, PepsiCo. “MAINTAINING U.S. LEADERSHIP IN SCIENCE AND TECHNOLOGY,” excerpted from Dr. Mehmood Khan’s testimony before the House Committee on Science, Space and Technology on 6 March 2019. <https://insight.ieeeusa.org/articles/maintaining-u-s-leadership-in-science-and-technology/> -- Iowa

Given the profound impact of science and technology on U.S. prosperity, standards of living, national security, modern society and geopolitical standing, every American should be concerned with the nation’s ability to lead in science, technology and innovation. More than any country in history, the United States has been the greatest driver and beneficiary of technology, innovation and a vibrant entrepreneurial spirit. In the 19th century, entrepreneurship and innovations surrounding agriculture, rail, oil, steel and electricity turned the United States into an industrial and economic powerhouse, laying the foundation for a manufacturing sector that provided middle class jobs and a higher standard of living for millions of Americans. In the 20th century, American inventions and advancements in vehicle and aircraft technology revolutionized transportation and changed society and the geographic face of the country. American-born digital technologies unleashed a revolutionary new age of computing, communications and information mobility, disrupting industries and business models, changing society and culture around the world, and creating enormous new wealth. This continuum of innovation has delivered prosperity and rising standards of living to Americans, and propelled the United States to global leadership. As we enter the third decade of the 21st Century, a new urgency, a new innovation reality, a new imperative faces the nation. Notwithstanding a currently robust economy – rising and strong economic, productivity and job growth; historically low unemployment; wage increases; an improved tax environment; etc. – the Council on Competitiveness believes U.S. leadership in technology and long-term competitiveness is under threat. This potential demands the urgent attention of our nation’s leaders, and a focused examination of our capabilities, investments and policies related to science, technology development and innovation. The Case for Ongoing Investment While the United States is enjoying an economic upswing on many fronts, U.S. leadership in technology is under renewed threat. In 1960, the United States dominated global research and development (R&D), accounting for 69 percent share of the world’s R&D investment. The United States could drive developments in technology globally by virtue of the size of its investment. Today, we have evolved into a multipolar science and technology world. As other nations have increased their R&D investments and capacity for innovation, the U.S. share of global R&D expenditures has dropped to 28 percent in 2016, diminishing the U.S. dominance and leverage over the direction of technology advancement. At the same time, China has risen to the account for a quarter of global R&D spending. In addition, America’s lead in venture capital is shrinking, further diminishing its role as a driver of technology and innovation globally. In 1992, U.S. investors represented 97 percent of the $2 billion in venture finance, and accounted for about three-quarters just a decade ago. However, in 2017, U.S. investors led 44 percent of a record $154 billion in venture finance, with Asian investors (with China leading) accounting for 40 percent. Moreover, while the absolute level of venture capital coming to the United States has increased substantially, the U.S. share of the growing global pool of venture capital – which has increased more than 200 percent since 2010 – has dropped sharply from 95 percent in the early 1990s to about half in 2017. While traditional U.S. competitors – such as Germany, Japan, France and the U.K. – continue to be strong R&D performers working at the leading edge of technology, many emerging economies seek to follow the path of the world’s innovators, transform to knowledge-based economies, and drive their economic growth with technology and innovation. A growing number of emerging economies are establishing government organizations and ministries focused on technology and innovation, adopting innovation-based growth strategies, boosting government R&D investments, and developing research parks and regional centers of innovation. Some of these economies are also working to increase their production of scientists and engineers. These actions are raising technology and development capabilities and innovation capacity around the world. A nation’s R&D intensity expressed as R&D expenditures as a percentage of GDP provides another gauge of national R&D performance. In this measure, the U.S. position globally has lagged in recent years, as other countries have expanded the range and scope of their R&D activities. Notably, South Korea, one of the world’s largest R&D performers and another formidable U.S. competitor, ranks at the top in this metric. At the same time, key U.S. science and technology infrastructure is eroding. Much like roads, rails and power plants were essential for the Industrial Age, infrastructure that supports knowledge creation and technology development is vital for the 21st century knowledge economy and U.S. success in innovation-based global competition. This includes laboratories, research and technology demonstration centers, supercomputers, test-beds, wind tunnels, propulsion and combustion facilities, simulators, accelerators and other user facilities. America’s national laboratory system is considered a distinctive and globally unique competitive asset. But, across the system, core scientific and technological capabilities are potentially at risk due to deficient and degrading infrastructure and repair hamstrung by chronic underfunding, and maintenance backlogs in the hundreds of millions of dollars. New Disrupters At the same time that competition in technology and innovation is rising around the world, and U.S. technology leadership is under threat, we are witnessing accelerated advancement of the greatest revolutions in science and technology; a new phase of the digital revolution characterized by vast deployment of sensors, the internet of things, artificial intelligence (AI), and the big data tsunami; biotechnology and gene editing; nanotechnology; and autonomous systems. Each of these technologies has numerous applications that cut-across industry sectors, society and human activities. Each is revolutionary; each is game-changing in its own right. But they are now colliding and converging on the global economy and society simultaneously, with profound implications for U.S. economic and national security. These technologies are crucial drivers of productivity and economic growth, altering the patterns of society and many dimensions of everyday life. For countries and companies, the ability to leverage these technologies for economic impact is fundamental to their competitiveness and economic success. In addition to their economic potential, these technologies could solve many of the world’s critical challenges surrounding areas such as health, energy and sustainability, clean water and the global food supply. Optimizing the Environment for Innovation Systems Since the early 2000s, new models of innovation have emerged, and others have matured in response to the transformation of the global competitive landscape that began in the 1980s. Multiple technology revolutions and their convergence, and the nature of global challenges require models of innovation built on internal resources, external collaboration and a larger, more diverse innovation skill set. For example, in a recent survey of U.S. manufacturing firms, of those firms that had innovated, 49 percent reported that the invention underlying their most important new product had originated from an outside source. These models of innovation have expanded the scope of participants in the innovation ecosystem, and the ways in which companies, innovators, and entrepreneurs pursue innovation. As companies have moved away from exploratory research toward nearer-term applied research and technology development that support business units, foundational technology breakthroughs increasingly come from universities, national laboratories and small start-up companies that are disproportionately supported by public R&D investments. While the public role in the innovation ecosystem has increased in importance, U.S. public investment has not kept pace. This government investment plays a key role as the seed for future applied research and technology development, and for training the next generation of scientists and engineers. However, with increasing democratization of innovation, a growing pool of innovators and problem solvers are largely disconnected from the research, development and training institutions this public investment supports. There are many factors that affect a country’s ability to innovate and compete. This includes levels of investment in R&D, the availability of capital including venture capital to fuel start-ups and innovation at critical stages, the availability of talent, the environment for entrepreneurship, and the general business environment including taxes and the level of business regulation. These elements are different in countries around the world, and can play a significant role in a country’s competitiveness and capacity for innovation. U.S. competitors around the world seek to build and strengthen knowledge and technology-based economies as the basis for advancing productivity, job creation, raising standards of living and, in some cases, advancing geopolitical goals. As a result, many deploy policies and programs to harness science, technology and innovation, and to create a business environment to achieve this impact. These countries are instituting their own distinctive innovation ecosystems, which may not be compatible or friendly with the U.S. innovation system. Can the U. S. Compete? We are seeing changes in technology, competition and the global economy, historic in terms of their size, speed and scope. The U.S. faces hyper competition, a potential new global superpower competitor in China, and the prospect of economic and social disruption brought about by the unrelenting and accelerating march of technology. Nevertheless, in a global economy ever more driven by technology and innovation, an enabling environment for innovation remains the advantage of only a few economies, with the United States in a position of significant strength: The U.S. remains the world’s epicenter for disruptive innovation, thanks to its exceptional research infrastructure and low barriers to entrepreneurs and start-ups. The U.S. remains the world leader in high-tech manufacturing. It has a 31-percent global share and its output is growing. China is closing the gap with a 24-percent share and its output is also growing, surpassing Japan and the EU. The U.S. remains the world’s largest investor in R&D for 28 percent of global R&D spending. It now invests half a trillion in R&D per year and has built up a globally unparalleled national stock of science and technology. Because the U.S. is by far the world’s largest innovator in basic research, it dominates patenting, sowing the seeds of future innovation, representing about one quarter of all international patent applications filed in 2016. The U.S. has distinctive assets – its national laboratories and top research universities. In the U.S. innovation ecosystem, industry, start-ups, national labs and universities collaborate on R&D across the spectrum of science and technology. Vast amount of venture capital is pouring in to commercialize advanced technologies. The U.S. is seen as the global technology leader. A recent survey asked researchers across the world which country they considered to be the global leader in 12 advanced industries. The U.S. was named most often in 11 of the 12 industries. Despite these significant U.S. strengths, the competitiveness of a wide range of nations – not to mention economic and technological change – is dynamic and ever transforming. A country’s comparative position can change rapidly. Conclusion The United States is at a critical moment in time in national innovation systems research and action. New, transformational models driven by the democratization and self-organization of innovation are emerging and taking root across the nation. But, at the same time, U.S. leadership is under threat. The United States faces now what are perhaps existential challenges to its global leadership in innovation. America’s role in technology advancement is diminishing globally—now accounting for only one-quarter of global research & development investments, down from two-thirds in 1960. Competitors are increasing their capacity for innovation. And rapid technological change and disruption have impacted the workforce and communities. When the U.S. controlled the direction of technology, we were positioned to control our economic destiny. That is no longer guaranteed. The United States must take stock. We must assess if our innovation ecosystems and investments are enough to maintain our global economic and technological leadership. And, as technology seeps into nearly every aspect of American life, our national leaders and our government at every level must bolster their knowledge and response capabilities to match the strengthening competition, technological change and disruptions that are coming.

#### Lack of FRAND certainty decks 5G, IoT, Autonomous Vehicles

Borgogno and Colangelo 2021, Giuseppe Colangelo University of Basilicata, Department of Mathematics, Computer Science and Economics; Stanford Law School; LUISS Guido Carli, Department of Business and Management Oscar Borgogno Bank of Italy, (4/16/2021 “SEPs licensing across the supply chain: an antitrust perspective” https://papers.ssrn.com/sol3/papers.cfm?abstract\_id=3766118)//ellie

The seemingly endless issue of the legal treatment of standard essential patents (SEPs) is clearly one of the most complex matters currently at the heart of intellectual property and competition law. At present, the standards are set to reinforce even further their role as building blocks of the modern global economy, playing a key role in ensuring interoperability and technical compatibility across a broad range of industries. Standards can facilitate the creation and integration of markets, foster positive feedback loops, reduce uncertainty in the marketplace, and lower costs and prices for downstream products.1 By ensuring interoperability, they make networks more valuable. As the holder of a patent included within a standard benefits from a significant increase in value of its legal title, if the standard is successfully adopted, firms may be incentivised to act opportunistically to influence the design of a standard and to maximise their resulting ex post benefits. Indeed, whereas at an early stage of standard definition alternative technologies compete for inclusion in the standard, once the selection has been carried out implementers are locked into the standard. Further, in some industries implementers invest into their products before the standard is chosen or before it is known whether a technology will violate an existing patent. This makes in turn switching prohibitively costly or impractical. High switching costs may create market power for the owners of patents that cover the standard. As a result, they can leverage their position demanding a royalty that reflects not only the value of the technology compared to alternatives, but also the value associated with investments made by producer to implement the standard. This issue is commonly known as hold-up problemand refers to the difference between patent holders’ pricing incentives ex ante (i.e. before the standard is set) and their pricing incentives ex post. At the same time, licensees may also engage in strategic practices refusing to agree on patent holders’ offers and exacerbating litigation in order to escape the payment of royalties or depress prices (reverse hold-up or hold-out). Until recently, the debate has centred on the nature of fair, reasonable and nondiscriminatory (FRAND) commitments and the mechanisms to avoid hold-up and reverse hold-up (or hold-out) problems between licensors and licensees. In order to prevent, or at least credibly reduce, the risks of patent hold-up and to increase the willingness of firms to participate in the development of a standard, Standard Setting Organisations (SSOs) typically adopt disclosure and licensing rules. Notably, with regard to the latter, SSOs require SEP holders to accept FRAND commitments. In general, by requiring a licence to be provided on fair and reasonable terms, the goal is to make SEPs available at a price equivalent to what the patents would have been worth on the market prior to being declared essential. Hence, the FRAND commitment aims to avoid or to reduce the extent of monopoly pricing by SEP holders. Similarly, the non-discrimination requirement is intended to prevent SEP holders from extracting monopoly premiums through selective licensing or “migrating their monopoly power from the FRAND-regulated market to unregulated standard-implementing product markets by licensing to only one or a few implementers or licensing to selected implementers on discriminatorily favorable terms.”2 However, it is debatable whether FRAND commitments can effectively prevent SEP holders from imposing excessive royalty obligations upon licensees, largely due to the unclear economic meaning of the FRAND acronym.3 In fact, there are no generally accepted tests to determine whether or not a particular licence satisfies a FRAND commitment. Furthermore, no consensus exists over its legal effects, notably in relation to whether or not FRAND commitments should imply a waiver of general legal remedies (more specifically, injunctions and other extraordinary remedies). Hence, while the implications of FRAND commitments are undoubtedly significant, their meaning is inherently ambiguous from both an economic and a legal perspective. It comes as no surprise that such broad uncertainty has led to a vast wave of litigation proceedings worldwide in recent years. Against this background, the rise of the Internet of Things (IoT) and the development of 5G are set to add an additional layer of complexity to the current practice of SEP licensing. Indeed, as new technologies are facilitating widespread interconnection between all sorts of devices, the smooth implementation of the 5G standard is crucial to the economic potential of the IoT. For instance, many of the impending disruptive technologies, such as AI-driven robots, personalised healthcare, autonomous driving, and augmented reality, would not be possible without the interconnection between physical and virtual objects enabled by the 5G standard. Therefore, in a break from the past, new standard implementers - which do not belong consistently to the ecosystem of mobile communications - will find themselves having to deal with the intellectual property complexities of this industry. For instance, the automotive industry is taking centre stage as the ecosystem in which the issue of FRAND licensing levels is raised to the highest degree. The market viability of new generation vehicles is closely dependent on their embedded connectivity with third parties and application platforms (such as Android and iOS).5 Therefore, as the industry's evolution hinges on advanced mobile telecommunication standards, automakers have been pledging to install connectivity solutions in all their new vehicles in the coming years. Notably, 5G-compliant mobile technologies are expected significantly to enhance the safety and functionality of vehicles, including vehicle-toeverything communication, allowing data to be transmitted from a car to another entity, including nearby vehicles.

#### Smooth 5g implementation allows for autonomous vehicles but maintaining FRAND standards are key

Woo et el 2019, Darryl M. Woo is an IP litigation partner at Goodwin Procter LLP in San Francisco, CA; and Raymond Millien is Vice President and Global Chief IP Counsel at Volvo Car Group in Gothenburg, Sweden, Darryl M. Woo, Goodwin Procter and Raymond Millien, Volvo Car Group (April 02, 2019 “5G and Autonomous Vehicles: Is FRAND Grand?” https://www.law.com/legaltechnews/2019/04/02/5g-and-autonomous-vehicles-is-frand-grand/)//ellie

With 5G, the promise of autonomous vehicles safely and efficiently gliding down roads and highways everywhere can become a reality. Such a promise, however, can only be achieved through the thoughtful setting of technology standards so that every vehicle is on the same page of a very complicated playbook of vehicle-to-vehicle, vehicle-to-network, vehicle-to-infrastructure, and vehicle-to-pedestrian communications, much of which will be covered by thousands and thousands of patents. If, for example, one OEM’s self-driving vehicle could not seamlessly and reliably communicate with another OEM’s self-driving vehicle, the promise of safer and more efficient personal transportation quickly falls apart. The questions of which patents cover the technology necessary to run this complicated communications playbook and how to license them represent a major issue for the automotive industry. Reminiscent of nineteenth-century settlers of Oklahoma, companies are already stockpiling patents on inventions that may be used to comply with 5G-related technical standards, positioning themselves for a modern-day land rush. In exchange for a standard setting body’s adoption of a company’s suite of patents, the company must contractually bind itself to refrain from seeking to enjoin unlicensed implementers, in favor of licensing them on terms deemed Fair, Reasonable and Non-Discriminatory (FRAND). FRAND by its literal terms suggests a desirable even-handedness. In a technology ecosystem that must implement standards to enable the ultimate goal of a network where vehicles communicate with each other as well as with road surfaces, traffic controls and other connected endpoints, FRAND licensing of standard essential patents (SEP) is an unquestionable prerequisite. If the past decade’s smartphone patent wars and the evolution of the mobile telephone market have taught us anything, it is that what is “fair” or “reasonable” to some, may be the antithesis of that to others. Non-discrimination sounds good until it is invoked to charge everyone—from an inexpensive 5G fitness bracelet to a more expensive autonomous drive vehicle—the same percentage of net sales. In the 4G LTE world of today, dominated by smartphones, tablets and handhelds, such a disparity among devices is not the issue it will be when 5G standards will be applicable to a much broader range of connected products. And yet, fights already exist between SEP owners and SEP implementers over a range of issues, including how to determine the essentiality of an alleged SEP, the reasonableness of a “reasonable” royalty, and what it means to be “non-discriminatory.”

#### **IOT-driven autonomous vehicle interoperability powers green mobility, which mitigates existential warming and environmental degradation**

Bahr et al, 8-26-21 – Roy Bahr, SINTEF Digital AS, Oslo, Norway, along with Reiner John (AVL List GmbH, Graz, Austria), Patrick Pype (NXP Semiconductors, Leuven, Belgium), Gerhard Mitic and Kai Kriegel (Siemens AG, Munich, Germany), Vincent Lorentz, Stefan Waldhör, and Steffen Bockrath (Fraunhofer IISB, Erlangen, Germany), Hans Erik Sand (NxTech AS, Fredrikstad, Norway). “Automotive Intelligence Embedded in Electric Connected Autonomous and Shared Vehicles Technology for Sustainable Green Mobility,” *Front. Future Transp.*, 26 August 2021, https://doi.org/10.3389/ffutr.2021.688482

Abstract

The automotive sector digitalization accelerates the technology convergence of perception, computing processing, connectivity, propulsion, and data fusion for electric connected autonomous and shared (ECAS) vehicles. This brings cutting-edge computing paradigms with embedded cognitive capabilities into vehicle domains and data infrastructure to provide holistic intrinsic and extrinsic intelligence for new mobility applications. Digital technologies are a significant enabler in achieving the sustainability goals of the green transformation of the mobility and transportation sectors. Innovation occurs predominantly in ECAS vehicles’ architecture, operations, intelligent functions, and automotive digital infrastructure. The traditional ownership model is moving toward multimodal and shared mobility services. The ECAS vehicle’s technology allows for the development of virtual automotive functions that run on shared hardware platforms with data unlocking value, and for introducing new, shared computing-based automotive features. Facilitating vehicle automation, vehicle electrification, vehicle-to-everything (V2X) communication is accomplished by the convergence of artificial intelligence (AI), cellular/wireless connectivity, edge computing, the Internet of things (IoT), the Internet of intelligent things (IoIT), digital twins (DTs), virtual/augmented reality (VR/AR) and distributed ledger technologies (DLTs). Vehicles become more intelligent, connected, functioning as edge micro servers on wheels, powered by sensors/actuators, hardware (HW), software (SW) and smart virtual functions that are integrated into the digital infrastructure. Electrification, automation, connectivity, digitalization, decarbonization, decentralization, and standardization are the main drivers that unlock intelligent vehicles' potential for sustainable green mobility applications. ECAS vehicles act as autonomous agents using swarm intelligence to communicate and exchange information, either directly or indirectly, with each other and the infrastructure, accessing independent services such as energy, high-definition maps, routes, infrastructure information, traffic lights, tolls, parking (micropayments), and finding emergent/intelligent solutions. The article gives an overview of the advances in AI technologies and applications to realize intelligent functions and optimize vehicle performance, control, and decision-making for future ECAS vehicles to support the acceleration of deployment in various mobility scenarios. ECAS vehicles, systems, sub-systems, and components are subjected to stringent regulatory frameworks, which set rigorous requirements for autonomous vehicles. An in-depth assessment of existing standards, regulations, and laws, including a thorough gap analysis, is required. Global guidelines must be provided on how to fulfill the requirements. ECAS vehicle technology trustworthiness, including AI-based HW/SW and algorithms, is necessary for developing ECAS systems across the entire automotive ecosystem. The safety and transparency of AI-based technology and the explainability of the purpose, use, benefits, and limitations of AI systems are critical for fulfilling trustworthiness requirements. The article presents ECAS vehicles’ evolution toward domain controller, zonal vehicle, and federated vehicle/edge/cloud-centric based on distributed intelligence in the vehicle and infrastructure level architectures and the role of AI techniques and methods to implement the different autonomous driving and optimization functions for sustainable green mobility.

Introduction

Climate change, global warming, ecological and environmental degradation are global existential threats. Consequently, the new European Green Deal (European Commission, 2019a) roadmap entails a growth strategy to transform Europe into a modern, resource-efficient, and competitive economy. The roadmap aims to transform the economy to achieve climate neutrality by 2050. The transformation can be done by “turning climate and environmental challenges into opportunities across all policy areas and making the transition just and inclusive for all” (European Commission, 2019a).

The European Green Deal is an essential part of the EC's strategy to implement the UN’s 2030 Agenda (United Nations, 2015a) and its sustainable development goals (United Nations, 2015b). To implement this strategy, the European Union has adopted a mobility action plan based on the Vision Zero and Safe System approach (European Commission, 2019b) (zero accidents, zero pollution, and zero congestion). The Green Deal defines four critical elements for sustainable mobility and the automotive industry: climate neutrality, zero pollution Europe, sustainable transport, and the transition to a circular economy. The circular economy action plan (European Commission, 2020) has detailed measures to make sure that sustainable products are the norm in the EU. This plan puts a primary focus on “digital technologies” such as electronics, ICT, and energy storage systems (e.g., batteries, supercapacitors, fuel cells, etc.), which can result in an increase in the lifetime, availability and usage of future vehicles based on AI-enabled technologies.

Digital technologies are a significant enabler for attaining the European Green Deal’s sustainability goals in many different sectors, including mobility and transportation. Digital technologies such as edge computing, IoT, AI, cellular/wireless connectivity, DTs, VR/AR and DLTs can accelerate and maximize the impact of policies that deal with climate change and protect the environment by developing new sustainable electronic component and systems technologies for future vehicles. Expanding automotive intelligence at the vehicle and mobility system level allows the Internet of Vehicles (IoV) and Internet of Energy (IoE) (Vermesan et al., 2011) to become the key enabling technologies to realize future autonomous driving scenarios that embed cognition and autonomous functions.

#### Warming causes extinction

Bryce, 20 – Emma, citing Nelson, Roman, and Kemp---Cassidy *Nelson* is Co-lead of the biosecurity team at Oxford), Sabin *Roman* earned a PhD in Complex Systems Simulation from the University of Southampton, and both Roman and Luke *Kemp* are research associates at the Cambridge University. "What Could Drive Humans to Extinction?" Real Clear Science, 7-27-2020, <https://www.realclearscience.com/articles/2020/07/27/what_could_drive_humans_to_extinction.html> -- Iowa

Nuclear war

An existential risk is different to what we might think of as a "regular" hazard or threat, explained Luke Kemp, a research associate at the Centre for the Study of Existential Risk at Cambridge University in the United Kingdom. Kemp studies historical civilizational collapse and the risk posed by climate change in the present day. "A risk in the typical terminology is supposed to be composed of a hazard, a vulnerability and an exposure," he told Live Science. "You can think about this in terms of an asteroid strike. So the hazard itself is the asteroid. The vulnerability is our inability to stop it from occurring — the lack of an intervention system. And our exposure is the fact that it actually hits the Earth in some way, shape or form."

Take nuclear war, which history and popular culture have etched onto our minds as one of the biggest potential risks to human survival. Our vulnerability to this threat grows if countries produce highly-enriched uranium, and as political tensions between nations escalate. That vulnerability determines our exposure.

As is the case for all existential risks, there aren't hard estimates available on how much of Earth's population a nuclear firestorm might eliminate. But it's expected that the effects of a large-scale nuclear winter — the period of freezing temperatures and limited food production that would follow a war, caused by a smoky nuclear haze blocking sunlight from reaching the Earth — would be profound. "From most of the modeling I've seen, it would be absolutely horrendous. It could lead to the death of large swathes of humanity. But it seems unlikely that it by itself would lead to extinction." Kemp said.

Pandemics The misuse of biotechnology is another existential risk that keeps researchers up at night. This is technology that harnesses biology to make new products. One in particular concerns Cassidy Nelson: the abuse of biotechnology to engineer deadly, quick-spreading pathogens. "I worry about a whole range of different pandemic scenarios. But I do think the ones that could be man-made are possibly the greatest threat we could have from biology this century," she said. As acting co-lead of the biosecurity team at the Future of Humanity Institute at the University of Oxford in the United Kingdom, Nelson researches biosecurity issues that face humanity, such as new infectious diseases, pandemics and biological weapons. She recognizes that a pathogen that's been specifically engineered to be as contagious and deadly as possible could be far more damaging than a natural pathogen, potentially dispatching large swathes of Earth's population in limited time. "Nature is pretty phenomenal at coming up with pathogens through natural selection. It's terrible when it does. But it doesn't have this kind of direct 'intent,'" Nelson explained. "My concern would be if you had a bad actor who intentionally tried to design a pathogen to have as much negative impact as possible, through how contagious it was, and how deadly it was.” But despite the fear that might create — especially in our currently pandemic-stricken world — she believes that the probability that this would occur is slim. (It's also worth mentioning that all evidence points to the fact that COVID-19 wasn't created in a lab.) While the scientific and technological advances are steadily lowering the threshold for people to be able to do this, "that also means that our capabilities for doing something about it are rising gradually," she said. "That gives me a sense of hope, that if we could actually get on top [of it], that risk balance could go in our favor." Still, the magnitude of the potential threat keeps researchers' attention trained on this risk.

From climate change to AI

A tour of the threats to human survival can hardly exclude climate change, a phenomenon that (is) already driving the decline and extinction of multiple species across the planet. Could it hurl humanity toward the same fate?

The accompaniments to climate change — food insecurity, water scarcity, and extreme weather events — are set to increasingly threaten human survival, at regional scales. But looking to the future, climate change is also what Kemp described as an "existential risk multiplier" at global scales, meaning that it amplifies other threats to humanity's survival. "It does appear to have all these relationships to both conflict as well as political change, which just makes the world a much more dangerous place to be." Imagine: food or water scarcity intensifying international tensions, and triggering nuclear wars with potentially enormous human fatalities.

This way of thinking about extinction highlights the interconnectedness of existential risks. As Kemp hinted before, it's unlikely that a mass extinction event would result from a single calamity like a nuclear war or pandemic. Rather, history shows us that most civilizational collapses are driven by several interwoven factors. And extinction as we typically imagine it — the rapid annihilation of everyone on Earth — is just one way it could play out.

#### Balanced antitrust approach is key

Hovenkamp 2020, Herbert J. a Fellow of the American Academy of Arts and Sciences, and in 2008 won the Justice Department’s John Sherman Award for his lifetime contributions to antitrust law (University of Pennsylvania Carey Law School “FRAND and Antitrust” https://scholarship.law.upenn.edu/cgi/viewcontent.cgi?article=3095&context=faculty\_scholarship)//ellie

While these various attempts to evade FRAND obligations very likely breach the patentee’s contractual obligations, only a subset also constitute antitrust violations. This does not mean that the standard-setting and FRAND process in which the conduct occurred is irrelevant to antitrust analysis. To the contrary, as in any antitrust case, it forms part of the market environment in which conduct must be evaluated. In her 2019 Qualcomm decision, Judge Lucy Koh addressed tying and exclusive dealing claims under general antitrust principles, and refusal to deal claims under the standards that the Supreme Court had developed in its Aspen47 and Trinko48 decisions.49 Although her opinion devoted considerable space to the importance of standard essential patents and the relevance of FRAND commitments, she addressed the antitrust claims by applying well established antitrust principles that require a showing of restraint of trade or anticompetitive exclusion.50 Nevertheless, anticompetitive effects become more transparent when one views the extent to which they undermined an output- and innovation-enhancing joint enterprise whose social value was not being called into question. SSOs operated by multiple firms are joint ventures.51 For bona fide joint ventures that are not simply fronts for cartels, the purpose of the antitrust laws is not to destroy the venture or undermine its purpose, but rather to evaluate how the challenged restraint operates within the venture and condemn unreasonably harmful restraints.52 For example, when the Supreme Court struck down the NCAA joint venture’s limitation on nationally televised football games, the purpose and effect were to make the NCAA behave more competitively, in the process increasing its output.53 SSOs should be addressed in the same manner. The goal of the standard setting venture is to facilitate competitive operation and entry, interoperability, as well as preserve appropriate competitive incentives for research and development. Antitrust analysis necessarily involves testing conduct against these goals, but only to the extent of looking for practices that are anticompetitive. This means it must identify practices that reduce market wide output unreasonably and increase prices, or that are unnecessarily exclusionary or harmful to consumers in other ways. A firm’s violation of its FRAND commitment is very likely a breach of contract, as several decisions have held.54 The FRAND contract is incomplete, in the sense that not every term is specified in detail. But participants are subject to a contractual duty to bargain in good faith, with some terms being filled in by courts or other tribunals as necessary. The breach of contract question does not depend on whether the conduct reduced market output or excluded a rival unreasonably. It certainly does not depend on the existence of any party’s market power. Remedies are ordinarily contract damages or an injunction. Nonparties to the contract will typically be able to obtain relief only to the extent that they are third-party beneficiaries. However, the courts have had little difficulty concluding that participating members of the SSO are third-party beneficiaries of FRAND commitments.55 In all events, challengers will not be able to obtain antitrust law’s treble damages unless they can prove an antitrust violation. Whether a firm’s breach of a FRAND commitment also violates the antitrust laws depends on whether the conduct in question causes competitive harm of a sort that the antitrust laws recognize.56 In the case of section 1 of the Sherman Act57 this requires a showing of a relevant agreement that is likely to reduce market output. If the conduct is reasonably ancillary to other arguably procompetitive activity, the court must also assess market power and anticompetitive effects. In the case of section 2 of the Sherman Act or section 3 of the Clayton Act, which reach mainly tying and exclusive dealing, it will require a showing of market power plus conduct that is unreasonably exclusionary. The antitrust harm results, not from the breach of the FRAND obligation per se. Rather, it results from the creation of monopoly and higher prices for consumers. The Ninth Circuit got this issue precisely wrong, holding that the district court incorrectly focused on downstream harm to buyers when it should have looked at harm to rivals.58 That confuses contract or tort law with antitrust law.

### 1AC – Plan

#### The United States federal government should increase prohibitions on anticompetitive business practices by standard-essential patent (SEP) owners by mandating that standard-setting organizations (SSOs) are in violation of the Sherman Act if the SSO fails to adopt and enforce rules that are effective to prevent SEP owners from exploiting the ex post monopoly power created by the standard.

### 1AC – Solvency

#### Applying Section 1 of Sherman prohibits patent holdup

Melamed and Shapiro, 18 – A. Douglas Melamed is Professor of the Practice of Law at Stanford Law School. Carl Shapiro is Professor of Business Strategy at the University of California at Berkeley. “How Antitrust Law Can Make FRAND Commitments More Effective,” Yale Law Journal 127:2110, <https://www.yalelawjournal.org/pdf/MelamedShapiro_12wf7fof.pdf> -- Iowa

Much attention has been paid in recent years to legal issues arising from standard setting, assertion of standard-essential patents, and the requirements imposed by standard-setting organizations that standard-essential patents be licensed on reasonable terms. This Feature argues that a fundamental aspect of the antitrust laws, heretofore overlooked in this context, can play an important role in ensuring that the rules established by standard-setting organizations are effective in preventing owners of standard-essential patents from engaging in patent holdup. It has long been a basic principle of antitrust law that when firms collaborate to engage in conduct that has efficiency benefits, like standard-setting, they violate the antitrust laws if their collaboration also harms competition more than necessary to obtain the efficiency benefits. Both standard-setting organizations and their members can violate Section 1 of the Sherman Act if the organization’s rules are ineffective in preventing owners of standard-essential patents from exploiting the monopoly power they gain as a result of the standard.

#### Flexible application of core antitrust law is a floor that checks monopolies but not a ceiling that caps innovation

Melamed and Shapiro, 18 – A. Douglas Melamed is Professor of the Practice of Law at Stanford Law School. Carl Shapiro is Professor of Business Strategy at the University of California at Berkeley. “How Antitrust Law Can Make FRAND Commitments More Effective,” Yale Law Journal 127:2110, <https://www.yalelawjournal.org/pdf/MelamedShapiro_12wf7fof.pdf> -- Iowa

As always, antitrust law can and should be flexible and attentive to the specific factual circumstances of each case. The best set of rules governing FRAND commitments for one SSO might not be best for another. Experience in the marketplace and the creativity of SSOs and their members can best determine which measures are most effective and efficient in any given case. Because one size does not fit all when it comes to FRAND rules, antitrust law should welcome competition among SSOs to solve the problem of ex post opportunism by SEP holders. The role of antitrust law is not to prescribe how SSOs should solve this problem, but simply to require that they solve it to the extent reasonably possible. Fundamental antitrust principles require SSOs and their members to implement effective solutions that minimize ex post opportunism based on market power they create, to the extent they can do so without sacrificing the many benefits associated with standard setting.

#### Section 2 of Sherman thumps but does not solve

Melamed and Shapiro, 18 – A. Douglas Melamed is Professor of the Practice of Law at Stanford Law School. Carl Shapiro is Professor of Business Strategy at the University of California at Berkeley. “How Antitrust Law Can Make FRAND Commitments More Effective,” Yale Law Journal 127:2110, <https://www.yalelawjournal.org/pdf/MelamedShapiro_12wf7fof.pdf> -- Iowa

Courts have already recognized that, in some situations, antitrust cases can be brought against SEP holders under Section 2 of the Sherman Act.44 For example, a SEP holder that makes a FRAND commitment without intending to comply, and thereby induces the SSO to include its technology in the standard, unlawfully obtains its monopoly and thus violates Section 2.45 In that situation, the SEP holder could be liable for damages to patent holders on technologies wrongfully excluded from the standard, and to implementers harmed by the SEP holder’s subsequent exercise of the unlawfully obtained monopoly power. 46 However, these kinds of Section 2 cases are unlikely to have a significant impact on the efficacy of measures designed to prevent ex post opportunism. This is because they require the plaintiff to prove both that the FRAND commitment was fraudulent when made and that it caused the inclusion of the patented technology in the standard and, thus, created the SEP holder’s monopoly. Both of these prongs are problematic and difficult to prove: a well-counseled firm can avoid creating discoverable materials showing that it never intended to abide by its FRAND commitment, and a plaintiff will have a difficult time proving at the time of trial several years later that a given standard would not have been adopted absent the SEP holder’s FRAND commitment.

#### **Interoperable standards via Section 1 of Sherman are key to every internal**

Melamed and Shapiro, 18 – A. Douglas Melamed is Professor of the Practice of Law at Stanford Law School. Carl Shapiro is Professor of Business Strategy at the University of California at Berkeley. “How Antitrust Law Can Make FRAND Commitments More Effective,” Yale Law Journal 127:2110, <https://www.yalelawjournal.org/pdf/MelamedShapiro_12wf7fof.pdf> -- Iowa

Compatibility standards comprise a critical part of the information and communications technology sector. From Wi-Fi and 4G cell phone standards to the ubiquitous JPEG and MPEG file formats, many of the benefits generated by the recent and dramatic advances in information technology would have been difficult or impossible to achieve without compatibility standards.

For the past twenty years, antitrust enforcement related to standard setting has focused largely on the interpretation and implementation of the commitments made by patent holders as part of the standard-setting process to license their Standard-Essential Patents (SEPs) on Fair, Reasonable and Non-Discriminatory (FRAND) terms. The Department of Justice (DOJ) and the Federal Trade Commission (FTC) devoted an entire chapter to this topic in their 2007 report on antitrust enforcement and intellectual property rights.1 The debate over FRAND commitments has continued undiminished in the ten years since the publication of that report.

With respect to SEPs, the most significant and immediate commercial and antitrust concern centers on the SEP owners’ command of substantial market power once the standard in question becomes widely adopted. Put simply: without some checks, SEP owners could opportunistically engage in patent holdup, taking advantage of the fact that the firms and users adopting the standard become individually and collectively locked in to the standard over time. Of course, it is precisely this danger of ex post opportunism that motivates market participants and standard-setting organizations (SSOs) to require participants in the standard-setting process to make FRAND commitments in the first place.

By its nature, standard setting involves collaboration among competitors and thus raises core antitrust issues. In this Feature, we argue that existing antitrust laws have an important role to play in ensuring that SSO rules are effective to prevent ex post opportunism. In Part I, we set forth the pertinent background regarding standard setting and the competitive process. In Part II, we explain why effective FRAND rules are needed to prevent exploitation by SEP holders of market power created by the standard-setting process, and we refute arguments that SEP-holder market power and holdup are not a serious problem. In Part III, we explain the important role that antitrust law can play in preventing and remedying anticompetitive violations of FRAND commitments and in ensuring that SSOs adopt effective FRAND rules. We explain in particular a heretofore overlooked reason why SSOs and their members can violate Section 1 of the Sherman Act2 if the SSO fails to adopt and enforce rules that are effective to prevent SEP owners from exploiting the ex post monopoly power created by the standard. This Section 1 liability facing SSO participants and SSOs works alongside liability under Section 2 of the Sherman Act for unilateral conduct by SEP owners.

#### **The aff has a ripple effect – solving patent hold-up drives interoperability, standardization, and innovation**

Singh, 20 – Dr. Manveen Singh is an Associate Professor and Associate Dean at Jindal Global Law School. “TRACING THE EVOLUTION OF STANDARDS AND STANDARD-SETTING ORGANIZATIONS IN THE ICT ERA,” 24 Marq. Intell. Prop. L. Rev. 217, 239-240, p. Nexis – Iowa

VI. Conclusion

From railway gauges to the most recent 5G technology, standards have come a long way in the past century and a half. Under the umbrella of SSOs, collaborative standard-setting has remodeled itself into an indomitable force in the innovation landscape, with standards acting as building blocks, fundamental in facilitating product compatibility and interoperability. 201 However, the success of any SSO or the standards coming through its ranks is largely governed by the care and caution exercised in structuring it from its very inception. 202 Whether it is a classic corporation or one with limited liability, an SSO must provide an effective platform supporting standardization activities, rather than impeding them. 203 Since the standard-setting process at SSOs involves participants from competing industries coming together to select interoperable technical standards, 204 there is an inherent risk of collusion on the part of certain market players in using the standardization process to drive their rivals out of the market. 205 Furthermore, technology included in standards is often the subject of patents, 206 thereby affording patent holders the opportunity to abuse the standardization process and assert their patents covering standardized technology, over implementers of such technology, and in the process, attracting scrutiny by competition agencies. 207 Despite the SSOs requiring patent holders to license their technologies on FRAND terms, competition concerns have arisen time and again, with patent holders likely to indulge in activities such as hold-up, royalty stacking and patent ambush, while at the same time, having to face the likelihood of hold-out from the implementers.

[\*240] Although collaborative standard-setting runs the risk of antitrust violation, the role of SSOs in driving technological innovation has been duly recognized by antitrust agencies. 208 Having said that, the task of balancing the varied interests of stakeholders is entrusted upon SSOs, which necessitates the creation of internal IPR policies. These policies are the focal point of all the standardization activity taking place in SSOs and play a key role in incentivizing the development of new technologies. 209 With changing standards, the SSOs also end up amending their IPR policies from time to time. Sometimes, these IPR policy amendments might come in the way of standardization and cause the standardization process to slow down, while on other occasions, they might run the risk of attracting antitrust scrutiny. In the era of highly complex telecommunications industries, various viewpoints have been put forward vis-a-vis IPR policies of SSOs, without any consensus being achieved. Since IPR policy changes have the potential of a ripple effect across innovation circles, it is essential to analyze these changes at a microscopic level.

# 2ac

### Harmonization

#### Studies overwhelmingly conclude hold up is real – assumes neg arguments

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An impressive body of empirical work supports the general theory of holdup described above. Literally hundreds of papers have been published in peer-reviewed journals developing and testing the general theory of holdup. As Robert Gibbons, one of the editors of the Handbook of Organizational Economics, stated in his article on transaction cost economics, “the huge body of TCE literature is overwhelmingly empirical.”28 One extensive line of research uses transaction cost economics to explain the scope and incidence of vertical integration.29 Put differently, these papers use transaction cost economics to explain the “make vs. buy” decisions of firms. A closely related line of research uses transaction cost economics to explain how firms structure their contractual relationships. Shelanski and Klein provide an early survey of this literature.30 As they conclude, “Studies that examine the make-or-buy decision and the structure of long-term contracts, in particular, overwhelmingly confirm transaction cost economic predictions.”31 Masten assembles some of the best early empirical articles on vertical integration and vertical contracting.32 Whinston notes that “TCE predicts that any increase in quasi-rents will increase the likelihood of vertical integration (a finding that is so far consistent with nearly all of the existing empirical literature).”33 Macher and Richtman reviewed “over 3,500 abstracts from which [they] obtained approximately 900 articles that empirically test some aspect of TCE theory.”34 After recognizing considerable variability in the quality of the empirical work that they surveyed, they concluded, “[e]ven so, the volume of our findings lend considerable support overall for the main predictions of TCE.”35 In addition, there is an enormous amount of anecdotal evidence based on long-term contracts between sophisticated parties in situations where substantial specific investments are involved and the parties come to rely on each other. It is safe to say that anyone who has seen a good number of such contracts will confirm that they normally contain provisions by which one party obtains price and performance protections to limit opportunism by the other party. E. Actual Holdups Are Very Difficult to Measure As just noted, the extensive empirical support for the general theory of holdup consists primarily of studies showing that firms structure their relationships to avoid or minimize the adverse effects of holdup. Critically, the evidence does not involve quantifying the magnitude of actual ex post holdups.36 Indeed, the empirical literature on holdup has relatively few documented examples of large-scale actual holdups.37 This will be important below when we turn to evaluating the empirical evidence regarding patent holdup in particular. Anticipating the arguments being made by those who deny that the patent holdup problem is real and significant, it is instructive to ask why the empirical literature on the general holdup problem has not proceeded by measuring the frequency or magnitude of actual holdups. In part this is for a very good conceptual reason: the theory predicts that market participants will structure their affairs to avoid or mitigate actual holdups. As stressed above, the social costs caused by the holdup problem can be large even if large-scale holdups are very infrequent. The validity of the general theory of holdup, and the importance of the holdup problem, do not hinge on the frequency or magnitude of actual holdups. But practical considerations also play a big role in explaining why the very large empirical literature on the holdup problem includes few documented instances of actual holdups. Even in situations where such holdups take place, they are exceedingly difficult for researchers to reliably detect and quantify. To see why, denote the holdup (ex post monopoly) price by 𝑃𝐻 and the ex ante competitive price by 𝑃 ∗ . The (perunit) magnitude of the actual ex post holdup is equal to (𝑃𝐻 − 𝑃 ∗ ). Measuring either component of this difference can pose quite a challenge for researchers. Actual transaction prices in complex business-to-business transactions are rarely observable by researchers. Plus, even when a measure of price is available, it typically is confounded by other terms and conditions, making 𝑃𝐻 very hard to observe. Coming up with a good measure of the competitive benchmark price 𝑃 ∗ is even harder, since it reflects a counterfactual and since the transactions at issue are by nature idiosyncratic. Practical considerations also explain why the empirical literature on the holdup problem includes few documented instances in which the prospect of holdup has discouraged investment. The resulting reduction in investment typically will not normally be observable to researchers, much less attributable to holdup. For all of these reasons, scholars studying the holdup problem widely agree that the general theory of holdup is very well supported empirically without expecting, much less demanding, a body of empirical work measuring actual holdups. This same sensible approach should be applied to patent holdup. When we turn to look at patent holdup below, we will examine the two types of evidence used in the more general empirical literature on holdup. First, we look for evidence identifying situations in which the patent holdup problem is significant. The telltale marker that the patent holdup problem is significant in a given setting is the presence of substantial investments specific to a given patent or patent portfolio. Second, we look for evidence that the mechanisms used to manage the patent holdup problem are costly or imperfect. There is clear evidence that the mechanisms used by SSOs to manage SEP holdup are costly and imperfect.

#### Economic Decline goes nuclear

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The next economic crisis is closer than you think. But what you should really worry about is what comes after: in the current social, political, and technological landscape, a prolonged economic crisis, combined with rising income inequality, could well escalate into a major global military conflict.

The 2008-09 global financial crisis almost bankrupted governments and caused systemic collapse. Policymakers managed to pull the global economy back from the brink, using massive monetary stimulus, including quantitative easing and near-zero (or even negative) interest rates.

But monetary stimulus is like an adrenaline shot to jump-start an arrested heart; it can revive the patient, but it does nothing to cure the disease. Treating a sick economy requires structural reforms, which can cover everything from financial and labor markets to tax systems, fertility patterns, and education policies.

Policymakers have utterly failed to pursue such reforms, despite promising to do so. Instead, they have remained preoccupied with politics. From Italy to Germany, forming and sustaining governments now seems to take more time than actual governing. And Greece, for example, has relied on money from international creditors to keep its head (barely) above water, rather than genuinely reforming its pension system or improving its business environment.

The lack of structural reform has meant that the unprecedented excess liquidity that central banks injected into their economies was not allocated to its most efficient uses. Instead, it raised global asset prices to levels even higher than those prevailing before 2008.

In the United States, housing prices are now 8% higher than they were at the peak of the property bubble in 2006, according to the property website Zillow. The price-to-earnings (CAPE) ratio, which measures whether stock-market prices are within a reasonable range, is now higher than it was both in 2008 and at the start of the Great Depression in 1929.

As monetary tightening reveals the vulnerabilities in the real economy, the collapse of asset-price bubbles will trigger another economic crisis – one that could be even more severe than the last, because we have built up a tolerance to our strongest macroeconomic medications. A decade of regular adrenaline shots, in the form of ultra-low interest rates and unconventional monetary policies, has severely depleted their power to stabilize and stimulate the economy.

If history is any guide, the consequences of this mistake could extend far beyond the economy. According to Harvard’s Benjamin Friedman, prolonged periods of economic distress have been characterized also by public antipathy toward minority groups or foreign countries – attitudes that can help to fuel unrest, terrorism, or even war.

For example, during the Great Depression, US President Herbert Hoover signed the 1930 Smoot-Hawley Tariff Act, intended to protect American workers and farmers from foreign competition. In the subsequent five years, global trade shrank by two-thirds. Within a decade, World War II had begun.

To be sure, WWII, like World War I, was caused by a multitude of factors; there is no standard path to war. But there is reason to believe that high levels of inequality can play a significant role in stoking conflict.

According to research by the economist Thomas Piketty, a spike in income inequality is often followed by a great crisis. Income inequality then declines for a while, before rising again, until a new peak – and a new disaster. Though causality has yet to be proven, given the limited number of data points, this correlation should not be taken lightly, especially with wealth and income inequality at historically high levels.

This is all the more worrying in view of the numerous other factors stoking social unrest and diplomatic tension, including technological disruption, a record-breaking migration crisis, anxiety over globalization, political polarization, and rising nationalism. All are symptoms of failed policies that could turn out to be trigger points for a future crisis.

Voters have good reason to be frustrated, but the emotionally appealing populists to whom they are increasingly giving their support are offering ill-advised solutions that will only make matters worse. For example, despite the world’s unprecedented interconnectedness, multilateralism is increasingly being eschewed, as countries – most notably, Donald Trump’s US – pursue unilateral, isolationist policies. Meanwhile, proxy wars are raging in Syria and Yemen.

Against this background, we must take seriously the possibility that the next economic crisis could lead to a large-scale military confrontation. By the logic of the political scientist Samuel Huntington , considering such a scenario could help us avoid it, because it would force us to take action. In this case, the key will be for policymakers to pursue the structural reforms that they have long promised, while replacing finger-pointing and antagonism with a sensible and respectful global dialogue. The alternative may well be global conflagration.

#### **Heg checks conflict – loss of it destabilizes the globe**

Brooks et al, 13 – Brooks and Wohlforth are Profs @ Dartmouth, Ikenberry is a Prof @ Princeton. John Ikenberry, Stephen G. Brooks, William C. Wohlforth, January/February, Foreign Affairs, “Lean Forward: In Defense of American Engagement” <http://www.foreignaffairs.com/articles/138468/stephen-g-brooks-g-john-ikenberry-and-william-c-wohlforth/lean-forward> --br

Of course, even if it is true that the costs of deep engagement fall far below what advocates of retrenchment claim, they would not be worth bearing unless they yielded greater benefits. In fact, they do. The most obvious benefit of the current strategy is that it reduces the risk of a dangerous conflict. The United States' security commitments deter states with aspirations to regional hegemony from contemplating expansion and dissuade U.S. partners from trying to solve security problems on their own in ways that would end up threatening other states. Skeptics discount this benefit by arguing that U.S. security guarantees aren't necessary to prevent dangerous rivalries from erupting. They maintain that the high costs of territorial conquest and the many tools countries can use to signal their benign intentions are enough to prevent conflict. In other words, major powers could peacefully manage regional multipolarity without the American pacifier. But that outlook is too sanguine. If Washington got out of East Asia, Japan and South Korea would likely expand their military capabilities and go nuclear, which could provoke a destabilizing reaction from China. It's worth noting that during the Cold War, both South Korea and Taiwan tried to obtain nuclear weapons; the only thing that stopped them was the United States, which used its security commitments to restrain their nuclear temptations. Similarly, were the United States to leave the Middle East, the countries currently backed by Washington--notably, Israel, Egypt, and Saudi Arabia--might act in ways that would intensify the region's security dilemmas. There would even be reason to worry about Europe. Although it's hard to imagine the return of great-power military competition in a post-American Europe, it's not difficult to foresee governments there refusing to pay the budgetary costs of higher military outlays and the political costs of increasing EU defense cooperation. The result might be a continent incapable of securing itself from threats on its periphery, unable to join foreign interventions on which U.S. leaders might want European help, and vulnerable to the influence of outside rising powers. Given how easily a U.S. withdrawal from key regions could lead to dangerous competition, advocates of retrenchment tend to put forth another argument: that such rivalries wouldn't actually hurt the United States. To be sure, few doubt that the United States could survive the return of conflict among powers in Asia or the Middle East--but at what cost? Were states in one or both of these regions to start competing against one another, they would likely boost their military budgets, arm client states, and perhaps even start regional proxy wars, all of which should concern the United States, in part because its lead in military capabilities would narrow. Greater regional insecurity could also produce cascades of nuclear proliferation as powers such as Egypt, Saudi Arabia, Japan, South Korea, and Taiwan built nuclear forces of their own. Those countries' regional competitors might then also seek nuclear arsenals. Although nuclear deterrence can promote stability between two states with the kinds of nuclear forces that the Soviet Union and the United States possessed, things get shakier when there are multiple nuclear rivals with less robust arsenals. As the number of nuclear powers increases, the probability of illicit transfers, irrational decisions, accidents, and unforeseen crises goes up. The case for abandoning the United States' global role misses the underlying security logic of the current approach. By reassuring allies and actively managing regional relations, Washington dampens competition in the world s key areas, thereby preventing the emergence of a hothouse in which countries would grow new military capabilities. For proof that this strategy is working, one need look no further than the defense budgets of the current great powers: on average, since 1991 they have kept their military expenditures as A percentage of GDP to historic lows, and they have not attempted to match the United States' top-end military capabilities. Moreover, all of the world's most modern militaries are U.S. allies, and the United States' military lead over its potential rivals is by many measures growing. On top of all this, the current grand strategy acts as a hedge against the emergence regional hegemons. Some supporters of retrenchment argue that the U.S. military should keep its forces over the horizon and pass the buck to local powers to do the dangerous work of counterbalancing rising regional powers. Washington, they contend, should deploy forces abroad only when a truly credible contender for regional hegemony arises, as in the cases of Germany and Japan during World War II and the Soviet Union during the Cold War. Yet there is already a potential contender for regional hegemony--China--and to balance it, the United States will need to maintain its key alliances in Asia and the military capacity to intervene there. The implication is that the United States should get out of Afghanistan and Iraq, reduce its military presence in Europe, and pivot to Asia. Yet that is exactly what the Obama administration is doing. MILITARY DOMINANCE, ECONOMIC PREEMINENCE Preoccupied with security issues, critics of the current grand strategy miss one of its most important benefits: sustaining an open global economy and a favorable place for the United States within it. To be sure, the sheer size of its output would guarantee the United States a major role in the global economy whatever grand strategy it adopted. Yet the country's military dominance undergirds its economic leadership. In addition to protecting the world economy from instability, its military commitments and naval superiority help secure the sea-lanes and other shipping corridors that allow trade to flow freely and cheaply. Were the United States to pull back from the world, the task of securing the global commons would get much harder. Washington would have less leverage with which it could convince countries to cooperate on economic matters and less access to the military bases throughout the world needed to keep the seas open. A global role also lets the United States structure the world economy in ways that serve its particular economic interests. During the Cold War, Washington used its overseas security commitments to get allies to embrace the economic policies it preferred--convincing West Germany in the 1960s, for example, to take costly steps to support the U.S. dollar as a reserve currency. U.S. defense agreements work the same way today. For example, when negotiating the 2011 free-trade agreement with South Korea, U.S. officials took advantage of Seoul's desire to use the agreement as a means of tightening its security relations with Washington. As one diplomat explained to us privately, "We asked for changes in labor and environment clauses, in auto clauses, and the Koreans took it all." Why? Because they feared a failed agreement would be "a setback to the political and security relationship." More broadly, the United States wields its security leverage to shape the overall structure of the global economy. Much of what the United States wants from the economic order is more of the same: for instance, it likes the current structure of the World Trade Organization and the International Monetary Fund and prefers that free trade continue. Washington wins when U.S. allies favor this status quo, and one reason they are inclined to support the existing system is because they value their military alliances. Japan, to name one example, has shown interest in the Trans-Pacific Partnership, the Obama administration's most important free-trade initiative in the region, less because its economic interests compel it to do so than because Prime Minister Yoshihiko Noda believes that his support will strengthen Japan's security ties with the United States. The United States' geopolitical dominance also helps keep the U.S. dollar in place as the world's reserve currency, which confers enormous benefits on the country, such as a greater ability to borrow money. This is perhaps clearest with Europe: the EU'S dependence on the United States for its security precludes the EU from having the kind of political leverage to support the euro that the United States has with the dollar. As with other aspects of the global economy, the United States does not provide its leadership for free: it extracts disproportionate gains. Shirking that responsibility would place those benefits at risk. CREATING COOPERATION What goes for the global economy goes for other forms of international cooperation. Here, too, American leadership benefits many countries but disproportionately helps the United States. In order to counter transnational threats, such as terrorism, piracy, organized crime, climate change, and pandemics, states have to work together and take collective action. But cooperation does not come about effortlessly, especially when national interests diverge. The United States' military efforts to promote stability and its broader leadership make it easier for Washington to launch joint initiatives and shape them in ways that reflect U.S. interests. After all, cooperation is hard to come by in regions where chaos reigns, and it flourishes where leaders can anticipate lasting stability. U.S. alliances are about security first, but they also provide the political framework and channels of communication for cooperation on nonmilitary issues. NATO, for example, has spawned new institutions, such as the Atlantic Council, a think tank, that make it easier for Americans and Europeans to talk to one another and do business. Likewise, consultations with allies in East Asia spill over into other policy issues; for example, when American diplomats travel to Seoul to manage the military alliance, they also end up discussing the Trans-Pacific Partnership. Thanks to conduits such as this, the United States can use bargaining chips in one issue area to make progress in others. The benefits of these communication channels are especially pronounced when it comes to fighting the kinds of threats that require new forms of cooperation, such as terrorism and pandemics. With its alliance system in place, the United States is in a stronger position than it would otherwise be to advance cooperation and share burdens. For example, the intelligence-sharing network within NATO, which was originally designed to gather information on the Soviet Union, has been adapted to deal with terrorism. Similarly, after a tsunami in the Indian Ocean devastated surrounding countries in 2004, Washington had a much easier time orchestrating a fast humanitarian response with Australia, India, and Japan, since their militaries were already comfortable working with one another. The operation did wonders for the United States' image in the region. The United States' global role also has the more direct effect of facilitating the bargains among governments that get cooperation going in the first place. As the scholar Joseph Nye has written, "The American military role in deterring threats to allies, or of assuring access to a crucial resource such as oil in the Persian Gulf, means that the provision of protective force can be used in bargaining situations. Sometimes the linkage may be direct; more often it is a factor not mentioned openly but present in the back of statesmen's minds." THE DEVIL WE KNOW Should America come home? For many prominent scholars of international relations, the answer is yes--a view that seems even wiser in the wake of the disaster in Iraq and the Great Recession. Yet their arguments simply don't hold up. There is little evidence that the United States would save much money switching to a smaller global posture. Nor is the current strategy self-defeating: it has not provoked the formation of counterbalancing coalitions or caused the country to spend itself into economic decline. Nor will it condemn the United States to foolhardy wars in the future. What the strategy does do is help prevent the outbreak of conflict in the world's most important regions, keep the global economy humming, and make international cooperation easier. Charting a different course would threaten all these benefits. This is not to say that the United States' current foreign policy can't be adapted to new circumstances and challenges. Washington does not need to retain every commitment at all costs, and there is nothing wrong with rejiggering its strategy in response to new opportunities or setbacks. That is what the Nixon administration did by winding down the Vietnam War and increasing the United States' reliance on regional partners to contain Soviet power, and it is what the Obama administration has been doing after the Iraq war by pivoting to Asia. These episodes of rebalancing belie the argument that a powerful and internationally engaged America cannot tailor its policies to a changing world. A grand strategy of actively managing global security and promoting the liberal economic order has served the United States exceptionally well for the past six decades, and there is no reason to give it up now. The country's globe-spanning posture is the devil we know, and a world with a disengaged America is the devil we don't know. Were American leaders to choose retrenchment, they would in essence be running a massive experiment to test how the world would work without an engaged and liberal leading power. The results could well be disastrous.

### Telecommunications

### 2ac Cap

#### Scenario analysis is pedagogically valuable -

Barma et al. 16 – (May 2016, [Advance Publication Online on 11/6/15], Naazneen Barma, PhD in Political Science from UC-Berkeley, Assistant Professor of National Security Affairs at the Naval Postgraduate School, Brent Durbin, PhD in Political Science from UC-Berkeley, Professor of Government at Smith College, Eric Lorber, JD from UPenn and PhD in Political Science from Duke, Gibson, Dunn & Crutcher, Rachel Whitlark, PhD in Political Science from GWU, Post-Doctoral Research Fellow with the Project on Managing the Atom and International Security Program within the Belfer Center for Science and International Affairs at Harvard, “‘Imagine a World in Which’: Using Scenarios in Political Science,” International Studies Perspectives 17 (2), pp. 1-19, <http://www.naazneenbarma.com/uploads/2/9/6/9/29695681/using_scenarios_in_political_science_isp_2015.pdf>)

\*\*FYI if anyone is skeptical of Barma’s affiliation with the Naval Postgraduate School, it’s worth looking at her publication history, which is deeply opposed to US hegemony and the existing liberal world order: co-authored an article entitled “How Globalization Went Bad” that has this byline: “From terrorism to global warming, the evils of globalization are more dangerous than ever before. What went wrong? The world became dependent on a single superpower. Only by correcting this imbalance can the world become a safer place.” (http://cisac.fsi.stanford.edu/publications/how\_globalization\_went\_bad)

Over the past decade, the “cult of irrelevance” in political science scholarship has been lamented by a growing chorus (Putnam 2003; Nye 2009; Walt 2009). Prominent scholars of international affairs have diagnosed the roots of the gap between academia and policymaking, made the case for why political science research is valuable for policymaking, and offered a number of ideas for enhancing the policy relevance of scholarship in international relations and comparative politics (Walt 2005,2011; Mead 2010; Van Evera 2010; Jentleson and Ratner 2011; Gallucci 2012; Avey and Desch 2014). Building on these insights, several initiatives have been formed in the attempt to “bridge the gap.”2 Many of the specific efforts put in place by these projects focus on providing scholars with the skills, platforms, and networks to better communicate the findings and implications of their research to the policymaking community, a necessary and worthwhile objective for a field in which theoretical debates, methodological training, and publishing norms tend more and more toward the abstract and esoteric.

Yet enhancing communication between scholars and policymakers is only one component of bridging the gap between international affairs theory and practice. Another crucial component of this bridge is the generation of substantive research programs that are actually policy relevant—a challenge to which less concerted attention has been paid. The dual challenges of bridging the gap are especially acute for graduate students, a particular irony since many enter the discipline with the explicit hope of informing policy. In a field that has an admirable devotion to pedagogical self-reflection, strikingly little attention is paid to techniques for generating policy-relevant ideas for dissertation and other research topics. Although numerous articles and conference workshops are devoted to the importance of experiential and problem-based learning, especially through techniques of simulation that emulate policymaking processes (Loggins 2009; Butcher 2012; Glasgow 2012; Rothman 2012; DiCicco 2014), little has been written about the use of such techniques for generating and developing innovative research ideas.

This article outlines an experiential and problem-based approach to developing a political science research program using scenario analysis. It focuses especially on illuminating the research generation and pedagogical benefits of this technique by describing the use of scenarios in the annual New Era Foreign Policy Conference (NEFPC), which brings together doctoral students of international and comparative affairs who share a demonstrated interest in policy-relevant scholarship.3 In the introductory section, the article outlines the practice of scenario analysis and considers the utility of the technique in political science. We argue that scenario analysis should be viewed as a tool to stimulate problem-based learning for doctoral students and discuss the broader scholarly benefits of using scenarios to help generate research ideas. The second section details the manner in which NEFPC deploys scenario analysis. The third section reflects upon some of the concrete scholarly benefits that have been realized from the scenario format. The fourth section offers insights on the pedagogical potential associated with using scenarios in the classroom across levels of study. A brief conclusion reflects on the importance of developing specific techniques to aid those who wish to generate political science scholarship of relevance to the policy world.

What Are Scenarios and Why Use Them in Political Science?

Scenario analysis is perceived most commonly as a technique for examining the robustness of strategy. It can immerse decision makers in future states that go beyond conventional extrapolations of current trends, preparing them to take advantage of unexpected opportunities and to protect themselves from adverse exogenous shocks. The global petroleum company Shell, a pioneer of the technique, characterizes scenario analysis as the art of considering “what if” questions about possible future worlds. Scenario analysis is thus typically seen as serving the purposes of corporate planning or as a policy tool to be used in combination with simulations of decision making. Yet scenario analysis is not inherently limited to these uses. This section provides a brief overview of the practice of scenario analysis and the motivations underpinning its uses. It then makes a case for the utility of the technique for political science scholarship and describes how the scenarios deployed at NEFPC were created.

The Art of Scenario Analysis

We characterize scenario analysis as the art of juxtaposing current trends in unexpected combinations in order to articulate surprising and yet plausible futures, often referred to as “alternative worlds.” Scenarios are thus explicitly not forecasts or projections based on linear extrapolations of contemporary patterns, and they are not hypothesis-based expert predictions. Nor should they be equated with simulations, which are best characterized as functional representations of real institutions or decision-making processes (Asal 2005). Instead, they are depictions of possible future states of the world, offered together with a narrative of the driving causal forces and potential exogenous shocks that could lead to those futures. Good scenarios thus rely on explicit causal propositions that, independent of one another, are plausible—yet, when combined, suggest surprising and sometimes controversial future worlds. For example, few predicted the dramatic fall in oil prices toward the end of 2014. Yet independent driving forces, such as the shale gas revolution in the United States, China’s slowing economic growth, and declining conflict in major Middle Eastern oil producers such as Libya, were all recognized secular trends that—combined with OPEC’s decision not to take concerted action as prices began to decline—came together in an unexpected way.

While scenario analysis played a role in war gaming and strategic planning during the Cold War, the real antecedents of the contemporary practice are found in corporate futures studies of the late 1960s and early 1970s (Raskin et al. 2005). Scenario analysis was essentially initiated at Royal Dutch Shell in 1965, with the realization that the usual forecasting techniques and models were not capturing the rapidly changing environment in which the company operated (Wack 1985; Schwartz 1991). In particular, it had become evident that straight-line extrapolations of past global trends were inadequate for anticipating the evolving business environment. Shell-style scenario planning “helped break the habit, ingrained in most corporate planning, of assuming that the future will look much like the present” (Wilkinson and Kupers 2013, 4). Using scenario thinking, Shell anticipated the possibility of two Arab-induced oil shocks in the 1970s and hence was able to position itself for major disruptions in the global petroleum sector.

Building on its corporate roots, scenario analysis has become a standard policymaking tool. For example, the Project on Forward Engagement advocates linking systematic foresight, which it defines as the disciplined analysis of alternative futures, to planning and feedback loops to better equip the United States to meet contemporary governance challenges (Fuerth 2011). Another prominent application of scenario thinking is found in the National Intelligence Council’s series of Global Trends reports, issued every four years to aid policymakers in anticipating and planning for future challenges. These reports present a handful of “alternative worlds” approximately twenty years into the future, carefully constructed on the basis of emerging global trends, risks, and opportunities, and intended to stimulate thinking about geopolitical change and its effects.4 As with corporate scenario analysis, the technique can be used in foreign policymaking for long-range general planning purposes as well as for anticipating and coping with more narrow and immediate challenges. An example of the latter is the German Marshall Fund’s EuroFutures project, which uses four scenarios to map the potential consequences of the Euro-area financial crisis (German Marshall Fund 2013).

Several features make scenario analysis particularly useful for policymaking.5 Long-term global trends across a number of different realms—social, technological, environmental, economic, and political—combine in often-unexpected ways to produce unforeseen challenges. Yet the ability of decision makers to imagine, let alone prepare for, discontinuities in the policy realm is constrained by their existing mental models and maps. This limitation is exacerbated by well-known cognitive bias tendencies such as groupthink and confirmation bias (Jervis 1976; Janis 1982; Tetlock 2005). The power of scenarios lies in their ability to help individuals break out of conventional modes of thinking and analysis by introducing unusual combinations of trends and deliberate discontinuities in narratives about the future. Imagining alternative future worlds through a structured analytical process enables policymakers to envision and thereby adapt to something altogether different from the known present.

Designing Scenarios for Political Science Inquiry

The characteristics of scenario analysis that commend its use to policymakers also make it well suited to helping political scientists generate and develop policy-relevant research programs. Scenarios are essentially textured, plausible, and relevant stories that help us imagine how the future political-economic world could be different from the past in a manner that highlights policy challenges and opportunities. For example, terrorist organizations are a known threat that have captured the attention of the policy community, yet our responses to them tend to be linear and reactive. Scenarios that explore how seemingly unrelated vectors of change—the rise of a new peer competitor in the East that diverts strategic attention, volatile commodity prices that empower and disempower various state and nonstate actors in surprising ways, and the destabilizing effects of climate change or infectious disease pandemics—can be useful for illuminating the nature and limits of the terrorist threat in ways that may be missed by a narrower focus on recognized states and groups. By illuminating the potential strategic significance of specific and yet poorly understood opportunities and threats, scenario analysis helps to identify crucial gaps in our collective understanding of global politicaleconomic trends and dynamics. The notion of “exogeneity”—so prevalent in social science scholarship—applies to models of reality, not to reality itself. Very simply, scenario analysis can throw into sharp relief often-overlooked yet pressing questions in international affairs that demand focused investigation.

Scenarios thus offer, in principle, an innovative tool for developing a political science research agenda. In practice, achieving this objective requires careful tailoring of the approach. The specific scenario analysis technique we outline below was designed and refined to provide a structured experiential process for generating problem-based research questions with contemporary international policy relevance.6 The first step in the process of creating the scenario set described here was to identify important causal forces in contemporary global affairs. Consensus was not the goal; on the contrary, some of these causal statements represented competing theories about global change (e.g., a resurgence of the nation-state vs. border-evading globalizing forces). A major principle underpinning the transformation of these causal drivers into possible future worlds was to “simplify, then exaggerate” them, before fleshing out the emerging story with more details.7 Thus, the contours of the future world were drawn first in the scenario, with details about the possible pathways to that point filled in second. It is entirely possible, indeed probable, that some of the causal claims that turned into parts of scenarios were exaggerated so much as to be implausible, and that an unavoidable degree of bias or our own form of groupthink went into construction of the scenarios. One of the great strengths of scenario analysis, however, is that the scenario discussions themselves, as described below, lay bare these especially implausible claims and systematic biases.8

An explicit methodological approach underlies the written scenarios themselves as well as the analytical process around them—that of case-centered, structured, focused comparison, intended especially to shed light on new causal mechanisms (George and Bennett 2005). The use of scenarios is similar to counterfactual analysis in that it modifies certain variables in a given situation in order to analyze the resulting effects (Fearon 1991). Whereas counterfactuals are traditionally retrospective in nature and explore events that did not actually occur in the context of known history, our scenarios are deliberately forward-looking and are designed to explore potential futures that could unfold. As such, counterfactual analysis is especially well suited to identifying how individual events might expand or shift the “funnel of choices” available to political actors and thus lead to different historical outcomes (Nye 2005, 68–69), while forward-looking scenario analysis can better illuminate surprising intersections and sociopolitical dynamics without the perceptual constraints imposed by fine-grained historical knowledge. We see scenarios as a complementary resource for exploring these dynamics in international affairs, rather than as a replacement for counterfactual analysis, historical case studies, or other methodological tools.

In the scenario process developed for NEFPC, three distinct scenarios are employed, acting as cases for analytical comparison. Each scenario, as detailed below, includes a set of explicit “driving forces” which represent hypotheses about causal mechanisms worth investigating in evolving international affairs. The scenario analysis process itself employs templates (discussed further below) to serve as a graphical representation of a structured, focused investigation and thereby as the research tool for conducting case-centered comparative analysis (George and Bennett 2005). In essence, these templates articulate key observable implications within the alternative worlds of the scenarios and serve as a framework for capturing the data that emerge (King, Keohane, and Verba 1994). Finally, this structured, focused comparison serves as the basis for the cross-case session emerging from the scenario analysis that leads directly to the articulation of new research agendas.

The scenario process described here has thus been carefully designed to offer some guidance to policy-oriented graduate students who are otherwise left to the relatively unstructured norms by which political science dissertation ideas are typically developed. The initial articulation of a dissertation project is generally an idiosyncratic and personal undertaking (Useem 1997; Rothman 2008), whereby students might choose topics based on their coursework, their own previous policy exposure, or the topics studied by their advisors. Research agendas are thus typically developed by looking for “puzzles” in existing research programs (Kuhn 1996). Doctoral students also, understandably, often choose topics that are particularly amenable to garnering research funding. Conventional grant programs typically base their funding priorities on extrapolations from what has been important in the recent past—leading to, for example, the prevalence of Japan and Soviet studies in the mid-1980s or terrorism studies in the 2000s—in the absence of any alternative method for identifying questions of likely future significance.

The scenario approach to generating research ideas is grounded in the belief that these traditional approaches can be complemented by identifying questions likely to be of great empirical importance in the real world, even if these do not appear as puzzles in existing research programs or as clear extrapolations from past events. The scenarios analyzed at NEFPC envision alternative worlds that could develop in the medium (five to seven year) term and are designed to tease out issues scholars and policymakers may encounter in the relatively near future so that they can begin thinking critically about them now. This timeframe offers a period distant enough from the present as to avoid falling into current events analysis, but not so far into the future as to seem like science fiction. In imagining the worlds in which these scenarios might come to pass, participants learn strategies for avoiding failures of creativity and for overturning the assumptions that prevent scholars and analysts from anticipating and understanding the pivotal junctures that arise in international affairs.

#### Capitalism is sustainable---recent data proves we’re entering the golden age

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The past 30 years have seen immense progress in improving the quality of life for much of humanity. Extreme poverty — the number of people living on less than $1.90 per day — has fallen by nearly two-thirds, from 1.9 billion to around 650 million. Life expectancy has risen in most of the world, along with literacy and access to education, while infant mortality has fallen. Despite perceptions to the contrary, the average person born today is likely to have access to more opportunities and have a better quality of life than at any other point in human history. Much of this increase in human wellbeing has been propelled by rapid economic growth driven largely by state-led industrial policy, particularly in poor-to-middle income countries. However, this growth has come at a cost: between 1990 and 2019, global emissions of CO2 increased by 56%. Historically, economic growth has been closely linked to increased energy consumption — and increased CO2 emissions in particular — leading some to argue that a more prosperous world is one that necessarily has more impacts on our natural environment and climate. There is a lively academic debate about our ability to “absolutely decouple” emissions and growth — that is, the extent to which the adoption of clean energy technology can allow emissions to decline while economic growth continues. Over the past 15 years, however, something has begun to change. Rather than a 21st century dominated by coal that energy modelers foresaw, global coal use peaked in 2013 and is now in structural decline. We have succeeded in making clean energy cheap, with solar power and battery storage costs falling 10-fold since 2009. The world produced more electricity from clean energy — solar, wind, hydro, and nuclear — than from coal over the past two years. And, according to some major oil companies, peak oil is upon us — not because we have run out of cheap oil to produce, but because demand is falling and companies expect further decline as consumers increasingly shift to electric vehicles. The world has long been experiencing a relative decoupling between economic growth and CO2 emissions, with the emissions per unit of GDP falling for the past 60 years. This is the case even in countries like India and China that have been undergoing rapid economic growth. But relative decoupling alone is inadequate in a world where global CO2 emissions need to peak and decline in the next decade to give us any chance at limiting warming to well below 2℃, in line with Paris Agreement targets. Thankfully, there is increasing evidence that the world is on track to absolutely decouple CO2 emissions and economic growth — with global CO2 emissions potentially having peaked in 2019 and unlikely to increase substantially in the coming decade. While an emissions peak is just the first and easiest step towards eventually reaching the net-zero emissions required to stop the world from continuing to warm, it demonstrates that linkages between emissions and economic activity are not an immutable law, but rather simply a result of our current means of energy production. In recent years we have seen more and more examples of absolute decoupling — economic growth accompanied by falling CO2 emissions. Since 2005, 32 countries with a population of at least one million people have absolutely decoupled emissions from economic growth, both for terrestrial emissions (those within national borders) and consumption emissions (emissions embodied in the goods consumed in a country). This includes the United States, Japan, Mexico, Germany, United Kingdom, France, Spain, Poland, Romania, Netherlands, Belgium, Portugal, Sweden, Hungary, Belarus, Austria, Bulgaria, El Salvador, Singapore, Denmark, Finland, Slovakia, Norway, Ireland, New Zealand, Croatia, Jamaica, Lithuania, Slovenia, Latvia, Estonia, and Cyprus. Figure 1, below, shows the declines in territorial emissions (blue) and increases in GDP (red). To qualify as having experienced absolute decoupling, we require countries included in this analysis to pass four separate filters: a population of at least one million (to focus the analysis on more representative cases), declining territorial emissions over the 2005-2019 period (based on a linear regression), declining consumption emissions, and increasing real GDP (on a purchasing power parity basis, using constant 2017 international $USD). We chose not to include 2020 in this analysis because it is not particularly representative of longer-term trends, and consumption and territorial emissions estimates are not yet available for many countries. There is a wide range of rates of economic growth between 2005-2019 among countries experiencing absolute decoupling. Somewhat counterintuitively, there is no significant relationship between the rate of economic growth and the magnitude of emissions reductions within the group. While it is unlikely that there is not at least some linkage between the two factors, there are plenty of examples of countries (e.g., Singapore, Romania, and Ireland) experiencing both extremely rapid economic growth and large reductions in CO2 emissions. One of the primary criticisms of some prior analyses of absolute decoupling is that they ignore leakage. Specifically, the offshoring of manufacturing from high-income countries over the past three decades to countries like China has led to “illusory” drops in emissions, where the emissions associated with high-income country consumption are simply shipped overseas and no longer show up in territorial emissions accounting. There is some truth in this critique, as there was a large increase in emissions embodied in imports from developing countries between 1990 and 2005. After 2005, however, structural changes in China and a growing domestic market led to a reversal of these trends; the amount of emissions “exported” from developed countries to developing countries has actually declined over the past 15 years. This means that, for many countries, both territorial emissions and consumption emissions (which include any emissions “exported” to other countries) have jointly declined. In fact, on average, consumption emissions have been declining slightly faster than territorial emissions since 2005 in the 32 countries we identify as experiencing absolute decoupling. Figure 2, below, shows the change in consumption emissions (teal) and GDP (red) between 2005 and 2019. There is a pretty wide variation in the extent to which these countries have reduced their territorial and consumption emissions since 2005. Some countries — such as the UK, Denmark, Finland, and Singapore – have seen territorial emissions fall faster than consumption emissions, while the US, Japan, Germany, and Spain (among others) have seen consumption emissions fall faster. Figure 3 shows reductions in consumption and territorial emissions for each country, with the size of the dot representing the size of the population in 2019. Absolute decoupling is possible. There is no physical law requiring economic growth — and broader increases in human wellbeing — to necessarily be linked to CO2 emissions. All of the services that we rely on today that emit fossil fuels — electricity, transportation, heating, food — can in principle be replaced by near-zero carbon alternatives, though these are more mature

#### Transition causes an immediate spike in warming – only capitalism solves – otherwise, exitinction

Crownshaw et al 18 (Timothy Crownshaw, Department of Natural Resource Sciences, McGill University, Caitlin Morgan, Food Systems Graduate Program, University of Vermont, Alison Adams, Rubenstein School of the Environment, University of Vermont, Martin Sers, Faculty of Environmental Studies, York University, Natália Britto dos Santos, Faculty of Environmental Studies, York University, Alice Damiano, Department of Natural Resource Sciences, McGill University, Laura Gilbert, Department of Natural Resource Sciences, McGill University, Gabriel Yahya Haage, Department of Natural Resource Sciences, McGill University, and Daniel Horen Greenford, Department of Geography, Planning and Environment, Concordia University, “Over the horizon: Exploring the conditions of a post-growth world”, The Anthropocene Review) DB

Near-term impacts to the climate system originating from macroeconomic disruptions remains a relatively unexplored topic, as the climate change research community typically assumes a continuation of economic growth and stability in their scenarios (for example, IPCC, 2014b, and UNEP, 2014b). However, industrial emissions will be significantly diminished during a period of economic contraction following the end of growth. This will bring local environmental benefits in the form of reduced air pollution but also a partial loss of the aerosol-induced cooling effect.3 The IPCC’s best estimate of the magnitude of aerosol cooling is approximately half that of the warming from carbon dioxide in the atmosphere (IPCC, 2013); clearly a significant counterbalance to the warming potential of GHGs. Contraction and deindustrialization of the global economy will curtail these cooling emissions, and thus complicate climate change policy and mitigation efforts. Owing to the short residence time of aerosols in the atmosphere (Textor et al., 2006), an increase in warming could manifest rapidly following a decline in industrial activity. Changes in the rate and global distribution of industrial aerosol emissions have already caused significant shifts in localized cooling effects (IPCC, 2013; Kühn et al., 2014). Several studies have highlighted a potential increase in global warming as aerosol emissions are gradually reduced via pollution control measures, finding that average temperatures will rise approximately an additional 1°C by 2100 as a consequence (Smith and Bond, 2014; Westervelt et al., 2015). While the magnitude is uncertain (Lewis and Curry, 2015; Rosenfeld et al., 2013), this additional warming may occur earlier and at a much faster rate than expected due to falling emissions from industrial activities resulting from the end of growth and subsequent economic contraction. This outcome could enhance climate impacts non-linearly, as human and natural systems would have little time to adapt to a rapid change in the rate of warming (Smith et al., 2015). As such, a relatively sudden increase in the pace of climate change and associated impacts followed by a gradual long-term reduction may be a more realistic prospect than current assumptions of a rising emissions trend in line with economic growth, partially mitigated by technological innovation and declining emissions intensity of the global economy. Post-growth climate mitigation and systemic feedbacks A transient increase in warming following the end of growth has the potential to affect multiple components of the climate system, including albedo dynamics and natural GHG sources. Additional short-term warming will induce greater albedo changes in the climate system due to melting of more ice and snow cover, reducing the reflection of sunlight (IPCC, 2014c). This is significant as greater near-term warming increases risks of runaway feedback between albedo reduction and increased warming (Curry et al., 1995; Hall, 2004). An increase in short-term warming may also exacerbate the release of terrestrial and oceanic sources of GHG emissions, such as the permafrost in high-latitude and high-altitude regions around the world (IPCC, 2013; Schuur et al., 2015), and emissions from aquatic ecosystems and methane clathrate deposits (Hamdan and Wickland, 2016). Consideration of these climate system feedbacks enhances expectations of post-growth warming and invalidates prevailing estimations of the underlying risks associated with self-reinforcing processes. As such, the near-term risks associated with climate feedbacks in scenarios assuming continued economic growth, already underestimated as noted by Bloch-Johnson et al. (2015), will be further exacerbated in a post-growth context. The climate system will also be affected by changing patterns of economic activity and GHG emissions stemming from trade and transportation. Long-distance transportation is a key emitter (Karl et al., 2009); a decline in international trade stemming from economic contraction will diminish GHG emissions. Additionally, increased disruption of long-distance trade routes from weather-related climate change impacts (WTO and UNEP, 2009) will further reduce GHG emissions from transportation (Heinberg and Fridley, 2016). This effectively forms a stabilizing feedback loop as future warming and associated impacts on trade will partially limit future emissions. Climate mitigation and adaptation presents an unwieldy problem for capital-constrained, contracting societies, and may in fact be a major component of the contraction process because of the redirection of investment away from productive capital, as mentioned in the introduction. The IPCC (2014c) estimates that the necessary investments per year in low-carbon technology and infrastructure will rise by several hundreds of billions of dollars each year before 2030. As the assumptions used to calculate these investment estimates are not consistent with a scenario of long-term economic contraction, they must be treated critically in the context of a post-growth world. However, mitigation efforts will remain a prerequisite for remaining within acceptable climate conditions. Current approaches to climate change mitigation relying on capital-intensive technological solutions, including a global transition from fossil fuels to renewable energy, continued development and deployment of carbon capture and storage (CCS), and geoengineering projects, may be untenable in this context. Climate change mitigation through a large-scale switch to biofuels, or bioenergy with carbon capture and storage (BECCS) technology, will be additionally constrained by a limited supply of agricultural land subject to rising food demand in the near-term (Kraxner et al., 2013). Instead, feasible climate mitigation options may be practically limited to low-capital, demand-side behavioral responses and lifestyle changes. A decrease in energy demand, associated with a decline in aggregate demand, will be complicated both by declining EROI of our major fuels (Hall, 2017; Lambert et al., 2014; Murphy, 2014) and the issue of capital constraints. As energy demand falls, extraction of costly unconventional hydrocarbon resources with higher emissions intensities (NRDC, 2010) will become increasingly uneconomic. However, declining investment capacity implies that an ongoing conversion to lowcarbon renewables may be similarly constrained due to the vast material, energy and capital requirements involved, as described by Trainer (2010). As energy demand falls, economies may be forced to return to conventional low-cost fuels with acceptable EROI, such as remaining coal reserves (Hall et al., 2014), which are attractive because of compatibility with existing energy infrastructure but have detrimental consequences for GHG emissions. The net effect of the above factors on the climate system will depend on their relative magnitudes and the respective time lags involved. Provided the effects of stabilizing feedbacks outweigh reinforcing feedbacks, the end of growth may ultimately reduce human perturbance of the climate system. Conversely, if stabilizing economy–climate feedbacks are insufficient to counteract the consequences of a near-term spike in warming, the world may face significantly worse climate stress than is currently anticipated.

#### A plethora of indicators demonstrate that catastrophic climate change can be averted. The momentum exists, but capitalizing on it is key.

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The change is much bigger than the turnover of American leadership. By the time the Biden presidency finds its footing in a vaccinated world, the bounds of climate possibility will have been remade. Just a half-decade ago, it was widely believed that a “business as usual” emissions path would bring the planet four or five degrees of warming — enough to make large parts of Earth effectively uninhabitable. Now, thanks to the rapid death of coal, the revolution in the price of renewable energy, and a global climate politics forged by a generational awakening, the [expectation](https://climateactiontracker.org/global/temperatures/) is for about three degrees. Recent pledges [could bring us closer to two](https://climateactiontracker.org/publications/global-update-paris-agreement-turning-point/). All of these projections sketch a hazardous and unequal future, and all are clouded with uncertainties — about the climate system, about technology, about the dexterity and intensity of human response, about how inequitably the most punishing impacts will be distributed. Yet if each half-degree of warming marks an entirely different level of suffering, we appear to have shaved a few of them off our likeliest end stage in not much time at all.

The next half-degrees will be harder to shave off, and the most crucial increment — getting from two degrees to 1.5 — perhaps impossible, dashing the dream of avoiding what was long described as “catastrophic” change. But for a climate alarmist like me, seeing clearly the state of the planet’s future now requires a conspicuous kind of double vision, in which a guarded optimism seems perhaps as reasonable as panic. Given how long we’ve waited to move, what counts now as a best-case outcome remains grim. It also appears, miraculously, within reach.

In December, a month after Biden was elected promising to return the U.S. to the Paris agreement, the U.N. celebrated five years since the signing of those accords. They were five of the six hottest on record. (The sixth was 2015, the year the agreement was signed.) They were also the years with the highest levels of carbon output in the history of humanity — with emissions equivalent to what was produced by all human and industrial activity from the speciation of Homo sapiens to the start of World War II.

They have also been the five years in which the nations of the world — and cities and regions, individuals and institutions, corporations and central banks — have made the most ambitious pledges of future climate action. Most of them were made in the past 12 months, in the face of the pandemic. Or, perhaps, to some degree, because of it — because the pandemic demanded a full-body jolt to the global political economy, provoking much more aggressive government spending, a much more accommodating perspective on debt, and a much greater openness to large-scale actions and investments of the kind that might plausibly reshape the world. And because decarbonization has come to seem, even to those economists and policy-makers blinded for decades to the moral and humanitarian cases for reform, a rational investment. “When I think about climate change,” Biden is fond of saying, “the word I think of is jobs.”

There are two ways of looking at these seemingly contradictory sets of facts. The first is that the distance between what is being done and what needs to be done is only growing. This is the finding of, among others, the U.N.’s comprehensive [“Emissions Gap” report](https://www.unenvironment.org/emissions-gap-report-2020), issued in December, which found that staying below two degrees of warming would require a tripling of stated ambitions. To bring the planet in reach of the 1.5-degree target — favored by activists, most scientists, and really anyone reading their work with open eyes — would require a quintupling. It is also the perspective of Greta Thunberg, who has spent the pandemic year castigating global leaders for paying mere lip service to far-off decarbonization targets and who called the E.U.’s new net-zero emissions law “surrender.”

The second is that all of the relevant curves are bending — too slowly but nevertheless in the right direction. The International Energy Agency, a notoriously conservative forecaster, recently [called](https://www.carbonbrief.org/solar-is-now-cheapest-electricity-in-history-confirms-iea#:~:text=Source%3A%20IEA%20World%20Energy%20Outlook%202020.&text=Together%2C%20low%2Dcarbon%20sources%20would,up%20from%2019%25%20in%202019.) solar power “the cheapest electricity in history” and projected that India will build 86 percent less new coal power capacity than it thought just one year ago. Today, business as usual no longer means a fivefold increase of coal use this century, as was once expected. It means pretty rapid decarbonization, at least by the standards of history, in which hardly any has ever taken place before.

Both of these perspectives are true. The gap is real, and the world risks tumbling into it, subjecting much of the global South to unconscionable punishments all the way down. But in the months since the pandemic wiped climate strikers off the streets, their concerns have seeped into not just public-opinion surveys but parliaments and presidencies, trade deals and the advertising business, finance and insurance — in short, all the citadels presiding over the ancien régime of fossil capital.

This is not exactly a climate revolution; the strikers and their allies didn’t win in the way they wanted to, at least not yet. But they did win something. Environmental anxieties haven’t toppled neoliberalism. Instead, to an unprecedented degree, they infiltrated it. (Or perhaps they were appropriated by it. It’s an open question.) Climate change isn’t an issue just for die-hards anymore — it’s for normies, sellouts, and anyone with their finger in the wind. It will take time, of course, for voters to see empty rhetoric for what it is, and for consumers to learn to distinguish, say, between the claims of guiltless airline tickets, or between carbon-free foods in the supermarket aisle. Harder still will be sorting through the differences between real corporate commitments like Microsoft’s and more evasive ones, like BP’s. Already, there is considerable consternation among climate activists that the public doesn’t understand the tricky math of “net-zero” on which so many of these commitments have been made—it is not a promise of ending emissions, but of offsetting some amount of them, in the future, with “negative emissions,” sometimes called “carbon dioxide removal,” though no approach of that kind is ready to go at anything like the necessary scale. And while some amount of skepticism about those commitments is surely warranted, it is also the case that, according to [a recent Bloomberg review](https://www.bloomberg.com/graphics/2020-company-emissions-pledges/), of 187 corporate climate pledges made for 2020 in 2015, 138 will be met. (Many of those promises were quite modest, but it is a much better performance than has been managed by the 189 parties to the Paris agreement, of which only two — Morocco and Gambia — are today [judged](https://climateactiontracker.org/countries/) fully “compatible” with the 1.5-degree goal, and only six more with the 2-degree target).

In the political sphere, the uneasy alliance between activists and those in power will be tested, producing new conflicts, or new equilibria, or both. Consider, though, that Varshini Prakash, whose [Sunrise Movement](https://www.sunrisemovement.org/) gave Biden’s primary candidacy an F, later helped write his climate plan along with Alexandria Ocasio-Cortez. Climate expertise has been distributed throughout the incoming administration, as was promised during a campaign that closed, remarkably, with a climate-focused advertising blitz. During the transition, Biden’s pick for director of the National Economic Council, Brian Deese, was targeted by the environmental left for his time with BlackRock, but even this purported stooge had been married by Bill McKibben, one of the godfathers of modern climate activism.

Elsewhere in the world, where 85 percent of global emissions are produced, the great infiltration of climate concerns represents what the British environmental [writer](https://www.businessgreen.com/blog-post/4025199/2020-crisis-crossroads-alternative-histories) James Murray has called “an alternative history to 2020” and what the scientist turned journalist Akshat Rathi [has declared](https://www.bloomberg.com/news/articles/2021-01-05/climate-action-is-embedding-into-how-the-world-works) “a strong sign that climate action is starting to be ‘institutionalized’ — that is, getting deeply embedded into how the world works.” This is not about coronavirus lockdowns producing emissions drops or “nature healing.” It is instead about long-standing trajectories passing obvious tipping points in coal use and political salience; promises and posturing by powerful if compromised institutions; and policy progress almost smuggled into place, all over the world, under cover of pandemic night. In the U.S., in the second coronavirus stimulus, [$35 billion in clean-energy spending](https://nymag.com/intelligencer/2020/12/what-is-in-covid-stimulus-omnibus-climate-pell-grants-medical-billing.html) passed in the Senate 92-6 — an effective down payment, energy researcher Varun Sivaram has estimated, on the innovation spending needed for a full electrification of the country. Did you even notice?

Biden’s climate plan now faces the challenge of a filibuster, a skeptical Supreme Court, and the mood of Senator Joe Manchin of West Virginia, which means American climate action over the next four years is probably more likely to be delivered piecemeal — through appropriations and stimulus, executive action, and regulation — than through a landmark Green New Deal–style piece of legislation. That does limit what can be achieved, but it also means avoiding a protracted battle over climate as a referendum on the identity of the nation. And at least nominally, having been pressured by activists to do so, Biden is promising to multiply the green spending in that recent stimulus by a factor of 60.

The numbers are numbingly large — reminders that in the midst of pandemic turmoil, the rules of state spending have been dramatically revised and perhaps even suspended. Is this global free-spending binge the beginning of a new era or merely a crisis interregnum to be followed by a new new austerity? “We don’t know what the recovery packages of COVID are going to be,” Christiana Figueres, one of the central architects of the Paris accords, told me this summer. “And honestly, the depth of decarbonization is going to largely depend on the characteristics of those recovery packages more than on anything else, because of their scale. We’re already at $12 trillion; we could go up to $20 trillion over the next 18 months. We have never seen — the world has never seen — $20 trillion go into the economy over such a short period of time. That is going to determine the logic, the structures, and certainly the carbon intensity of the global economy at least for a decade, if not more.”

For those dreaming of a climate recovery, the first round of spending was not so encouraging. The E.U. was the gold standard, promising that 30 percent of its stimulus would be earmarked for climate. The U.S. and China each pledged only a fraction of that (and in each case, there was fossil stimulus, too). But in October, a team of researchers including Joeri Rogelj of the Imperial College of London [calculated](https://www.reuters.com/article/climate-change-stimulus/tenth-of-pandemic-stimulus-spend-could-help-world-reach-climate-goals-study-idUSKBN271098) that just one-tenth of the COVID-19 stimulus spending already committed around the world, directed toward decarbonization during each of the next five years, would be sufficient to deliver the goals of the Paris agreement and stop global warming well below two degrees. That analysis may be a touch optimistic, but the level of spending seems, now, doable.

When Donald Trump was elected, trashing Paris, climate hawks were left hoping that the world would hang on for the length of his administration — insisting that, in the long term, the crisis couldn’t be solved without America at the helm. But the past four years of missing leadership have produced astonishing gains.

The price of solar energy has fallen ninefold over the past decade, as has the price of lithium batteries, critical to the growth of electric cars. The costs of utility-scale batteries, which could solve the “intermittency” (i.e., cloudy day) problem of renewables and help power whole cities in relatively short order, have fallen 70 percent since just 2015. Wind power is 40 percent cheaper than it was a decade ago, with offshore wind experiencing an even steeper decline. Overall, renewable energy is less expensive than dirty energy almost everywhere on the planet, and in many places it is simply cheaper to build new renewable capacity than to continue running the old fossil-fuel infrastructure. Oil demand and carbon emissions may both have peaked this year. Eighty percent of coal plants planned in Asia’s developing countries have been shelved.

This summer, I heard the Australian scientist and entrepreneur Saul Griffith talk about what it would take to get the U.S. within range of a 1.5 degree world. He said it would mean that beginning in 2021, this year, every single person buying a new car would have to be buying an electric one. That seems unrealistic, I thought, making a note of it as a useful benchmark illustrating just how far we have to go.

Then, in the fall, the U.K. pledged to ban nonelectrics by 2030—a once-unthinkable law coming both too slow and much more quickly than seemed possible not very long ago. Similar plans are now in place in 16 other countries, plus Massachusetts and California. Canada recently raised its tax on carbon sixfold. Italy cut its power-sector emissions 65 percent between 2012 and 2019, and Denmark is now aiming to reduce its overall emissions 70 percent by 2030. “We set ourselves challenges that on paper looked almost impossible,” the country’s minister for the environment, Dan Jørgensen, told me recently. “And I think experts in many countries said, when looking at Denmark, ‘This is going to be too expensive, this is going to lower their living standards, this is going to hurt their ability to compete.’ But actually I’m proud to say that the opposite has happened. Now, of course, we have set even higher standards.”

In the midst of the pandemic, new net-zero pledges, far more ambitious than those offered at Paris, were independently made by Japan, South Korea, the E.U., and, most significant, China, the world’s biggest emitter, which promised to reach an emissions peak by 2030 and get all the way to zero by 2060. China’s promise is so ambitious it has inspired one wave of debate among experts about whether it is even feasible — given that it would require, for instance, roughly twice as much renewable power to be installed every year for the next decade as Germany has operating nationwide today — and another debate about whether it has revived the possibility of that 1.5-degree target, with economic historian Adam Tooze writing, just after Xi Jinping’s surprise announcement in September, that it single-handedly “redefined the future prospects for humanity.” Together, the new net-zero pledges may have subtracted a full half-degree from ultimate warming. Add Biden’s campaign pledge of net zero by 2050, and you’ve got about two-thirds of global emissions at least nominally committed to firm, aggressive timelines to zero.

These are all just paper promises, of course, and the history of climate action is littered with the receipts of similar ones uncashed. Plot the growth of carbon concentration in the atmosphere against the sequence of climate-action conferences and a distressing pattern emerges: the World Meteorological Conference of 1979, the U.N. framework of 1992, the Kyoto protocol of 1997, the Copenhagen accord of 2009, and the 2015 Paris accords, all tracking an uninterrupted trajectory upward for carbon from a “safe” level under 350 parts per million, past 400, to 414 today, and pointing upward from there. Before the industrial revolution, humans had never known an atmosphere with even 300 parts per million. Inevitably now, within a few years, the concentration will reach levels not seen since 3.3 million years ago, when sea levels were 60 feet higher. For all their momentum, renewables still only make up 10 percent of global electricity production.

But alarmists have to take the good news where they find it. And while mood affiliation is not always the best guide to the state of the world, in 2020, for me, there were three main sources of hope.

The first is the fact that the age of climate denial is over thanks to extreme weather and the march of science and the historic labor of activists — climate strikers, Sunrise, Extinction Rebellion — whose success in raising alarm may have been so sudden that they brought an end to the age of climate Jeremiahs as well. Their voices now echo in some unlikely places. Exxon was booted from the S&P 500 within months of Tesla making Elon Musk the world’s richest man. The cultural cachet of oil companies is quickly approaching that of tobacco companies. Jair Bolsonaro of Brazil aside, practically every leader of every country and every major figure in every corporate and industrial sector now feels obligated — because of protest and social pressure, economic realities, and cultural expectation — to at least make a show of support for climate action. It would be nice not to have to count that as progress, but it is. The questions are: How much does it matter? And what will follow? Disinformation and human disregard are not the only instruments of delay, and the age of climate denial is likely to yield first not to an age of straightforward climate deliverance but to one characterized by climate hypocrisy, greenwashing, and gaslighting. But those things, ugly and maddening and even criminal as they are, have always been with us. It is the other thing that is new.

The second source of good news is the arrival on the global stage of climate self-interest. By this I don’t mean the profiteering logic of BlackRock, which opportunistically announced some half-hearted climate commitments last year, but rather the growing consensus in almost every part of the globe, and at almost every level of society and governance, that the world will be made better through decarbonization. A decade ago, many of the more ruthless capitalists to analyze that project deemed it too expensive to undertake. Today, it suddenly appears almost too good a deal to pass up. (A recent McKinsey [report](https://www.mckinsey.com/business-functions/sustainability/our-insights/how-the-european-union-could-achieve-net-zero-emissions-at-net-zero-cost): “Net-Zero Emissions at Net-Zero Cost.”)

The logic may be clearest in considering the effects of air pollution, which kills an estimated 9 million people per year. In India, where more than 8 percent of GDP is lost to pollution, poor air quality is also responsible for 350,000 miscarriages and stillbirths every year. Globally, coal kills one person for every thousand people it provides power to, and even in the U.S., with its enviably clean air, total decarbonization would be entirely paid for, Duke’s Drew Shindell [recently testified](https://www.vox.com/energy-and-environment/2020/8/12/21361498/climate-change-air-pollution-us-india-china-deaths) before Congress, just through the public-health benefits of cutting out fossil fuels. You don’t even have to calculate any of the other returns — more jobs, cheaper energy, new infrastructure. Of course, countries all around the world are incorporating those considerations too, turning the page on a generation of economic analysis that said decarbonization was too costly and its benefits too small to sell to the public as upside.

A decade ago, capitalists deemed decarbonization too expensive. Suddenly, it appears too good a deal to pass up.

What is perhaps most striking about all the new climate pledges is not just that they were made in the absence of American leadership but that they were made outside the boundaries of the Paris framework. They are not the result of geopolitical strong-arming or “Kumbaya” consensus. They are, instead, plans arrived at internally, in some cases secretly. This has been eye-opening for the many skeptics who worried for decades about climate’s collective-action problem — who warned that because the benefits of decarbonization were distributed globally while the costs were concentrated locally, nations would move only if all of their peers did too. But a [recent paper](https://www.mitpressjournals.org/doi/full/10.1162/glep_a_00578) by Matto Mildenberger and Michaël Alkin suggests this shouldn’t be a surprise. In their retrospective analysis, they found that, despite much consternation about designing climate policy to prevent countries from “cheating,” there was basically no evidence of any country ever pulling back from mitigation efforts to take a free ride on the good-faith efforts of others. There was, in other words, no collective-action problem on climate after all. For a generation, the argument for climate action was made on a moral basis. That case has only grown stronger. And now there are other powerful, more mercenary arguments to offer.

The third cause for optimism is that, while the timelines to tolerably disruptive climate outcomes have already evaporated, the timelines to the next set of benchmarks is much more forgiving. This is why Glen Peters, the research director at the Cicero Center for International Climate Research, often jokes that while keeping warming below two degrees is very hard, perhaps even impossible, keeping it below 2.5 degrees now looks like a walk in the park.

This isn’t to say we’re on a glide path to safety. At current emissions levels, the planet will entirely exhaust the carbon budget for 1.5 degrees in just seven years — stay merely level, in other words, and we’ll burn through the possibility of a relatively comfortable endgame within the decade. We could buy ourselves a little more time by starting to move quickly, but not that much more. To decarbonize fast enough to give the planet a decent chance of hitting that 1.5-degree target without any negative emissions would require getting all the way to net-zero emissions by around 2035. Simply running the cars and furnaces and fossil-fuel infrastructure that already exists to its expected retirement date would push the world past 1.5 degrees—without a single new gasoline SUV hitting the road, or a single new oil-heated home being built, or a single new coal plant opened.

A two-degree target, by contrast, yields a much longer timeline, requiring the world to achieve net-zero by 2070 or 2080 — without even the help of negative emissions. We’d have to cut carbon production in half in about three decades, rather than one. That pathway will almost certainly prove harder than it looks. The good news is that we seem to be beginning, at least, to try.

#### COVID induced restructuring that prevents catastrophic future fallouts

Sneader & Singhal 20 [Kevin, degree in law with first-class honors from his hometown University of Glasgow. He went on to graduate from Harvard Business School, where he received a master of business administration degree with highest distinction, and Shubham, leads McKinsey’s healthcare, public sector and social sector work globally. He serves leading healthcare and social institutions and governments on all top-management agenda issues. “Beyond Coronavirus: The Path to the Next Normal” https://www.mckinsey.com/~/media/McKinsey/Industries/Healthcare%20Systems%20and%20Services/Our%20Insights/Beyond%20coronavirus%20The%20path%20to%20the%20next%20normal/Beyond-coronavirus-The-path-to-the-next-normal.ashx]

Reimagination A shock of this scale will create a discontinuous shift in the preferences and expectations of individuals as citizens, as employees, and as consumers. These shifts and their impact on how we live, how we work, and how we use technology will emerge more clearly over the coming weeks and months. Institutions that reinvent themselves to make the most of better insight and foresight, as preferences evolve, will disproportionally succeed. Clearly, the online world of contactless commerce could be bolstered in ways that reshape consumer behavior forever. But other effects could prove even more significant as the pursuit of efficiency gives way to the requirement of resilience—the end of supply-chain globalization, for example, if production and sourcing move closer to the end user. The crisis will reveal not just vulnerabilities but opportunities to improve the performance of businesses. Leaders will need to reconsider which costs are truly fixed versus variable, as the shutting down of huge swaths of production sheds light on what is ultimately required versus nice to have. Decisions about how far to flex operations without loss of efficiency will likewise be informed by the experience of closing down much of global production. Opportunities to push the envelope of technology adoption will be accelerated by rapid learning about what it takes to drive productivity when labor is unavailable. The result: a stronger sense of what makes business more resilient to shocks, more productive, and better able to deliver to customers. Reform The world now has a much sharper definition of what constitutes a black-swan event. This shock will likely give way to a desire to restrict some factors that helped make the coronavirus a global challenge, rather than a local issue to be managed. Governments are likely to feel emboldened and supported by their citizens to take a more active role in shaping economic activity. Business leaders need to anticipate popularly supported changes to policies and regulations as society seeks to avoid, mitigate, and preempt a future health crisis of the kind we are experiencing today. In most economies, a healthcare system little changed since its creation post–World War II will need to determine how to meet such a rapid surge in patient volume, managing seamlessly across in-person and virtual care. Public health approaches, in an interconnected and highly mobile world, must rethink the speed and global coordination with which they need to react. Policies on critical healthcare infrastructure, strategic reserves of key supplies, and contingency production facilities for critical medical equipment will all need to be addressed. Managers of the financial system and the economy, having learned from the economically induced failures of the last global financial crisis, must now contend with strengthening the system to withstand acute and global exogenous shocks, such as this pandemic’s impact. Educational institutions will need to consider modernizing to integrate classroom and distance learning. The list goes on. The aftermath of the pandemic will also provide an opportunity to learn from a plethora of social innovations and experiments, ranging from working from home to large-scale surveillance. With this will come an understanding of which innovations, if adopted permanently, might provide substantial uplift to economic and social welfare— and which would ultimately inhibit the broader betterment of society, even if helpful in halting or limiting the spread of the virus.

#### The alternative’s lack of hyper-specific demands means it will inevitably be coopted by corporations, losing its radical potential

JULIANNE TVETEN 18, writes about the tech industry, labor, and culture, “Living in a Pepsi Ad World”, https://newrepublic.com/article/147748/commodified-protest-movements-trump-era

In a commercial for Google’s smart-home subsidiary Nest, a teenage boy, dressed for prom night, prepares to board a limousine. Before he leaves, a paternal voice off camera gently commands the boy to treat his date with respect, reminding him that he is entitled to nothing. That voice, it’s soon revealed, belongs not to the girl’s father, but to the boy’s: It emanates from a curved, black audio device mounted in place of a doorbell as the father tele-parents from work via the Nest app. A text overlay appears, reading, “It starts at home.” The ad, which occupied a coveted Academy Awards slot, is an obvious nod to the #MeToo movement—a concept surely familiar to the Oscar-viewing public in the wake of Hollywood’s recent sexual-assault reckoning. At first glance, there’s nothing remarkable about the commercial; it uses such standard marketing techniques as demographic targeting and imparts a general air of corporate goodwill. Yet beneath its putative message of male responsibility lies a more insidious phenomenon: The commodification of protest, particularly in the era of Trump. This issue reached a fever pitch a year ago, when an infamous Pepsi commercial starring Kendall Jenner distilled the iconography of protests against police brutality into a collage of meaningless signs, dance moves, and amicable cops. Though it was an egregious example of corporate appropriation, the repercussions were mild and fleeting: Pepsi removed the ad, apologized, and moved on. Meanwhile, companies like Nest have continued to glom on to mainstream social movements, simply in more subtle forms. Since, roughly, Trump’s inauguration, private enterprise has tapped into an American furor gone mainstream, leveraging marches into marketplaces. In 2017, New York magazine’s style vertical, The Cut, informed readers which scarves and leggings from Uniqlo, Amazon, and American Apparel they should tote at the Women’s March. Smaller companies, too, used it as an advertising platform: The CEO of cosmetics firm Glossier carried a sign to the same march proclaiming “We’re in it together” under the company’s signature “G,” and health-tech startup Tia offered free poster templates for download, its playful serif logo nestled in the corner. (The page appears to have been deactivated.) Cell carrier CREDO Mobile adopted the same tactic, branding intact, for last month’s March For Our Lives to protest gun violence. If protesters are a market, it should come as no surprise that signs and posters designed for them aren’t just canvases for ads; they’re also for sale. Princeton Architectural Press, for instance, has published a series of ready-made signs: Posters for Change, a collection of 50 removable posters running the gamut of causes of the #Resistance, from the abstract “Stay woke” to the more concrete, if nonspecific, “Fund the Arts.” The book exhorts prospective marchers to “Tear, Paste, Protest”—that is, after they fork over the requisite $25. Media outlets reinforce this process of commercialization. Like clockwork, the likes of BuzzFeed, The Washington Post, The Guardian, and Slate comb the crowds at the Women’s March, March For Our Lives, and other mass demonstrations, compiling the signs they deem the wittiest and pithiest of the bunch. Here, the protest sign transitions from an expression of conviction to something far more marketable—clickbait—plus bragging rights for whichever clever marcher happened to make the cut. This predated Trump: In 2011, New York consulted with a Madison Avenue ad executive to “grade” signs from the Occupy Wall Street movement on their “brand-building” potential. As the Occupy report card suggests, the monetization of resistance didn’t begin with the ascendancy of Trump. Genevieve LeBaron and Peter Dauvergne examined how corporations like ExxonMobil and WalMart co-opt and neuter dissent in 2014’s Protest Inc.: The Corporatization of Activism, starting with the year 2008, when the financial crisis awoke even the world’s wealthiest countries to their own precarity. In 2011, journalist Allison Kilkenny lamented the corporatization of Occupy Wall Street, citing such youth-capturing wangles as an MTV music award for “Most Memorable #OWS Performance” and the possibility of Occupy Wall Street-themed installments of MTV’s reality franchises The Real World and True Life. Yet it’s worth considering the effect of the Trump presidency on this trend. Trump’s victory rattled a segment of the American population that, thanks to its own social and financial capital, had been complacent under the eight years of the Obama administration. As many have noted, Trump didn’t introduce America’s ugliness—its militarism, its feeble social-welfare programs, its rampant privatization of public goods, its latent and overt bigotries, to name a few—he merely amplified it. However, those with the wherewithal to think otherwise—that “America Is Already Great,” as the Democrats suggested in 2016—treated the current presidency as an affront on American values, a departure from Who We Are. The members of this demographic—largely middle-class, white, self-described liberals—are, on the whole, new to protest. Historically, they’ve been shielded from America’s worst policies; after the election, however, they were thrust out of their institution-trusting comfort zone, forced to acknowledge the ills that, as subtext under Obama, became text under Trump. Previously unaccustomed to taking it to the streets, this group had suddenly arrived with pun-laden signs in tow. Accordingly, the Women’s March of 2017 generated record numbers, peppered with celebrities and food trucks. Protest had, again, entered the mainstream, its new core attendees equipped with money to burn—a fact of which “conscious” corporations became all too aware. Relatedly, most mass movements, while aiming to counteract some of the horrors of the Trump administration, have been content to couch their messaging in broad, fuzzy terms. They lack many of the demands that lie at the heart of activist politics on the left, which are both granular in their specifics and sweeping in their call for holistic, systemic change. This is evident in criticism of the Women’s March for its racial exclusion; of the post-Weinstein #MeToo movement for its scant attention to class; and of the March For Our Lives for silencing the voices of Marjory Stoneman Douglas’s black students. In an absence of specific, structural critiques and demands—even if that absence is unconscious—corporations can more easily claim causes as their own. If, say, economic injustice isn’t clearly among the chief grievances of the Women’s March, it’s far easier for companies to shoehorn themselves in—to, as Pepsi so nebulously put it, “join the conversation.” These companies can then masquerade as champions of social justice, proclaiming a half-baked message of equality with no financial loss and plenty to gain. It’s difficult to make prescriptions about acts of protest, especially in such fraught times. What shouldn’t be up for debate, though, is that effective, inclusive social movements are compromised when they become vehicles for corporate exploitation. The next time a protester at one of America’s post-2016 marches sees a business logo on a sign, an article prompting them to buy leggings, or a #woke commercial, it just might behoove them to ask what, and who, it’s all for.

#### Capitalism doesn’t lead to fascism.

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Does Capitalism eventually lead to Fascism? In the US it doesn’t and it won’t. Many people in the world believe that Capitalism will eventually lead to Fascism. [Some claim](https://eand.co/you-cant-talk-to-americans-about-the-things-they-need-to-hear-most-5d6392935586) that nearly everyone, except Americans, understand this. The reality is that American Capitalism, when practiced correctly, leads to more individual freedom, more individual responsibility, low rates of taxation and a limited role for government. These principles are opposite to the principles of Fascism. People in other countries simply do not understand the value that Americans place on freedom. In every other country, the population is willing to sacrifice some freedom for the appearance of more security or safety. As our own [Benjamin Franklin](https://www.npr.org/2015/03/02/390245038/ben-franklins-famous-liberty-safety-quote-lost-its-context-in-21st-century) said, “Those who would give up essential Liberty, to purchase a little temporary Safety, deserve neither Liberty nor Safety.” Admittedly today, there are Americans who appear willing to challenge Franklin’s words. There is a deep division in the US today, mostly centered around the role of government. Historically, Americans favored a very limited role for government. Today there is a movement toward a larger role for government. That means some Americans want the government to control key markets like the market for healthcare. The US is the only developed country in the world that does not have some kind of national health insurance. Recent surveys rank the [US 15th](https://www.usnews.com/news/best-countries/slideshows/countries-with-the-most-well-developed-public-health-care-system) for the quality of the healthcare system. Rational, freedom-oriented Americans would reject that claim. Most Americans would say that if they were seriously ill or suffering from a serious injury, they would rather be in the US, where the most advanced protocols and the most advanced equipment are readily and easily available. In virtually every other country, that is not the case. The reality is that the US leads the way for advancements in healthcare. Because of our capitalist system and the resulting profit motive, the US has already developed three vaccines for the worldwide Covid pandemic with at least three more about to be approved. The US led the world in producing lifesaving equipment including ventilators. Some argue that Capitalism produces billionaires who eventually have too much power because of their wealth. Some want to limit the number of billionaires. In the US, it is exactly the opposite. We would like to see as many billionaires as possible. Why? Because to become a billionaire a person has to make a huge contribution to the welfare of the citizens like Jeff Bezos, or Bill Gates or Elon Musk did. Capitalism is about freedom and free markets. Capitalism is about competition. Freedom and competition always lead to higher quality products, lower costs of production, faster innovation and more profitable companies. But the current objection to Capitalism revolves around the distribution of income. In Capitalism an individual is paid according to the value of the contribution that the individual makes. Very simply, the more valuable the contribution, the more income the individual earns. Because there are vast differences in contributions, an unequal distribution of income results. Some in the US believe that this large income inequality is not fair. Indeed measured by what economists call the [GINI coefficient](https://www.statista.com/statistics/219643/gini-coefficient-for-us-individuals-families-and-households/#:~:text=In%202019%2C%20according%20to%20the,over%20the%20past%2030%20years.), the US has a high degree of [income inequality](https://www.indexmundi.com/facts/indicators/SI.POV.GINI/rankings). To a freedom-oriented American this is normal and is how it should be. It is social justice. As the recently deceased American economist Walter Williams said, “ But let me offer you my definition of social justice: I keep what I earn and you keep what you earn. Do you disagree? Well then tell me how much of what I earn belongs to you — and why?” In the US system, an individual is free to figure out how to increase the value of their contribution. Unfortunately, the current administration believes that large income inequality is bad and must be corrected by taking income away from those who have earned large amounts and giving the income to people, who for whatever reason, did not earn it. While compassionate Americans allow some of this, the basic concept is just un-American. The citizens of every other country in the world, simply do not understand the great American experiment in Capitalism and a truly Representative Democracy, where the people make major decisions and not some ruling class. Historians thought the experiment would fail in 1861 when a Civil War ripped the US. We lived through that war and eventually became stronger while gaining an even deeper understanding of freedom. American Capitalism won’t lead to Fascism. In fact, once the US gets back to the basic principles that made us great, freedom will flourish and the capitalistic system will become even stronger. The four basic principles allowed the US to go from the birth of a nation to the largest economy and the most prosperous country in the world in about 150 years. Other countries were hundreds and even thousands of years older. Individual freedom, individual responsibility, low rates of taxation and a limited role for government work with Capitalism and Democracy to encourage more prosperity, more freedom and more control by the people rather than some government official. If only citizens of the other countries in the world understood that.

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## Case

#### Environment resilient and alt causes

Kareiva et al 12 – Chief Scientist and Vice President, The Nature Conservancy (Peter, Michelle Marvier **--**professor and department chair of Environment Studies and Sciences at Santa Clara University, Robert Lalasz **--** director of science communications for The Nature Conservancy, Winter, “Conservation in the Anthropocene,” http://thebreakthrough.org/index.php/journal/past-issues/issue-2/conservation-in-the-anthropocene/)

2. As conservation became a global enterprise in the 1970s and 1980s, the movement's justification for saving nature shifted from spiritual and aesthetic values to focus on biodiversity. Nature was described as primeval, fragile, and at risk of collapse from too much human use and abuse. And indeed, there are consequences when humans convert landscapes for mining, logging, intensive agriculture, and urban development and when key species or ecosystems are lost.¶ But ecologists and conservationists have grossly overstated the fragility of nature, frequently arguing that once an ecosystem is altered, it is gone forever. Some ecologists suggest that if a single species is lost, a whole ecosystem will be in danger of collapse, and that if too much biodiversity is lost, spaceship Earth will start to come apart. Everything, from the expansion of agriculture to rainforest destruction to changing waterways, has been painted as a threat to the delicate inner-workings of our planetary ecosystem.¶ The fragility trope dates back, at least, to Rachel Carson, who wrote plaintively in Silent Spring of the delicate web of life and warned that perturbing the intricate balance of nature could have disastrous consequences.22 Al Gore made a similar argument in his 1992 book, Earth in the Balance.23 And the 2005 Millennium Ecosystem Assessment warned darkly that, while the expansion of agriculture and other forms of development have been overwhelmingly positive for the world's poor, ecosystem degradation was simultaneously putting systems in jeopardy of collapse.24¶ The trouble for conservation is that the data simply do not support the idea of a fragile nature at risk of collapse. Ecologists now know that the disappearance of one species does not necessarily lead to the extinction of any others, much less all others in the same ecosystem. In many circumstances, the demise of formerly abundant species can be inconsequential to ecosystem function. The American chestnut, once a dominant tree in eastern North America, has been extinguished by a foreign disease, yet the forest ecosystem is surprisingly unaffected. The passenger pigeon, once so abundant that its flocks darkened the sky, went extinct, along with countless other species from the Steller's sea cow to the dodo, with no catastrophic or even measurable effects.¶ These stories of resilience are not isolated examples -- a thorough review of the scientific literature identified 240 studies of ecosystems following major disturbances

such as deforestation, mining, oil spills, and other types of pollution. The abundance of plant and animal species as well as other measures of ecosystem function recovered, at least partially, in 173 (72 percent) of these studies.25¶ While global forest cover is continuing to decline, it is rising in the Northern Hemisphere, where "nature" is returning to former agricultural lands.26 Something similar is likely to occur in the Southern Hemisphere, after poor countries achieve a similar level of economic development. A 2010 report concluded that rainforests that have grown back over abandoned agricultural land had 40 to 70 percent of the species of the original forests.27 Even Indonesian orangutans, which were widely thought to be able to survive only in pristine forests, have been found in surprising numbers in oil palm plantations and degraded lands.28¶ Nature is so resilient that it can recover rapidly from even the most powerful human disturbances. Around the Chernobyl nuclear facility, which melted down in 1986, wildlife is thriving, despite the high levels of radiation.29 In the Bikini Atoll, the site of multiple nuclear bomb tests, including the 1954 hydrogen bomb test that boiled the water in the area, the number of coral species has actually increased relative to before the explosions.30 More recently, the massive 2010 oil spill in the Gulf of Mexico was degraded and consumed by bacteria at a remarkably fast rate.31¶ Today, coyotes roam downtown Chicago, and peregrine falcons astonish San Franciscans as they sweep down skyscraper canyons to pick off pigeons for their next meal. As we destroy habitats, we create new ones: in the southwestern United States a rare and federally listed salamander species seems specialized to live in cattle tanks -- to date, it has been found in no other habitat.32 Books have been written about the collapse of cod in the Georges Bank, yet recent trawl data show the biomass of cod has recovered to precollapse levels.33 It's doubtful that books will be written about this cod recovery since it does not play well to an audience somehow addicted to stories of collapse and environmental apocalypse.¶ Even that classic symbol of fragility -- the polar bear, seemingly stranded on a melting ice block -- may have a good chance of surviving global warming if the changing environment continues to increase the populations and northern ranges of harbor seals and harp seals. Polar bears evolved from brown bears 200,000 years ago during a cooling period in Earth's history, developing a highly specialized carnivorous diet focused on seals. Thus, the fate of polar bears depends on two opposing trends -- the decline of sea ice and the potential increase of energy-rich prey. The history of life on Earth is of species evolving to take advantage of new environments only to be at risk when the environment changes again.¶ The wilderness ideal presupposes that there are parts of the world untouched by humankind, but today it is impossible to find a place on Earth that is unmarked by human activity. The truth is humans have been impacting their natural environment for centuries. The wilderness so beloved by conservationists -- places "untrammeled by man"34 -- never existed, at least not in the last thousand years, and arguably even longer.

## K

### Extinction

#### Extinction outweighs.

Ord ’20 [Toby Ord, Senior Research Fellow in Philosophy at Oxford University & world-renowned risk-assessment expert who’s advised the World Health Organization, the World Bank, the World Economic Forum, the US National Intelligence Council and the UK Prime Minister’s Office. (3-3-2020, “The Precipice: Existential Risk and the Future of Humanity,” Hachette Book Group & Bloomsbury Publishing, <https://www.google.com/books/edition/The_Precipice/3aSiDwAAQBAJ?hl=en&gbpv=0>, Google Books]

UNDERSTANDING EXISTENTIAL RISK

Humanity’s future is ripe with possibility. We have achieved a rich understanding of the world we inhabit and a level of health and prosperity of which our ancestors could only dream. We have begun to explore the other worlds in the heavens above us, and to create virtual worlds completely beyond our ancestors’ comprehension. We know of almost no limits to what we might ultimately achieve.

Human extinction would foreclose our future. It would destroy our potential. It would eliminate all possibilities but one: a world ~~bereft~~ [lacking] of human flourishing. Extinction would bring about this failed world and lock it in forever—there would be no coming back.

The philosopher Nick Bostrom showed that extinction is not the only way this could happen: there are other catastrophic outcomes in which we lose not just the present, but all our potential for the future.

Consider a world in ruins: an immense catastrophe has triggered a global collapse of civilization, reducing humanity to a pre-agricultural state. During this catastrophe, the Earth’s environment was damaged so severely that it has become impossible for the survivors to ever reestablish civilization. Even if such a catastrophe did not cause our extinction, it would have a similar effect on our future. The vast realm of futures currently open to us would have collapsed to a narrow range of meager options. We would have a failed world with no way back.

Or consider a world in chains: in a future reminiscent of George Orwell’s Nineteen Eighty-Four, the entire world has become locked under the rule of an oppressive totalitarian regime, determined to perpetuate itself. Through powerful, technologically enabled indoctrination, surveillance and enforcement, it has become impossible for even a handful of dissidents to find each other, let alone stage an uprising. With everyone on Earth living under such rule, the regime is stable from threats, internal and external. If such a regime could be maintained indefinitely, then descent into this totalitarian future would also have much in common with extinction: just a narrow range of terrible futures remaining, and no way out.

[FIGURE 2.1 Omitted]

Following Bostrom, I shall call these “existential catastrophes,” defining them as follows: 3

An existential catastrophe is the destruction of humanity’s longterm potential.

An existential risk is a risk that threatens the destruction of humanity’s longterm potential.

These definitions capture the idea that the outcome of an existential catastrophe is both dismal and irrevocable. We will not just fail to fulfill our potential, but this very potential itself will be permanently lost. While I want to keep the official definitions succinct, there are several areas that warrant clarification.

First, I am understanding humanity’s longterm potential in terms of the set of all possible futures that remain open to us. 4 This is an expansive idea of possibility, including everything that humanity could eventually achieve, even if we have yet to invent the means of achieving it. 5 But it follows that while our choices can lock things in, closing off possibilities, they can’t open up new ones. So any reduction in humanity’s potential should be understood as permanent. The challenge of our time is to preserve our vast potential, and to protect it against the risk of future destruction. The ultimate purpose is to allow our descendants to fulfill our potential, realizing one of the best possible futures open to us.

While it may seem abstract at this scale, this is really a familiar idea that we encounter every day. Consider a child with high longterm potential: with futures open to her in which she leads a great life. It is important that her potential is preserved: that her best futures aren’t cut off due to accident, trauma or lack of education. It is important that her potential is protected: that we build in safeguards to make such a loss of potential extremely unlikely. And it is important that she ultimately fulfills her potential: that she ends up taking one of the best paths open to her. So too for humanity.

Existential risks threaten the destruction of humanity’s potential. This includes cases where this destruction is complete (such as extinction) and where it is nearly complete, such as a permanent collapse of civilization in which the possibility for some very minor types of flourishing remain, or where there remains some remote chance of recovery. 6 I leave the thresholds vague, but it should be understood that in any existential catastrophe the greater part of our potential is gone and very little remains.

Second, my focus on humanity in the definitions is not supposed to exclude considerations of the value of the environment, other animals, successors to Homo sapiens, or creatures elsewhere in the cosmos. It is not that I think only humans count. Instead, it is that humans are the only beings we know of that are responsive to moral reasons and moral argument—the beings who can examine the world and decide to do what is best. If we fail, that upward force, that capacity to push toward what is best or what is just, will vanish from the world.

Our potential is a matter of what humanity can achieve through the combined actions of each and every human. The value of our actions will stem in part from what we do to and for humans, but it will depend on the effects of our actions on non-humans too. If we somehow give rise to new kinds of moral agents in the future, the term “humanity” in my definition should be taken to include them.

My focus on humanity prevents threats to a single country or culture from counting as existential risks. There is a similar term that gets used this way—when people say that something is “an existential threat to this country.” Setting aside the fact that these claims are usually hyperbole, they are expressing a similar idea: that something threatens to permanently destroy the longterm potential of a country or culture.

Third, any notion of risk must involve some kind of probability. What kind is involved in existential risk? Understanding the probability in terms of objective long-run frequencies won’t work, as the existential catastrophes we are concerned with can only ever happen once, and will always be unprecedented until the moment it is too late. We can’t say the probability of an existential catastrophe is precisely zero just because it hasn’t happened yet.

Situations like these require an evidential sense of probability, which describes the appropriate degree of belief we should have on the basis of the available information. This is the familiar type of probability used in courtrooms, banks and betting shops. When I speak of the probability of an existential catastrophe, I will mean the credence humanity should have that it will occur, in light of our best evidence.9

There are many utterly terrible outcomes that do not count as existential catastrophes.

One way this could happen is if there were no single precipitous event, but a multitude of smaller failures. This is because I take on the usual sense of catastrophe as a single, decisive event, rather than any combination of events that is bad in sum. If we were to squander our future simply by continually treating each other badly, or by never getting around to doing anything great, this could be just as bad an outcome but wouldn’t have come about via a catastrophe.

Alternatively, there might be a single catastrophe, but one that leaves open some way for humanity to eventually recover. From our own vantage, looking out to the next few generations, this may appear equally bleak. But a thousand years hence it may be considered just one of several dark episodes in the human story. A true existential catastrophe must by its very nature be the decisive moment of human history—the point where we failed.

Even catastrophes large enough to bring about the global collapse of civilization may fall short of being existential catastrophes. While colloquially referred to as “the end of the world,” a global collapse of civilization need not be the end of the human story. It has the required severity, but may not be permanent or irrevocable.

In this book, I shall use the term civilization collapse quite literally, to refer to an outcome where humanity across the globe loses civilization (at least temporarily), being reduced to a pre-agricultural way of life. The term is often used loosely to refer merely to a massive breakdown of order, the loss of modern technology, or an end to our culture. But I am talking about a world without writing, cities, law, or any of the other trappings of civilization.

This would be a very severe disaster and extremely hard to trigger. For all the historical pressures on civilizations, never once has this happened— not even on the scale of a continent.10 The fact that Europe survived losing 25 to 50 percent of its population in the Black Death, while keeping civilization firmly intact, suggests that triggering the collapse of civilization would require more than 50 percent fatality in every region of the world.11

Even if civilization did collapse, it is likely that it could be reestablished. As we have seen, civilization has already been independently established at least seven times by isolated peoples.12 While one might think resource depletion could make this harder, it is more likely that it has become substantially easier. Most disasters short of human extinction would leave our domesticated animals and plants, as well as copious material resources in the ruins of our cities—it is much easier to re-forge iron from old railings than to smelt it from ore. Even expendable resources such as coal would be much easier to access, via abandoned reserves and mines, than they ever were in the eighteenth century. 13 Moreover, evidence that civilization is possible, and the tools and knowledge to help rebuild, would be scattered across the world.

There are, however, two close connections between the collapse of civilization and existential risk. First, a collapse would count as an existential catastrophe if it were unrecoverable. For example, it is conceivable that some form of extreme climate change or engineered plague might make the planet so inhospitable that humanity would be irrevocably reduced to scattered foragers.14 And second, a global collapse of civilization could increase the chance of extinction, by leaving us more vulnerable to subsequent catastrophe.

One way a collapse could lead to extinction is if the population of the largest remaining group fell below the minimum viable population—the level needed for a population to survive. There is no precise figure for this, as it is usually defined probabilistically and depends on many details of the situation: where the population is, what technology they have access to, the sort of catastrophe they have suffered. Estimates range from hundreds of people up to tens of thousands.15 If a catastrophe directly reduces human population to below these levels, it will be more useful to classify it as a direct extinction event, rather than an unrecoverable collapse. And I expect that this will be one of the more common pathways to extinction.

We rarely think seriously about risks to humanity’s entire potential. We encounter them mostly in action films, where our emotional reactions are dulled by their overuse as an easy way to heighten the drama.16 Or we see them in online lists of “ten ways the world could end,” aimed primarily to thrill and entertain. Since the end of the Cold War, we rarely encounter sober discussions by our leading thinkers on what extinction would mean for us, our cultures or humanity. 17 And so in casual contexts people are sometimes flippant about the prospect of human extinction.

But when a risk is made vivid and credible—when it is clear that billions of lives and all future generations are actually on the line—the importance of protecting humanity’s longterm potential is not, for most people, controversial. If we learned that a large asteroid was heading toward Earth, posing a greater than 10 percent chance of human extinction later this century, there would be little debate about whether to make serious efforts to build a deflection system, or to ignore the issue and run the risk. To the contrary, responding to the threat would immediately become one of the world’s top priorities. Thus our lack of concern about these threats is much more to do with not yet believing that there are such threats, than it is about seriously doubting the immensity of the stakes.

Yet it is important to spend a little while trying to understand more clearly the different sources of this importance. Such an understanding can buttress feeling and inspire action; it can bring to light new considerations; and it can aid in decisions about how to set our priorities.

### Sustainability

#### Cap is sustainable, inevitable, and key to solve the environmental crisis – alternatives fail and ensure environmental collapse

-at: timeframe, thermodynamics, rebound effects

Bosch and Schmidt 19 (Stephan, Institute of Geography, Chair for Human Geography, University of Augsburg, and Matthias, Institute of Geography, Chair for Human Geography, University of Augsburg, “Is the post-fossil era necessarily post-capitalistic? – The robustness and capabilities of green capitalism”, Ecological Economics, Vol. 161, July) DB

Concerning the second dimension of criticism, Section 4 illustrates how the rejection of green capitalism overlooks promising approaches to surmounting the environmental crisis. On the one hand, we argue that in face of the given narrow time slot as well as the prevailing political strategies, it is more realistic and pragmatic to primarily assess the efficiency of market-oriented solutions. Even though in principle we take sufficiency to have the best effectiveness regarding the solution of ecological and social problems, we still do not count on people's willingness to live in greater moderation within due time. On the other hand, we therefore presume that there are no other suitable economic frame conditions for surmounting the crisis than those offered by the capitalist social order. This perspective is based on the assumption that innovations, which above all emanate from thriving economies (Wangler, 2013), are highly relevant for overcoming the environmental crisis. As growth, innovation, and the development of new industries are to be seen as directly related to the export sector as well as the utilisation of comparative advantages (Bathelt and Glückler, 2012), we therefore also strictly object to the concept of autonomy. Moreover, we take innovation and the aspects of growth, entrepreneurship, and democratic processes of negotiation related to it (cf. Gailing et al., 2013; Walter and Gutscher, 2013; Raven et al., 2016), to be essential for the implementation of regenerative energy systems and social welfare (Iversen, 2005; Nasirov et al., 2017). Our presumption that innovations occur more likely and more frequently within a capitalist, than in alternative social orders (e.g. Harris, 2013: socialist markets), is derived from Schumpeter's notion of competitive capitalism, which he distinctly sets apart from trustified capitalism. Competitive capitalism is about fertile destructive impulses emanating from enthusiastic entrepreneurs who are ready to take risks, and act solution-oriented. These impulses may revolutionise the economic process: “This process of Creative Destruction is the essential fact about capitalism” (Schumpeter, 2009). Based on Schumpeter's ‘theory of economic development’ (cf. Herzog and Honneth, 2016; Schumpeter, 1994; Schumpeter, 2009) – which, according to Marques (2008), represents the original idea of innovation-driven capitalism – we analyse capitalism's robustness to the downfall of fossil energy; moreover, we investigate its potential contributions to ecologic sustainability. Yet we want to go beyond Schumpeter's perspective, which fixes on the entrepreneur, and take a closer look at the role of state policy in Section 5. Our argument is that creative entrepreneurs and markets alone will not suffice to specifically and quickly initiate the change of the energy system driven by innovation. We state the thesis that an active role of the state is needed which relies on political continuity when it comes to promoting environmental innovation and creates stable institutional frame conditions. In a last step, we will show that during the deployment of regenerative energy systems, social aspects have hitherto been given too little attention by actors of state and politics and that national objectives were uncoupled from local contexts. To achieve a successful low-carbon transition, these deficits need to be corrected. In principle, this seems possible, as market-economically oriented regenerative energy systems have often been the result of open-minded democratic negotiations. In Section 6, the findings of the study will be summarised. 2. The crisis of fossil energies and capitalism Energy sources are a central element of humankind's materialistic history and elementary changes in the relevance of energy carriers have always led to extensive economic and societal transformations (Bridge et al., 2013). Exemplarily, the drastic increase in productivity during industrialisation cannot be explained without the revolutionary change of the energy system towards fossil fuels (Osterhammel, 2011). Ever since, economic growth is accompanied by an increasing consumption of finite energy resources and non-energetic primary materials (Altvater, 2005). Accordingly, questions of economic development must always be regarded in the context of the energy system, as well as the circulation of energetic and non-energetic crude materials within it (Meadows et al., 2004). Altvater (2007) takes the relationship between humans and nature to be crisis-laden because a limited stock of energy resources within the Earth's thin crust forms the basis of the present economic system. This limitation implied grave consequences for the global ecology. The apparently crisis-laden interrelation of nature and economy is also highlighted in ‘Anthropocene or Capitolocene?’ edited by Moore (2016), in which the impacts of capitalism are regarded as significant enough to be marked as their own geochronological era. The main point of criticism is capitalism's orientation to industrial scaling and quantitative growth (Mathews, 2011), which likely will end abruptly once Earth's limited capacities will have been depleted by the exponential growth of population and economy (Daly, 1995). Yet not only the finiteness of energy carriers, but also the accumulation of extreme meteorological incidents, mass mortality of species, and sea level rise represent impediments of stable economic growth (McCarthy, 2015). The scenarios concerning trends of the world's condition developed by the Club of Rome illustrate that keeping a high wealth level can only be accomplished if a radical change in societal attitude concerning the valuation of growth will take effect (Meadows et al., 2004). Stopping environmental destruction while maintaining the present economic system appears to be impossible, since fossil energy carriers provide globally acting companies with the opportunity to spatially separate production and consumption as well as to externalise the manifold ecological expenses (Chisholm, 1990). Bridge (2010) rates the heated debates about Peak Oil as ecologically motivated forebodings of a new energy order in which the modern industrial nations are going to free themselves of their dependence on oil. For Neomarxist groups, the end of the age of mineral oil even represents an apocalyptic turn of eras during which nature were going to take vengeance on the ecological arrogance of capitalism. According to Bettini and Karaliotas (2013), the narration of Peak Oil thereby attains a symbolism that reaches far beyond mathematical calculations of the scarcity of fossil energy sources, being extended to a general criticism of a system that is exclusively oriented on growth. McCarthy (2015) sees the chance of a post-fossil capitalism especially in the commodification of wind, sunlight, geothermal heat, and waves. This way, nature would again be introduced into the cycle of capital. Van den Bergh (2011) presumes that this may be a practicable approach, perceiving criticism of market economy and capitalism as too radical and warns of one-sidedly problematising growth without simultaneously pointing out realisable alternative ways. He therefore prefers the ‘a-growth-concept’, which assumes a neutral position on growth, trying to create social as well as ecological sustainability by means of pricing policy, environmental agreements, and education initiatives. The commodification of nature, however, is rejected by the degrowth movement, as the comparison of the Montreal Protocol, which is based on regulations (ozone) with the Kyoto Protocol based on trade had shown a greater effectiveness of regulative measures (Kallis, 2011). Concerning the market's capabilities, North (2010) additionally speaks of the neoliberal enthusiasts' mindless faith in technology, who were mistakenly convinced that creative destruction is sufficient to face the societal challenges posed by Peak Oil and the climate crisis. Sarkar and Kern (2008) limit the possibilities of the global community's further development to the two options ‘eco socialism’ or ‘barbarism’. This rhetoric stylises capitalism as the image of the enemy: on the one hand, it represents the cause of the global ecological crisis due to the exploitation of natural resources – and for that reason alone were not to be maintained (Daly, 2005) – while on the other hand not offering a suitable social framework for mastering the crisis (Kallis et al., 2009). Hence, the development of a symbiotic economy (Garcia-Olivares and Sole, 2015) rooted beyond obsessive economic growth (Buch-Hansen, 2018) is promoted. Renewable energies were apt to meet these requirements since they can be developed through collaborative bottom-up mechanisms on a communal level, therefore enabling the decentralisation and democratisation of energy supply (Rifkin, 2013). In fact, this may be an option. However, in the following, we want to demonstrate that capitalism is not only very robust to crises, but is also able to contribute to the solution of the environmental crisis. 3. Robustness of capitalism 3.1. Space-time compression We will now show that the possibility of increasing productivity does not end with the transition to a regenerative energy system, but only needs to be embedded into new logistic-infrastructural contexts. In this, we contradict Altvater (2007), Huber (2009) and North (2010), who claim that capitalism could expand only on the basis of fossil fuels, since, due to the global transportability of oil, gas, and coal, entrepreneurial actions are no longer bound to the local availability of energy resources, but range globally. Furthermore, the usage of fossil energy carriers is not subject to daily or seasonal fluctuations. Transportability and baseload capacity hence lead to space-time compression (Harvey, 1996), as products can be generated in ever shorter intervals of time. Following this logic, the limitation of the fossil resource basis inevitably brings about the end of the capitalistic system. It remains undisputed that energy flow within a solar-based energy system is hard to control (Georgescu-Roegen, 1971). Most forms of renewable energies are intermittent sources, whose contribution to the energy mix are subject to the rhythms of sun, wind, precipitation, and tides (Fares, 2015). Adapting energy production to demand, a fundamental prerequisite of continuous economic growth, thus becomes a major challenge. What Altvater (2007), Huber (2009) and North (2010) actually do not include in their considerations, are the numerous technological innovations for the stabilisation of regenerative energy systems. After all, with biomass and geothermal power, two energy carriers capable of providing base load are at hand (Matek and Gawell, 2015), which may, in the form of regenerative combined power plants, support the weather-dependent energy sources sun and wind (Palensky and Dietrich, 2011; Ramchurn et al., 2011). The numerous energy storage technologies are also important, albeit only few of these have reached industrial maturity. In principle, mechanical, chemical, electrical, or thermal kinds of storage are being discerned (Hadjipaschalis et al., 2009). Compressed air and pumped storage power plants with efficiency levels of up to 80% are especially promising (Anagnostopoulos and Papantonis, 2008). Research is also conducted on the conversion of surplus regenerative power into methane or hydrogen (Jensen et al., 2007), by which the bidirectional operation of the power and gas network is made possible, allowing for transportability as well as baseload capacity within large spatial units. Space-time availability may also be augmented by the development and capacity expansion of high-voltage transmission lines (Walter and Bosch, 2013). Harriss-White and Harriss (2007) have pointed out at an early point, that the existent grids, having been developed following a monopolistic logic, are outdated and incapable of integrating decentrally-produced electricity with strong fluctuations. These deficits, however, are successively being corrected. E.g., Germany's South, which is poor in wind but strong in terms of industry is being provided with direct access to the big wind energy off-shore potentials in the North as well as to the storage power plants in Scandinavia (cf. Fig. 1). The possibilities of intercontinental power transport from regenerative sources have been thoroughly investigated by DLR (2006) and Grossmann et al. (2014). Both energy storage and the development of the power grid thus will successively reverse the present space-time limitations of regenerative energy systems. The two domains, however, are not isolated from one another, but are coordinated via smart grids. Solomon and Krishna (2011) emphasise that smart grids are superbly suitable for the implementation of market-based approaches, so that an innovation-driven mass market for energy efficiency technologies could be anticipated. Smart grids also provide the possibility of no longer designing the mass production of renewable energy technologies on a fossil basis, but by the usage of renewable energy. While the production of the first generation of regenerative technologies was based on fossil energy, in future, the possibilities of energy storage, the almost unlimited energy potential of a solar-based economy, and the combination of both aspects through smart grids will ensure the flexible provision of regenerative energy at every production site without limits of time. Yet in order to optimise the flows of energy and material in smart grids, concepts of closed crude material cycles are needed, which, in the sense of the cradle-to-cradle approach (cf. Section 4), allow the reintroduction of used materials (e.g. old wind power plants made of renewable resources) to the biosphere. Thus, the problem of externalisation of ecological costs can be minimised. Summing up, the increase of productivity and stable economic growth within regenerative energy systems seems possible. Still, it remains to be emphasised that large-scale energy projects also entail negative social consequences. E.g., Yenneti et al. (2016) have shown that the Charanka solar park in Gujarat, India, was erected on areas that the local population's livelihood had depended on for decades. The refuse of access to these areas, as well as the inhabitants' successive dispossession through state measures thus are direct results of the Indian economy's ecological modernisation (Levien, 2013). In this context, Baka (2013) speaks of “energy dispossessions”, a phenomenon which has also been observed with large-scale wind energy parks (Avila, 2018; Cowell, 2010). The socio-material impact of economic modernisation on the local population, whose lives strongly depend on agricultural land use, are often insufficiently respected (Yenneti et al., 2016), so that the dubious impression was given that environmental protection and economic growth based on efficient technologies, competition, and state measures could go with one another without social side effects. Remarkably, the controversial energy mega-projects especially in the global South, are not the cause of the development of new power asymmetries and conflicts, but rather reproduce and harden long-standing social disparities and injustices (Avila, 2018). According to Bradley and Hedrén (2014), a low-carbon transition hence misses its aims if it is only about modernising the energy system without likewise transforming the underlying social structures. 3.2. Crisis as an element of capitalist social order We hold the view that the occurrence of crises in capitalism is not due to it being an ailing, doomed economic order; nor is it a proof of capitalism's ineptitude for meeting ecological challenges. Instead, we deem that crisis is a fundamental element of the capitalist social order that actually provides a chance for readjusting economic processes. Harvey (2011) explains that anything blocking the circulation and accumulation of capital may pose a threat to the capitalist system and induce a fundamental crisis. The finiteness of fossil fuels is a crisis of this kind (McCarthy, 2015). Altvater (2007) is convinced that capitalism will not be able to overcome this crisis; therefore, future technologic progress had to be embedded in a non-fossil, non-capitalist framework. Kallis (2011) also emphasises that the approach to a steady state (cf. Daly, 1991, Daly, 2005) will transform the institutional preconditions of property, work, banking, and distribution to such an extent that in the end, it will be impossible to still identify them as capitalistic. With regard to Kallis' doubts concerning the institutional robustness of capitalism, Schumpeter points out that precisely the ups and downs of industrial development, which are the outcomes of successful innovations' intensifying competition, enable progress (Herzog and Honneth, 2016). As crises therefore represent an immanent part of the capitalist system, an environmental and resources-related crisis caused by the capitalistic process does not provide sufficient evidence to suggest a possible downfall of the capitalistic social order. The crisis might even be taken as proof of an economic cycle, if it is regarded as a period of depression between the dwindling fossil and the emerging regenerative age. Böhm et al. (2012) and McCarthy (2015) confirm that capitalism is capable of overcoming even fundamental crises, actually using these as starting points of its further expansion. Concerning the environmental crisis, Harriss-White and Harriss (2007) also concede that the deployment of renewable energies holds the potential of founding a new form of capitalism that is characterised by a much lower degree of materialistic lavishness. Bettini and Karaliotas (2013) emphasise that from a neo-liberal point of view, the accusation of capitalism bringing about a resources-related and environmental crisis does not at all provoke self-doubts. Rather, it caused the profitable marketing of adequate approaches to solutions in the field of resource depletion and environmental impacts to move into economic focus. Even Altvater (2007) points out that the externalised effects of production and consumption on nature become relevant for companies once they jeopardise profitability and accumulation. In that case, environmental problems and their solutions can actually be made part of capitalist logic. Solomon and Krishna (2011) are convinced that in order to solve the environmental crisis, it were not even necessary to achieve further technologic breakthroughs, as the technologies needed for the remodeling of society towards energy efficiency were already mature and cost-efficient. Even if capitalism might be sufficiently robust, Kallis (2011) still takes the crisis as a chance to break up obstructive social and political lock-ins that have hitherto seemed unalterable and have lead into the crisis. Yet he does not regard the ability of social and political transformation to be inherent in the traits of market, but as a characteristic of a social order orientated towards degrowth. Certainly, Kallis is right in saying that the market is hard to control, making a concerted transformation towards sustainability difficult. Still his criticism only refers to that form of capitalism which Schumpeter characterised as trustified capitalism and which does lead to ecologically problematic lock-in effects. The criticism cannot, however, be applied to competitive capitalism, which generates those basic innovations giving rise to the revolutionary crises described as so fertile by Kallis (2011). Thus, an opportunity is provided for alternative social conditions to be brought about – but within the capitalist social order – and for substantiating these new conditions through further innovations. Innovations may emerge outside of competition and market economy, but will then lack the required frequency and force, as growth represents the most important incentive of innovation (Wangler, 2013). On the other hand, a continuous process of innovation again leads to growth, which may revolutionise the present social conditions, as Schumpeter states (Herzog and Honneth, 2016). Thereby, a new combination of the given means of production within new sites of production emerges, generating new goods, methods, and markets. Productive resources are applied to hitherto untested usages while being withdrawn from those usages they served before (Geels, 2011). What Kallis (2011) terms technological optimism with regard to the ecological innovative power of capitalism, is therefore technological realism in the context of Schumpeter's competitive capitalism. Without doubt, innovative boosts on the part of already established companies are also conceivable and may give rise to the possibility of maintaining trustified capitalism with its ecologically precarious structures. An example hereof is the innovation ‘Carbon Dioxide Capture and Storage’, by which the ecological impact of the emission intensive electrical conversion of coal is being reduced (Benson and Orr, 2008). Technological progress may hence stabilise the existent system of economy and policy that is accountable for the environmental crisis (Bettini and Karaliotas, 2013). In Schumpeter's view, however, the decisive economic order is competitive capitalism, which is characterised by the aggressive economic demeanour of new, innovative enterprises economically challenging the establishment (Herzog and Honneth, 2016). The start-ups of new companies, which are inseparably connected with the processes of innovation, withdraw production goods from the present capitalist system by underbidding, disturbing the former economic balance that is so destructive for nature. Competition is therefore essential for overcoming the environmental crisis. In that respect, the concept of ‘solidary economics’ and its precept of surmounting the allegedly ruthless principle of competition and emancipating oneself from the logic of the markets (Embshoff and Giegold, 2008), is counterproductive, as the renunciation of competition impedes the breakup of crusted economic structures, which thus continue to harm the environment. After all, the big energy providers' strategy was and is to hold on to the fossil-nuclear power plant pool for as long as possible, suppressing alternative concepts of energy supply (Gawel et al., 2012). A radical transformation of the energy system therefore cannot emerge from the existent structures, as Schumpeter assesses (Herzog and Honneth, 2016). Instead, innovative processes emerge outside of the old major companies until proceeding to attack the incumbent regime through the rededication of means of production (Geels, 2011). Innovative marketing strategies of small and middle scale businesses supplanting cumbersome large companies play an essential part especially in the field of renewable energies (Walsh, 2012). In this, competition is a decisive element that cannot easily be superseded. 4. Capabilities of green capitalism A competitive green capitalism develops great creativity by its high rate of innovation, which may also reinvent the relationship between humans and nature. We now want to exemplify how this might be brought about. Schumpeter holds the view that innovation is the result of the capitalistic entrepreneurial spirit, not the other way round (Herzog and Honneth, 2016). Technological and social progress hence are no independent variables materialising out of thin air, but arise from the logic of the capitalist process. Meadows et al. (2004) accept that innovations may relocate the limits of growth, making it possible to maintain the living standard by continuously reducing the consumption of crude materials and energy. However, one of the energy system's prevailing deficits is that depleted or not yet tapped resources are being (re-)obtained based on non-regenerative energy (Schwartzman, 2008), causing capitalistic production to be increasingly energetically inefficient (Murphy and Hall, 2011). Overcoming the energy crisis hence calls for the consideration of thermodynamic principles (Georgescu-Roegen, 1971, Georgescu-Roegen, 1986; Martinez-Alier, 1987). Harriss-White and Harriss (2007) see the deployment of renewable energies as a possibility of limiting the creation of entropy. Kaberger and Mansson (2001) have shown that innovative resources-saving material cycles may be possible and economical if they are based on the usage of the inexhaustible energy of irradiance. What is promising about this approach is that, due to research and development, the utilisation of solar energy becomes more and more efficient and lucrative (Schmid, 2016). Moreover, its inexhaustible potential allows for the exploitation of material resources even from deposits with extremely low crude material density. On a local level, the utilisation of solar energy may actually lead to a reduction of entropy (Ebeling et al., 1998; Kranert and Cord-Landwehr, 2010), as it is the case with the usage of waste heat of solar thermal power plants for the desalination of sea water (DLR, 2007). The integration of these capacities into smart grids and the associated remodeling of every production process to purely regenerative sources have been detailed in Section 3. We further argue that innovation surpasses conceivability. Even Harris (2010) sees a particularly high potential in unpredictable technological innovations to break through economic routine, thus encouraging further entrepreneurs in issuing their own innovations. Capitalism might thereby be provided with the chance to reduce its ecological exploitation. But innovation exceeds strictly technological aspects and may as well comprise social and institutional aspects (Arentsen and Bellekom, 2014). E.g., in the mobility sector, whose pollutant emissions have significantly contributed to the environmental crisis, innovations have led to new features of cargo and passenger transportation. This is illustrated by the example of car sharing as an innovative life style (Prettenthaler and Steininger, 1999) or bicycle-sharing schemes in urban areas (Midgley, 2011). Another representative case is the history of the ozone hole, which Meadows et al. (2004) describe as a history of civil success regarding the correction of a severe overshoot. Quite in the sense of Schumpeter, Meadows et al. (2004) name the ‘industry's creative heads’ as the crucial problem-solving determinant. Through the three innovative boosts ‘better insulation’, ‘reduced toxic substitute materials’, and ‘emission-free alternative substances’, it will be possible to rebuild the original density of the ozone layer by the mid-21st century. Remarkably, this is realised without abandoning the existent economic system. Furthermore, we argue that it is realistic to assume growth-oriented, competitive markets in the future, rather than socio-material conditions beyond them, which, as stated by Van den Bergh (2011) are completely uncertain as of now (e.g. Harris, 2013: socialist markets). We therefore hold the view that it is more pragmatic to design future mass markets in an eco-friendly way. Kallis (2011) rejects the possibility that the wonder of a dematerialised economy might occur, as improvements of efficiency were overcompensated by growing consumption. While dematerialisation may be tantamount to a wonder, researchers still do put effort into adjusting the materialised economy to ecological compatibility. One aspect is the thorough redefinition of nature protection, because nowadays, nature protection is reduced to the attempt of limiting the harmfulness of processes and products (Mulhall and Braungart, 2010). However, due to the potential creation of new mass markets for more eco-friendly and efficient processes or products, this strategy holds the danger of actually augmenting unwanted effects through rebound effects. In this regard, Alcott (2005) points to the Jevon's Paradox which says it is a great error to think that technologic innovations were going to reduce the consumption of resources. Polimeni et al. (2015) name the example of the Green Revolution: the remarkable increase of food production's area efficiency was not at all able to abate the problems of hunger and area consumption, as consequently, the population greatly increased. Likewise, a mass market of efficient and eco-friendly products would again lead to a massive amount of poison and waste, with disposed crude materials hardly being recycled. The ecological costs then would have to be externalised, which Sturm and Vogt (2011) regard as strong evidence of the failure of the market. The core problem hence lies in the fact that products are being produced exclusively for the technosphere (McDonough and Braungart, 2013). E.g., copper is almost universally applicable to and beneficial for technological systems, while in biological systems, this material is extremely poisonous. Thus, the aim must be to design products in a way that makes them equally usable in biosphere, i.e. subsequent to their technical usage. This calls for the development of a combined management of nutrients for techno- and biosphere. Human ways of living, the processes and products they are based on, may thereby be employed for the benefit of nature. The focus must therefore be put on those innovations that break up the present paradigm of environmental protection by realising products that create a useful material connection between techno- and biosphere. An example of this kind of creative destruction is the Austrian company Gugler, the first print shop worldwide that produces printing products free from harmful ingredients and exclusively with substances that can be biologically recycled (Gugler GmbH, 2018). E.g., the accruing sludge is returned to biosphere and the ash of burned printing products can be reused as a fertilizer. These conditions provide the possibility of designing economic activities to be ecologically compatible despite a high resource throughput.

#### It’s key to space exploration

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There are thus two plausible end-points to our current phase of growth: collapse back to a pre-industrial level (the supernova burns out), or continued growth taking us onto a sustainable level of technological maturity (the baby grows up). The difference between these two future courses is immense. In terms of population, the carrying capacity of Earth for human populations is greater than the current 6 or 7 billion, but not very much so, perhaps a few tens of billions (depending on the technologies available). Any retreat to medieval levels of technology would cut this figure by a factor of ten, probably down to less than a billion. But the carrying capacity of the Solar System is at least a million times greater than that of a high-tech Earth, and that of the Galaxy at least a billion times greater again than that of the Solar System. The present-day situation of human society is therefore that it finds itself at a cross-roads of unparalleled significance. If growth is not maintained, then, unless they can reignite that growth phase, our descendants are forever restricted to planet Earth. But must they necessarily fall back to a medieval or even more primitive level? Could industrial civilisation survive for a while in a zero-growth phase at around its present-day level of development, and if so, for how long? In any discussion of mankind and space, this is a key question which must be addressed. Certainly, pre-industrial civilisations have survived with little change over millennial timespans, but to what extent does industrial technology change this picture? And what about million-year timespans? The only types of industrial civilisation we have observed so far have been that based on capitalist economics, and that based on socialism, in which a political ideology takes over the role of capital. Capitalist societies would seem to be expansionary in their very nature: they are defined by the self-multiplying power of capital. But could a socialist society, one with a suitable ideology which was sufficiently severely imposed, preserve zero growth indefinitely? I think not, because societies evolve in an unpredictable manner. Governments which have tried to maintain control in, say, Tokugawa Japan (1603-1868) or Soviet Russia (1917-1989) have failed in their goals of stability (Japan) or planned growth (Russia), and modern liberal democracy works by limiting its ambitions and ceding much power to the economy at large. Even a global dictatorship, which unlike those two historical examples would by definition not face competition from abroad, would, I think, be unable to control all the disruptive political, technological and economic forces emerging unpredictably worldwide over centuries and millennia. The result would then be either the breakout of a new phase of growth, or decline and collapse. In view of the likelihood of long-term adverse climate change (whether triggered by industrial pollution, or asteroid impact, or an outbreak of super-vulcanism, or the return of ice-age conditions, or solar variations), and in addition the persistent threat of global high-tech conflict (whether spreading destruction by nuclear weapons, or computer viruses, or genetically engineered organisms, or microscopic or macroscopic robots), decline would be the more plausible outcome. Nevertheless, the question as to how long a global zero-growth industrial civilisation could survive in a stable state on one planet is an interesting one, though not one that is likely to attract unbiased analysis by modern sociology. What, however, if growth is maintained? Surely Earth will become overburdened and that growth will lead to environmental and social collapse? The point here is that, while the resources of Earth are limited, those of the Solar System are very much greater. Growth in population sizes and in the usage of energy and raw materials may therefore continue for a number of centuries into the future, provided that two conditions are met: \* Material growth on Earth levels off; \* Material growth in space and on other planets takes over the upward trend. Is this not equivalent to saying that Earth must settle down with a zero-growth society before space development begins? No, so long as the terrestrial and extraterrestrial economies are linked. While this remains true, it will be possible for investors on Earth to invest capital in extraterrestrial development, and receive dividends back from that development. While most Earth-dwelling people will remain on the mother planet, there will also be flows of people, goods and ideas between Earth and her colonies, which must also have a profound economic effect. A net inflow of value to Earth is in any case necessary in order that terrestrial investment in outer space does not merely produce inflation in the home economy. But that inflow need not be of material goods, and is more likely to consist of energy (solar power delivered on microwaves or lasers) and information (software and product development). But surely ultimately the limits of the Solar System will be reached, and the interplanetary civilisation have to settle down as a zero-growth society? Yes, granted. But this differs from a zero-growth planet Earth due to the immense size of the Solar System, which is larger than Earth by between four and six orders of magnitude, depending how far out one wants to go – to the distance of Mars, say, or to the Oort comet cloud far beyond Pluto. An interplanetary industrial civilisation is secure for the long term in a way that a monoplanetary one is not, because it is too large to form a unity, either politically or environmentally, and because it is forced to adapt to a wide range of hostile environmental conditions. It will therefore be secure against any conceivable environmental or military disaster, because such a disaster can only affect a single planet, or at most a limited region of the system. Climate change or world war on Earth has no effect on Mars, and vice versa. And with the majority of the population in orbiting artificial space colonies, even a major change in solar luminosity could be tolerated (though such a change is not expected to have a noticeable effect for hundreds of millions of years yet). With interplanetary civilisation, the social system as a whole can tolerate decline and collapse in particular locations, because they can then be recolonised from outside. Once humanity achieves interstellar status, this security factor is clearly vastly enhanced. However, in order for interplanetary growth to occur in the first place, an economic mechanism must be in place to drive it. The most suitable economic mechanism that has been demonstrated so far is capitalism. Its need for continuous expansion makes it highly appropriate as an economic system for a society colonising its local planetary system.