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### Innovation Adv

#### Advantage One: Innovation

#### Innovation lags cause China conflict and existential threats

Suchodolsk 20 [Jeanne Suchodolsk, attorney with the United States Navy Office of General Counsel, December 2020 https://scholarship.law.unc.edu/cgi/viewcontent.cgi?article=1416&context=ncjolt]

Innovation, in particular, technology-based innovation, is the key driver for both economic competitiveness and national security. Other nations, with interests adverse to the United States, recognize this fact. In an increasingly interconnected world, nation states seek to accumulate innovation prowess, and hence economic strength, as a key element of their geopolitical power. Especially savvy nation states also pursue such ends as a mechanism to influence or diminish the national security and geopolitical power of the United States. There is no need to inflict upon the world the carnage of war if one’s geopolitical aims can be achieved via alternative competitive means.

Several authors suggest China’s long-term ambitions include unseating the United States as the world’s economic and political leader.1 More compelling than opinions, several United States (“U.S.”) government and private studies document a systematic and coordinated effort by China to achieve technical and economic dominance through misappropriation of U.S. technology.2 These efforts are additionally supported by a companion effort to weaken international economic institutions and norms designed to protect U.S. intellectual property and free trade.3 The Chinese tactics include illegal means, and sophisticated use of legal means, to misappropriate U.S. technology and weaken the U.S. innovation infrastructure including:

a) Leveraging the open university and laboratory ecosystem via direct sponsorship and engagement of Chinese nationals;4 b) Devaluing U.S. positions in patents and technology platforms;5 and c) Accessing private sector U.S. technology through acquisitions and ownership stakes in existing firms, funding of high-tech start-ups, and forced joint ventures and other contractual agreements as a prerequisite for entering the Chinese market.6 This particular form of competitive strategy targeting the innovation ecosystem in the United States is labeled by the Authors as “Innovation Warfare,”7 and it is defined as an executable competitive strategy: a) Reflecting an innovation, intellectual property, and technology strategy articulated and executed by the state (e.g. China); b) Using illegal means, political means, and legal economic activities—of the type previously residing solely in the province of commercial enterprise, to achieve the state’s objectives; c) Employing these economic and innovation activities to achieve both economic geopolitical power and to enhance military capabilities; and d) Functioning as a military, national security, and defense doctrine not solely as a reflection of the state’s economic policy goals nor commercial competition in the ordinary course.

Innovation Warfare does not just threaten American jobs and economic prosperity. By simultaneously co-opting and weakening the innovation capabilities of the United States, China seeks to advance its rise to world power. China’s prosecution of Innovation Warfare not only encompasses a rejection of a rules-based international order, but also poses an existential threat. A world where China dominates the technology landscape is not just about who earns the profits or prevails in an abstract geopolitical fight. According to the National Security Strategy of the United States of America (“National Security Strategy”), China pursues a world in which economies are less free, less fair, and less likely to respect human dignity and freedoms.8 China’s Innovation Warfare activities risk the type of economic and geopolitical aggressions that were a root cause of two World Wars.

#### Arguments that the US will continue to beat China in innovation are highly risky assumptions – the US is losing its edge and is in danger of failing

Atkinson 19 (Robert David Atkinson is a Canadian-American economist. He is president of the Information Technology and Innovation Foundation, a public policy think tank based in Washington, D.C., that promotes policies based on innovation economics. He was previously Vice President of the Progressive Policy Institute, Caleb Foote is a research assistant at the Information Technology and Innovation Foundation NOT the actor from The Kids are Alright, unfortunately :/ April 2019, “Is China Catching Up to the United States in Innovation?” Page 6, Information Technology and Innovation Foundation <https://projects.iq.harvard.edu/files/innovation/files/2019-china-catching-up-innovation.pdf>) MULCH

The second factor relates to national security and the defense industrial base—a critical issue for the United States as U.S. defense superiority is based is in largely part on technological superiority. American service men and women go into any conflict with the advantage of fielding technologically superior weapons systems. But sustaining that advantage depends on the U.S. economy maintaining global technological superiority, not just in defense-specific technologies, but in a wide array of dual-use technologies. To the extent the United States continues to lose technological capabilities to China, U.S. technological advantage in defense over China will diminish, if not evaporate, as U.S. capabilities whither and Chinese ones strengthen. It is certainly a highly risky proposition to assume the United States can continue its weapons systems superiority over the Chinese if: 1) the Chinese continue to advance, largely through unfair, predatory practices, at their current pace; and 2) the United States loses a moderate to significant share of its advanced technology innovation and production capabilities. As ITIF wrote in 2014, “The United States defense system is still the most innovative in the world, but that leadership is not assured and is in danger of failing. This decline is not only impacting defense innovation and capabilities, but also overall commercial innovation and U.S. competitiveness.

#### Specifically, Parker immunity discourages disruptive healthcare innovation

Sage 17 (William Sage, James R. Dougherty Chair for Faculty Excellence in the School of Law and Professor of Surgery and Perioperative Care in the Dell Medical School, University of Texas at Austin; and David Hyman Professor at Georgetown University School of Law, “Antitrust as Disruptive Innovation in Health Care: Can Limiting State Action Immunity Help Save a Trillion Dollars?” Loyola University Chicago Law Journal, Pages 731-734, modified for ableist language indicated by strikethrough and [brackets]) MULCH

Physicians possess this power for a simple reason: the body of doctrines and practices that we call “health law” systematically supports it. Laws protect the public from individuals and therapies not controlled by physicians, and discourage medical self-help. Laws fund physicians’ tools and assure their quality—though unfortunately not their value. Laws mandate and subsidize insurance coverage for the treatments physicians recommend. Laws insulate physicians from corporate structures and contractual norms. Laws mediate disputes between physicians and patients based on professional standards. Laws apply medical criteria to most ethical issues. Finally, laws such as those challenged in North Carolina State Board delegate substantial rule making and disciplinary authority to state licensing boards (i.e., to entities populated from, and controlled by, the medical profession). States typically justify this abdication of direct oversight in terms of physicians’ scientific expertise, and their ethical duty to heal, not harm, patients.

Both individually and collectively, these laws profoundly distort competition in health care and severely hamper the market’s ability to generate the benefits of competition that we see in other industries. Production remains fragmented. Prices are both inflated and arbitrary— and price competition is minimal (when it even exists at all). There are many barriers to competitive entry—even to deliver the most basic services. Geographic markets are needlessly small and are surprisingly concentrated. Supply bottlenecks are common, often to the mutual benefit of large health insurers and dominant health care providers. And innovation is limited to the sorts of inputs that fit into existing production processes—mainly drugs, diagnostics, and medical devices.

The result is that our health care system almost never trades in the types of consumer products that dominate other costly, complex, technologically sophisticated industries. Instead of fully assembled products accompanied by a strong performance warranty, patients are expected to pay for disaggregated professional process steps (including procedures and consultations) to which billing codes have been assigned, and for equally atomized inputs and complements to those professional processes (such as diagnostic tests and surgical supplies). Health insurance agglomerates these unstructured procedural steps and physical inputs into “covered benefits,” but it does not assemble them into actual, useful products—and only a few true Health Maintenance Organizations (“HMOs”) provide comprehensive prepaid care.

The past decade has witnessed growing agreement regarding both the necessary attributes of a high-performing health care system,17 and the managerial strategies for achieving them.18 Much less attention has been paid to the legal obstacles that have long hindered attempts to redesign acute and complex care—let alone to moving the locus of basic care “upstream,” where it can be communally or self-administered, rather than professionally controlled. As currently constituted, American health law presents concrete structural impediments to accomplishing these consensus health policy goals, and also creates opportunities for incumbent providers to delay or sabotage such efforts.

C. Anticompetitive Effects of Medical Licensing The deep legal architecture of health care strongly favors physician self-regulation, and furthers physicians’ professional insularity and self interest. Physician-controlled medical licensing boards have attracted criticism for decades. Milton Friedman famously wrote in 1962: I am . . . persuaded that [restrictive] licensure has reduced both the quantity and quality of medical practice; . . . that it has forced the public to pay more for less satisfactory medical service[;] and that it has ~~retarded~~ [slowed] technological development both in medicine itself and in the organization of medical practice.19

At the time he made it, Friedman’s harsh economic critique of occupational licensing was not widely shared (except among other libertarians). Professional elites were thought to represent a progressive, prosperous alternative to industrial commodification and the supposed exploitation of labor. To be sure, there was some recognition that the professions might use ethical codes to pursue their own economic selfinterest.20 But mainstream economists such as Kenneth Arrow still believed that collective professionalism improved the marketability of health care by fostering the trust needed to overcome medical uncertainty and informational asymmetry between physicians and patients.21 More recently, a wide array of voices have questioned the economics, and even the justice, of professional privilege.22 In 2015, the Obama Administration issued a report on occupational licensing, finding that “licensing can . . . reduce employment opportunities and lower wages for excluded workers, and increase costs for consumers,” and that “the costs of licensing fall disproportionately on certain populations.”23

To be sure, medical licensing laws are not solely to blame for health care’s competitive shortcomings. Other federal and state regulations and subsidies bear responsibility as well. Still, licensing boards set the tone for the rest of health law as gatekeepers into the health professions and arbiters of practice once admitted. These boards determine the permitted scope of practice, confer authority to write prescriptions, police departures from conventional patterns of care, respond to complaints by licensees about outsiders, and decide when (and, usually, when not) to take disciplinary action against a licensed professional.

From a health policy perspective, physician-imposed barriers to market entry and innovation—typically enforced by a professional licensing board—are the most pernicious practice. Licensing boards set standards for acceptability and impose discipline on licensees who violate their dictates. Unlicensed practice is a criminal act. These entry barriers not only deter novel approaches from new directions, such as telehealth and various “upstream” self-care modalities, but they also discourage existing competitors from adopting practices introduced to the market by disruptive innovators.

#### Disruptive innovation in healthcare solves pandemics

Shaikh 15 (Affan T. Shaikh, Professor at Emory’s school of public health Lisa Ferland, Robert Hood-Cree, Loren Shaffer, and Scott J. N. McNabb, September 23rd 2015, “Disruptive Innovation Can Prevent the Next Pandemic” NCBI <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4585064/>) MULCH

Public health surveillance (PHS) is at a tipping point, where the application of novel processes, technologies, and tools promise to vastly improve efficiency and effectiveness. Yet twentieth century, entrenched ideology and lack of training results in slow uptake and resistance to change. The term disruptive innovation – used to describe advances in technology and processes that change existing markets – is useful to describe the transformation of PHS. Past disruptive innovations used in PHS, such as distance learning, the smart phone, and field-based laboratory testing have outpaced older services, practices, and technologies used in the traditional classroom, governmental offices, and personal communication, respectively. Arguably, the greatest of these is the Internet – an infrastructural innovation that continues to enable exponential benefits in seemingly limitless ways. Considering the Global Health Security Agenda and facing emerging and reemerging infectious disease threats, evolving environmental and behavioral risks, and ever changing epidemiologic trends, PHS must transform. Embracing disruptive innovation in the structures and processes of PHS can be unpredictable. However, it is necessary to strengthen and unlock the potential to prevent, detect, and respond.

Introduction

Fifty-two years ago, Alexander Langmuir articulated our modern understanding of public health surveillance (PHS) – the systematic collection, consolidation and evaluation, and dissemination of data (1). In this workflow process, public health provides epidemiologic intelligence to assess and track conditions of public health importance, define public health priorities, evaluate programs, and conduct public health research (2). However, amid this rapidly changing world, PHS has remained sluggish and hindered by the impediments of siloed, vertical (outcome-specific) systems, inadequate training and technical expertise, different information and communication technology (ICT) standards, concerns over data sharing and confidentiality, poor interoperability, and inadequate analytical approaches and tools (3–7).

Gaps and impediments in PHS have become increasingly evident to the world in the wake of the largest Ebola epidemic ever – in which these challenges impacted our ability to prevent, detect, and respond. Under the looming threat of MERS-CoV, leishmaniasis, influenza, multidrug-resistant tuberculosis, and plague, the global public health community now realizes the urgent need to address shortcomings in PHS. Properly preparing for the next major outbreak hinges on our willingness to transform; the consequences of not doing so are dire.

Transforming PHS to meet the needs of the twenty-first century requires novel approaches. A helpful concept to understand and chart this future is disruptive innovation – a term first introduced by Clayton Christensen to describe innovations in technology and processes that disrupt existing markets (8). Disruptive innovations occur when advances in technologies or processes create markets in existing industries. This differs from sustaining innovations, where existing practices are incrementally improved to meet the demands of existing customers; in contrast, newly introduced innovations with disruptive potential (typically unrefined, simple, and affordable in character) target lower-end market needs or create entirely new market segments. As sustaining innovations improve disrupting technologies or processes, these new innovations will meet increasingly greater needs, capture greater market share, and eventually reshape the industry. Christensen uses the example of increasingly smaller disk sizes in the hard disk drive industry, the introduction of hydraulic technology in the mechanical excavator industry, and the rise of minimills in the steel industry to demonstrate the impact of disruptive innovations (8). Here, we describe the need for disruptive innovation in PHS and identify opportunities for disruption in PHS structures and processes.

#### New pandemics are coming and cause extinction – preventative measures solve

Diamandis 21 (Eleftherios P. Diamandis, Division Head of Clinical Biochemistry at Mount Sinai Hospital and Biochemist-in-Chief at the University Health Network and is Professor & Head, Clinical Biochemistry, Department of Laboratory Medicine and Pathobiology, University of Toronto, Ontario, Canada, April 14th 2021, “The Mother of All Battles: Viruses vs. Humans. Can Humans Avoid Extinction in 50-100 Years?” modified to fix author typo [“could result n” 🡪 “could result in” <https://www.preprints.org/manuscript/202104.0397/v1>) MULCH

The recent SARS-CoV-2 pandemic, which is causing COVID 19 disease, has taught us unexpected lessons about the dangers of human extinction through highly contagious and lethal diseases. As the COVID 19 pandemic is now being controlled by various isolation measures, therapeutics and vaccines, it became clear that our current lifestyle and societal functions may not be sustainable in the long term. We now have to start thinking and planning on how to face the next dangerous pandemic, not just overcoming the one that is upon us now. Is there any evidence that even worse pandemics could strike us in the near future and threaten the existence of the human race? The answer **is** unequivocally yes. It is not necessary to get infected by viruses of bats, pangolins and other exotic animals that live in remote forests in order to be in danger. Creditable scientific evidence indicates that the human gut microbiota harbor billions of viruses which are capable of affecting the function of vital human organs such as the immune system, lung, brain, liver, kidney, heart etc. It is possible that the development of pathogenic variants in the gut can lead to contagious viruses which can cause pandemics, leading to destruction of vital organs, causing death or various debilitating diseases such as blindness, respiratory, liver, heart and kidney failures. These diseases could result [in] the complete shutdown of our civilization and probably the extinction of human race. In this essay, I will first provide a few independent pieces of scientific facts and then combine this information to come up with some (but certainly not all) hypothetical scenarios that could cause human race misery, even extinction. I hope that these scary scenarios will trigger preventative measures that could reverse or delay the projected adverse outcomes.

#### **Health innovation solves ABR – kills 10 million people per year, more market access is key**

McMurry-Heath 9/16 (Michelle McMurry-Heath is president and CEO of the Biotechnology Innovation Organization, and lives in Washington, D.C. Tomaras is chief scientific officer at Forge Therapeutics, and lives in San Diego, September 16th 2021, “Opinion: Antibiotic-resistant superbugs are a ticking time bomb in global health care” San Diego Union Tribune, <https://www.sandiegouniontribune.com/opinion/commentary/story/2021-09-16/superbug-drugs-therapy-antibiotics>) MULCH

The global health-care system faces a ticking time bomb.

Deadly bacteria and fungi are evolving to resist all current antimicrobials. If that happens, everything from chemotherapy to routine surgeries will become extraordinarily risky, since patients’ weakened immune systems won’t be able to fight off these dangerous infections, and existing medicines will be of little use. The United Nations estimates that without new antibiotics, by 2050, superbugs could kill 10 million people a year.

We don’t know exactly when our last antibiotics will lose their efficacy. We don’t know which strain of “superbug” will push us past the tipping point. But we do know that America’s small biotechnology firms house some of the brain power to avert this disaster.

These firms and their scientists — many based here in California — are battling hard against this microscopic enemy. But small biotechnology firms are not just fighting microbial evolution; they are also grappling with a broken antibiotics market whose inefficiencies are putting millions of lives at risk.

Antibiotics are expensive to develop, costing upwards of $1 billion per new medicine. But doctors only prescribe advanced new antibiotics sparingly — because every dose gives bacteria a chance to evolve and become resistant. And most patients only need antibiotics for a few days, unlike insulin or statins, which many chronic disease patients need to take every day for years or even decades.

Because of the high research and development costs and low probability of earning a financial return on antibiotics, many large pharmaceutical companies have pivoted away from antibiotics development. Since the 1980s, the number of major drug companies developing new antibiotics has fallen from 18 to three.

#### Antibiotic resistant superbugs and zoonotic viruses are catastrophic risks that guarantee extinction.

Victor 20 — Gavin Victor, Pioneer Journalist and Philosophy Research Assistant for Whitman College, 2020 (“Forget coronavirus: Worry about antibiotic resistance instead,” *Whitman Wire*, March 12th, Available Online at https://whitmanwire.com/opinion/2020/03/12/forget-coronavirus-worry-about-antibiotic-resistance-instead/, Accessed 07-02-2021)

A survey of experts from the “Future of Humanity Institute” at the University of Oxford states that there is a 19 percent chance of human extinction before 2100. If this is the risk of our extinction, then consequently, an extreme decrease in quality of life is much more likely, too. Among the many risks within contemporary life, issues surrounding antibiotic resistance are almost completely unacknowledged, incredibly dangerous and subject to change with only slight cultural and industrial shifts. The WHO claims that, “without urgent action, we are heading towards a post-antibiotic era, in which common infections and minor illnesses can once again kill.” The UN claims that by 2050, ten million people will die every year from antibiotic-resistant diseases – which is more than the current figure for cancer.

Antibiotic resistance stems from the misuse of antibiotics. The more we use antibiotics, the more we allow bacteria to build up a tolerance to them. We have already seen the advent of MRSA and antibiotic-resistant salmonella. The most obvious fix for this is to only prescribe antibiotics when absolutely necessary, which doctors are beginning to do. Humans, however, only use 20 percent of the antibiotics manufactured. The rest are consumed constantly by animals waiting for slaughter in massive feeding operations. Lance Price, an expert on bacteria resistant “superbugs”, claims that our food system’s predication on a constant use of antibiotics for animals is a recipe for disaster, because it uses antibiotics in a way that will inevitably lead to antibiotic resistance.

As with almost all recent disease outbreaks – like Swine-flu, MERS and SARS – COVID-19 is zoonotic, meaning that it originated in animals. Not only did these diseases originate in animals but in a particular species of animals that inhabit unnatural conditions for the sake of humans: including Swine-flu from pigs, MERS from camels, as well as SARS and COVID-19 likely originating from bats. While viruses are not the same problem as is antibiotic resistance, overlap between them indicates that top priority global health issues are stemming from our failure to have a healthy relationship with animals. We get zoonotic diseases as a result of exploitative and unnatural relationships with animals.

We need to use the fear generated by COVID-19 to jump start legitimate action in order to mitigate the fallout from catastrophes right around the corner. The fact that we turn a blind eye to pandemics that are becoming more and more inevitable is a sign that we shouldn’t trust our natural tendency to just “deal with it later.” Dealing with it later, dealing with the pandemics that are coming, doesn’t work. We should be scared – but of much more than COVID-19.

#### Narrowing Parker immunity empowers the FTC to challenge anticompetitive business sanctioned by state regulatory schemes. Those stifle innovation – incumbent regulations are outdated and block new entrants.

Crane 19 [Daniel A. Crane, Frederick Paul Furth Sr. Professor of Law, University of Michigan, 60 Wm. & Mary L. Rev. 1175, 2019, Lexis]

INTRODUCTION

This Article's intended audience holds a common view that state and local governments frequently adopt anticompetitive regulations for the benefit of economic special interests and that these acts of cronyism are pernicious to democracy, consumers, and economic efficiency. 1 In other words, the costs to society of these regulations far outweigh any reasonable benefits. A wise, beneficent, and all-knowing Platonic guardian of the state would have little trouble in striking down such regulations.

A further point of general consensus might relate to the particularly pernicious effect of anticompetitive state and local regulation in stifling new production innovation. In a variety of ways, our constitutional order is stodgy. Its conservatism lends a hand to the beneficiaries of incumbent technologies as they seek to deploy state power to block or to slow the advent of new technologies that may eventually displace the old, thereby preventing a realignment of wealth and position. In recent years, innovative technologies developed by companies such as Tesla, Uber, Lyft, and Airbnb have encountered determined opposition from purveyors of predecessor technologies, who have often used state and local regulation to thwart innovation. 2

So much for the common ground. Where consensus quickly fragments is on the question of what, if anything, to do about such regulations given that wise, beneficent, and all-knowing Platonic guardians of the state are in short supply. In the imperfect messiness that is liberal democracy, we frequently accept a host of comparatively petty inconveniences--political and economic--in order to preserve larger values. Just as we tolerate many market failures because the attempt at a regulatory fix might aggravate matters, we may have to tolerate some political failures on the same grounds.

[\*1178] Much of the difficulty has to do with the fact that while there might be a broad consensus that state and local governments enact many unjustifiable anticompetitive regulations, there is not a clear consensus on which ones they are. The experience with economic substantive due process in the late nineteenth and early twentieth centuries, epitomized in Lochner v. New York, 3 has left the American political psyche gun-shy about permitting judges to strike down protectionist economic regulations on constitutional grounds. Shortly after getting out of the Lochner business, the Supreme Court announced that it would not get into the same business under the guise of the antitrust laws. 4 Over time, the development of the Parker state action doctrine allowed the courts to play a somewhat expanded role with respect to anticompetitive state and local regulations, but the zone of judicial review remains relatively constricted. 5

The purpose of this Article is to compare the deployment of constitutional and antitrust tools to scrutinize potentially anticompetitive state and local regulations against the backdrop of the ubiquitous concern about "Lochnerizing" under the auspices of either constitutional or statutory authority. Here is the question in a nutshell: If one believes that courts (or perhaps federal administrative agencies) should do somewhat more than they currently do to scrutinize and potentially invalidate anticompetitive state and local regulations, which lever should they pull--constitutional doctrines, antitrust preemption, or both? Because there are some overlapping, and some separate, institutional constraints and potential pathologies between constitutional and antitrust law, it is important to compare the two tools before deploying them.

This Article is organized as follows: Part I diagnoses the underlying features of democratic government that produce anticompetitive regulation. Some of this story is quite familiar, but I present some new observations with respect to the role of technological incumbency as a strong factor in invoking regulation to thwart innovation.

[\*1179] Part II explores the historical, ideological, and institutional foundations of the current legal doctrines with respect to constitutional and antitrust scrutiny of anticompetitive regulations. It shows that, despite the narrowing of Parker immunity in recent decades and some recent revival of equal protection and substantive due process as constraints on anticompetitive regulation, a good deal of anticompetitive state and local regulation remains impervious to legal challenge.

Part III compares the potential efficacy and pitfalls of deploying constitutional or antitrust doctrines as checks on anticompetitive state and local regulations. It considers: (1) the reach and domain of constitutional and antitrust theories; (2) the ways in which each theory could accommodate genuine and sufficient justifications for the challenged regulations; (3) ways in which the antitrust and constitutional tools differ substantively and procedurally; and (4) ways in which the two theories might interact.

I. WHY ANTICOMPETITIVE REGULATION SUCCEEDS

This Article opened with the assumption that a wide universe of unjustified state and local anticompetitive regulation exists that a benevolent Platonic guardian of the state would instantly nullify. Given this conceit, the presence of such regulations necessarily represents democratic failures, as democracy should, in principle, strive for laws that confer positive, rather than negative, public benefit. What, then, accounts for the pervasive existence of these undesirable regulations? The answer comes in two parts--a generic (and largely familiar) story concerning anticompetitive regulations as a whole, and a more specific story concerning the battle between incumbent and innovative technologies.

A. The Generic Story

The generic story is largely familiar from public choice theory and the literature on the Parker state action doctrine. Democratic processes systematically fail to overcome two embedded hurdles to matching regulatory schemes to broad public preferences: (1) the asymmetrical distribution of costs and benefits of anticompetitive [\*1180] regulations, and (2) the externalization of costs on populations outside the boundaries of the relevant democratic unit. 6 In tandem, these hurdles to democratic correction of cronyistic dispensations of monopoly power by governmental regulators perpetuate regulatory schemes that a broad majority of citizens would vote to overturn if they understood the issue and were sufficiently motivated to invest political energy in correcting it. 7 The first democratic deficit, well documented in public choice literature, arises because producers typically receive a much more concentrated benefit from anticompetitive regulations in comparison to the relatively unconcentrated cost imposed on consumers. 8 A small band of producers may lobby aggressively to enact or maintain an anticompetitive scheme that permits the producers to collect significant monopoly rents. 9 Those rents, in turn, may be spread across thousands or millions of consumers, each one paying a relatively small increase in rent. 10 Collective action constraints--the cost of mobilizing consumer sentiment and action to oppose the regulation--give the producers a systematic advantage in maintaining the regulation. 11 As John Shepard Wiley explained in bringing public choice theory literature to bear on Parker immunity questions: [I]f the group [of consumers] is large, individual members have little incentive to participate because participation is personally costly and contributes little to the group's chances for successful joint action. Small groups encounter fewer of such problems. If group members behave in this rational self-interested manner, then "there is a systematic tendency for exploitation of the great by the small"; less numerous, more intensely concerned special [\*1181] interests can predictably outmatch more numerous, more mildly concerned consumer or "public" interests in legislative or regulatory fora--even though the actions of special interests impose a net loss on society. 12 The second deficit arises when governmental units--whether state or local--externalize the costs of the anticompetitive regulation outside their jurisdiction. The classic example is Parker itself, in which 90 percent of the raisins subject to California's agricultural cartel mandate were sold outside of California. 13 Out-of-state consumers could not be counted on to mobilize democratically to oppose the California regulation, as they had no political voice in California. 14 Many similar examples of jurisdictional cost externalization have been documented. 15 One arose in an important Supreme Court decision on state action immunity, Town of Hallie v. City of Eau Claire. 16 Hallie, Seymour, Union, and Washington were unincorporated towns adjacent to the city of Eau Claire, Wisconsin. 17 Their citizens could not vote in Eau Claire, but Eau Claire wanted to annex those territories into its boundaries, possibly through coercive means. 18 Eau Claire received federal funds to build a sewage treatment plant in its service area, which covered the four towns, then refused to supply sewage treatment services to the towns. 19 However, the city did agree to provide treatment services to certain homeowners in the towns if a majority of area voters voted by referendum to allow Eau Claire to annex their homes and to commit to use Eau Claire's sewage and transportation services. 20 The towns claimed this scheme was designed to keep the other towns from effectively competing with Eau Claire's sewage collection and transportation services. 21 The scheme also possibly allowed the [\*1182] city to raise costs for nonresidents while at the same time leveraging the higher prices to bring the nonresidents (and presumably their property taxes) into the city. 22 Although the city's motivation was ultimately political rather than narrowly economic, it used an anticompetitive strategy to dump monopoly costs on nonresidents who could not vote to rescind the regulations until they joined the city, at which point the question would be moot. 23 Together, these two deficits--asymmetrical costs and benefits to both producers and consumers and cost externalization--explain why democratic processes often fail to weed out anticompetitive regulations. Without concerted efforts by champions of consumer interests to overcome collective action problems and mobilize support for regulatory reform, the regulatory barriers to competition can linger indefinitely. As discussed next, these failures of democratic self-correction are exacerbated by regulations that entrench incumbent technologies at the expense of innovation.

B. Additional Considerations Affecting Product Market Innovation

Many of the contemporary regulatory battles between old and new technologies (particularly those involving the sharing economy) can be understood as follows. The incumbent regulatory scheme arose many decades ago and may well have been legitimately justified (in the sense of not imposing more costs than benefits) at the time of its adoption. 24 Our hypothesized Platonic guardian might even have approved of it at the time of its adoption. 25 The passage of time and advent of new technologies has now eroded the original basis of the regulation, and our Platonic guardian would therefore want the regulation rescinded or reformed. However, incumbent firms succeed in blocking or slowing innovative competition by circling the wagons around the incumbent regulatory schemes. 26 In [\*1183] these wars, the incumbents have a decisive advantage for at least three structural reasons.

First, if the incumbent regulatory scheme has allowed the incumbent firms to collect monopoly rents, then there may be a sharp asymmetry of incentives between old and new firms. 27 This is the same asymmetry that attends any struggle between incumbent monopolists and new competitive entrants: the monopolist is seeking to protect a large market share at a monopoly price, whereas the new entrant can only hope to gain a smaller market share at a competitive price. 28 Because the incumbent has more to gain than the new entrant has to lose, the incumbent will be willing to spend more to entrench the regulatory monopoly than the new entrant will be to challenge it. 29 This, in turn, discourages potential new entrants from investing in innovative new technologies and mounting political and market-oriented challenges to the incumbents. 30

Second, the incumbents have the advantage of status quo biases and fears about the consequences of technological change. 31 Costs of the existing system--to human safety, for example--may be seen as an inevitable baseline, whereas potential risks from the new technology may be seen as incremental threats. 32 Hence, risks and costs of the existing system may be undercounted or not counted at all, while risks and costs of the new system will be made to bear the full weight of their risks and costs.

For example, in recent months there have been widely reported stories of Uber drivers sexually abusing passengers. 33 These stories rarely report the base rate of abuse by taxi drivers or public transit [\*1184] workers, who might well present similar risks to passengers. 34 Similarly, the news media seem to wait with bated breath to report every accident involving a driverless vehicle 35 --even ones where the vehicle was stationary and hit by another at-fault vehicle--without reporting the base rate of nearly 40,000 deaths a year from human-driven vehicles. 36 The focus of news reporting seems to be on the incremental risks created by automated driving without regard to the baseline number of deaths that automated driving might diminish. 37 In principle, regulators should compare the likely risks of allowing new technologies to those of perpetuating the incumbent technology, but they often default to some version of the precautionary principle, insisting that new technologies prove their safety and efficacy in an absolute rather than comparative sense. 38 Given this baseline asymmetry, proponents of new technologies frequently must overcome significant regulatory hurdles not faced by incumbent technologies. Or, incumbent technologies may persuade regulators to force new technologies to play by rules that favor the incumbent technologies--a form of raising rivals' costs and creating regulatory entry barriers. 39

Finally, incumbents enjoy the generic benefits of incumbency in a structurally conservative constitutional and political system. The multiple "veto gates" to reform legislation--structural factors such as bicameralism, presentment, filibusters, and committee structures 40 --empower technological incumbents to ride the status quo for years or decades after our hypothetical Platonic guardian would have instituted public-minded reforms. 41

[\*1185] In combination, these three factors create additional barriers to the expected flow of democratic processes toward majoritarian equilibria--that is to say, equilibria that favor consumers' interests in competition and innovation over those of producers in capturing monopoly rents. In light of these factors and the collective action and cost externalization factors discussed earlier, 42 it is unsurprising that regulation serves as a barrier to innovation.

C. An Illustration from Automobile Distribution

The ongoing story of Tesla's efforts to break into the American automobile market illustrates the stickiness of incumbent regulations. 43 For a variety of business reasons, when Tesla entered the market in 2012, it decided that it would have to sell its all-electric vehicles (EVs) directly to consumers, meaning that it would have to open its own showrooms and service centers rather than outsourcing that function to franchised dealers. 44 Among other things, Tesla believed that traditional dealerships would be reluctant and ill-positioned to sell EVs and that Tesla therefore could not expect to convince already skeptical customers to buy EVs unless it opened its own retail facilities. 45 Since the mid-twentieth century, however, most states have adopted laws intended to protect dealers from unfair exploitation by manufacturers. 46 Among the provisions in many of these state statutes is a prohibition on a manufacturer opening its own showrooms and service centers. 47 In many states, manufacturers are required to distribute through independent dealers only. 48

Legislatures adopted these direct distribution prohibitions at a time when American car manufacturing was dominated by the "Big Three" (Chrysler, Ford, and General Motors) and many dealers were [\*1186] "mom and pop" businesses. 49 State legislatures were convinced that the dominant manufacturers were taking advantage of their franchisees by selling cars through their company-owned stores at lower prices than the dealers could afford to charge given the wholesale prices charged by the manufacturers. 50 The direct distribution prohibitions were justified as correcting a severe imbalance in bargaining power leading to contracts of adhesion and unfair exploitation in manufacturer-dealer relations. 51

Assuming that dealer protection rationale made sense in circa 1950, its basis has almost entirely vanished today. With the advent of competition from Europe and Asia, the Big Three are no longer dominant. 52 Dealers have many choices of automobile franchisors and hence considerably more power in negotiations over franchise terms. Further, the dealers are no longer mostly mom and pops. 53 Rather, most dealers are organized into multi-dealer groups, many with hundreds of millions or billions of dollars in annual revenue. 54 Indeed, some of the largest dealer groups have more annual revenue than Tesla. 55 Most significantly, the dealer protection rationale has nothing to do with a company such as Tesla that does not seek to distribute through dealers at all. 56 No dealers, no dealer exploitation.

Recognizing that the dealer protection rationale that justified the original statutes no longer works, the dealers have attempted to recast the direct distribution prohibitions as consumer protection decisions. 57 They have argued that forcing consumers to buy automobiles from dealers rather than from manufacturers will lead to more price competition, and hence lower prices, and prevent [\*1187] consumers from manufacturer exploitation. 58 These consumer protection arguments have been roundly rejected by economists, 59 the Federal Trade Commission (FTC), 60 and major proconsumer groups such as the Consumer Federation of America, Consumer Action, Consumers for Automobile Reliability and Safety, and the American Antitrust Institute. 61 Nonetheless, the dealers have succeeded in using the existing structure of dealer protection laws to block or slow Tesla's direct distribution program in a number of states. 62

The Tesla story evidences most of the factors that contribute to the persistence of anticompetitive regulations. The dealers have a concentrated interest in preserving their protected position, while the costs of that protectionism are spread out over millions of consumers. In the state with arguably the most pernicious record with respect to direct distribution reform--Michigan--there is a record of antireform advocacy by a leading incumbent--General Motors--and acquiescence by the political class to protect an in-state champion against an out-of-state challenger. 63 Even though consumers complain more about car dealers than about any other business, indicating the baseline system is not particularly attractive to them, 64 the dealers have invoked fears about the risks of direct distribution in opposition to legislative reforms. And legislative [\*1188] inertia has slowed the consideration of reform bills in some states, extending the incumbent regulatory scheme long past its reasonable expiration date. 65

The structural factors weighing against proconsumer and pro-innovation reforms will not block Tesla forever. The company has already seen significant successes in some state legislatures and courts and is progressively penetrating the market. 66 Yet it would be misguided to consider the company's eventual success a reason not to worry about the structural factors entrenching anticompetitive regulations, especially those foreclosing innovation. No monopoly is permanent--even the most persistent are eventually eroded. 67 Innovative technologies will almost always find a way out eventually, despite incumbent machinations. 68 What incumbents can buy is not monopoly in perpetuity but in extension. 69 Those years or decades of extension are costly to society. They represent significant overcharges to consumers, misallocations of social resources and, in the extreme, impairment to health and safety-- even lives lost. 70

Not every instance of anticompetitive state or local regulation exhibits the full set of explanatory factors discussed in this Article as cleanly as the ongoing Tesla saga does. Yet the Tesla story is more paradigmatic than idiosyncratic. Across the economy, incumbent technologies are structurally advantaged to deploy regulatory forces to stifle or slow innovation.

[\*1189] II. CONSTITUTIONAL AND ANTITRUST PRINCIPLES AS A CHECK ON ANTICOMPETITIVE REGULATION

If democratic processes fail to check anticompetitive state and local regulations on a systematic basis, then what can be done about it? Among the potential tools are institutional efforts to address the quality of legislation and regulation through democratic processes, such as creating governmental competition advocacy bodies within state and local governments or using federal purse strings to incentivize state and local governments to reevaluate their regulations. These democratic options are important, but they often fall prey to the pathologies of democratic decision making identified earlier. 71 Competition advocates--whether in government or in the private sector--often face formidable structural barriers to advancing the procompetition interest: entrenched incumbent monopolies, difficulties in mobilizing consumer support given the often diffuse nature of consumer harm, and institutional biases against change. 72

In addition to the democratic options, there are what could be styled counterdemocratic possibilities, insofar as they involve the use of courts or agencies to strike down anticompetitive statutes and regulations as inconsistent with some overarching norm of federal law, whether statutory or constitutional. 73 These counterdemocratic possibilities often do not run into the same structural status quo biases as the democratic possibilities do. For example, advocates of a legal theory for overruling an anticompetitive state or local regulation do not have to mobilize broad political support for their position or surmount the "veto gates" 74 built into ordinary political processes. Rather, they typically only have to persuade a small set of elite decision makers that their position is legally correct. It is with these counter-democratic possibilities that this Article is primarily interested.

[\*1190] The counterdemocratic or countermajoritarian quality of these deployments of judicial review is what places their use in some doubt, 75 even granting the assumption that they are targeting objectively undesirable regulations. 76 In the arc of American history, the courts have vacillated in their willingness to engage in such judicial review since the mid-twentieth century. Late nineteenth and early twentieth century courts were willing to engage in broad judicial review of economic regulation, 77 but the tide turned strongly against such review in the mid-twentieth century. 78 Only in recent years have glimmers of a return to some form of strong judicial review of anticompetitive regulations made a reappearance. 79

A. Lochner, anti-Lochner, and Parker

The stage for the current constellation of judicial doctrines and attitudes towards federal judicial review of anticompetitive state and local regulations was set through the progression of Lochner-era substantive due process, the anti-Lochner constitutional revolution of 1937, and the extension of anti-Lochner sentiment to federal antitrust law in the creation of Parker's state action immunity doctrine in 1943. 80 In 1905, the Supreme Court in Lochner struck down a New York law regulating bakeshop working hours on substantive due process grounds, 81 over Justice Oliver Wendell Holmes's famous objection that "[t]he Fourteenth Amendment does not enact Mr. Herbert Spencer's Social Statics." 82 During the Progressive and New Deal eras, Lochner and Lochnerism were broadly vilified for interfering with progressive reforms and substituting judges' economic views for those of legislatures. 83 In the New Deal constitutional revolution associated with the year 1937 (although spanning a few years in either direction), the Supreme [\*1191] Court announced it was getting out of the Lochner business--that it would not strike down economic legislation simply on the grounds that it was, in the judgment of the court, ill-considered. 84 Over time, it became clear that the anti-Lochner jurisprudence extended to nakedly anticompetitive regulations adopted to favor economic special interests to the detriment of the consuming public. In cases such as Williamson v. Lee Optical 85 and Ferguson v. Skrupa, 86 there was a fairly apparent record that the regulations in question had been adopted to stifle competition and benefit economic special interests, but the courts refused to create an exception to the anti-Lochner doctrine on those grounds. 87 In Williamson, the Court acknowledged that the "Oklahoma law may exact a needless, wasteful requirement in many cases," but insisted that the "day is gone when this Court uses the Due Process Clause of the Fourteenth Amendment to strike down state laws, regulatory of business and industrial conditions, because they may be unwise, improvident, or out of harmony with a particular school of thought." 88 Rather, the Court held that "[f]or protection against abuses by legislatures the people must resort to the polls, not to the courts." 89 In 1943, the Supreme Court in Parker v. Brown also made clear that it would not permit the federal Sherman Act to be used as an end-run around the anti-Lochner cases. 90 Parker involved both dormant commerce clause and Sherman Act challenges to California's Agricultural Prorate Act, which forced farmers into a marketing plan that effectively operated as an output reduction cartel run by farmers. 91 The Supreme Court rejected both challenges. 92 Finding "nothing in the language of the Sherman Act or in its history which suggests that its purpose was to restrain a state or its officers or agents from activities directed by its legislature," 93 the Court created a doctrine of state action immunity for anticompetitive state [\*1192] and local laws. 94 The effect of this ruling was to restrict the Sherman Act's coverage solely to purely private conduct. 95 Anticompetitive schemes orchestrated by the state would be excluded from judicial review. 96 As Judge Merrick Garland has observed, Parker is best understood as a continuation of the post-1937 jurisprudence rejecting Lochner: Parker v. Brown was much less a case about judicial faith in economic regulation than it was a case about judicial respect for the political process. Parker was indeed a child of its times, but the most salient element of that historical context was the Court's recent rejection of the Lochner-era doctrine of substantive due process, under which federal courts struck down economic regulations they viewed as unreasonably interfering with the liberty of contract. Having only just determined not to use the Constitution in that manner, the Court was not about to resurrect Lochner in the garb of the Sherman Act. 97

B. The Potential for an Increased Level of Judicial Scrutiny

As of 1943, one would have been justified in believing that, at least from the perspective of federal judicial review, anticompetitive state and local regulations would receive a free pass unless they [\*1193] committed certain egregious violations, such as disadvantaging "discrete and insular minorities" 98 or discriminating against out-of-state commerce. 99 But the judicial impulse to cast a stern glance at perniciously anticompetitive regulations could not be forever stifled, and before long cracks began to appear in the courts' anti-Lochnerian resolve.

Antitrust law and its state action immunity doctrine were the first to move in a significantly more interventionist direction. By the time of the Midcal decision, the state action immunity doctrine had been narrowed to permit judicial scrutiny unless the state regulation met a two-part test: (1) clear and affirmative expression of the anticompetitive policy by the sovereign state itself, and (2) active supervision of the policy's implementation by state actors. 100 Under this structure, the courts have invalidated a number of anticompetitive state regulatory schemes--most recently the practice of delegating regulatory power to occupational licensing boards staffed with potentially self-interested industry participants. 101

The Midcal test invokes a democracy-reinforcement theory of antitrust judicial review. 102 States may enact anticompetitive regulations so long as they take conspicuous responsibility for them. 103 If the state can be obviously identified with the scheme, then perhaps citizens will "vote out the bums" if the costs to consumers are too high. 104 Alas, many anticompetitive regulations escape Midcal's net because of the systemic factors identified in the previous section. 105 Even when a state conspicuously takes ownership of an anticompetitive scheme, democratic processes may fail to provide a remedy because of the asymmetry of costs and benefits [\*1194] between producers and consumers, the externalization of costs outside the voting jurisdiction, and the entrenched advantage of technological incumbency. 106

In light of the limited efficacy of Midcal's regime, one could consider additional ways to increase the level of antitrust scrutiny of anticompetitive state and local regulations. Commentators have proposed various such doctrinal approaches to invigorate antitrust preemption. For example, courts might adopt a cost-externalization test, which would invalidate regulatory schemes that externalize a disproportionate share of monopoly overcharges outside the boundaries of the political district enacting the regulation. 107 Or, as I have proposed elsewhere, they might read the Parker doctrine as entirely inapplicable to enforcement actions by the FTC--a legal question that the Supreme Court has held is still open. 108 In the event that the courts hold Parker inapplicable to the FTC, the Commission might play a significantly enhanced role in checking anticompetitive abuses by state and local governments.

Despite calls for a broader use of federal antitrust law to police anticompetitive state and local regulations, the Supreme Court continues to refine the Parker doctrine with an eye on Lochner. Then-Justice Rehnquist once worried that the Court should not "engage in the same wide-ranging, essentially standardless inquiry into the reasonableness of local regulation that th[e] Court … properly rejected" in terminating Lochnerism. 109 In his dissenting opinion in Community Communications Co. v. City of Boulder, Justice [\*1195] Rehnquist warned about the risks of opening up antitrust review of municipal regulations in a way that would require cities to justify their regulations, and the courts, in turn, to weigh those justifications. 110 Rehnquist wrote:

If the Rule of Reason were "modified" to permit a municipality to defend its regulation on the basis that its benefits to the community outweigh its anticompetitive effects, the courts will be called upon to review social legislation in a manner reminiscent of the Lochner era. Once again, the federal courts will be called upon to engage in the same wide-ranging, essentially standardless inquiry into the reasonableness of local regulation that this Court has properly rejected. Instead of "liberty of contract" and "substantive due process," the procompetitive principles of the Sherman Act will be the governing standard by which the reasonableness of all local regulation will be determined. Neither the Due Process Clause nor the Sherman Act authorizes federal courts to invalidate local regulation of the economy simply upon opining that the municipality has acted unwisely. The Sherman Act should not be deemed to authorize federal courts to "substitute their social and economic beliefs for the judgment of legislative bodies, who are elected to pass laws." The federal courts have not been appointed by the Sherman Act to sit as a "superlegislature to weigh the wisdom of legislation." 111

Also in the shadow of Lochner, recent years have shown glimmers of a reinvigoration of constitutional doctrines checking anticompetitive abuses by state and local governments. The negative or dormant commerce clause--limited by the Parker Court on anti-Lochner grounds--has occasionally been deployed to invalidate not only anticompetitive regulatory schemes 112 that discriminated against out-of-state interests, but also, on occasion, those that impose significant burdens on interstate commerce without a sufficient justification. 113 As of this writing, Tesla is testing the limits of these [\*1196] doctrines in its challenge to Michigan's direct distribution law. 114 Its complaint for injunctive relief asserts:

[Michigan's] [p]articularly egregious protectionist legislation … blocks Tesla from pursuing legitimate business activities and subjects it to arbitrary and unreasonable regulation in violation of the Due Process Clause of the Fourteenth Amendment; subjects Tesla to arbitrary and unreasonable classifications in violation of the Equal Protection Clause of the Fourteenth Amendment; and discriminates against interstate commerce and restricts the free flow of goods between states in violation of the dormant Commerce Clause. 115

Thus far, Tesla has survived a motion to dismiss in federal court and won a key discovery motion seeking automobile dealers' communications concerning the Michigan ban on direct distribution. 116

Perhaps even more significant have been a handful of court of appeals decisions applying equal protection principles to invalidate anticompetitive regulations designed solely to protect a discrete group of economic actors from competition--although there remains a circuit split over this practice. Morbidly, the most significant cases have all been related to funeral parlors and casket sales.

In 2004, the Tenth Circuit in Powers v. Harris rejected a constitutional challenge to an Oklahoma statute that limited casket sales to licensed funeral parlors. 117 The court accepted the premise that the statute had no genuine health and safety rationale and was "a classic piece of special interest legislation designed to extract monopoly rents from consumers' pockets and funnel them into the coffers of a small but politically influential group of business people--namely, Oklahoma funeral directors." 118 Nonetheless, the court held its hands were tied by the anti-Lochner cases--particularly [\*1197] Williamson and Ferguson, which also involved (arguably) nakedly parochial anticompetitive regulations. 119

On the other hand, in their own casket cases, the Fifth and Sixth Circuits invalidated the anticompetitive schemes on equal protection grounds, holding that "protecting a discrete interest group from economic competition is not a legitimate governmental purpose" and therefore fails even rational basis review. 120 This exercise of what Judge Ginsburg calls "rational basis with economic bite" could grow into a significant check on anticompetitive state and local regulation if utilized more expansively. 121 If this Article's premise is valid--that regulations designed solely to protect "discrete interest group[s] from economic competition" 122 are pervasive--then the federal courts have their work cut out for them if they take up the casket maxim with seriousness.

However, it is far from certain that they will or should. Despite the movement towards enhanced scrutiny of anticompetitive economic cronyism just described, the ghosts of Lochner continue to loom large. Even judges unsympathetic to the casket regulations may be concerned about the prospect of unelected judges substituting their own economic preferences for those of democratically elected representatives. In Powers, the Tenth Circuit listed a series of classically anti-Lochner rationales (including a rejection of the role of the Platonic guardian hypothesized in this Article) for refusing to embrace the Sixth Circuit's antiparochialism principle:

First, in practical terms, we would ~~paralyze~~ state governments if we undertook a probing review of each of their actions, constantly asking them to "try again." Second, even if we assumed such an exalted role, it would be nothing more than substituting our view of the public good or the general welfare for that chosen by the states. As a creature of politics, the definition of the public good changes with the political winds. There simply is no constitutional or Platonic form against which [\*1198] we can (or could) judge the wisdom of economic regulation. Third, these admonitions ring especially true when we are reviewing the regulatory actions of states, who, in our federal system, merit great respect as separate sovereigns. 123

So here is the question for those who accept this Article's central premise regarding the prevalence of anticompetitive state and local regulation and yet worry, like the Powers court, about a return to Lochner: If one is interested in pulling additional judicial levers to scrutinize anticompetitive state and local regulations, but worried about returning to Lochnernism, how do the constitutional and antitrust levers compare? Are both equally susceptible to misuse and abuse, is one less risky than the other, and are there limits that could be placed on both to cabin their potential risks? This Article's final Part compares the constitutional and antitrust tools as potential foils to anticompetitive state and local regulation to help answer these questions.

III. COMPARING THE RISKS AND LIMITS OF THE CONSTITUTIONAL AND ANTITRUST TOOLS

A. Limiting the Scope of Judicial Review to Regulations Affecting Competition

The fear of a return to Lochnerism is in large part a fear that judicial review of economic regulatory decisions is a Pandora's box that, once open, would quickly unleash a full-scale movement toward a substitution of judicial economic philosophies for those of the democratically responsive branches. 124 Hence, in the current constellation of Lochner-phobia, it is important to explain how any doctrine that invites increased judicial scrutiny of economic regulation would be cabined or restrained by a workable limitation principle. Both the antitrust and constitutional tools under consideration embody such a limitation principle insofar as they do not propose universal federal scrutiny of all undesirable state economic regulation. Instead, they limit the scrutiny to regulations that harm [\*1199] competition for the benefit of identifiable special interests. In other words, the prima facie case in either event requires demonstration of competitive harm as opposed to merely social undesirability. 125 The "competitive harm" limitation principle excludes from judicial review a wide set of regulations and hence limits the range of judicial interference with state regulatory schemes. Many cronyist regulations line the pockets of politically connected special interests without necessarily impairing competition. Consider, for example, a city ordinance that required disposal of a certain kind of medical waste at a pharmacy. Assume further that the waste in question could be safely disposed of through ordinary garbage collection, and the sole purpose of the scheme in question was to provide pharmacies with an opportunity to charge a fee for collecting the waste. Our hypothesized Platonic guardian would wish to overturn that regulation but could not do so on the constitutional or antitrust grounds under consideration because the regulation in question does not limit competition in any important sense. Rather than stifling competition in a legitimate market, it creates a new market for an undesired and unnecessary service. Lochner-phobes may wonder whether this limitation principle is limited enough. Although the limitation carves off a large swath of cronyist regulations from review, it still includes a relatively large universe of regulations, creating the possibility that judges will have a free hand to strike down many important state regulatory programs in the name of enhanced competition. Those less worried about Lochner and more willing to encourage judicial review of economic regulation may worry that the limitation principle is too limited and that it would allow a vast universe of cronyist regulation to escape judicial scrutiny on the same grounds that much cutthroat business behavior escapes antitrust scrutiny today--it may be unethical or undesirable, but does not fall within the purview of the antitrust laws because it does not impair general market competitiveness. 126 [\*1200] Limiting the scope of judicial review to economic regulations impairing competition also raises a question of legal principle. As to antitrust, it is easy to justify such a principle. Notwithstanding Oliver Wendell Holmes's protestation that the Sherman Act "says nothing about competition," 127 a century of judicial construction has oriented the antitrust laws towards a singular focus on competition. 128 On the other hand, it is not obvious that constitutional scrutiny should rise or fall on the effects a cronyist regulation has on competition. It may be true that "protecting a discrete interest group from economic competition is not a legitimate governmental purpose," 129 but it seems equally true that dispensing economic rents to favored discrete interest groups more generally is also not a legitimate government purpose. In either case, the argument for limiting judicial review is not that the set of targeted regulations is constitutionally legitimate, but that the process of separating sheep from goats is fraught with the potential for judicial usurpation.

B. Considering Governmental Justifications for Restraints on Competition

Assuming that judicial review of anticompetitive state and local regulations is to occur with some degree of bite, the fighting question may often become how to evaluate the state's proffered justifications for the restraint on competition. Both antitrust and constitutional tools would need to allow ample room for the state to demonstrate verifiable justifications for the challenged regulations. To put this point in antitrust parlance, there are no per se unlawful state restraints on competition--the state's reasons for regulating will always be up for review in judicial or administrative proceedings challenging their validity. [\*1201] The critical question is how much interrogation into the state's proffered justifications a court or reviewing agency would, could, or should undertake. In conventional post-Lochner terms, economic regulations were subjected to no more than rational basis review--an exceedingly deferential standard of review. 130 The state did not have to advance any empirical support for its proffered justifications and, indeed, did not have to advance any justifications at all. 131 Judges were supposed to uphold the regulation if they could conceive of any justification that might plausibly support it: A State, moreover, has no obligation to produce evidence to sustain the rationality of a statutory classification. "[A] legislative choice is not subject to courtroom factfinding and may be based on rational speculation unsupported by evidence or empirical data." A statute is presumed constitutional, and "[t]he burden is on the one attacking the legislative arrangement to negative every conceivable basis which might support it," whether or not the basis has a foundation in the record. Finally, courts are compelled under rational-basis review to accept a legislature's generalizations even when there is an imperfect fit between means and ends. A classification does not fail rational-basis review because it "is not made with mathematical nicety or because in practice it results in some inequality." 132 That sort of rational basis review is far from the sort of review conducted by the Craigmiles and St. Joseph Abbey courts in striking down the Tennessee and Louisiana casket rules. 133 Those courts required evidentiary support for states' claimed justifications and subjected the states' claims to rigorous cross-examination for logical consistency. 134 In the Sixth Circuit case--Craigmiles--the court rejected the state's arguments that the casket regulation protected casket quality and public health, made it more feasible for casket sellers to advise bereaved families about which casket was most suitable for their needs, and protected against sharp business [\*1202] dealing. 135 The court found these arguments inconsistent with the state's own regulatory practices and unsupported by any record evidence. 136 Similarly, in the Fifth Circuit case--St. Joseph Abbey--the court repeated the familiar proposition that "rational basis review places no affirmative evidentiary burden on the government," but quickly added that "plaintiffs may nonetheless negate a seemingly plausible basis for the law by adducing evidence of irrationality." 137 The court then inquired into evidentiary support for the state's proferred "rational bases." 138 For example, on the ostensible consumer protection rationale for prohibiting casket sales except by licensed funeral parlors, the court observed that the FTC had largely rejected this argument as an empirical matter, noting that the FTC found "insufficient evidence that … third-party sellers of funeral goods are engaged in widespread unfair or deceptive acts or practices" and that the empirical "record [is] 'bereft of evidence indicating significant consumer injury caused by third-party sellers.'" 139 This form of review resembles antitrust litigation, where once a plaintiff raises a prima facie case of anticompetitive effect (outside of per se rules, where no justifications are allowed), the defendant typically can proffer procompetitive justifications but bears the burden of offering evidentiary support. 140 Although giving lip service to the norms of rational basis review, these courts were in fact taking a hard look at the states' proffered justifications once the regulation in question appeared prima facie to meet the description of a measure designed to protect "discrete interest group[s] from economic competition." 141 Inquiries into offsetting justifications for prima facie suspect conduct raise two doctrinal-analytical questions: (1) how tight must the fit between means and ends be in order for the conduct in question to survive scrutiny, and (2) once the conduct has been shown to advance legitimate ends, should its harms be balanced against its [\*1203] benefits, or should it simply be deemed lawful without any balancing? 142 Both constitutional and antitrust tools for addressing anticompetitive regulation would need to address these questions. As to the first question--the required tightness of means-ends fit--both constitutional and antitrust law already contain suitable doctrines. Moving up the ladder of scrutiny from rational basis review, intermediate scrutiny in constitutional law (such as that applicable to content-neutral restrictions on speech) requires that the restriction in question advance important governmental interests and not burden the protected interest (speech in the speech cases, competition in competition cases) more than necessary to further these interests. 143 The fit between means and ends need be only "reasonable," not strictly necessary or essential. 144 Unless the constitutional limitation on anticompetitive cronyism should fall into the more stringent strict scrutiny category--a very doubtful possibility--this sort of fit between regulatory means and ends would seem applicable. Antitrust law shares a similar approach to the less restrictive alternative analysis under the rule of reason, and it too would presumably apply to government restraints on competition under an expanded form of judicial review. 145 As explained in the Justice Department and FTC competitor collaboration guidelines, a reasonable, but not essential, fit between means and ends is required to credit proffered justifications for prima facie anticompetitive agreements: The Agencies consider only those efficiencies for which the relevant agreement is reasonably necessary. An agreement may be "reasonably necessary" without being essential. However, if the participants could have achieved or could achieve similar efficiencies by practical, significantly less restrictive means, then the Agencies conclude that the relevant agreement is not [\*1204] reasonably necessary to their achievement. In making this assessment, the Agencies consider only alternatives that are practical in the business situation faced by the participants; the Agencies do not search for a theoretically less restrictive alternative that is not realistic given business realities. 146 A potential difference between constitutional and antitrust analysis might arise on the second important means-ends question--whether to balance harms against benefits of the regulatory restriction. For example, suppose that a regulation limiting ride-sharing services resulted in some small safety benefit to customers but an arguably much greater harm to customers in the form of diminished choice of service options and higher prices. Should a reviewing court or agency balance the safety enhancements against the harms to competition, or should it rather conclude that, having shown a legitimate reason for its existence, the regulation should stand? Although intermediate scrutiny in constitutional law is often described as a "balancing test," courts do not generally engage in explicit balancing after passing the less restrictive alternatives inquiry. 147 Some degree of value judgment must be embedded in the inquiry into whether the state's interest is sufficiently "important," but it is rare to see a court say, in effect, that although the state's interest is concededly important and the regulation at stake is reasonably related to it, the harms caused by the regulation outweigh its benefits. 148 For purposes of the principle against protecting "discrete interest group[s] from economic competition," it seems apparent that there is no room for balancing at all, as a state [\*1205] regulation that serves some legitimate end by definition is not "simple economic protectionism." 149 By contrast, antitrust law is, in principle, supposed to require open-ended balancing at this final step: "if the monopolist's procompetitive justification stands unrebutted, then the plaintiff must demonstrate that the anticompetitive harm of the conduct outweighs the procompetitive benefit." 150 If followed in state action doctrine cases, this sort of balancing could precipitate serious accusations of Lochnerizing, as it would put judges in the position of substituting their own preferences for market outcomes over the state's legitimate regulatory objectives. Fortunately, although antitrust law nominally calls for balancing, courts typically do not engage in it. 151 Even in Microsoft--the case that most explicitly and authoritatively called for final-stage balancing--the D.C. Circuit engaged in very little, if any, true balancing. 152 Perhaps because of the incommensurability between anticompetitive or procompetitive effects or concern about chilling procompetitive conduct, courts tend to exonerate competitive behavior that is necessary to procompetitive effects without asking whether the harms outweigh the benefits. 153 In order to stave off Lochnerizing concerns, any expanded antitrust review of state and local regulations might need to formalize this practice doctrinally: Once a state demonstrates that the regulation in question is reasonably tailored to achieve some legitimate governmental objective, [\*1206] antitrust does not require balancing of the harms to competition against the legitimate governmental objectives. A final question unique to antitrust review is whether, when it comes to means-ends review, the catalogue of permissible ends is limited to those recognized by antitrust law as "procompetitive." One of the important doctrinal and policy structures of antitrust law is a division of the world into virtues that are said to be "procompetitive" and those that are not. 154 To count as a legitimate virtue in the antitrust domain, an effect must be "procompetitive," meaning that it must work to enhance or improve market competition. 155 Supposed benefits of a restraint that assume that competition is itself the problem in need of curtailment are labeled with the epithet of "ruinous competition" theories and are dismissed as inconsistent with the Sherman Act's procompetition policy. 156 While this single-minded devotion to competition may make sense as to the world of private restraints, it is less clear that it can be applied sensibly to governmental regulation. Do governments not have the right to take the view that competition of certain types causes social evils that should be curtailed? For example, many regulatory restrictions on alcohol and tobacco distribution are designed to decrease competition and hence reduce output as compared to that which would be obtained in a competitive market. 157 While it may be undesirable for private actors to limit harmful output through private means, the state's police power surely includes the right to do so, including by limiting competition. 158 This suggests that the range of regulatory interests [\*1207] states might legitimately advance in support of challenged regulations would be broader than those deemed "procompetitive" in conventional antitrust analysis. Opening the door to a wider scope of justifications in cases where the restraint on competition is imposed by governmental rather than private actors would appear on first impression to favor the government. Such a widening of the rule of reason, however, raises precisely the Lochnerizing concern raised by Justice Rehnquist in his previously quoted City of Boulder dissent. 159 If courts were called upon to balance health and safety benefits against traditional competition concerns around prices and innovation, then they might well slip into a Lochnerizing mold. But perhaps such concerns could be abated by limiting the reviewing court or agency's role to determining whether the regulation in question actually supported the state's proffered goals. As long as the goals were permissible (that is, not simply protecting discrete interest groups from competition as a form of political patronage) and the regulations were reasonably related to the goals, the reviewing court or agency would not inquire more broadly into the regulation's overall desirability.

C. Institutional and Procedural Distinctions

Antitrust preemption and constitutional review are differently situated in one significant way: Constitutional equal protection, substantive due process, and dormant commerce clause principles are privately enforceable by any party that meets the Article III standing requirements--which, in this context, means at least anyone directly affected by a regulation impairing competition. 160 Antitrust has its own private right of action standing rules, 161 as well as an additional institutional feature that might significantly limit some of the abuses associated with Lochnerizing. One proposed route for increasing the preemptive scope of federal antitrust law over anticompetitive state and local regulation is to hold the [\*1208] Parker doctrine inapplicable to the FTC. 162 This would give the FTC enhanced power to challenge anticompetitive state and local regulations. Not only would this limit the incidence of challenges to state regulation (the FTC Act is not privately enforceable and only the Commission can initiate an action under the Act), 163 but it would also put the Commission itself, rather than an Article III court, in the position of making an initial decision on the case. An Article III court could ultimately become involved, as adverse Commission decisions are appealable to any federal court of appeal in which the case could have been initially brought. 164 However, lodging the antitrust review function in the FTC would grant the Commission an initial regulatory review function and the power to make factual findings subject to "substantial evidence" review. 165

### Plan

The United States Federal Government should significantly increase prohibitions on anticompetitive business practices by the private sector by narrowing the state action immunity doctrine.

### Federalism Adv

#### Advantage Two: Federalism

#### Nextgen tech is emerging at an exponential rate – effective state regulatory experimentation avoids downsides and maximize the benefits of AI and nano

McGinnis 11(John, George C. Dix Professor of Law, Northwestern Law School, “LAWS FOR LEARNING IN AN AGE OF ACCELERATION,” <http://scholarship.law.wm.edu/cgi/viewcontent.cgi?article=3404&context=wmlr>)

The twenty-first century’s information age has the potential to usher in a more harmonious and productive politics. People often disagree about what policies to adopt, but the cornucopia of data that modern technology generates can allow them to better update their beliefs about policy outcomes on the basis of shared facts. In the long run, convergence on the facts can lead incrementally to more consensus on better policies. More credible factual information should over time also help make for a less divisive society, because partisans cannot as easily stoke social tensions by relying on false facts or exaggerated claims to support conflicting positions. Thus, a central task of contemporary public law is to accelerate a politics of learning whereby democracy improves a public reason focused on evaluating policy consequences. Government should be shaped into an instrument that learns from the analysis of policy consequences made available from newly available technologies of information.1 Greater computer capacity is generating more empirical analysis.2 The Internet permits the rise of prediction markets that forecast policy results even before the policies are implemented.3 The Internet also creates a dispersed media that specializes in particular topics and methodologies, gathers diverse information, and funnels salient facts about policy to legislators and citizens.4 But a public reason focused on policy consequences will improve only if our laws facilitate it. For instance, constitutional federalism must be reinvigorated to permit greater experimentation across jurisdictions, because with the rise of empiricism, decentralization has more value for social learning today than ever before.5 Congress should include mandates for experiments within its own legislation making policy initiatives contain the platforms for their own selfimprovement.6 Creating a contemporary politics of democratic updating on the basis of facts is a matter both of great historical interest and of enormous importance to our future. In the historical sweep of ideas, a government more focused on learning from new information moves toward fulfilling the Enlightenment dream of a politics of reason—but a reason based not on the abstractions of the French Revolution, but instead on the hard facts of the more empirical tradition predominating in Britain. By displacing religion from the center of politics, the Enlightenment removed issues by their nature not susceptible to factual resolution, permitting a focus on policies that could be improved by information.7 The better democratic updating afforded by modern technology can similarly increase social harmony and prosperity by facilitating policies that actually deliver the goods. For the future, a more consequentially informed politics is an urgent necessity. The same technological acceleration that potentially creates a more information-rich politics also generates a wide range of technological innovation—from nanotechnology to biotechnology to [AI] artificial intelligence. Although these technologies offer unparalleled benefits to mankind, they may also create catastrophic risks, such as rapid environmental degradation and new weapons of mass destruction.8 Only a democracy able to rapidly assimilate the facts is likely to be able to avoid disaster and reap the benefits inherent in the technology that is transforming our world at a faster pace than ever before. Every industry that touches on information—book publishing, newspapers, and college education to name just a few—is undergoing a continuous series of revolutionary changes as new technology permits delivery of more information more quickly at lower cost. The same changes that are creating innovation in such private industries can also quickly create innovation in social governance. But the difference between information-intensive private industries and political institutions is that the latter lack the strong competitive framework for these revolutions to occur spontaneously. This Essay thus attempts to set out a blueprint for reform to make better use of some available information technologies. Part I describes the reality of technology acceleration as the acceleration both creates the tools for democratic updating and prompts its necessity. Technological acceleration is the most important development of our time—more important even than globalization. Although technologists have described and discussed its significance, its implications for law and political structure have been barely noticed. Part II briefly discusses how better social knowledge can change political results. A premise of the claim is that some political disagreements revolve about facts, not simply values. As a result, better social knowledge can help democracies design policies to achieve widely shared goals. Social knowledge energizes citizens to act on those encompassing interests, like improved public education, because they come to better recognize the policy instruments to advance those interests. Better social knowledge provides better incentives for citizens to vote on these interests. Part III considers the mechanisms for creating a contemporary politics of democratic updating that begins to meet the needs of the age of accelerating technology. It focuses on two of the new resources that can have substantial synergies in improving social common knowledge and shows how an increase in common knowledge can systematically improve political results by providing better incentives for citizens to work for encompassing social goods. First, Part III considers the improvement in empirical analysis of social policy that flows from increasing computational capacity. It then discusses how specialized and innovative media does much more than disseminate opinions: it widely distributes facts and factual analysis. The combination of these technologies can better discipline experts and representatives, providing stronger incentives for them to update on the basis of new facts. Part IV discusses the information-eliciting rules that will maximize the impact of new technologies of information. These steps include a program of restoring, where possible, governmental structures that permit appropriate decentralization for experimentation, empirical testing, and learning. Congress and regulatory agencies should structure legislation and regulations to include social experiments when such experiments would help resolve disputed matters of policy. The Supreme Court should generally refrain from imposing new substantive rights for the nation so that it is easier to evaluate the consequences of different bundles of rights chosen by the states. But it should also protect the dispersed media, like blogs, from discriminatory laws, because this dispersed media plays a crucial role in modern policy evaluation. In short, the Supreme Court needs to emphasize a jurisprudence fostering social discovery and the political branches need to create frameworks for better social learning. Constitutive structures encouraging and evaluating experimentation become more valuable in an age where better evaluation of social experiments is possible. I. TECHNOLOGICAL ACCELERATION It is the premise of this Essay that technological acceleration is occurring and that our political system must adapt to the world it is creating. The case for technological acceleration rests on three mutually supporting kinds of evidence. First, from the longest-term perspective, epochal change has sped up: the transitions from hunter-gatherer society to agricultural society to the industrial age each took progressively less time to occur, and our transition to an information society is taking less time still. Second, from a technological perspective, computational power is increasing exponentially, and increasing computational power facilitates the growth of other society-changing technologies like biotechnology and nanotechnology. Third, even from our contemporary perspective, technology now changes the world on a yearly basis both in terms of hard data, like the amount of information created, and in terms of more subjective measures, like the social changes wrought by social media. From the longest-term perspective, it seems clear that technological change is accelerating and, with it, the basic shape of human society and culture is changing.9 Anthropologists suggest that for 100,000 years, members of the human species were hunter-gather- ers.10 About 10,000 years ago humans made a transition to agricultural society.11 With the advent of the Industrial Revolution, the West transformed itself into a society that thrived on manufacturing.12 Since 1950, the world has been rapidly entering the information age.13 Each of the completed epochs has been marked by a transition to substantially higher growth rates.14 The period between each epoch has become very substantially shorter.15 Thus, there is reason to extrapolate to even more and faster transitions in the future. This evolution is consistent with a more fine-grained evaluation of human development. Recently, the historian Ian Morris has rated societies in the last 15,000 years on their level of development through objective benchmarks, such as energy capture.16 The graph shows relatively steady, if modest, growth when plotted on a log linear scale, but in the last 100 years development has jumped to become sharply exponential.17 Morris concludes that these patterns suggest that there may be four times as much social development in the world in the next 100 years than there has been in the last 14,000.18 The inventor and engineer Ray Kurzweil has dubbed this phenomenon of faster transitions “the law of accelerating returns.”19 Seeking to strengthen the case for exponential change, he has looked back to the dawn of life to show that even evolution seems to make transitions to higher organisms ever faster.20 In a more granulated way, he has considered important events of the last 1000 years to show that the periods between extraordinary advances, such as great scientific discoveries and technological inventions, have decreased.21 Thus, both outside and within the great epochs of recorded human history, the story of acceleration is similar. The technology of computation provides the second perspective on accelerating change. The easiest way to grasp this perspective is to consider Moore’s Law. Moore’s Law—named after Gordon Moore, one of the founders of Intel—is the observation that the number of transistors that can be fitted onto a computer chip doubles every eighteen months to two years.22 This prediction, which has been approximately accurate for the last forty years,23 means that almost every aspect of the digital world—from computational calculation power to computer memory—is growing in density at a similarly exponential rate.24 Moore’s Law reflects the rapid rise of computers to become the fundamental engine of mankind in the late twentieth and early twenty-first centuries.25 The power of exponential growth is hard to overstate. As the economist Robert Lucas has said, once you start thinking about exponential growth, it is hard to think about anything else.26 The computational power in a cell phone today is a thousand times greater and a million times less expensive than all the computing power housed at MIT in 1965.27 Projecting forward, the computing power of computers twenty-five years from now is likely to prove a million times more powerful than computing power today. To be sure, many people have been predicting the imminent death of Moore’s Law for a substantial period now,29 but it has nevertheless continued. Intel—a company that has a substantial interest in accurately telling software makers what to expect—projects that Moore’s Law will continue at least until 2029.30 Ray Kurzweil shows that Moore’s Law is actually part of a more general exponential computation growth that has been gaining force for over a 100 years.31 Integrated circuits replaced transistors that previously replaced vacuum tubes that in their time had replaced electromechanical methods of computation.32 Through all of these changes in the mechanisms of computation, its power increased at an exponential rate.33 This perspective suggests that other methods under research—from carbon nanotechnology to optical computing to quantum computing—are likely to continue growing exponentially even when silicon-based computing reaches its physical limits.34 Focusing on the exponential increase in hardware capability may actually understate the acceleration in computational capacity in two ways. First, a study considering developments in a computer task using a benchmark for measuring computer speed over a fifteen-year period suggests that the improvements in software algorithms improved performance even more than the increase in hardware capability.35 Second, computers are interconnected more than ever before through the Internet, and these connections increase collective capacity, not only because of the increasing density among computer connections, but because of the increasing density of connections among humans made possible by computers. The salient feature of computers’ exponential growth is their tremendous range of application compared to previous improvements. Almost everything in the modern world can be improved by adding an independent source of computational power. That is why computational improvement has a far greater social effect than improvements in technologies of old. Energy, medicine, and communication are now being continually transformed by the increase in computational power.36 As I will discuss in Part II, even the formulation of new hypotheses in natural and social science will likely be aided by computers in the near future. The final perspective on accelerating technology is the experience that the contemporary world provides. Technology changes the whole tenor of life more rapidly than ever before. At the most basic level, technological products change faster.37 Repeated visits to a modern electronics store—or even a grocery store—reveal a whole new line of products within very few years. In contrast, someone visiting a store in 1910 and then again in 1920—let alone in 1810 and 1820—would not have noticed much difference. Even cultural generations move faster. Facebook, for instance, has changed the way college students relate in only a few years,38 whereas the tenor of college life would not have seemed very different to students in 1920 and 1960. Our current subjective sense of accelerating technology is also backed by more objective evidence from the contemporary world. Accelerating amounts of information are being generated.39 Information, of course, is a proxy for knowledge. Consistent with this general observation, we experience exponential growth in practical technical knowledge, as evidenced by the rise in patent applications.40 Thus, the combination of data from our present life, together with the more sweeping historical and technological perspectives, makes a compelling case that technological acceleration is occurring. It is this technological acceleration that creates both the capacity and the need for improving collective decision making. As technology accelerates, it creates new phenomena, from climate change to biotechnology to artificial intelligence of a human-like capacity. These technologies may themselves have very large positive or negative externalities and may require government decisions about their prohibition, regulation, or subsidization to forestall harms and capture their full benefits. They may also cause social dislocations, from unemployment to terrorism, that also require certain collective decisions. Society can best handle these crises not only by making better social policy to address them directly but by improving social policy more generally to create both more resources and more social harmony to endure them. Thus, society must deploy information technology in the service of democratic updating if it is to manage technological acceleration

#### Unregulated tech diffuses globally---acquisition by omnicidal non-state actors risks extinction via super-pathogens, eco-terrorism, and planetoid bombs.

Torres 21 (Phil Torres, Former writer for Future of Life Institute, Former Affiliate Scholar at the Institute for Ethics and Emerging Technologies, M.A. in Neuroscience from Brandeis University, Ph.D. candidate at Leibniz Universität Hannover; “International Criminal Law and the Future of Humanity: A Theory of the Crime of Omnicide;” 03-08-21, <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3777140>, TM)

3.2 The Greatest Threats Arise from Nonstate Actors. Since the Neolithic Revolution some 12,000 years ago, groups of people—tribes, city-states, kingdoms, countries, and empires—have invariably possessed a greater potential to cause harm than individuals or small collections of individuals within those groups. For example, the Roman Empire considered as a cohesive entity was more powerful than any Roman citizen, just as Nazi Germany had more resources to leverage against the Jewish people than any single antisemite. (This idea finds expression in Max Weber’s famous characterization of the state as possessing a “monopoly of the legitimate use of violence within a given territory.”70) But this dynamic is quickly changing: the difference in “violence capacity” between state and nonstate actors is narrowing as a result of the growing power and accessibility of dual-use emerging technologies, which are almost universally being developed at an exponential or superexponential pace, in accordance with the so-called Law of Accelerating Returns, which subsumes more specific tends like Moore’s Law, Huang’s law, the Carlson curve, Dennard scaling, Keck’s law, Kryder’s law, and so on. As the “power and accessibility” locution 71 implies, there are two crucial features of such technologies, namely:

(i) Omniviolence thesis. The growing power of emerging technologies means a lower ratio of “killers to killed,” or “K/K ratio,” per incident, a phenomenon that Daniel Deudney neologizes as “omniviolence.” Consider a non-lethal recent case that exemplifies this trend: the 2016 Dyn 72 cyberattack. This distributed denial-of-service (DDoS) attack may have been perpetrated by a single “angry gamer.”73 Yet an extraordinary number of major websites were disrupted: Airbnb, Amazon, BBC, The Boston Globe, CNN, Comcast, FiveThirtyEight, Fox News, The Guardian, iHeartRadio, Imgur, National Hockey League, Netflix, The New York Times, PayPal, Pinterest, Pixlr, Reddit, SoundCloud, Squarespace, Spotify, Starbucks, Storify, the Swedish Government, Tumblr, Twitter, Verizon Communications, Visa, Vox Media, Walgreens, The Wall Street Journal, Wired, Yelp, and Zillow. This is a non-exhaustive list of the websites affected, which numbered more 74 than 60 in total. Thus, the “affecter-to-affected ratio,” so to speak, of this attack was extremely low: one person managed to take down a vast constellation of websites that hundreds of millions of people visit and depend upon every day. The point is that this trend of mass empowerment can be found within virtually every domain of emerging technology, including biotechnology, synthetic biology, nanotechnology, drone technology, and artificial intelligence. Whereas in the past, bioterrorism took the form of poisoning wells with carcasses contaminated with the plague, soon it could take the form of synthesizing a super-pathogen that combines the lethality of rabies, the incurability of Ebola, the contagiousness of the common cold, and the long incubation period of HIV. Whereas in the 75 past, destroying an enemy civilization required a physical attack involving tens or hundreds of thousands of soldiers, today a nuclear electromagnetic pulse (NEMP) could fry the electrical infrastructure of an entire country. Whereas in the past, annihilating Earth’s biosphere was technically impossible, future self-replicating nanobots could potentially disassemble all organic matter around the world, thus resulting in a lifeless, barren planet. And so on.

(ii) Democratization thesis. This refers to the phenomenon of dual-use emerging technologies becoming increasingly accessible to the demos. When combined with (i), it implies that omniviolence is being distributed among state and nonstate actors—i.e., the K/K ratio is falling while the number of potential “killers” that instantiate the first “K” is growing.

Historically speaking, the first actor—a state—to acquire the technological ability to unilaterally destroy the world was the United States, sometime around 1948 or 1949, when the United States stockpiled enough nuclear weapons, about 100 in total, to have single-handedly initiated a worldwide nuclear winter. I choose the number “100” here because a 2008 study found that a regional “nuclear exchange involving 100 Hiroshima-size bombs (15 kilotons) on cities in the subtropics” could effectively “lower temperatures regionally and globally for several years, open up new holes in the ozone layer protecting the Earth from harmful radiation, reduce global precipitation by about 10 percent, and trigger massive crop failures.” Thus, bracketing the nontrivial 76 fact that many weapons built since World War II have a far greater explosive yield than 15 kilotons of TNT, we can crudely estimate when countries acquired the capacity to unilaterally cause a global nuclear winter by identifying the years during which their arsenals exceeded 100 nuclear weapons. On this criterion—for perspective, consider that the United State’s “Castle Bravo” weapon was equivalent to 15 megatons of TNT, while the Soviet Union’s “Tsar Bomba” had an extraordinary 58 megaton yield—the Soviet Union joined the club of potential world-destroyers at least by 1952, the United Kingdom at least by 1962, China at least by 1971, France at least by 1973, and other countries like Pakistan, India, and Israel perhaps by the 2010s, depending on the make-up of their arsenals.77 Thus, since World War II, the number of entities with doomsday capabilities has grown from zero to eight.

But the democratization of dual-use emerging technologies is rapidly transforming this predicament by multiplying the number of not only state but, far more importantly, nonstate actors having the capacity to unilaterally destroy the world. As I have previously discussed, there are four axes along which this trend, which I have elsewhere dubbed the “threat of universal unilateralism,” is unfolding. In brief, these are:

(i) The intelligence threshold that must be exceeded to effect large-scale destruction is lowering. This fact is humorously, but accurately, captured by Eliezer Yudkowsky’s so-called “Moore’s Law of Mad Science,” which states that “every eighteen months, the minimum IQ necessary to destroy the world drops by one point.” (ii) The information threshold that one must exceed to use 78 a wide range of emerging technologies in a competent manner is also falling. For example, the genomes of many of the most dangerous pathogens, including Ebola and smallpox, are readily accessible online, thus making such information easy to copy-paste onto one’s computer. (iii) The skill threshold that one must exceed to convert one's know-that into actionable know-how is dropping as well. Perhaps the most conspicuous example comes from synthetic biology, which is “explicitly devoted to the minimization of the importance of tacit knowledge.” The BioBricks 79 Foundation’s standardization of biological entities and devices like digital-to-biological converters are also relevant here. Yet the irrelevance of tacit knowledge may be especially salient with respect to molecular nanotechnology—e.g., nanofactories that can manufacture virtually any technical product for virtually zero cost given a digital blueprint, source of energy, and feedstock molecule like acetone or acetylene.81 And finally, (iv) the materials and equipment necessary for omniviolence are rapidly becoming more widely available and affordable. For example, the advent of nanofactories would make it possible to produce super-high-quality technical products of all sorts at almost no cost, and third-generation laser enrichment technologies such as SILEX (whereby uranium isotopes are separated by laser excitation) could enable small groups or lone individuals to produce weapons-grade uranium without the need for costly, large centrifuges.82

To couch the implications of these four trends in terms of the 2016 Dyn cyberattack, it is no longer unreasonable to ask in the wake of a major incident spanning multiple countries and affects millions of people whether the perpetrator is a state actor like Russia or North Korea, or someone in [their] ~~her or his~~ basement, with limited knowledge of computer systems or how to initiate a DDoS attack, using a $1,000 computer. To underline this point, consider the following two scenarios that could potentially cause the extinction of humanity. Both illustrate the fact that, as Benjamin Wittes and Gabriella Blum observe, greater technological capabilities entail greater susceptibility to harm; in their words, “technologies that expand the power to attack necessarily expand vulnerability to attack.”83 However, for reasons relating to “information hazards,”84 I have not chosen the most effective ways of bringing about human extinction that scholars in the nascent field of “existential risk studies” have privately devised (and kept secret within the community for information-hazard reasons), nor will I go into much detail about the logistics of actually realizing these scenarios. The simple point is merely to emphasize that we are, indeed, entering a new era of unprecedentedly distributed destructive capabilities.

Scenario 1: The CRISPR/Cas9 system consists of a segment of DNA from bacterial immune systems—CRISPR—and a protein that acts as “molecular scissors” capable of cutting DNA at target sequences—Cas9—which are specified by an RNA guide molecule. This system has enabled scientists to alter the genomes of organisms with unprecedented precision. Now consider “gene drives,” or genetic mechanisms that enable a segment of DNA to be inherited by an organism’s offspring at a probability of greater than 50 percent, even when the allele expressed by the gene is deleterious to the organism. Gene drives are found in nature, but advancements in synthetic biology are enabling scientists to create them artificially. Combining these two technologies: CRISPR/Cas9 and gene drives will enable the synthesis of genes that propagate through and decimate entire populations of organisms. At the extreme, so-called “suppression drives” that “reduce the population of the target species (for example by damaging a gene with a function essential to survival or reproduction)” could precipitate the extinction of the affected species.85

Now imagine that a terrorist sets up a “biohacker” lab with some basic synthetic biology capabilities. It will soon be feasible for a group or lone wolf to create suppression drives that target, for example, the primary pollinators: bees, wasps, moths, butterflies, and beetles. If these short-generation species were to perish, the result would be a cascade of disasters that E.O. Wilson adumbrates as follows, to quote him at length:

A majority of flowering plants, upon being deprived of their pollinators, cease to reproduce. Most herbaceous plant species among them spiral down to extinction. Insect-pollinated shrubs and trees hang on for a few more years, in rare cases of up to centuries. The great majority of birds and other land vertebrates, now denied the specialized foliage, fruits, and insect prey on which they feed, follow the plants into oblivion. The soil remains largely unturned, accelerating plant decline, because insects, not earthworms as generally supposed, are the principal turners and renewers of the soil. Populations of fungi and bacteria explode and remain at a peak over a few years while metabolizing the dead plant and animal material that piles up. Wind-pollinated grasses and a handful of fern and conifer species spread over much of the deforested terrain, then decline to some extent as the soil deteriorates. The human species survives, able to fall back on wind-pollinated grains and marine fishing. But amid widespread starvation during the first several decades, human populations plunge to a small fraction of their former level. The wars for control of the dwindling resources, the suffering, and the tumultuous decline to dark-age barbarism would be unprecedented in human history.86

In sum, CRISPR/Cas9 plus gene drives will open the door to unprecedentedly effective omnicidal attacks.

Scenario 2: The human expansion into space has historically coincided with the militarization of space. That is to say, the very first human-made artifact to reach space was the V2 ballistic missile built by Nazi Germany. The militarization of space continues today, with President Donald Trump, for example, announcing in 2018 the creation of a “United States Space Force” branch of the Armed Forces by 2020. But the situation is becoming more complicated as space simultaneously becomes increasingly privatized. Private companies are already delivering supplies to the International Space Station (ISS), and some plan to deliver satellites and offer tourists trips up to 50 miles above the ground, where the mesosphere becomes the thermosphere. Even more, molecular nanotechnology, which would enable one to manipulate matter with absolute atomic precision, could open up the space frontier to most everyone.87 In particular, nanofactories might enable groups and even individuals with no prior knowledge of rocket science and no manufacturing skills to build their own orbital spacecraft.88

The implications of this are unsettling, not just because more objects in space would increase the probability of an accidental Kessler syndrome (whereby shrapnel initiates a positivefeedback cascade that destroys all satellites in the Lower Earth Orbit), but because of the so-called “deflection dilemma.” This arises from the fact that technologies capable of redirecting larger asteroids or comets away from Earth could also be used to direct them toward Earth, a possibility taken seriously by many astronomers. The idea is simply that Earth is not safe from extraterrestrial impacts, a view that scientists almost unanimously rejected until the Alvarez hypothesis was vindicated by tests on the Chicxulub crater in 1990. In other words, there have been major impact events in the past and there will be more in the future. Hence, it is critical that humanity designs and builds spacecraft that could nudge incoming celestial bodies past Earth. But the dual usability of such technologies would also enable [malevolent actors] “~~madmen~~”—to borrow Sagan’s preferred term90—to potentially annihilate humanity by converting otherwise non-threatening asteroids or comets into “planetoid bombs” that smash into Earth and, in doing so, initiate a global impact winter of the sort that killed-off the non-avian dinosaurs 66 million years ago. Given the democratization of space technologies, this scenario could become increasingly probable in the coming decades.

These two scenarios illustrate the proposition that nonstate actors could plausibly bring about an omnicidal catastrophe with existing and emerging dual-use technologies. Indeed, state actors are far less likely to attempt to cause human extinction than nonstate actors, since states generally value their continued existence. For example, if humanity were to go extinct, then aspiring global autocrats (perhaps Vladimir Putin or Kim Jung-un) would be unable to fulfill their megalomaniacal ambitions. Similarly, if Hitler had destroyed the world in 1941, his vision of a Thousand Year Reich would not have been realizable. Yet Sagan notes that

in the winter and spring of 1945, Hitler ordered Germany to be destroyed—even “what the people need for elementary survival”—because the surviving Germans had “betrayed” him, and at any rate were “inferior” to those who had already died. If Hitler had nuclear weapons, the threat of a counterstrike by Allied nuclear weapons, had there been any, is unlikely to have dissuaded him. It might have encouraged him.91

The point is that under normal circumstances, states are pro-human-survival; they are much less likely to attempt an omnicidal attack than nonstate actors, who may be motivated by a range of “kill everyone” ideologies. In previous papers, I have outlined a six-part typology of groups/individuals that engender what I call “agential risks,” which are defined as follows:

Agential risk: the risk posed by any agent who could initiate an existential catastrophe in the presence of sufficiently powerful dual-use technologies either on purpose or by accident.92

Not all of the six agential risk types are germane to the present discussion, since this discussion is limited to the particular existential risk of human extinction (see section 4 for additional scenarios outlined by Bostrom ). These are the three agential risk types that are relevant: 93

(1) Omnicidal ecoterrorists, or individuals who believe that the biosphere, or Gaian system, would be better off if humans were to disappear entirely.

(2) Omnicidal ethicists, or individuals who believe that humanity should go extinct for moral reasons and that this should happen involuntarily (“pro-mortalism”).

(3) Omnicidal idiosyncratic actors, a catch-all category that subsumes individuals who harbor a death wish for humanity for idiosyncratic reasons, which might arise from sadistic, anti-humanist, misanthropic, etc. proclivities.

Although no scientific surveys have yet been conducted to assess the prevalence of omnicidal ideologies in society (such surveys would likely encounter the problem known as “Lizardman’s Constant” ), I have elsewhere catalogued a number of historical groups and individuals who almost 94 certainly would have brought about human extinction if only the means had been available.95 Convincing the reader of this point goes beyond the scope of this paper; I will thus refer them to previous work. For the nonce, I will proceed on the assumption that a nontrivial number of omnicidal agents exist in the world—that is to say, while the percentage of the global population with omnicidal urges is quite small, the absolute number is worrisomely large. This fact is enough to take the issue seriously, since as John Sotos calculates, the probability of any single individual successfully causing human extinction need be only minuscule for this to accumulate over space and time to more or less guarantee doom on timescales relevant to contemporary civilization. More 96 specifically, Sotos shows that a 1-in-100 chance of only a few hundred agents releasing a speciesdestroying pathogen yields virtually certain doom within just 100 years or so.97

#### U.S. model is key to stable nano---checks gray goo, super-weapons, and eco-collapse

Dennis 6 (Lindsay V., JD Candidate – Temple University School of Law, “Nanotechnology: Unique Science Requires Unique Solutions”, Temple Journal of Science, Technology & Environmental Law, Spring, 25 Temp. J. Sci. Tech. & Envtl. L. 87, Lexis)

Nanotechnology, a newly developing field merging science and technology, promises a future of open-ended potential. [6](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n6) Its scientific limits are unknown, and its myriad uses cross the boundaries of the technical, mechanical and medical fields. [7](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n7) Substantial research [8](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n8) has led scientists, [9](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n9) politicians [10](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n10) and academicians [11](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n11) to believe that nanotechnology has the potential to profoundly change the economy and to improve the national standard of living. [12](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n12) In addition, nanotechnology may touch every facet of human life because its products cross the boundaries of the most important industries, including electronics, biomedical and pharmaceutical  [\*89]  industries, and energy production. [13](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n13) In the future, nanotechnology could ensure longer, healthier lives with the reduction or elimination of life-threatening diseases, [14](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n14) a cleaner planet with pollution remediation and emission-free energy, [15](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n15) and the innumerable benefits of increased information technology. [16](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n16) However, certain uses, such as advanced drug delivery systems, [17](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n17) have given rise to an ethical debate similar to that surrounding cloning and stem cell research. [18](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n18) Moreover, some analysts have theorized that nanotechnology may endanger humankind with more dangerous warfare and weapons of terrorism, [19](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n19) and that nanotechnology may lead to artificial intelligence beyond human control. [20](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n20) The widespread use of nanotechnology far in the future threatens to alter the societal framework and create what has been called "gray goo." [21](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n21) Because nanotechnology has the potential to improve the products that most of us rely on in our daily lives, but also imperil society as we know it, we should research, monitor and regulate nanotechnology for the public good with trustworthy systems, and set up pervasive controls over its research, development, and deployment. In addition, its substantial impacts on existing regulations should be ascertained, and solutions incorporated into the regulatory framework. This paper addresses these concerns and provides potential solutions. Part I outlines the development of nanotechnology. Parts II and III explore the current and theoretical future applications of nanotechnology, and its potential side-effects. Then, Part IV analyzes the government's current role in monitoring nanotechnology, and the regulatory mechanisms available to manage or eliminate the negative implications of nanotechnology. Part V considers the creation of an Emerging Technologies Department as a possible solution to maximize the benefits and minimize the detrimental effects of nanotechnology. Lastly, Part VI examines certain environmental regulations to provide an example of nanotechnology's impact on existing regulatory schema.  [\*90]  Part I: Nanotechnology Defined   Nanoscience is the study of the fundamental principles of molecules and structures with at least one dimension roughly between 1 and 100 nanometers (one-billionth of a meter, or 10[su'-9']), otherwise known as the "nanoscale." [22](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n22) Called nanostructures, these are the smallest solid things possible to make. [23](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n23) Nanofabrication, or nanoscale manufacturing, is the process by which nanostructures are built. [24](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n24) Top-down nanofabrication creates nanostructures by taking a large structure and making it smaller, whereas bottom-up nanofabrication starts with individual atoms to build nanostructures. [25](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n25) Nanotechnology applies nanostructures into useful nanoscale devices. [26](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n26) The nanoscale is distinctive because it is the size scale where the properties of materials like conductivity, [27](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n27) hardness, [28](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n28) or melting point [29](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n29) are no longer similar to the properties of these same materials at the macro level. [30](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n30) Atom interactions, averaged out of existence in bulk material, give rise to unique properties. [31](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n31) In  [\*91]  nanotech research, scientists take advantage of these unique properties to develop products with applications that would not otherwise be available. [32](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n32) Although some products using nanotechnology are currently on the market, [33](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n33) nanotechnology is primarily in the research and development stage. [34](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n34) Because nanoparticles are remarkably small, tools specific to nanotechnology have been created to develop useful nanostructures and devices. [35](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n35) Two techniques exclusive to nanotechnology are self-assembly, and nanofabrication using nanotubes and nanorods. [36](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n36)  [\*92]  In self-assembly, particular atoms or molecules are put on a surface or preconstructed nanostructure, causing the molecules to align themselves into particular positions. [37](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n37) Although self-assembly is "probably the most important of the nanoscale fabrication techniques because of its generality, its ability to produce structures at different length-scales, and its low cost," [38](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n38) most nanostructures are built starting with larger molecules as components. [39](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n39) Nanotubes [40](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n40) and nanorods, [41](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n41) the first true nanomaterials engineered at the molecular level, are two examples of these building blocks. [42](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n42) They exhibit astounding physical and electrical properties. [43](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n43) Certain nanotubes have tensile strength in excess of 60 times high-grade steel while remaining light and flexible. [44](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n44) Currently, nanotubes are used in tennis rackets and golf clubs to make them lighter and stronger. [45](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n45) Part II: Nanotechnology's Uses   Researching and manipulating the properties of nanostructures are important for a number of reasons, including, most basically, to gain an understanding of how matter is constructed, and more practically, to use these unique properties to develop unique products. [46](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n46) Nanoproducts can be divided into four general categories: [47](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n47) smart materials, [48](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n48) sensors, [49](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n49) biomedical applications, [50](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n50) and optics and electronics. [51](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n51)  [\*93]  A "smart" material incorporates in its design a capability to perform several specific tasks. [52](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n52) In nanotechnology, that design is done at the molecular level. [53](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n53) Clothing, enhanced with nanotechnology, is a useful application of a smart material at the nanoscale. Certain nano-enhanced clothing contains fibers that have tiny whiskers that repel liquids, reduce static and resist stains without affecting feel. [54](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n54) Nano-enhanced rubber represents another application of a nanoscale smart material. [55](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n55) Tires using nanotech-components increase skid resistance by reducing friction, which reduces abrasion and makes the tires last longer. [56](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n56) The tires may be on the market "in the next few years" according to the National Nanotechnology Initiative (NNI). [57](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n57) Theoretically, this rubber could be used on a variety of products, ranging from tires to windshield wiper blades to athletic shoes. [58](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n58) A more complex nanotechnology smart material is a photorefractive polymer. [59](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n59) Acting as a nanoscale "barcode," these polymers could be used as information storage devices with a storage density exceeding the best available magnetic storage structures. [60](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n60) Nano-sensors may "revolutionize much of the medical care and the food packaging industries," [61](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n61) as well as the environmental field because of their ability to detect toxins and pollutants at fewer than ten molecules. [62](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n62) As the Environmental Protection Agency (EPA) recognizes: Protection of human health and ecosystems requires rapid, precise sensors capable of detecting pollutants at the molecular level. Major improvements in process control, compliance monitoring, and environmental decision-making could  [\*94]  be achieved if more accurate, less costly, more sensitive techniques were available. Nanotechnology offers the possibility of sensors enabled to be selective or specific, detect multiple analytes, and monitor their presence in real time. [63](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n63) Examples of research in sensors include the development of nano-sensors for efficient and rapid biochemical detection of pollutants; sensors capable of continuous measurement over large areas; integration of nano-enabled sensors for real-time continuous monitoring; and sensors that utilize "lab-on-a-chip" technology. [64](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n64) All fundamental life processes occur at the nanoscale, making it the ideal scale at which to fight diseases. [65](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n65) Two quintessential examples of biomedical applications of nanotechnology are advanced drug delivery systems and nano-enhanced drugs. [66](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n66) The promise of advanced drug delivery systems lies in that they direct drug molecules only to where they are needed in the body. [67](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n67) One example is focusing chemotherapy on the site of the tumor, instead of the whole body, thereby improving the drug's effectiveness while decreasing its unpleasant side-effects. [68](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n68) Other researchers are working to develop nanoparticles that target and trick cancer cells into absorbing certain nanoparticles. [69](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n69) These nanoparticles would then kill tumors from within, avoiding the destruction of healthy cells, as opposed to the indiscriminate damage caused by traditional chemotherapy. [70](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n70) Nano-enhanced suicide inhibitors [71](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n71) limit enzymatic activity by forcing naturally occurring enzymes to form bonds with the nanostructured molecule. [72](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n72) This may treat conditions such as epilepsy and depression because of the enzyme action component involved in these conditions. [73](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n73) Lastly, nanotechnology has the potential to revolutionize the electronics and optics fields. [74](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n74) For instance, nanotechnology has the potential to produce clean,  [\*95]  renewable solar power. [75](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n75) Through a process called artificial photosynthesis, solar energy is produced by using nanostructures based on molecules which capture light and separate positive and negative charges. [76](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n76) Certain Swiss watches and bathroom scales are illuminated through a nanotech procedure that transforms captured sunlight into an electrical current. [77](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n77) In the electronics field, nanostructures offer many different ways to increase memory storage by substantially reducing the size of memory bits and thereby increasing the density of magnetic memory, increasing efficiency, and decreasing cost. [78](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n78) One example is storing memory bits as magnetic nanodots, which can be reduced in size until they reach the super-paramagnetic limit, the smallest possible magnetic memory structure. [79](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n79) Advances in electronics and computing brought on by nanotechnology could allow reconfigurable, "thinking" spacecraft. [80](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n80) Some uses of nano-products already on the market include suntan lotions and skin creams, tennis balls that bounce longer, faster-burning rocket fuel additives, and new cancer treatments. [81](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n81) Solar cells in roofing tiles and siding that provide electricity for homes and facilities, and the prototypic tires, supra, may be on the market in the next few years. [82](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n82) The industry expects advanced drug delivery systems with implantable devices that automatically administer drugs and sensor drug levels, and medical diagnostic tools such as cancer-tagging mechanisms to be on the market in the next two to five years. [83](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n83) It is nearly impossible to foresee what developments to expect in nanotechnology in the decades to come. [84](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n84) Nonetheless, the book Engines of Creation presented one vision of the possibilities of advanced nanotechnology. [85](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n85) Nano-machines could be designed to construct any product, from mundane items such as a chair, to exciting items such as a rocket engine. [86](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n86) These "assemblers" could also be programmed to build copies of themselves. [87](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n87) Known as "replicators," these nano-machines could alter the world by producing an exponential quantity of themselves that are to be put to work as assemblers. [88](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n88) The development of assemblers could advance the space  [\*96]  exploration program, [89](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n89) biomedical field, [90](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n90) and even repair the damage done to the world's ecological systems. [91](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n91) Over time, production costs may sharply decrease because the assemblers will be able to construct all future products from an original blueprint at virtually no additional cost. [92](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n92) Part III: Nanotechnology's Side-Effects   With the good, however, comes the bad. The "gray goo problem," the most well-known unwanted potential consequence of the spread of nanotechnology, [93](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n93) arises when replicators and assemblers produce almost anything, and subsequently spread uncontrolled, obliterating natural organisms and replacing them with nano-enhanced organisms. [94](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n94) A more foreseeable issue is environmental contamination. [95](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n95) The EPA noted   As nanotechnology progresses from research and development to commercialization and use, it is likely that manufactured nanomaterials and nanoproducts will be released into the environment... . The unique features of manufactured nanomaterials and a lack of experience with these materials hinder the risk evaluation that is needed to inform decisions about pollution prevention, environmental clean-up and other control measures, including regulation. Beyond the usual concerns for most toxic materials ... the adequacy of current toxicity tests for chemicals needs to be assessed ... . To the extent that nanoparticles  [\*97]  ... elicit novel biological responses, these concerns need to be accounted for in toxicity testing to provide relevant information needed for risk assessment to inform decision making. [96](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n96)   In addition, nanotechnology could change the face of global warfare and terrorism. [97](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n97) Assemblers could be used to duplicate existing weapons out of superior materials, and chemical and biological weapons could be created with nano-enhanced components. [98](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n98) Modern detection systems would be inadequate to detect nano-enhanced weapons built with innocuous materials such as carbon. [99](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n99) Luckily, nanotechnology offers responses to these problems, and researchers are already tackling these issues. [100](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n100) "Labs-on-a-chip," a sensor system the size of a microchip, could be woven into soldiers' uniforms to detect toxins immediately. [101](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n101) Adding smart materials could make soldiers' uniforms resistant to certain chemical and biological agents. [102](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n102) Nanotechnology also enhances threats against citizens. Drugs and bugs (electronic surveillance devices) could be used by police states to monitor and control its citizenry. [103](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n103) Viruses could be created that target specific genetic characteristics. [104](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n104) Not only is the development of technologically advanced, devastating weaponry itself a hazardous effect of nanotechnology, but also, millions of dollars have already been spent researching potential uses of nanotechnology in the military sphere, [105](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n105) thus diverting funds from more beneficial uses such as biomedical applications and clean energy. However, these negative effects are not inevitable. By analyzing the scope of potential drawbacks accompanying these research investments, lawmakers can institute regulatory controls that could mitigate these problems.  [\*98]  Part IV: Maximizing Benefits, Minimizing Catastrophe   To minimize or eliminate the problems associated with nanotechnology, while maximizing the beneficial effects, nanotechnology research and development should be monitored and regulated by "trustworthy systems." [106](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n106) Currently, the federal government oversees a massive funding and research program with the purpose of "ensuring United States global leadership in the development and application of nanotechnology." [107](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n107) Nonetheless, as nanotechnology becomes more prevalent, more thorough regulation may be necessary. [108](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n108) Nanotechnology may greatly impact some of the largest revenue producing industries in the United States, such as the pharmaceutical and medical fields, utilities and power generation, and computer electronics. [109](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n109) Thus, it is clear that nanotechnology will likely touch every facet of human life. In addition, these powerful industries have been known to promote profits over human safety, [110](http://www.lexis.com/research/retrieve?cc=&pushme=1&tmpFBSel=all&totaldocs=&taggedDocs=&toggleValue=&numDocsChked=0&prefFBSel=0&delformat=XCITE&fpDocs=&fpNodeId=&fpCiteReq=&brand=&_m=82ab008e42cdd5d1d23cfd1d96b430bb&docnum=5&_fmtstr=FULL&_startdoc=1&wchp=dGLbVtz-zSkAb&_md5=f86737f923f2df1de12147f84a019421&focBudTerms=Nanotechnology%3A+Unique+Science+Requires+Unique+Solutions&focBudSel=all#n110) one of the reasons for their stringent regulation.  [\*99]

#### Only existential impact---that outweighs

Bostrom 2 – Nick Bostrom, Professor of Philosophy at Oxford University, “Existential Risks: Analyzing Human Extinction Scenarios and Related Hazards”, Journal of Evolution and Technology, 9(1), http://www.nickbostrom.com/existential/risks.html

1.2 Existential risks In this paper we shall discuss risks of the sixth category, the one marked with an X. This is the category of global, terminal risks. I shall call these existential risks. Existential risks are distinct from global endurable risks. Examples of the latter kind include: threats to the biodiversity of Earth’s ecosphere, moderate global warming, global economic recessions (even major ones), and possibly stifling cultural or religious eras such as the “dark ages”, even if they encompass the whole global community, provided they are transitory (though see the section on “Shrieks” below). To say that a particular global risk is endurable is evidently not to say that it is acceptable or not very serious. A world war fought with conventional weapons or a Nazi-style Reich lasting for a decade would be extremely horrible events even though they would fall under the rubric of endurable global risks since humanity could eventually recover. (On the other hand, they could be a local terminal risk for many individuals and for persecuted ethnic groups.) I shall use the following definition of existential risks: Existential risk – One where an adverse outcome would either annihilate Earth-originating intelligent life or permanently and drastically curtail its potential. An existential risk is one where humankind as a whole is imperiled. Existential disasters have major adverse consequences for the course of human civilization for all time to come. 2 The unique challenge of existential risks Risks in this sixth category are a recent phenomenon. This is part of the reason why it is useful to distinguish them from other risks. We have not evolved mechanisms, either biologically or culturally, for managing such risks. Our intuitions and coping strategies have been shaped by our long experience with risks such as dangerous animals, hostile individuals or tribes, poisonous foods, automobile accidents, Chernobyl, Bhopal, volcano eruptions, earthquakes, draughts, World War I, World War II, epidemics of influenza, smallpox, black plague, and AIDS. These types of disasters have occurred many times and our cultural attitudes towards risk have been shaped by trial-and-error in managing such hazards. But tragic as such events are to the people immediately affected, in the big picture of things – from the perspective of humankind as a whole – even the worst of these catastrophes are mere ripples on the surface of the great sea of life. They haven’t significantly affected the total amount of human suffering or happiness or determined the long-term fate of our species. With the exception of a species-destroying comet or asteroid impact (an extremely rare occurrence), there were probably no significant existential risks in human history until the mid-twentieth century, and certainly none that it was within our power to do something about. The first manmade existential risk was the inaugural detonation of an atomic bomb. At the time, there was some concern that the explosion might start a runaway chain-reaction by “igniting” the atmosphere. Although we now know that such an outcome was physically impossible, it qualifies as an existential risk that was present at the time. For there to be a risk, given the knowledge and understanding available, it suffices that there is some subjective probability of an adverse outcome, even if it later turns out that objectively there was no chance of something bad happening. If we don’t know whether something is objectively risky or not, then it is risky in the subjective sense. The subjective sense is of course what we must base our decisions on.[2] At any given time we must use our best current subjective estimate of what the objective risk factors are.[3] A much greater existential risk emerged with the build-up of nuclear arsenals in the US and the USSR. An all-out nuclear war was a possibility with both a substantial probability and with consequences that might have been persistent enough to qualify as global and terminal. There was a real worry among those best acquainted with the information available at the time that a nuclear Armageddon would occur and that it might annihilate our species or permanently destroy human civilization.[4] Russia and the US retain large nuclear arsenals that could be used in a future confrontation, either accidentally or deliberately. There is also a risk that other states may one day build up large nuclear arsenals. Note however that a smaller nuclear exchange, between India and Pakistan for instance, is not an existential risk, since it would not destroy or thwart humankind’s potential permanently. Such a war might however be a local terminal risk for the cities most likely to be targeted. Unfortunately, we shall see that nuclear Armageddon and comet or asteroid strikes are mere preludes to the existential risks that we will encounter in the 21st century. The special nature of the challenges posed by existential risks is illustrated by the following points: · Our approach to existential risks cannot be one of trial-and-error. There is no opportunity to learn from errors. The reactive approach – see what happens, limit damages, and learn from experience – is unworkable. Rather, we must take a proactive approach. This requires foresight to anticipate new types of threats and a willingness to take decisive preventive action and to bear the costs (moral and economic) of such actions. · We cannot necessarily rely on the institutions, moral norms, social attitudes or national security policies that developed from our experience with managing other sorts of risks. Existential risks are a different kind of beast. We might find it hard to take them as seriously as we should simply because we have never yet witnessed such disasters.[5] Our collective fear-response is likely ill calibrated to the magnitude of threat. · Reductions in existential risks are global public goods [13] and may therefore be undersupplied by the market [14]. Existential risks are a menace for everybody and may require acting on the international plane. Respect for national sovereignty is not a legitimate excuse for failing to take countermeasures against a major existential risk. · If we take into account the welfare of future generations, the harm done by existential risks is multiplied by another factor, the size of which depends on whether and how much we discount future benefits [15,16]. In view of its undeniable importance, it is surprising how little systematic work has been done in this area. Part of the explanation may be that many of the gravest risks stem (as we shall see) from anticipated future technologies that we have only recently begun to understand. Another part of the explanation may be the unavoidably interdisciplinary and speculative nature of the subject. And in part the neglect may also be attributable to an aversion against thinking seriously about a depressing topic. The point, however, is not to wallow in gloom and doom but simply to take a sober look at what could go wrong so we can create responsible strategies for improving our chances of survival. In order to do that, we need to know where to focus our efforts. 3 Classification of existential risks We shall use the following four categories to classify existential risks[6]: Bangs – Earth-originating intelligent life goes extinct in relatively sudden disaster resulting from either an accident or a deliberate act of destruction. Crunches – The potential of humankind to develop into posthumanity[7] is permanently thwarted although human life continues in some form. Shrieks – Some form of posthumanity is attained but it is an extremely narrow band of what is possible and desirable. Whimpers – A posthuman civilization arises but evolves in a direction that leads gradually but irrevocably to either the complete disappearance of the things we value or to a state where those things are realized to only a minuscule degree of what could have been achieved. Armed with this taxonomy, we can begin to analyze the most likely scenarios in each category. The definitions will also be clarified as we proceed. 4 Bangs This is the most obvious kind of existential risk. It is conceptually easy to understand. Below are some possible ways for the world to end in a bang.[8] I have tried to rank them roughly in order of how probable they are, in my estimation, to cause the extinction of Earth-originating intelligent life; but my intention with the ordering is more to provide a basis for further discussion than to make any firm assertions. 4.1 Deliberate misuse of nanotechnology In a mature form, molecular nanotechnology will enable the construction of bacterium-scale self-replicating mechanical robots that can feed on dirt or other organic matter [22-25]. Such replicators could eat up the biosphere or destroy it by other means such as by poisoning it, burning it, or blocking out sunlight. A person of malicious intent in possession of this technology might cause the extinction of intelligent life on Earth by releasing such nanobots into the environment.[9] The technology to produce a destructive nanobot seems considerably easier to develop than the technology to create an effective defense against such an attack (a global nanotech immune system, an “active shield” [23]). It is therefore likely that there will be a period of vulnerability during which this technology must be prevented from coming into the wrong hands. Yet the technology could prove hard to regulate, since it doesn’t require rare radioactive isotopes or large, easily identifiable manufacturing plants, as does production of nuclear weapons [23]. Even if effective defenses against a limited nanotech attack are developed before dangerous replicators are designed and acquired by suicidal regimes or terrorists, there will still be the danger of an arms race between states possessing nanotechnology. It has been argued [26] that molecular manufacturing would lead to both arms race instability and crisis instability, to a higher degree than was the case with nuclear weapons. Arms race instability means that there would be dominant incentives for each competitor to escalate its armaments, leading to a runaway arms race. Crisis instability means that there would be dominant incentives for striking first. Two roughly balanced rivals acquiring nanotechnology would, on this view, begin a massive buildup of armaments and weapons development programs that would continue until a crisis occurs and war breaks out, potentially causing global terminal destruction. That the arms race could have been predicted is no guarantee that an international security system will be created ahead of time to prevent this disaster from happening. The nuclear arms race between the US and the USSR was predicted but occurred nevertheless. 4.2 Nuclear holocaust The US and Russia still have huge stockpiles of nuclear weapons. But would an all-out nuclear war really exterminate humankind? Note that: (i) For there to be an existential risk it suffices that we can’t be sure that it wouldn’t. (ii) The climatic effects of a large nuclear war are not well known (there is the possibility of a nuclear winter). (iii) Future arms races between other nations cannot be ruled out and these could lead to even greater arsenals than those present at the height of the Cold War. The world’s supply of plutonium has been increasing steadily to about two thousand tons, some ten times as much as remains tied up in warheads ([9], p. 26). (iv) Even if some humans survive the short-term effects of a nuclear war, it could lead to the collapse of civilization. A human race living under stone-age conditions may or may not be more resilient to extinction than other animal species. 4.3 We’re living in a simulation and it gets shut down A case can be made that the hypothesis that we are living in a computer simulation should be given a significant probability [27]. The basic idea behind this so-called “Simulation argument” is that vast amounts of computing power may become available in the future (see e.g. [28,29]), and that it could be used, among other things, to run large numbers of fine-grained simulations of past human civilizations. Under some not-too-implausible assumptions, the result can be that almost all minds like ours are simulated minds, and that we should therefore assign a significant probability to being such computer-emulated minds rather than the (subjectively indistinguishable) minds of originally evolved creatures. And if we are, we suffer the risk that the simulation may be shut down at any time. A decision to terminate our simulation may be prompted by our actions or by exogenous factors. While to some it may seem frivolous to list such a radical or “philosophical” hypothesis next the concrete threat of nuclear holocaust, we must seek to base these evaluations on reasons rather than untutored intuition. Until a refutation appears of the argument presented in [27], it would intellectually dishonest to neglect to mention simulation-shutdown as a potential extinction mode. 4.4 Badly programmed superintelligence When we create the first superintelligent entity [28-34], we might make a mistake and give it goals that lead it to annihilate humankind, assuming its enormous intellectual advantage gives it the power to do so. For example, we could mistakenly elevate a subgoal to the status of a supergoal. We tell it to solve a mathematical problem, and it complies by turning all the matter in the solar system into a giant calculating device, in the process killing the person who asked the question. (For further analysis of this, see [35].) 4.5 Genetically engineered biological agent With the fabulous advances in genetic technology currently taking place, it may become possible for a tyrant, terrorist, or lunatic to create a doomsday virus, an organism that combines long latency with high virulence and mortality [36]. Dangerous viruses can even be spawned unintentionally, as Australian researchers recently demonstrated when they created a modified mousepox virus with 100% mortality while trying to design a contraceptive virus for mice for use in pest control [37]. While this particular virus doesn’t affect humans, it is suspected that an analogous alteration would increase the mortality of the human smallpox virus. What underscores the future hazard here is that the research was quickly published in the open scientific literature [38]. It is hard to see how information generated in open biotech research programs could be contained no matter how grave the potential danger that it poses; and the same holds for research in nanotechnology. Genetic medicine will also lead to better cures and vaccines, but there is no guarantee that defense will always keep pace with offense. (Even the accidentally created mousepox virus had a 50% mortality rate on vaccinated mice.) Eventually, worry about biological weapons may be put to rest through the development of nanomedicine, but while nanotechnology has enormous long-term potential for medicine [39] it carries its own hazards. 4.6 Accidental misuse of nanotechnology (“gray goo”) The possibility of accidents can never be completely ruled out. However, there are many ways of making sure, through responsible engineering practices, that species-destroying accidents do not occur. One could avoid using self-replication; one could make nanobots dependent on some rare feedstock chemical that doesn’t exist in the wild; one could confine them to sealed environments; one could design them in such a way that any mutation was overwhelmingly likely to cause a nanobot to completely cease to function [40]. Accidental misuse is therefore a smaller concern than malicious misuse [23,25,41]. However, the distinction between the accidental and the deliberate can become blurred. While “in principle” it seems possible to make terminal nanotechnological accidents extremely improbable, the actual circumstances may not permit this ideal level of security to be realized. Compare nanotechnology with nuclear technology. From an engineering perspective, it is of course perfectly possible to use nuclear technology only for peaceful purposes such as nuclear reactors, which have a zero chance of destroying the whole planet. Yet in practice it may be very hard to avoid nuclear technology also being used to build nuclear weapons, leading to an arms race. With large nuclear arsenals on hair-trigger alert, there is inevitably a significant risk of accidental war. The same can happen with nanotechnology: it may be pressed into serving military objectives in a way that carries unavoidable risks of serious accidents. In some situations it can even be strategically advantageous to deliberately make one’s technology or control systems risky, for example in order to make a “threat that leaves something to chance” [42].

#### Defense doesn’t assume interactions of multiple simultaneous threats

Pamlin, 15 -- Dennis Pamlin, Executive Project Manager of the Global Risks Global Challenges Foundation, and Stuart Armstrong, James Martin Research Fellow at the Future of Humanity Institute of the Oxford Martin School at University of Oxford, Global Challenges Foundation, February, http://globalchallenges.org/wp-content/uploads/12-Risks-with-infinite-impact.pdf

If a safe artificial intelligence is developed, this provides a great resource for improving outcomes and mitigating all types of risk.585 Artificial intelligence risks worsening nanotechnology risks, by allowing nanomachines and weapons to be designed with intelligence and without centralised control, overcoming the main potential weaknesses of these machines586 by putting planning abilities on the other side. Conversely, nanotechnology abilities worsen artificial intelligence risk, by giving AI extra tools which it could use for developing its power base.587 Nanotechnology and synthetic biology could allow the efficient creation of vaccines and other tools to combat global pandemics.588 Nanotechnology’s increased industrial capacity could allow the creation of large amounts of efficient solar panels to combat climate change, or even potentially the efficient scrubbing of CO2 from the atmosphere.589 Nanotechnology and synthetic biology are sufficiently closely related 590 (both dealing with properties on an atomic scale) for methods developed in one to be ported over to the other, potentially worsening the other risk. They are sufficiently distinct though (a mainly technological versus a mainly biological approach) for countermeasures in one domain not necessarily to be of help in the other. Uncontrolled or malicious synthetic pathogens could wreak great damage on the ecosystem; conversely, controlled and benevolent synthetic creations could act to improve and heal current ecological damage.

#### Strong risk reduction key to prevent AI-driven extinction---it’s uniquely likely, but success solves every impact

Pamlin, 15 -- Dennis Pamlin, Executive Project Manager of the Global Risks Global Challenges Foundation, and Stuart Armstrong, James Martin Research Fellow at the Future of Humanity Institute of the Oxford Martin School at University of Oxford, Global Challenges Foundation, February, http://globalchallenges.org/wp-content/uploads/12-Risks-with-infinite-impact.pdf

Despite the uncertainty of when and how AI could be developed, there are reasons to suspect that an AI with human-comparable skills would be a major risk factor. AIs would immediately benefit from improvements to computer speed and any computer research. They could be trained in specific professions and copied at will, thus replacing most human capital in the world, causing potentially great economic disruption. Through their advantages in speed and performance, and through their better integration with standard computer software, they could quickly become extremely intelligent in one or more domains (research, planning, social skills...). If they became skilled at computer research, the recursive self-improvement could generate what is sometime called a “singularity”, 482 but is perhaps better described as an “intelligence explosion”, 483 with the AI’s intelligence increasing very rapidly.484 Such extreme intelligences could not easily be controlled (either by the groups creating them, or by some international regulatory regime),485 and would probably act in a way to boost their own intelligence and acquire maximal resources for almost all initial AI motivations.486 And if these motivations do not detail 487 the survival and value of humanity in exhaustive detail, the intelligence will be driven to construct a world without humans or without meaningful features of human existence. This makes extremely intelligent AIs a unique risk,488 in that extinction is more likely than lesser impacts. An AI would only turn on humans if it foresaw a likely chance of winning; otherwise it would remain fully integrated into society. And if an AI had been able to successfully engineer a civilisation collapse, for instance, then it could certainly drive the remaining humans to extinction. On a more positive note, an intelligence of such power could easily combat most other risks in this report, making extremely intelligent AI into a tool of great positive potential as well.489 Whether such an intelligence is developed safely depends on how much effort is invested in AI safety (“Friendly AI”)490 as opposed to simply building an AI.49

#### AI-nano combo causes Universe extinction

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[Nick, Professor in the Faculty of Philosophy at Oxford University. He is the founding Director of the Future of Humanity Institute, Superintelligence: Paths, Dangers, Strategies, Oxford University Press, 2014]

An agent’s ability to shape humanity’s future depends not only on the absolute magnitude of the agent’s own faculties and resources—how smart and energetic it is, how much capital it has, and so forth—but also on the relative magnitude of its capabilities compared with those of other agents with conflicting goals. In a situation where there are no competing agents, the absolute capability level of a superintelligence, so long as it exceeds a certain minimal threshold, does not matter much, because a system starting out with some sufficient set of capabilities could plot a course of development that will let it acquire any capabilities it initially lacks. We alluded to this point earlier when we said that speed, quality, and collective superintelligence all have the same indirect reach. We alluded to it again when we said that various subsets of superpowers, such as the intelligence amplification superpower or the strategizing and the social manipulation superpowers, could be used to obtain the full complement. Consider a superintelligent agent with actuators connected to a nanotech assembler. Such an agent is already powerful enough to overcome any natural obstacles to its indefinite survival. Faced with no intelligent opposition, such an agent could plot a safe course of development that would lead to its acquiring the complete inventory of technologies that would be useful to the attainment of its goals. For example, it could develop the technology to build and launch von Neumann probes, machines capable of interstellar travel that can use resources such as asteroids, planets, and stars to make copies of themselves.13 By launching one von Neumann probe, the agent could thus initiate an open-ended process of space colonization. The replicating probe’s descendants, travelling at some significant fraction of the speed of light, would end up colonizing a substantial portion of the Hubble volume, the part of the expanding universe that is theoretically accessible from where we are now. All this matter and free energy could then be organized into whatever value structures maximize the originating agent’s utility function integrated over cosmic time—a duration encompassing at least trillions of years before the aging universe becomes inhospitable to information processing (see Box 7). The superintelligent agent could design the von Neumann probes to be evolution-proof. This could be accomplished by careful quality control during the replication step. For example, the control software for a daughter probe could be proofread multiple times before execution, and the software itself could use encryption and error-correcting code to make it arbitrarily unlikely that any random mutation would be passed on to its descendants.14 The proliferating population of von Neumann probes would then securely preserve and transmit the originating agent’s values as they go about settling the universe. When the colonization phase is completed, the original values would determine the use made of all the accumulated resources, even though the great distances involved and the accelerating speed of cosmic expansion would make it impossible for remote parts of the infrastructure to communicate with one another. The upshot is that a large part of our future light cone would be formatted in accordance with the preferences of the originating agent. This, then, is the measure of the indirect reach of any system that faces no significant intelligent opposition and that starts out with a set of capabilities exceeding a certain threshold. We can term the threshold the “wise-singleton sustainability threshold” (Figure 11):

#### The Court has recently narrowed Parker immunity to limit deference to the states in antitrust law

Allensworth 16 [Rebecca Haw Allensworth, Associate Professor of Law, Vanderbilt Law School; J.D., Harvard Law School; M.Phil, University of Cambridge; B.A., Yale University, October 2016, ARTICLE: THE NEW ANTITRUST FEDERALISM, 102 Va. L. Rev. 1387]

Introduction

IN just three relatively obscure antitrust cases, 1

[Footnote 1] N.C. State Bd. of Dental Exam'rs v. FTC, 135 S. Ct. 1101 (2015) [hereinafter NC Dental]; FTC v. Phoebe Putney Health Sys., Inc., 133 S. Ct. 1003 (2013); FTC v. Ticor Title Ins. Co., 504 U.S. 621 (1992).

the U.S. Supreme Court has quietly revolutionized how states and the federal government share power. These cases addressed a doctrine - unfamiliar to those outside of the field of antitrust law - that grants "state action" immunity from federal antitrust liability 2 and thus marks the thin line that insulates state regulation from wholesale invalidation through federal antitrust lawsuits. 3 For decades, the Court conceived of this line, and the "antitrust federalism" it effected, as a formal question about where the state ended and antitrust liability began. This was the old antitrust federalism: a boundary-drawing exercise that gave strong deference to state regulation. The Court's state action revolution ushers in a new antitrust federalism, one that all but dispenses with the notion of separate spheres in favor of something less deferential to the states - procedural review of state regulation.

Antitrust federalism may be less familiar than its constitutional cousin, but it is just as important - if not more so - to the state-federal balance of power. The Sherman Act forbids anticompetitive restraints of trade and monopolization of markets, and it does not seem to limit these prohibitions to private citizens and corporations. 4 Because regulation often tinkers with the free market economy and tends to create competitive winners and losers, Sherman Act liability for state conduct would severely restrict a state's ability to regulate within its borders. 5 So when [\*1390] the Court extended the reach of the Sherman Act - along with all federal regulation passed under the Commerce Clause - during the New Deal, 6 it became necessary to define an exemption for "state action" or risk the demise of state regulatory autonomy altogether. And state action immunity from the Sherman Act was born. 7

#### But, the current interpretation fails to account for interstate spillovers. Limiting Parker is crucial to establish federal role limiting regulatory externalities

Sack 21 [John Sack, J.D., Duke Law School, Class of 2022, B.S. University of Michigan, 2019, 2021 https://scholarship.law.duke.edu/cgi/viewcontent.cgi?article=1196&context=djclpp\_sidebar]

III. DOCTRINAL CRITICISM

Although the Court has continued to re-affirm Parker v. Brown’s central holding, many have criticized the Parker doctrine. Both scholars and the Federal Trade Commission (FTC) have highlighted problems with the doctrine and offered a number of solutions for how to remedy its faults.63

The first common critique of the doctrine is that it does not account for out-of-state economic effects. Unless a regulation runs afoul of another constitutional barrier, no consideration of interstate spillovers applies.64 One need not look farther than Parker itself to see how the state action doctrine can impose costs on out-of-state residents, even though those residents have diminished political capital in the state. At the time Parker was decided, between 90 and 95 percent of raisins produced in California entered interstate commerce and California provided almost all of the nation’s raisins.65 Most American raisin consumers lived outside of California and had no political means to oppose the state’s legislative program, yet they bore the costs of California’s state-sanctioned monopoly.66

Second, similar concerns about political representation animate critiques of Parker immunity. The policy at issue in Parker restricted output and artificially raised prices, two results federal antitrust law generally seeks to prohibit.67 Although the benefits of such a program were borne almost exclusively by California, the costs of the program were incurred by raisin consumers across the nation.68 The political incentives to promote such a program follow closely with economic costs and benefits.69 California raisin producers have a strong incentive to lobby their own government to install such a program, but it would be nearly impossible for non-California residents to challenge such a policy through the normal political channels.70 The government of California is not the appropriate body to properly weigh the benefits to in-state raisin producers with the costs to out-of-state consumers, yet the Parker doctrine grants California per se immunity on federalism grounds.71 Although the California program was implicitly endorsed by Congress, one is just as likely to find similar programs with no similar implicit endorsement.72

The U.S. Constitution embodies a system of federalism where the federal government is sovereign in some respects, and the several states are sovereign in others.73 This system of federalism gives states the power to regulate local matters and the federal government the power to regulate issues that states are less suited to regulate.74 When costs spill over into other states, the national government becomes the appropriate body to regulate the costs and benefits of such a program.75 The Court has recognized such spillover effects, and how political actors, even government entities, can act solely in self-interest.76 Such state self-interest can directly harm consumers outside of its territorial jurisdiction.77

Parker immunity, as it stands, runs counter to longstanding ideals of national unity that harken back to the Founding era. The law has long prohibited states from imposing excessive costs on the nation as a whole, solely for the purpose of furthering its own intrastate policy interests. McCulloch v. Maryland illustrates the Court’s wariness of self-serving state action.78 In McCulloch, Chief Justice Marshall held that states may not tax the national bank, as they would be wielding power against the whole of the United States, even though the whole of the United States is not represented by each state.79 Similar to a state tax being problematic since it is the part acting on the whole, anticompetitive restraints by the states would unduly impose costs on the nation. The people of the United States, acting through Congress, christened competition and free markets through the Sherman Act.80 Just as one state could not tax the resources of the United States, one state should not be allowed to use state policy to burden the national economy. Because the potential costs to state-created monopolies are so high,81 federal policy should prohibit states from allocating those costs beyond their borders. Any state that wishes to impose monopoly costs outside of its borders to benefit itself and undermine competition should be carefully scrutinized when it does so. This scrutiny would not be fatal-in-fact for the legislation, but it should be enough for states to second-guess an attempt to enrich itself to the detriment of its sister states.

IV. PROPOSED SOLUTIONS

The Sherman Act, and specifically Parker immunity, should be interpreted in light of the above concerns. After all, the Sherman Act is the standard-bearer for the U.S. free market system, and so our interpretation of it should evolve with our understanding of constitutional principles and economic conditions.82 Justice Burger’s concurrence in City of Lafayette elaborates on this point:

Our conceptions of the limits imposed by federalism are bound to evolve, just as our understanding of Congress’ power under the Commerce Clause has evolved. Consequently, since we find it appropriate to allow the ambit of the Sherman Act to expand with evolving perceptions of congressional power under the Commerce Clause, a similar process should occur with respect to “state action” analysis under Parker. That is, we should not treat the result in the Parker case as cast in bronze; rather, the scope of the Sherman Act’s power should parallel the developing concepts of American federalism.83

As states impose costs on each other through state-sanctioned monopolies, the Court’s understanding of federalism and the Commerce Clause counsels scrutiny of the Parker doctrine. An entirely new doctrine is not necessary to curtail Parker immunity. Rather, the issue can be resolved by applying Parker immunity in light of the American dual system of federalism and the Commerce Clause. Modern scholarship critiques the lack of concern for interstate spillovers. By that token, the modern Parker doctrine fails to account for economic efficiency and undermines political representation values meant to be protected by federalism.84 So while scholars almost universally recognize that interstate economic spillovers are problematic, there is no consensus on what remedy is most appropriate.

#### The aff preserves state authority to enforce antitrust but absent clarification on the transboundary effects from broad Parker immunity turf wars cause enforcement failures

Kobayashi 20 [Bruce H. Kobayashi, George Mason University, Antonin Scalia Law School Professor, 10-4-2020 https://gaidigitalreport.com/2020/10/04/exemptions-and-immunities/#\_ftn92]

B. Spillover Effects and Antitrust Federalism

The current state action doctrine does not enable jurisdictional competition or promote the principles of federalism because it does not account for the spillover effects of anticompetitive state regulation. Judge Easterbrook examined the Court’s state action holdings and found that the Court’s rulings were indifferent as to whether the effects of the regulation were actually internalized by the regulating state.[91] Allowing states to enact anticompetitive legislation reduced the extent and effectiveness of competition among the states, and thereby increased the cost of exit and relocation.[92]

This nature of the spillover effect is exemplified in Parker v. Brown.[93] The state action doctrine was used to uphold a California regulation which authorized a raisin cartel. California raisin growers benefited greatly from that ability to price fix. However, over 90% of the grapes were exported outside of California—nationally and internationally—making the impact of the California raisin regulation reach beyond state lines.[94] The regulation harmed a large number of consumers outside of California while only benefiting a small number of private interest parties within the state.

State action doctrine, although meant to preserve that state’s independence, actually allows the state to reap the benefits of the anticompetitive regulation while displacing the costs onto other states.[95] Therefore, it is worth considering if the current state action doctrine should be thought of differently, in a way that fully takes into accounts issues of federalism. Judge Easterbrook proposes a state action rule which considers the spillover effect of anticompetitive state regulation. Instead of examining clear articulation and active supervision, the Court would uphold an anticompetitive state regulation as long as its anticompetitive effects are internalized by that state’s residents.[96] Aligning state action doctrine with the economics of federalism will not only maintain states’ roles in antitrust, but also ensure that state antitrust exemptions have a diminished negative impact on consumer welfare. Analyzing the anticompetitive overcharge of regulations is also more administrable than attempting to analyze the regulations under the dormant Commerce Clause.[97] Considered under Easterbrook’s approach, Parker’s California raisin prorate program would be subject to antitrust scrutiny because the regulation’s costs were not internalized.

State regulation of seemingly local competition is likely to effect more than just the economy of that specific state. When states grant antitrust immunities in situations involving interstate commerce, the state is exporting the anticompetitive effects of its regulations to citizens outside its own borders. Without accounting for the federal interest in an integrated national economy, state action doctrine far surpasses its narrow purpose of supervising local competition.

C. The Appropriate Role of State Attorneys General in Federal Antitrust Disputes

Federalism most often refers to the vertical relationship between the federal government and the states. Divergent viewpoints among antitrust enforcers can strain the system, thus comity and deference are crucial to efficient antitrust enforcement. A merger or acquisition is often scrutinized by multiple enforcers with multi-dimensional relationships.

For example, the Sprint/T-Mobile merger involved the Antitrust Division and Federal Communications Commission, who share a horizontal relationship, and state attorneys general, with which the federal agencies share a vertical relationship. Disagreement between enforcers may occur at either level.[98] The merger between the two telecommunications firms was cleared by the FCC, the Antitrust Division, and ten state attorneys general.[99] Although a settlement agreement—which required divestitures—was in the process of being approved, several other state attorneys general filed a lawsuit to block the merger anyway.[100] Assistant Attorney General Makan Delrahim questioned the relief sought by the states,[101] citing the federal agencies’ expertise in the matter.[102] He noted that “a minority of states and the District of Columbia” were “trying to undo [the nationwide settlement],” a situation he believed was “odd.”[103] Delrahim reaffirmed states’ rights to sue for antitrust violations but criticized their attempt to seek relief inconsistent with the federal government’s settlement.[104]

States may also enter settlement agreements with merging parties that are repugnant to sound antitrust enforcement. For example, in UnitedHealth Group/Sierra Health Services, the Nevada Attorney General required the merged firm to submit $15 million in charitable contributions which were not related to any antitrust violation.[105] Similarly, Massachusetts entered a settlement agreement with two hospitals that required increased spending on select programs and the creation of other projects and programs unrelated to antitrust concerns.[106]

On the other hand, state antitrust enforcement can play a useful role in supplementing federal antitrust enforcement. First, the use of state autonomy within a federal system allows state and local governments to act as social “laboratories,” where laws and policies are created and tested at the state level of the democratic system, in a manner similar (in theory, at least) to the scientific method.[107] Thus, even if states enter into agreements with merging parties that the federal authorities view as anticompetitive or that impose ineffective remedies for the anticompetitive effects that would be generated by the merger, the information generated by such actions can be invaluable inputs into retrospective analyses of the competitive effects of mergers. These analyses are based on causal empirical designs which require both observation of post-merger price and quality effects from consummated mergers and the ability to compare these effects with a credible control group.[108] For example, state interventions such as COPA or Certificate on Need Laws that allow hospital mergers that generate competitive effects in local geographic markets facilitate retrospective studies of hospital mergers that can be used to validate and improve the economic models and other tools used to predict merger effects.[109]

Second, in a system of federalism, the state enforcement of both the state and federal antitrust laws can be a valuable complementary resource that supplements scarce federal resources. Conflicts between the federal and state antitrust authorities are generated by the use of a cooperative or “marble cake” approach to federalism, where the tasks of the state and federal agencies are relatively undefined, overlapping, and imperfectly coordinated. In contrast, a “dual” or “layer cake” federalism approach, where power is divided ex-ante between the federal and state governments in clearly defined terms, can mitigate direct conflicts between state and federal authorities discussed above.

#### Failure to hold states accountable for spillovers destroys optimal state experimentation – correctly “right sizing” regulation impossible without accounting for externalities in interjurisdictional competition

Adler 20 [Jonathan H. Adler, Case Western University School of Law, 2020 <https://scholarlycommons.law.case.edu/cgi/viewcontent.cgi?article=3058&context=faculty_publications>]

The race-to-the-bottom theory presumes that interjurisdictional competition creates a prisoner’s dilemma for states. Each state wants to attract industry for the economic benefits that it provides. Each state also wishes to maintain an optimal level of environmental protection. However, in order to attract industry, the theory holds, states will lower environmental safeguards so as to reduce the regulatory burden they impose upon firms. This competition exerts downward pressure on environmental safeguards as firms seek to locate in states where regulatory burdens are the lowest, and states seek to attract industry by lessening the economic burden of environmental safeguards. Because the potential benefits of lax regulation are concentrated among relatively few firms, these firms can effectively oppose the general public’s preference for environmental protection regulation. This will lead to social welfare losses even if environmental harm does not spill over from one state to another. The result, according to the theory, is the systematic under-regulation of environmental harms, and a need for federal intervention.26

The race-to-the-bottom theory may have had some basis in the 1960s and 1970s, but there is little reason to believe that this dynamic inhibits state regulatory efforts today, particularly given how aggressive many states are in environmental policy. Empirical evidence that states race to relax their environmental regulations in pursuit of outside investment is decidedly lacking. If the prospect of interstate competition discourages state-level environmental regulation, it is hard to explain why state environmental regulation often preceded federal intervention and why many states adopt more stringent measures than federal regulations require. Numerous studies have been conducted attempting to determine whether a race-to-the-bottom can be observed in the context of environmental regulation, and they have generally failed to find any evidence that environmental quality worsens when states are given more flexibility to set their own priorities.27 Indeed, some studies have \found precisely the opposite: that when states have more flexibility to set their own environmental priorities they increase their efforts.28

None of the above should be taken as an argument against all federal environmental regulation. For just as the federal government is overly interventionist in localized environmental concerns, the federal government is unduly absent in areas where a federal presence is most necessary. That is, the undue centralization of some environmental concerns co-exists with substantial federal abdication from concerns the federal government should be addressing. The federal government devotes relatively little of its regulatory resources on those matters for which the federal government possesses a comparative advantage and abdicates its responsibility to provide the data and knowledge base necessary for successful environmental regulation at all levels of government.

It is often remarked that environmental problems do not respect state borders. This is unquestionably true, and the observation provides ample justification for federal measures to address transboundary pollution problems.29 Where pollution or other environmental problems span jurisdictional borders there is less reason to believe state and local jurisdictions will respond adequately.

Consider a simple transboundary pollution problem involving two states, A and B. When economic activity in State A causes pollution in State B, State A is unlikely to adopt measures to prevent the resulting environmental harm because it would bear the primary costs of any such regulatory measures, without capturing the primary benefits. Put simply, State A is unlikely to impose costs on itself to benefit State B. Absent some external controls or dispute resolution system, the presence of interstate spillovers can actually encourage polices that externalize environmental harms, such as subsidizing development near jurisdictional borders so as to ensure that environmental harms fall disproportionately “downstream.” Policymakers in State B may wish to take action, but they will be unable to control pollution created in State A without State A’s cooperation. Even where polluting activity imposes substantial environmental harm within State A, the externalization of a portion of the harm is likely to result in the adoption of less optimal environmental controls.

#### Biden’s XO empirically denies any FTC Parker links and more restrictions coming

Bulusu 21 [Siri Bulusu, Reporter Bloomberg Law, 7-12-2021 https://news.bloomberglaw.com/antitrust/worker-license-rules-emerge-as-ftc-competition-oversight-priority]

President Joe Biden’s order, signed Friday, calls on the Federal Trade Commission to boost labor market competition by writing new rules that limit “unnecessary, cumbersome” licensing requirements, often imposed by states’ regulatory boards and quasi-public organizations.

“Some overly restrictive occupational licensing requirements can impede workers’ ability to find jobs and to move between states,” according to the order. The order comes amid a flurry of lawsuits against state or state-backed licensing bodies that accuse them of violating antitrust law by imposing expensive fees or threatening to shut down out-of-state businesses. The text of the order didn’t include specific directions for federal antitrust agencies. But the FTC’s anticipated actions and possible rulemaking could lead to streamlined licensing requirements across states, eliminating demands for worker information unrelated to the job, enforcement of interstate commerce rules, and levying of punitive fines, market watchers say. Licenses are expensive and requirements vary among states, even in the same industry. Reining in the requirements could remove a significant employment barrier, particularly for military families and others who frequently move between states or offer services across state lines. But it also could shift states’ calculations in cracking down on frauds and impostors. Cosmetology licenses can cost up to $15,000 and sometimes years of study, said Dick Carpenter, a senior director of strategic research for the Institute for Justice. Other jobs, ranging from public health and safety positions to interior designers, barbers, and manicurists, also require licensing. “Without any kind of standardization of different licensing requirements—even if you have the same requirements in different jurisdictions—you still have to get a license for each jurisdiction, which impedes an employee’s ability to be mobile,” said Tracey Diamond, a partner at Troutman Pepper LLP’s labor and employment practice.

Potential FTC Moves

The FTC’s options include writing new rules or heightening enforcement of interstate commerce rules in areas where they overlap with antitrust violations, labor market watchers say. Under this principle, restricting labor through onerous licensing requirements would be tantamount to limiting movement of services across borders.

“In the past, occupational licensing was a matter overseen by the Department of Labor, but they don’t quite have the teeth that the Federal Trade Commission has in terms of working in specific locations,” said Morris Kleiner, a University of Minnesota professor of labor policy.

The FTC could turn its limited resources toward scrutinizing occupational licensing programs that narrow the practice scope of a certain profession and limit competition, Kleiner said.

How the commission interprets which licensing requirements are “unnecessary” could be scrutinized. Those could include common requirements such as citizenship and a clean criminal record, said Bobby Chung, a postdoctoral research associate at the University of Illinois at Urbana-Champaign who focuses on licensing. .

“The required training, education and exams should confer the relevant skill sets,” Chung said. “If not, I would regard those requirements as unnecessary.” The agency also may impose specific guidelines that limit fees or frequency of license renewal, Kleiner said. “But more importantly, the FTC’s guidelines could be aimed specifically at states that have ratcheted up their requirements,” he said.

Gaining Attention

Burdensome licensing requirements have increasingly come under federal scrutiny as the labor market has shifted away from manufacturing jobs to service-oriented professions. States began imposing licensing requirements in order to protect consumers from bad actors and standardize services. “Licenses create a monopoly of workers who can provide a service,” Kleiner said. “But if you provide those services without a license, the police powers of the state can arrest and severely fine those individuals.” In 2020, roughly 23% of workers were required to have a license, according to the Bureau of Labor Statistics. Over the years, many states, including Arizona, Connecticut, Nebraska, and Tennessee, have modified their rules to lower what they considered to be burdensome barriers to obtaining licenses. Biden’s move is part of states’ broader push for changes, Carpenter said. “There is a momentum building to raise awareness to the issue.” Advocates for change also cite underemployment and unemployment stemming from the burdensome licensing requirements, as well as allegations that certain industries create occupational licensing to limit competition. Immigrants also can be affected by the licensing requirements, particularly if they hold foreign degrees but are performing lesser-skilled jobs in the U.S., according to a 2017 study by the Migration Policy Institute. Licensing particularly hurts foreign nationals with temporary work visas whose immigration status impedes them from seeking a license to work within their specialty, Chung said. That in turn impedes their path to permanent residency or citizenship, he said.

State Action

The FTC has struggled to rein in licensing practices with antitrust violations partly because public entities, like state-controlled licensing boards, can claim state action immunity. Such immunity authorizes a state to carry out certain legitimate government functions, often in regulated industries that require licensing.

“Many of these state certifications don’t violate antitrust law and that’s because of this doctrine that displaces antitrust law,” said Jesse Markham, a partner at Baker & Miller PLLC’s San Francisco office. “And that’s why these certification requirements exist with impunity.”

In 2015, the Supreme Court ruled in North Carolina State Board of Dental Examiners v. FTC that the state board was operated by market participants. Without active supervision from the state, the board couldn’t claim state action immunity from federal antitrust actions.

The ruling unleashed “dozens of lawsuits"—seeking antitrust treble damages—against individual members of licensing boards, according an October 2020 statement from Reps. Mike Conaway (R-Texas), Jamie Raskin (D-Md.), and David Cicilline (D-R.I.) in support of a bill they introduced to shield board members from such suits.

Qualifying for state action immunity largely depends on whether a board is a true government actor or a private market participant. But this delineation becomes more complex if there’s a blurred line between a state agency handling its own actions or a private group acting under state guidance.

How the FTC handles that blurred line will be one issue the agency tackles as it implements the president’s order.

#### Court rulings on Parker empirically deny disad links

Grossman 15 [Jonathan M. Grossman, co-chair at Cozen O’Connor, Harvard Law School, J.D., 2000, 2-25-2015 https://www.cozen.com/news-resources/publications/2015/supreme-court-delivers-another-blow-to-state-action-antitrust-immunity]

Supreme Court Delivers another Blow to State Action Antitrust Immunity

Today’s Supreme Court decision in North Carolina State Board of Dental Examiners v. Federal Trade Commission1 is the second time in two years that the Court has spoken on the state action exemption to the federal antitrust laws, and the Court once again has made it clear that the days of an expansive interpretation of that exemption are over.

Under the state action exemption, which is based on the principles of state sovereign immunity, restraints imposed by a state as an act of government are exempt from federal antitrust laws. Parker v. Brown, 317 U.S. 341 (1943). Private parties carrying out a state’s regulatory program are also immune as long as the private party: 1) is acting pursuant to a “clearly articulated and affirmatively expressed … state policy;” and 2) is “actively supervised by the state itself.” Cal. Retail Liquor Dealers Ass'n v. Midcal Aluminum, 445 U.S. 97 (1980).

Today’s decision in NC Dental and the 2013 Supreme Court decision in Phoebe Putney2 each focused on one of the two prongs of the Midcal test, and each decision will have the effect of making it more difficult to extend the exemption beyond the state itself.

In NC Dental, the Court focused on the “active supervision” requirement and concluded that the North Carolina Board of Dental Examiners (the Board) did not meet that test. The controversy began in 2003 when non-dentists in North Carolina began to offer teeth-whitening services. The Board, which is designed as a state agency by statute, consisted of six licensed dentists, one licensed dental hygienist, and one consumer member; with the dentists and dental hygienists elected by their peers and the consumer member appointed by the governor of the state. The Board issued nearly 50 cease-and-desist letters to non-dentist providers that effectively resulted in the end of non-dentists providing teeth-whitening services in the state. In 2010, the Federal Trade Commission (FTC) issued an administrative complaint against the Board alleging that it had violated the FTC Act by excluding the non-dentist teeth-whitening providers. The Board argued that it was acting as a state agency and thus immune from federal antitrust laws. The FTC issued a final order against the Board and enjoined it from issuing further extrajudicial orders to teeth-whitening providers in North Carolina. The 4th Circuit denied the Board’s subsequent petition seeking review of the FTC order.3

In affirming the 4th Circuit decision, the Supreme Court held that a state board on which a controlling number of decision makers are active market participants in the occupation the board regulates must satisfy Midcal’s active supervision requirement in order to invoke antitrust immunity under the state action exemption. The Court noted that “when a State empowers a group of active market participants to decide who can participate in its market, and on what terms, the need for supervision is manifest.” Furthermore, while the Board did not argue that it was actively supervised by the state, the Court concluded its decision by reiterating the requirements of active state supervision: (1) the substance of the anti-competitive decision must be reviewed by a state supervisor; (2) the state supervisor must have the power to veto or modify decisions to ensure that they align with state policy; (3) the “mere potential for state supervision” is not a sufficient substitute for an actual decision by the state; and (4) the state supervisor may not be an active market participant.

The 2013 Phoebe Putney decision focused on the “clear articulation” prong of Midcal. That case arose out of a merger of a for-profit hospital with a hospital owned and operated by a county hospital authority (Authority), which was created by the state legislature but operated independently of the state government. The FTC alleged that the transaction was technically structured as an acquisition of the for-profit by the Authority, in a specific attempt to take advantage of the state action exemption. The 11th Circuit observed that Georgia’s Hospital Authorities Law granted hospital authorities the power to “operate projects” including hospitals, to “make and execute contracts and other instruments necessary to exercise the[ir] powers,” and to “acquire by purchase, lease or otherwise … projects.” Based on this broad language, the 11th Circuit found that the legislation clearly indicated that the Georgia Legislature anticipated that the powers it granted to the Authority would produce anti-competitive effects, and thus were a foreseeable result of the legislation and sufficient to meet the Midcal “clear articulation” test. The Supreme Court reversed, holding that the Georgia Legislature did not clearly articulate or affirmatively express a state policy to displace competition in the market for hospital services. The Court noted that the Authority needed to show not just that it had been delegated authority to act, but also that it was authorized to act or regulate in an anti-competitive manner.

The combined effect of NC Dental and Phoebe Putney is that any regulatory body that is not clearly part of the executive branch of a state will have a significantly higher burden to take advantage of the state action exemption. This will require state governments to review and reconsider the structure and procedures of such bodies and should force the bodies themselves to carefully consider whether the state action exemption applies before taking any action that might implicate the federal antitrust laws.

It will also mean that industry participants regulated by such quasi-governmental bodies likely will be emboldened to challenge more adverse actions in court. Given the prevalence of quasi-government entities in states – many of which include market participants – and that they regulate a wide variety of industries including energy, professional services, health care, transportation, and many others, these decisions will likely have significant policy and legal implications for years to come.

# 2AC

## Innovation

### Disease – A2: No Extinction – Ord 20

#### Ord is descriptive of past pandemics, concedes worse pandemics are coming, and agrees extinction is possible

Dr. Toby Ord 20, Senior Research Fellow in Philosophy at Oxford University, DPhil in Philosophy from the University of Oxford, The Precipice: Existential Risk and the Future of Humanity, Hachette Books, Kindle Edition, p. 124-126

Are we safe now from events like this? Or are we more vulnerable? Could a pandemic threaten humanity’s future?10

The Black Death was not the only biological disaster to scar human history. It was not even the only great bubonic plague. In 541 CE the Plague of Justinian struck the Byzantine Empire. Over three years it took the lives of roughly 3 percent of the world’s people.11

When Europeans reached the Americas in 1492, the two populations exposed each other to completely novel diseases. Over thousands of years each population had built up resistance to their own set of diseases, but were extremely susceptible to the others. The American peoples got by far the worse end of exchange, through diseases such as measles, influenza and especially smallpox.

During the next hundred years a combination of invasion and disease took an immense toll—one whose scale may never be known, due to great uncertainty about the size of the pre-existing population. We can’t rule out the loss of more than 90 percent of the population of the Americas during that century, though the number could also be much lower.12 And it is very difficult to tease out how much of this should be attributed to war and occupation, rather than disease. As a rough upper bound, the Columbian exchange may have killed as many as 10 percent of the world’s people.13

Centuries later, the world had become so interconnected that a truly global pandemic was possible. Near the end of the First World War, a devastating strain of influenza (known as the 1918 flu or Spanish Flu) spread to six continents, and even remote Pacific islands. At least a third of the world’s population were infected and 3 to 6 percent were killed.14 This death toll outstripped that of the First World War, and possibly both World Wars combined.

Yet even events like these fall short of being a threat to humanity’s longterm potential.15

[FOONOTE]

In addition to this historical evidence, there are some deeper biological observations and theories suggesting that pathogens are unlikely to lead to the extinction of their hosts. These include the empirical anti-correlation between infectiousness and lethality, the extreme rarity of diseases that kill more than 75% of those infected, the observed tendency of pandemics to become less virulent as they progress and the theory of optimal virulence. However, there is no watertight case against pathogens leading to the extinction of their hosts.

[END FOOTNOTE]

In the great bubonic plagues we saw civilization in the affected areas falter, but recover. The regional 25 to 50 percent death rate was not enough to precipitate a continent-wide collapse of civilization. It changed the relative fortunes of empires, and may have altered the course of history substantially, but if anything, it gives us reason to believe that human civilization is likely to make it through future events with similar death rates, even if they were global in scale.

The 1918 flu pandemic was remarkable in having very little apparent effect on the world’s development despite its global reach. It looks like it was lost in the wake of the First World War, which despite a smaller death toll, seems to have had a much larger effect on the course of history.16

It is less clear what lesson to draw from the Columbian exchange due to our lack of good records and its mix of causes. Pandemics were clearly a part of what led to a regional collapse of civilization, but we don’t know whether this would have occurred had it not been for the accompanying violence and imperial rule. The strongest case against existential risk from natural pandemics is the fossil record argument from Chapter 3. Extinction risk from natural causes above 0.1 percent per century is incompatible with the evidence of how long humanity and similar species have lasted. But this argument only works where the risk to humanity now is similar or lower than the longterm levels. For most risks this is clearly true, but not for pandemics. We have done many things to exacerbate the risk: some that could make pandemics more likely to occur, and some that could increase their damage. Thus even “natural” pandemics should be seen as a partly anthropogenic risk.

## Federalism

## T

### Expanding the Scope – Must End CWS

#### Their interp misreads the rez – the phrase “expand the scope of core antitrust laws” is meaningfully distinct from the “core of antitrust” – core modifies laws not antitrust

Attempt to include argument – says that antitrust can go beyond single industries

Dr. Babette Boliek November 2011, Associate Professor of Law at Pepperdine University School of Law, J.D. from the Columbia University School of Law, and Ph.D. in Economics from the University of California, Davis, “FCC Regulation Versus Antitrust: How Net Neutrality is Defining the Boundaries”, Boston College Law Review, 52 B.C. L. Rev. 1627, , Lexis lilw

Although the **two regimes** share a commonality of purpose--to protect consumers and to promote allocative efficiencies in production--the two have **quite distinct**, predominately opposing, means of securing social benefits. As Justice Stephen Breyer stated when serving [\*1629] as a judge on the U.S. Court of Appeals for the First Circuit, **although regulation and the antitrust laws "typically aim at similar goals--i.e., low and economically efficient prices, innovation, and efficient production methods"**--regulation looks to achieve these goals directly "through rules and regulations; [but] antitrust seeks to achieve them indirectly by promoting and preserving a process that tends to bring them about." The battle between these two regimes may be broadly summarized in a single issue thusly: in the face of the industry-specific regulator, what is (or what should be) the role of antitrust law?

**Antitrust law preserves the process of competition across all industries** by condemning anticompetitive conduct when it occurs. **In contrast, industrial regulation by its nature is** a **public declaration** that, in a given industry, **market forces are too** weak or **underdeveloped to produce** the **consumer benefits** that are realized in competitive markets--**regulated industries are carved out from the rest of the economy and are subject to proactive, regulatory intervention** **that** goes above and beyond **antitrust enforcement measures**. Not surprisingly, regulatory agencies were historically created as substitutes for market forces in the few markets that, by the nature of the product or technology, were natural monopolies or severely prone to monopoly. In the vast majority [\*1630] of markets, however, the antitrust law is the default government control, designed to supplement market forces to inhibit or prevent the growth of monopoly.

Again, although the goals of the two regimes may be similar, the means by which each can achieve those goals are in opposition. Therefore, the threshold determination of which industries are to be singled out for industry-specific regulation, and to what degree, is of vital importance as it simultaneously determines the predominance of the regulator versus the antitrust authority in securing the social good.

#### We meet – expands reach of Sherman and FTCA

Crane 16 [Daniel A. Crane Frederick Paul Furth Sr. Professor of Law, University of Michigan Law School Adam Hester J.D., May 2016, University of Michigan Law School, 2016, State-Action Immunity and Section 5 of the FTC Act, 115 MICH. L. REV. 365, https://repository.law.umich.edu/cgi/viewcontent.cgi?article=1510&context=mlr]

This Article addresses the statutory prong—federal antitrust preemption of state law—in the wider context of constitutional and institutional history. In particular, it examines the assumed, but never decided, position that the United States Federal Trade Commission (“FTC”) lacks any preemptive power over anticompetitive state and local regulations, apart from the relatively light preemptive reach of the Sherman Act. It asserts, to the contrary, that the best historically informed and institutionally sound reading of Section 5 of the Federal Trade Commission Act suggests that the FTC should enjoy what the Supreme Court has hypothesized as “superior preemption authority” over state and local regulations that unduly restrict competition.12

As a matter of legal doctrine, the question of the FTC’s preemptive authority originates in the Supreme Court’s seminal 1943 decision in Parker v. Brown. 13 In Parker, the Court held that “[t]here is no suggestion of a purpose to restrain state action in the [Sherman] Act’s legislative history.”14 The resulting state-action immunity doctrine sharply limited any preemptive scope of the Sherman Act over anticompetitive state regulations.15 Parker also rejected a dormant commerce clause challenge to the state regulation at issue.16 The case thus showcased the Court’s uniform reluctance to permit any strand of federal law—constitutional or statutory—to revive Lochnerism

#### CWS affs link to their interp – it’s purely interpretive and not codified by the core antitrust laws

Dameron 16 [Charlie Dameron is an associate in the Washington, D.C. office of Latham & Watkins and a member of the Litigation & Trial Department 2016 https://www.yalelawjournal.org/note/present-at-antitrusts-creation-consumer-welfare-in-the-sherman-acts-state-statutory-forerunners]

The judiciary’s evolving understanding of the Sherman Act has dramatically affected the scope of antitrust law in the United States. The Supreme Court first purported to strictly construe the Act’s prohibition of “every contract . . . in restraint of trade,” noting that “no exception or limitation can be added without placing in the act that which has been omitted by Congress.”8 The Court later set aside the statute’s plain meaning9 and seized upon the statute’s use of common-law language to derive a common-law “rule of reason” prohibiting only those agreements that “unreasonably” restrained trade.10

In the middle of the twentieth century, the dominant reading shifted. In the legislative history of the Sherman Act courts found a congressional intent to preserve competition for the benefit of other producers. In his famous Alcoa opinion, Judge Hand wrote that “Congress . . . was not necessarily actuated by economic motives alone. It is possible, because of its indirect social or moral effect, to prefer a system of small producers, each dependent for his success upon his own skill and character.”11 He cited the Congressional Record for the proposition that the Sherman Act was designed “to put an end to great aggregations of capital because of the helplessness of the individual before them.”12 In cases like United States v. Von’s Grocery Co., the Supreme Court invoked Congress’s general fear of “concentration,” and adopted the view that the purpose of the Sherman Act was “to prevent economic concentration in the American economy by keeping a large number of small competitors in business.”13

Change came yet again in 1966. Robert Bork, then an antitrust professor at Yale, delved into the Senate debates over the Sherman Act and concluded that Congress’s legislative intent in enacting the Sherman Act was to “maximiz[e] . . . consumer welfare,” without regard to the interests of competitors.14 Within a decade, lower federal courts began signing on to this proposition.15 In 1979 the Supreme Court unanimously concluded, “Congress designed the Sherman Act as a ‘consumer welfare prescription.’”16 The Court has since repeatedly affirmed that interpretation.17

### Expanding the Scope – 2AC

#### We meet – plan increases the scope of antitrust law

Crane 19 [Daniel A. Crane, Frederick Paul Furth Sr. Professor of Law, University of Michigan, 60 Wm. & Mary L. Rev. 1175, 2019, Lexis]

Antitrust preemption and constitutional review are differently situated in one significant way: Constitutional equal protection, substantive due process, and dormant commerce clause principles are privately enforceable by any party that meets the Article III standing requirements--which, in this context, means at least anyone directly affected by a regulation impairing competition. 160 Antitrust has its own private right of action standing rules, 161 as well as an additional institutional feature that might significantly limit some of the abuses associated with Lochnerizing. One proposed route for increasing the preemptive scope of federal antitrust law over anticompetitive state and local regulation is to hold the [\*1208] Parker doctrine inapplicable to the FTC. 162 This would give the FTC enhanced power to challenge anticompetitive state and local regulations. Not only would this limit the incidence of challenges to state regulation (the FTC Act is not privately enforceable and only the Commission can initiate an action under the Act), 163 but it would also put the Commission itself, rather than an Article III court, in the position of making an initial decision on the case. An Article III court could ultimately become involved, as adverse Commission decisions are appealable to any federal court of appeal in which the case could have been initially brought. 164 However, lodging the antitrust review function in the FTC would grant the Commission an initial regulatory review function and the power to make factual findings subject to "substantial evidence" review. 165

#### Scope refers to BOTH the letter of the law and the application --- topical affs can expand EITHER

Surden 11 --- Harry Surden, Associate Professor of Law, University of Colorado Law School, “Efficient Uncertainty in Patent Interpretation”, 2011 https://scholar.law.colorado.edu/cgi/viewcontent.cgi?article=1185&context=articles

One can understand scope-of-law issues through at least two distinct analytical frameworks: one oriented upon boundaries and the other upon function. In one sense, the scope of any legal right, including a patent claim, concerns the demarcation of legal boundaries. Within law the term "legal scope" refers to both the coverage and non-coverage of a given law.96 The concept of scope suggests that application of a given legal rule will be, in some sense, limited. To reference a law’s scope is to imply that a law will not apply to all future entities, objects, and behaviors, but to some limited subset.97 From that perspective, legal scope is related to the substantive criteria by which we differentiate, ex ante, the subset of legal actors, objects, behaviors, and states that will be subject to a law’s differential treatment or legal consequences.98 A scope boundary is the "line" distinguishing that which is covered by a law from that which is not. In this sense, critiques of legal scope generally tend to focus upon demarcation of legal boundaries via the legal criteria chosen ex ante.

Within the patent claim context, questions of literal scope are, in many respects, similarly concerned with boundary-defining criteria. A primary emphasis is on the claim words and interpretive information upon which a lay observer must rely to distinguish infringing products from noninfringing products.99

Legal scope can also be understood through a related but distinct functional definition. In this orientation, we are not so concerned with legal boundaries for their own sake; rather we ask how well those boundaries perform their functional role of distinguishing specific identifiable entities or behaviors that violate a given law and are accordingly subject to its differential legal consequences. This approach to scope directs us to decompose our abstract legal categories into particular legal entities and to make specific determinations as to whether they do or do not "violate" the criteria of the law. Under this functional conception, one can characterize formal notice about patent scope by the extent to which the words of the patent claim establish boundaries that distinguish real-world objects covered by a patent claim from those that are not.

This functional framing of patent claim scope highlights a key point— claim scope is a relative formulation. It is not sufficient to simply focus on the inadequacy of the claim-word boundaries in the abstract. Rather, we must evaluate the scope of a patent claim by its ability to effectively classify the relevant universe of potentially accused products and to do so in a way that is not over- or underbroad. Any inquiry into the sufficiency of the delineation of the patent claim’s scope should be considered relative to the class of accused devices potentially inside or outside its scope. If we aim to critique a claim for having an uncertain scope, we should do so in relation to the class of products that may or may not potentially infringe. The heart of the scope inquiry is functional—to delineate and distinguish those products that literally infringe from those that do not. The import of this functional and relational component of patent scope will be apparent later when exploring strategies for improving ex ante scope certainty.

#### Substantial means “considerable amount” – *qualitative* not *quantitative*

Prost 4 (Judge – United States Court of Appeals for the Federal Circuit, “Committee For Fairly Traded Venezuelan Cement v. United States”, 6-18, http://www.ll.georgetown.edu/federal/judicial/fed/opinions/04opinions/04-1016.html)

The URAA and the SAA neither amend nor refine the language of § 1677(4)(C).  In fact, they merely suggest, without disqualifying other alternatives, a “clearly higher/substantial proportion” approach.  Indeed, the SAA specifically mentions that no “precise mathematical formula” or “‘benchmark’ proportion” is to be used for a dumping concentration analysis.  SAA at 860 (citations omitted); see also Venez. Cement, 279 F. Supp. 2d at 1329-30.  Furthermore, as the Court of International Trade noted, the SAA emphasizes that the Commission retains the discretion to determine concentration of imports on a “case-by-case basis.”  SAA at 860.  Finally, the definition of the word “substantial” undercuts the CFTVC’s argument.  The word “substantial” generally means “considerable in amount, value or worth.”  Webster’s Third New International Dictionary 2280 (1993).  It does not imply a specific numberor cut-off.  What may be substantial in one situation may not be in another situation.  The very breadth of the term “substantial” undercuts the CFTVC’s argument that Congress spoke clearly in establishing a standard for the Commission’s regional antidumping and countervailing duty analyses.  It therefore supports the conclusion that the Commission is owed deference in its interpretation of “substantial proportion.”  The Commission clearly embarked on its analysis having been given considerable leeway to interpret a particularly broad term.

## Reg CP

### Regulation CP – 2AC

#### Perm – do both – solves the link

#### Doesn’t solve federalism – arg is about Court interpretive precedent on Parker immunity allowing states to experiment – Sack and Kobayashi

#### Doesn’t solve innovation or links to the net benefit – the anticompetitive practice is sanctioned by a specific legal doctrine that allows it – the counterplan leaves immunity in place and, if it’s no longer applied, they link to the net benefit – Crane

#### No neg fiat --- no “should not” in the resolution, potential CPs are infinite

#### Perm – do the counterplan – not functionally competitive – wrecks aff ground and justifies worst normal means counterplans like the 9-0 counterplan

Robinhood 20 [Robinhood Financial LLC. “What are Antitrust Laws?”. 10-6-20. https://learn.robinhood.com/articles/4x5oCZOtg43uORfxEnxPRW/what-are-antitrust-laws/]

Antitrust laws are regulations that aim to promote fair business competition in an open market and protect consumers by banning certain predatory practices.

#### Conditionality is a voter – creates time and strategy skews, not reciprocal – undermines argument responsibility – dispo solves

### FTC – AO – 2AC

#### Limiting Parker immunity empowers FTC enforcement

Crane 19 [Daniel A. Crane, Frederick Paul Furth Sr. Professor of Law, University of Michigan, 60 Wm. & Mary L. Rev. 1175, 2019, Lexis]

C. Institutional and Procedural Distinctions

Antitrust preemption and constitutional review are differently situated in one significant way: Constitutional equal protection, substantive due process, and dormant commerce clause principles are privately enforceable by any party that meets the Article III standing requirements--which, in this context, means at least anyone directly affected by a regulation impairing competition. 160 Antitrust has its own private right of action standing rules, 161 as well as an additional institutional feature that might significantly limit some of the abuses associated with Lochnerizing. One proposed route for increasing the preemptive scope of federal antitrust law over anticompetitive state and local regulation is to hold the [\*1208] Parker doctrine inapplicable to the FTC. 162 This would give the FTC enhanced power to challenge anticompetitive state and local regulations. Not only would this limit the incidence of challenges to state regulation (the FTC Act is not privately enforceable and only the Commission can initiate an action under the Act), 163 but it would also put the Commission itself, rather than an Article III court, in the position of making an initial decision on the case. An Article III court could ultimately become involved, as adverse Commission decisions are appealable to any federal court of appeal in which the case could have been initially brought. 164 However, lodging the antitrust review function in the FTC would grant the Commission an initial regulatory review function and the power to make factual findings subject to "substantial evidence" review. 165

Whether lodging an enhanced review function in the FTC as opposed to private litigants would lessen concerns over Lochnerizing depends in large part on what one perceives to be the central evil of Lochner. Was Lochner problematic because judges usurped the decisions rightfully committed to more democratically representative branches of government? Or was the problem that they were ideologically committed to formalistic categories such as common law baselines, the existing distribution of wealth and entitlements, and an arbitrary distinction between government action and inaction? 166

The institutional concerns about judges substituting their own economic preferences for those of legislators and members of the executive branch might have less force in a context in which an administrative agency--here the FTC--reviewed state and local regulations for compatibility with federal antitrust law. Historically, the political coalitions that opposed economic substantive due process during the Progressive and New Deal eras were comfortable with delegating extensive regulatory powers to federal administrative agencies 167 and rejected Lochnerism because of the political character of judicial activism by unelected judges even while [\*1209] supporting activism by theoretically more democratically accountable institutions such as the FTC. 168 Though ostensibly designed to be technocratic and politically detached, the FTC is in fact politically responsive to the will of Congress, which holds its purse strings. 169 It is thus a more evidently "democratic" institution than the courts are and has a legislative mandate from Congress to make economic policy, 170 which might lend legitimacy to its review of anticompetitive state and local regulation.

#### Narrow FTC enforcement under the FTCA are modeled globally – causes nationalist competition regimes

Nam 18 [Steven S. Nam - Distinguished Practitioner, Center for East Asian Studies, Stanford University. Steven is also a Commission member of the Model International Mobility Treaty Commission under Columbia University's Global Policy Initiative. He is a member of the Antitrust Section of the American Bar Association and earned his B.A. at Yale and his J.D. and M.A. degrees at Columbia – “OUR COUNTRY, RIGHT OR WRONG: THE FTC ACT’S INFLUENCE ON NATIONAL SILOS IN ANTITRUST ENFORCEMENT” – University of Pennsylvania Journal of Business Law, Vol. 20, No. 1, 2018 - – No text omitted – but the Table of Contents – which comes after the Abstract - was not included – modified for language that may offend - https://scholarship.law.upenn.edu/cgi/viewcontent.cgi?article=1555&context=jbl]

ABSTRACT:

The Federal Trade Commission Act of 1914 (“FTC Act”), a model for many other countries that set up their own competition agencies, combines the control afforded by presidential appointment and removal powers over FTC commissioners with an exceedingly discretionary mandate. This Article contends that the FTC Act’s outmoded openness to strong presidential direction, where adapted abroad, has helped detract from antitrust regulator independence. Even advanced players in the liberal international economic order such as South Korea have made use of the United States’ original blueprint for unitary executive-stamped antitrust enforcement without sharing a long historical evolution of counterbalancing regulatory norms, e.g. the judicial check that was Humphrey’s Executor v. United States, 295 U.S. 602 (1935).

Strong executive direction in antitrust enforcement is particularly suited to capitalist economies helmed by administrations with mercantilist policies, given their belief that the state and big business must cooperate in the face of zero-sum international competition. South Korean President Lee MyungBak’s term (2008-2013) serves as an apt recent case study, featuring dirigiste calibration of antitrust enforcement against a backdrop of global recession. This Article examines the parallels between the FTC Act and the South Korean Monopoly Regulation and Fair Trade Act (“MRFTA”) before scrutinizing the enabled silo-like enforcement patterns of the Korean Fair Trade Commission under the Lee administration. Increasingly widespread erosion of public confidence in free and competitive trade demands a better understanding of the forces preventing global convergence in antitrust enforcement, and of their roots.

We have created, in the Federal Trade Commission, a means of inquiry and of accommodation in the field of commerce which ought both to coordinate the enterprises of our traders and manufacturers and to remove the barriers of misunderstanding and of a too technical interpretation of the law. —President Woodrow Wilson, September 1916

[Our companies] are fighting with unfavorable conditions amid competition in the global economy. To do so, they must be allowed to escape various regulations. Let’s take just a half step forward to move beyond the pace of change in the global economy. —South Korean President Lee Myung-bak, March 2008

It is clear that, at the beginning of the 21st century, we cannot afford to operate, to enforce our competition laws, in national or regional silos. We must not remain isolated from what happens in other jurisdictions. Even if markets often remain regional or national in terms of competitive assessment, fostering global convergence in our legal and economic analysis is essential to ensuring effectiveness of our enforcement and creating a level playing field for businesses across our jurisdictions. —Joaquín Almunia, Vice-President of the European Commission for Competition Policy, April 2010

The [U.S.] Agencies do not discriminate in the enforcement of the antitrust laws on the basis of the nationality of the parties. Nor do the Agencies employ their statutory authority to further nonantitrust goals. —The U.S. Department of Justice and the Federal Trade Commission, April 1995

INTRODUCTION

The International Competition Network’s founding in October 2001, with the aim of “formulat[ing] proposals for procedural and substantive convergence” among its stated goals,5 sought to usher in a future with more cosmopolitan and coherent global antitrust enforcement. Although U.S. regulatory leadership maintained that “consistently sound antitrust enforcement policy cannot be defined and decreed for others by the U.S., the EU, or anyone else,” many countries (turned) ~~looked~~ to the U.S. as a role model while developing their competition regimes.6 It is ironic, then, that to this day a central obstacle to the aspired international “culture of competition” can be found in none other than the influence of the U.S.’s own FTC Act.7

American antitrust priorities around the time of the legislation’s passage oscillated between tempering trusts and shepherding business to further national economic strength, all towards the domestic interest. They shaped a regulatory environment that would reemerge abroad in many later-developing countries.

The deepening global retreat from internationalism and free market principles in the present day, with the specter of trade wars looming, is exacerbated by nationalist competition regimes that are derivative of a U.S. model predating the modern world economy. Domestic critics of open markets often overlook the U.S.’s own past vis-à-vis protectionist governments today. Illiberal or nominally liberal, they walk the kind of dirigiste path once treaded by the American School through the early twentieth century.8

#### Extinction

Arctic, space, prolif, conflict, climate, geo-engineerin

Langan-Riekhof 21 [et al; Maria Langan-Riekhof is the Lead Author and is the new Director of the Strategic Futures Group at the National Intelligence Council, leading the Intelligence Community’s assessment of global dynamics and charged with producing the quadrennial Global Trends product for the incoming or returning administration. She has spent more than 27 years in the intelligence community as both a senior analyst and manager, serving at the CIA and on the NIC. She brings a background in Middle East studies and has spent more than half her career analyzing regional dynamics. Her leadership roles include: Chief of the CIA’s Red Cell, founder and director of the CIA’s Strategic Insight Department, and research director for the Middle East. She was one of the DNI’s Exceptional Analysts in 2008-09 and the Agency’s fellow at the Brookings Institution in 2016-17. She is a member of the Senior Analytic Service and the Senior Intelligence Service and hold degrees from the University of Chicago and the University of Denver - National Intelligence Council - Global Trends 2040 – Form the section: “Scenario Four – Separate Silos” - MARCH 2021 - https://www.dni.gov/files/ODNI/documents/assessments/GlobalTrends\_2040.pdf]

With the trade and financial connections that defined the prior era of globalization disrupted, economic and security blocs formed around the United States, China, the EU, Russia, and India. Smaller powers and other states joined these blocs for protection, to pool resources, and to maintain at least some economic efficiencies. Advances in AI, energy technologies, and additive manufacturing helped some states adapt and make the blocs economically viable, but prices for consumer goods rose dramatically. States unable to join a bloc were left behind and cut off.

Security links did not disappear completely. States threatened by powerful neighbors sought out security links with other powers for their own protection or accelerated their own programs to develop nuclear weapons, as the ultimate guarantor of their security. Small conflicts occurred at the edges of these new blocs, particularly over scarce resources or emerging opportunities, like the Arctic and space. Poorer countries became increasingly unstable, and with no interest by major powers or the United Nations in intervening to help restore order, conflicts became endemic, exacerbating other problems. Lacking coordinated, multilateral efforts to mitigate emissions and address climate changes, little was done to slow greenhouse gas emissions, and some states experimented with geoengineering with disastrous consequences.

*Note*: this ev appears to advance a cemented future – but it is an ebook report by the National Intelligence Council outlining possible futures \*if\* certain premises were to take place. Perhaps this is best explained by an except from the opening of this report: “Welcome to the 7th edition of the National Intelligence Council’s Global Trends report. Published every four years since 1997, Global Trends assesses the key trends and uncertainties that will shape the strategic environment for the United States during the next two decades. Global Trends is designed to provide an analytic framework for policymakers early in each administration as they craft national security strategy and navigate an uncertain future. The goal is not to offer a specific prediction of the world in 2040; instead, our intent is to help policymakers and citizens see (aware of) what may lie beyond the horizon and prepare for an array of possible futures”.

## K

### 2AC – SAI – Long

#### Link is reductionist and can’t explain US-EU divergences

Foster 19 [Chase Michael Foster was a Doctoral Candidate at Harvard University at the time of this dissertation. The author has served as a Election Observer (OSCE, ODIHR) in Moldova, Belarus, Russia, Georgia and as a Teaching Assistant at the Harvard Kennedy School of Government. At the time of this writing, the author held a MPP (Democracy, Politics, and Institutions) from the Harvard Kennedy School of Government. “The Politics of Delegation: Constitutional Structure, Bureaucratic Discretion, and the Development of Competition Policy in the United States and the European Union, 1890-2017” – Doctoral dissertation to The Department of Government, Harvard University, Graduate School of Arts & Sciences. In partial fulfillment of the requirements for the degree of Doctor of Philosophy in the subject of Government - January 2019 - #E&F –https://dash.harvard.edu/bitstream/handle/1/41121359/FOSTER-DISSERTATION-2019.pdf?sequence=1]

Ideational Theories

Any analysis of the change in antitrust enforcement over time must begin with a consideration of ideas. Most of the existing social scientific scholarship on competition policy emphasizes the role of changing economic paradigms in spurring the transformation of European and American competition policy. A number of scholars of American antitrust have explained the dramatic decrease in antitrust enforcement as stemming from the shift in authority from lawyers to economists at the antitrust agencies (Eisner 1991). Others have emphasized the institutionalization of Chicago School-inspired economic ideas within antitrust jurisprudence (Ergen and Kohl 2017; Davies 2010; Pitofsky 2008). Both of these sets of accounts capture an important component of the shift. As theories of economic efficiency changed in the US academy during the 1960's and 1970's, much of the postwar enforcement program was delegitimized. Beginning in the early 1970's, both the prevailing judicial opinion on antitrust and the enforcement program of the antitrust agencies dramatically shift, leading to a precipitous drop in enforcement output, especially in areas such as vertical restraints, monopolies, and exclusionary practices.

The increase in the intensity of European enforcement has also been explained as the result of ideational change. Some EU scholars have argued that the institutionalization of neoliberal economic ideas in European regulatory law has led to the intensification of regulatory enforcement (Thatcher 2013; Buch-Hansen and Wigger 2010; Wigger 2008). Concomitant to the Single European Act, the European competition directorate began to more intensely apply competition rules, and to shift its enforcement focus to state aid, publicly-owned companies, and the promotion of competition in previously protected network industries (Quack and Djelic 2005). During the late 1990's, competition law modernization led to a more neoliberal approach to the evaluation of market competition, while also expanding the breadth and intensity of enforcement (Wigger and Nolke 2007).

While each of these accounts points to some of the real ways that ideational change affected competition policy in each system, there are problems with explaining opposite trends as the result of the same paradigm shift. An ideas-only approach leaves us in the awkward position of explaining both the increase in the intensity of competition enforcement in the EU and the decrease in antitrust enforcement in the US as resulting from the same (or similar) neoliberal policy paradigm. While any analysis of competition policy developments must account for ideational change, we need to understand why the same set of ideas has produced different patterns of enforcement in Europe and the United States.

Additionally, there are empirical gaps in the ideational explanation. Certainly, the influence of the Chicago School cannot account for why US regulators have failed to follow much of the neoliberal prescription for liberalization and industrial policy. Chicago School economists, after all, have long supported the application of antitrust in these areas (Van I lorn 2015; McChesney 1986; Bork 1978). Moreover, there is no shortage of classically-trained economists in the European competition system.

#### Alt fails---transition is impossible and causes conflict. Even if transition occurs, it doesn’t solve

Smith 19 [Noah; 4/5/19; Bloomberg Opinion columnist, former assistant professor of finance at Stony Brook University; "Dumping Capitalism Won’t Save the Planet," https://www.bloomberg.com/opinion/articles/2019-04-05/capitalism-is-more-likely-to-limit-climate-change-than-socialism]

It has become fashionable on social media and in certain publications to argue that capitalism is killing the planet. Even renowned investor Jeremy Grantham, hardly a radical, made that assertion last year. The basic idea is that the profit motive drives the private sector to spew carbon into the air with reckless abandon. Though many economists and some climate activists believe that the problem is best addressed by modifying market incentives with a carbon tax, many activists believe that the problem can’t be addressed without rebuilding the economy along centrally planned lines.

The climate threat is certainly dire, and carbon taxes are unlikely to be enough to solve the problem. But eco-socialism is probably not going to be an effective method of addressing that threat. Dismantling an entire economic system is never easy, and probably would touch off armed conflict and major asdasd upheaval. In the scramble to win those battles, even the socialists would almost certainly abandon their limitation on fossil-fuel use — either to support military efforts, or to keep the population from turning against them. The precedent here is the Soviet Union, whose multidecade effort to reshape its economy by force amid confrontation with the West led to profound environmental degradation. The world's climate does not have several decades to spare.

Even without international conflict, there’s little guarantee that moving away from capitalism would mitigate our impact on the environment. Since socialist leader Evo Morales took power in Bolivia, living standards have improved substantially for the average Bolivian, which is great. But this has come at the cost of higher emissions. Meanwhile, the capitalist U.S managed to decrease its per capita emissions a bit during this same period (though since the U.S. is a rich country, its absolute level of emissions is much higher).

In other words, in terms of economic growth and carbon emissions, Bolivia looks similar to more capitalist developing countries. That suggests that faced with a choice of enriching their people or helping to save the climate, even socialist leaders will often choose the former. And that same political calculus will probably hold in China and the U.S., the world’s top carbon emitters — leaders who demand draconian cuts in living standards in pursuit of environmental goals will have trouble staying in power.

The best hope for the climate therefore lies in reducing the tradeoff between material prosperity and carbon emissions. That requires technology — solar, wind and nuclear power, energy storage, electric cars and other vehicles, carbon-free cement production and so on. The best climate policy plans all involve technological improvement as a key feature.

#### Cap’s sustainable and ensures global prosperity and environmental protection

Rhonheimer 20—teaching professor at the Pontifical University of the Holy Cross (Martin, “Capitalism is Good for the Poor – and for the Environment,” <https://austrian-institute.org/en/subjects-en/catholic-social-doctrine-2/capitalism-is-good-for-the-poor-and-for-the-environment/>, dml)

It is not social policy but capitalism that has created today’s prosperity.

What is important is that what made today’s mass prosperity possible – a phenomenon unprecedented in history – was not social policy or social legislation, organised trade union pressure, or corrective interventions in the capitalist economy, but rather market capitalism itself, due to its enormous potential for innovation and the ever-increasing productivity of human labour that resulted from it.

Increasing prosperity and quality of life are always the result of increasing labour productivity. Only increased productivity enabled higher social standards, better working conditions, the overcoming of child labour, a higher level of education, and the emergence of human capital. This process of increasing triumph over poverty and the constantly rising living standards of the general masses is taking place on a global scale – but only where the market economy and capitalist entrepreneurship are able to spread.

From industrial overexploitation of nature to ecological awareness

The first phase of industrialisation and capitalism was characterised by an enormous consumption of resources and frequent overexploitation of nature, which soon gave the impression that this process could not be sustainable. Since the end of the 19th century, disaster and doom scenarios have repeatedly been put forward, but in retrospect they have proved to be wrong: The combination of technological innovation, market competition, and entrepreneurial profit-seeking (with the compulsion to constantly minimise costs) have meant that these scenarios never occurred. The ever-increasing population has been increasingly better supplied thanks to innovative technologies, ever-increasing output with lower consumption of resources less harmful to the environment – e.g. less arable land in agriculture, or oil and electricity instead of coal for rapidly increasing mobility. More recent disaster scenarios, such as those spread by reputable scientists since the late 1960s and in the 1970s, have also proved to be inaccurate.

The reason things developed differently was the always underestimated innovative dynamism of the capitalist market economy, a growing ecological awareness and, as a result, legislative intervention that took advantage of the logic of market capitalism: As a result of the ecological movement that had come out of the United States since 1970, wise legislation began to use the price mechanism to apply market incentives to internalize negative externalities. Environmental pollution was given a price-tag.

This led to an enormous decrease in air pollution and other ecological consequences of growth, which is only possible in free, market-based societies, because the production process here is characterized by competition and constant pressure to reduce costs, i.e. to the most profitable use of resources. On the other hand, all forms of socialism, i.e. a state-controlled economy, have proved to be ecological disasters and have left behind destruction of gigantic proportions, without providing the population with anything that is near comparable in prosperity, often even by destroying existing prosperity, such as happened in Venezuela.

Capitalist profit motive combined with digitalization as a solution: Increasing decoupling of growth and resource consumption

Moreover, technological innovations combined with capitalist profit-seeking and market competition have led to a new and surprising phenomenon over the past decades, which is still hardly noticed in the public debate: the decoupling of growth and resource consumption (“dematerialization”). In a wide variety of industrial sectors, the developed countries, above all the U.S., are now achieving ever greater productive output with increasingly fewer resources. This has a lot to do with technology, especially the digitalization of the economy and of our entire lives.

As the well-known MIT professor Andrew McAfee shows in his book More from Less, published in October 2019, this process also follows the logic of capitalist profit maximization. To get it going, we do not need politics, even though wise, properly incentivizing legislation can be helpful and sometimes necessary. Above all, however, it is the combination of technological innovation, capitalist profit-seeking, and market-based entrepreneurial competition that will also solve the problem of man-made global warming.

In addition, property rights and their protection are decisive for the careful use of natural resources. And where this is not possible, legal support for collective self-governing structures, in accordance with the principle of subsidiarity, are important—as is analysed by Nobel Economic Prize winner Elinor Ostrom. By contrast, the growing ideologically motivated anti-capitalist eco-activism, and the policies influenced by it, are leading in the wrong direction, distracting precisely from what would be best for the climate and the environment—and distracting us from what could help protect us against the inevitable consequences of global warming.

#### Wholesale rejection of neoliberalism is impossible and insisting on theoretical purity dooms crucial short-term measures to avoid violence---it’s better to combine structural approaches with non-reformist reforms that propel mobilization.

Schram 15 – Sanford F. Schram, Visiting Professor of Social Work and Social Research at Bryn Mawr College, Professor of Political Science at Hunter College, PhD and MA in Political Science from St. Lawrence University, The Return of Ordinary Capitalism: Neoliberalism, Precarity, Occupy, p. 178-186 [language modified]

The Movement of Movements: The Occupy Left Versus the Organized Left

In the current era, there is much intellectual, if not political, credibility to be gained by refusing to practice the multilevel mobilizing of an Occupy Left and subsequent efforts like Black Lives Matter. There is a growing consensus that Occupy was a failure and its current extensions just fritter away energy that should be concentrated on building an organized Left that can push successfully for wholesale change.16 Some on the left refuse to work with diverse groups on their different issues in real time. Instead, they insist on taking the long view that says such work is a distraction to the larger and critical cause of organizing for fundamental transformation of the existing political economic system.

A major concern for this faction is maintaining the purity of the Left, striving to remain uncontaminated by the compromises of coalitional politics that are necessary when addressing the myriad of specific issues associated with the inequities of neoliberalism.17 In this way, activism remains true to the tradition of radical politics as it was practiced during the age of revolution and especially the heyday of communist organizing. Sometimes this nostalgia for the history of radical politics can lead to blaming the victim, this time not so much blaming the poor for their own poverty but blaming the subordinated for their failure to organize effectively to enact fundamental change.18 Sometimes, the nostalgia for “one big union” to challenge the capitalist power structure is born of letting historical understanding crowd out the exigencies of the moment. In discussing the problem of combining scholarship and activism among leftist academics in the humanities, Bruce Robbins makes a point that has direct relevance to the academics of the organized Left as I am characterizing it. He asserts: “One trap the Left faces, at least to the extent that that Left is located in the academy, is an overemphasis on making a political program out of what it already does for a living.”19 Robbins is talking about bringing too much history into efforts to mobilize people who are focused on immediate concerns. Knowing about the history of the labor movement surely could help members of the precariat think about how to address their plight; from the perspective of ordinary citizens, they may not be all that open to hearing all that history when they are mostly concerned about landing a job once their unemployment has been cut off and they have had to declare bankruptcy. The bottom-up perspective encourages us to see things the way they do. And that might mean pushing to raise the minimum wage rather than holding out for the demise of capitalism or the adoption of a basic income.

Too much history can be matched with too much theory.20 Too often today, the organized Left is joined by the theoretical Left. An overemphasis on theory produces what John Gunnell calls “epistemic privilege,” that is, the idea that theory comes first and underwrites and authorizes the action that follows. Exercising epistemic privilege involves unquestioned acceptance of the cliché that without a sound theory there can never be effective political action.21 Yet it is questionable to what extent we need to be able to theorize why things are the way they are to be able to do something about them. Theory is undoubtedly important for placing political action in context, deepening meaning, and clarifying the conditions of political possibility.22 Yet an overemphasis on theory can be politically [destructive] ~~paralyzing~~. The preoccupation with theory can undermine the needed focus on strategy,23 especially when theory is concerned with the big picture of understanding the current situation overall and over time, and strategy is more narrowly focused on what will connect with ordinary people’s immediate concerns as they struggle to cope with the effects of a neoliberalizing economy.24

In other words, being an academic can get in the way of being an activist. A preoccupation with theory can distract us from working to achieve modest but worthwhile reforms that directly address people’s immediate concerns. This is doubly unfortunate if those reforms actually work to lay the groundwork for larger, transformational change in the future. Epistemic privilege can lead us away from the radical incrementalism of making small, realistic changes now that can lay the groundwork for larger ones down the road.

In fact, the very idea of modest reform can be dismissed by those seeking more dramatic change because it poses the real possibility that it will defuse anger among the politically diverse precariat and thereby forestall the more dramatic systemic change that is needed to put the inequities of the new normal of neoliberalism safely behind us. While largely limited to the ruminations of bloggers, it seems that many on the left have their own crisis strategy that is premised on the idea that if things get bad enough, spreading from the lower to the middle classes, mass mobilization against the existing structure of power will finally gain traction and political transformation will result. Yet this crisis strategy is indebted to the very same dichotomous thinking that prevents some on the left from appreciating the value, and even the need, to mobilize on multiple levels. It is a crisis strategy that trades off addressing people’s immediate needs in the short run for building up popular support for more dramatic change in the long run. It pits a “politics of survival” against a “politics of social change,” seeing them as mutually exclusive.25

This bloggers’ crisis strategy, however, seems at best an imagined strategy that no one is really actively working to execute (especially since it would impose growing hardship on the very people whom the Left wants to help). Yet even those among the Occupy Left are vulnerable to this type of misplaced crisis thinking. Chris Hayes, in his otherwise thoughtful examination of U.S. politics in the current age of hyperinequality, looks to a radicalized middle class that has become frustrated with its ability to move ahead.26 Hayes writes:

Crisis is not something to be longed for or embraced: as we’ve seen, war, financial crisis, natural disaster visit their most punitive blows upon the weakest, the poorest, the least powerful members of society. But political crises, moments when the keystone of authority of some major governing institution is whisked away like a Jenga block, can produce a tumbling cascade of new forms of politics. We’ve been looking at the tower for so long we forget it’s made of blocks; we forget it can be put back together in a different way.27

Hayes sees the economic malaise spreading upward to the point that the privileged with resources can now be mobilized to redress the situation and push for dramatic change. While the middle classes can indeed be a source of change, especially today (see chapter 2), this type of top-down, elite-driven political mobilization is vulnerable to being defused by concessions for those higher up at the expense of those below them.

Yet a better crisis strategy actually was implemented. It was made famous by Richard Cloward and Frances Fox Piven as the central means of mobilizing support in the 1960s for reform of the welfare system and transition to a guaranteed income.28 It was premised on a win-win that saw a politics of survival and a politics of social change as working synergistically. Piven and Cloward premised their strategy on their research, which estimated that about half of those eligible for welfare nationwide were not receiving it. If everyone who was eligible enrolled it would overload the system, create a crisis, and force elites to consider moving to a better system such as a guaranteed income (now called a basic income). The strategy worked in good part, with millions of people getting public assistance and Congress twice voting on a guaranteed income plan that was proposed by President Richard Nixon. While the plan was never adopted, many people got aid in the process. Signing up people for welfare helped address their immediate needs while growing membership in the cause for welfare rights intensified concern in the public that something had to be done to transform the broken system of aiding the poor. A politics of survival and a politics of social change were not pitted against each other; choosing one over the other was not required. Instead, the real crisis strategy was premised on the idea the two could work together synergistically.

This confusion about what is an effective crisis strategy is premised on overly dichotomous thinking that leads many on the left away from multilevel mobilizing. It also might explain why they are often better at resisting anything less than total transformation to a new society than in finding ways to support improvements that reduce people’s suffering in the here and now. This resistance to reform also reflects nostalgic preoccupations with a lost past, when the revolution by the laboring classes was a real possibility. In contrast today the diverse people whose economic condition is made precarious by the changing economy are less available to be organized for mass mobilization on behalf of a fundamental transformation of the inequitable neoliberal political economy. As a result, many on the left are at risk of passing up on politics as it actually occurs today and instead contenting themselves with perfecting theoretical purity. Even left-leaning alternative political parties, such as the initially quite successful Working Families Party, get dismissed as not deserving of support as soon as the party makes questionable compromises as part of the effort to leverage power within the existing system.29 In the hothouse environment born of frustration over the Left’s inability to make a concerted and effective effort for transformational change, any misstep potentially becomes an excuse for continued inaction. Sometimes it seems the only political action the purists would support is a coup. They long for days when revolution was a real option. In this way, the Left continues to practice one of its more dominant forms of melancholia.

We may, however, come to look nostalgically on the academic Left, regardless of its disabling preoccupations. Today, that group is rapidly being replaced by academics fortunate enough to secure appointments but too insecure in them to dare to think of combining activism and scholarship.30 This new generation is not even positioned to freely protest its own plight in the face of the ongoing corporatization of the academy, let alone start to work with ordinary Americans outside the academy who suffer the worst effects of the inequitable neoliberal economy. Confronting growing professional and institutional pressures from performance measurement schemes to publish in “high-impact” journals (i.e., highly cited, not highly influential politically), many academics now must publish constantly; however, their work is often assiduously theoretical and methodically arcane, as well as apolitical and disconnected from ongoing political struggle. Many of these younger academics are of the Left in their hearts and minds, but not on the printed page or in the streets.

Too often an insistence on organizing only for dramatic change can lead to immobilization on the grounds that proposed actions are less than entirely consistent with some blueprint about what is to be done to produce long-term structural change of society. Instead activism should be more humble, accepting that not all contingencies can be anticipated and social movement mobilization is not entirely predictable and cannot be planned out before it occurs.31 In particular, the Left needs to stop making political action an either/or proposition and begin to think seriously about how political mobilization on multiple levels—protests, parties, policy, and program administration—can be made to work together to bring into being a better world for those suffering on the bottom of the socioeconomic ladder. Radical movement politics in a variety of forms is what is needed today. Efforts focused on dramatic regime change still have their place, especially when there is a gnawing need to call out injustice and identify its structural sources embedded in the very foundations of the existing neoliberalized society. Yet what are we to do in the meantime? Is it possible to help alleviate suffering even while we work for more fundamental change? The ongoing resistance to anything less than wholesale societal change stems from the fact that it poses a falsely stark choice between radical movement politics and more conventional electoral and policy politics. This kind of thinking is overly dichotomous and fails to appreciate that mobilizing for change to redress the injustices of the neoliberalized economy does not always involve seeing the options as mutually exclusive.32

In fact, many activists today appreciate and participate in the diversity of movements involved in creating noteworthy changes in cultural practices, social relations, economics and politics.33 Much of the energy of these movements comes from outside the academy where people are not weighed down with theoretical preoccupations. When big ideas, theory included, get to matter are when ordinary people confronting their difficulties in their everyday lives come to see the relevance of those ideas.34 Today, there is a veritable movement of movements where change efforts take a diversity of forms, with some even working with, rather than against, the market system in ways that create more freedom and less oppression for ordinary people.35 Just as we should not see protest politics and electoral politics as mutually exclusive, so should we learn to appreciate the value of a radical incrementalism that works to address people’s problems in the here and now, while laying the groundwork for larger political transformation in the future. The protest politics of Occupy Wall Street has contributed to creating a context for the electoral successes of candidates such as Bill de Blasio, who became mayor of New York City with the support of the Working Families Party, which has strong ties to Occupy movement participants.36 How de Blasio works with protest groups, including those that have become embroiled in the volatile issue of racialized policing, suggests real challenges but also hope for change.37 Radical incrementalism suggests just this kind of synergy. It combines a politics of survival with a politics of social change to get significant improvements in state policy, following the successful model of welfare mobilization in the 1960s.38

The Road to Radical Incrementalism

Radical incrementalism is not really an option: it is the prevailing reality of politics. It realistically recognizes the economic, social, and political constraints that limit mobilization on behalf of radical change. It also is based on an appreciation often shared by proponents for radical change that efforts at sustained political mobilization are not something that happen overnight. Instead, it works to help people in the short run within existing constraints but in ways that make more dramatic political transformation eventually more likely.

As much as people on the left hope for a radical swing away from neoliberal social welfare programming in the current era, the arc of history under U.S. capitalism suggests a more modest process of incrementalism. Incrementalism is defined in the public policy literature as a process of policymaking where a series of small remedial, corrective steps enable change in existing policy.39 Yet the criticism of incrementalism is that it amounts to no more than tinkering with the existing system in ways that do nothing more than fine-tune the status quo. Perfecting neoliberalism means little more than making the ascendant disciplinary regime more effective in managing the poverty population and by extension everyone else who is made economically precarious by the transformed economy.40 Incremental changes in neoliberal policies can result in nothing more than improving the system for embedding market logic more deeply into society and our daily lives.41 It could amount to no more than perfecting the system for incentivizing market-consonant behavior in ways that end up leaving most people having to make do with the inadequate resources and opportunities afforded them in a changing economy.

Nonetheless, especially in an age of extreme political polarization that begets policy gridlock, incrementalism may be the prevailing reality more than ever. Under these conditions, it may be that ideas about more dramatic change need to be tempered with the reality of working for more limited changes that nonetheless do more than reinforce the existing system.42 The issue then becomes how to practice a radical incrementalism.43 By “radical incrementalism,” I mean a process in which people push for change recognizing it will not necessarily be as large as they might like but also in which small changes can do more than fine-tune the existing system. Radical incrementalism is not about tweaking what is already in place to help perpetuate the status quo and the existing structure of power. It rejects changes that in all likelihood are going to lead to the continuation of the very problems that people are trying to address. Instead, the small changes of radical incrementalism lay the groundwork for further changes that over time can help build to a transformation of the existing structure of power, the source of the problems being attacked.44 The key then is that when pushing for change as activists we must be able to distinguish radical incrementalism from the status-quo-reinforcing incrementalism most often offered by elites. This is often not easy but the goal is to try as much as possible to resist the cooptation elites will seek to gain by making minimal concessions. That is the focus we need today in an era of political gridlock born of polarization that stems in no small part from the wealthy using their wealth to block constructive responses to address the problems extreme inequality creates.

André Gorz highlighted the challenge in distinguishing between status quo incrementalism and radical incrementalism in his own terms when he distinguished what he called “non-reformist reform” from “reformist reform.”45 Gorz recognized that what distinguished progressive reform from statusquo-reinforcing reform was not easy to always identify, but nonreformist reforms are the progressive reforms that are essentially laying the groundwork to get beyond the inequities of capitalism by restructuring power relations. More recently David Harvey has called for appreciating the value of what he calls “revolutionary reforms” that provide the basis for challenging capitalist power over time.46 Radical incrementalism similarly involves making small changes that lay the basis for restructuring embedded power relations that prevent more ambitious changes from happening.47

Radical incrementalism is focused on changing power relationships but it is not against the use of power, and it is focused on finding ways for government and the governance of populations to work to improve the lives of ordinary people. It does not simply resist oppressive state power, it seeks to bend it toward enhancing the conditions under which people live with, participate in, and benefit from state power. Radical incrementalism works to offer constructive answers to such questions as: what type of governance is appropriate for ordinary people today and how can we rework power relations to realize it?48

Radical incrementalism can be practiced on multiple levels and across different dimensions of the policy process. It can involve protest movements adroitly deciding to accept particular concessions elites offer to quell dissent.49 It can also involve participating in electoral campaigns for candidates who resist capitulating to conventional politics as usual. It can involve pushing for changes in public policy that redistribute power and lay the foundation for broader changes in the future. Reallocating resources, such as to improve wages so that people can do more than just survive but also be better positioned to participate in the political process, is but one example.

## Politics

### Politics – General – 2AC

#### No vote switching --- ideology, party affiliation and commitments overwhelm

Edwards 16 – George C. Edwards III, Distinguished Professor of Political Science and Jordan Chair in Presidential Studies at Texas A&M, 2016, “The Potential of Presidential Leadership”, Study Done for the White House Transition Project

The best evidence is that presidential persuasion is effective only at the margins of congressional decision making. Presidential legislative leadership operates in an environment largely beyond the president’s control and must compete with other, more stable factors that affect voting in Congress in addition to party. These include ideology, personal views and commitments on specific policies, and the interests of constituencies. By the time a president tries to exercise influence on a vote, most members of Congress have made up their minds on the basis of these other factors.

### Biden Good – PC – 2AC

#### Plan’s popular and XO thumps

Financial Press, 8-21 [2021 “The best job-market fix you've never heard of: 'occupational licensing reform' may be having a moment”]

It's an issue progressives and libertarians can agree on. It has unique potential to help service workers at a moment when many of those professions have been upended. And it just got some attention from the White House.

'Occupational licensing reform' may be the most awkwardly-named, little-discussed labor topic in the American economy today. The idea is simple: the number of occupations for which an American worker must be licensed has exploded, to nearly 30% of all jobs now, up from 5% in the 1950s. That throws up barriers to entry, crimps competition, and keeps workers less mobile. Examples include service jobs such as cosmetology, floral arranging, tooth-whitening and others. As the issue gathers more attention, more workers may find it easier to access occupations that might have had requirements keeping them out — and consumers may have a broader set of choices, as well. 'Lots of people lost their jobs during the pandemic, so making sure we don't have artificial barriers to jobs is important,' said Shoshana Weissmann, a fellow and the senior manager of digital media at the R Street Institute, a free-market think tank. 'Also, when you have fewer professionals in an industry, those services can become more expensive.'

The White House, in a July executive order[1], described it this way: 'In certain occupations, such as skilled construction trades, licensing is critical to protecting public health and safety and increasing wages for workers who acquire in-demand skills and knowledge. In other occupations, however, it can impede worker mobility without countervailing benefits.'

There are nearly as many explanations about why occupational licensing is mushrooming as people taking an interest in reforming it. Ryan Nunn is a researcher at the Minneapolis Fed, and previously worked on the issue as part of the Obama administration[2]. In an interview with MarketWatch, Nunn noted that some of the licensing sprawl over the past few decades comes from the country's broad shift to a service-based economy. But, he says, research shows that two-thirds of the increase is due to 'professionalization of the workforce.' 'Occupations are organizing themselves, setting up common standards and industry groups,' Nunn said. 'Then it becomes a short leap to getting licensed. They go to the state legislature and ask for requirements to be licensed. They may see that as the final step.' That evolution is a classic example of what economists call 'rent-seeking.' It privileges those already working in the profession and makes it harder for new people to enter, which means incumbents may be able to charge more for their services, benefitting themselves at the expense of consumers. It may also be the case that giving that professional group what it wants leads to happier outcomes — contributions — for legislators. Weissmann also points to what she calls the 'there oughta be a law!' kind of outrage that so often boils up when something goes wrong. 'That's not always a bad impulse,' she said. But it may be misguided. Take the example of the New Jersey dog groomers. Dozens of dogs died over the course of a decade after being groomed at privately held PetSmart stores around the state, prompting a 2018 local news investigation[3] and a push for legislation that would require licensing for groomers. 'Bijou's Law'[4] failed to pass initially but has been re-introduced. 'There's better ways to achieve a lot of the same outcomes that people want,' Weissmann told MarketWatch: inspections, for example. (Dog-grooming safety seems to strike a special chord for Americans: a recent Twitter kerfluffle erupted after a local television reporter in Washington, DC, seemed to suggest dogs were being murdered by groomers.)

Nunn points to North Carolina State Board of Dental Examiners v. Federal Trade Commission, a Supreme Court case decided in 2016, as an example of overreach and reform. The high court agreed with the FTC[5] that a state licensing board made up of practitioners needed some supervision. 'Their concern was the state was delegating too much authority to the industry,' Nunn said in a MarketWatch interview. 'The dentists got to regulate themselves.'

Even though nearly all licensing is done on the state level, Nunn believes there's a role for the federal government to play, as the FTC did in that North Carolina case. There's also the bully pulpit that the White House and others can command, he said — issuing an executive order, as the Biden administration did, or convening a task force of state leaders, as the Obama administration did.

### Courts – 2AC

#### Courts don’t link – avoids gridlock, horse-trading and takes the blame for elected branches

Ward 9 [Artemus, Professor – Political Science – Northern Illinois University “Political Foundations of Judicial Supremacy: The Presidency, the Supreme Court”, Congress & the Presidency, Jan-Apr, (36)1; p. 119]

After the old order has collapse the once- united, new-regime coalition begins to fracture as original commitments are extended to new issues. In chapter 3 Whittington combines Skowronek's articulation and disjunctive categories into the overarching "affiliated" presidencies as both seek to elaborate the regime begun under reconstructive leaders. By this point in the ascendant regime, Bourts are staffed by justices from the dominant ruling coalition via the appointment process - and Whittington spends time on appointment politics here and more fully in chapter 4. Perhaps counter-intuitively, affiliated political actors - including presidents - encourage Courts to exercise vetoes and operate in issue areas of relatively low political salience. Of course, this "activism" is never used against the affiliated president per se. Instead, affiliated Courts correct for the overreaching of those who operate outside the preferred constitutional vision, which are often state and local governments who need to be brought into line with nationally dominant constitutional commitments. Whittington explains why it is easier for affilitated judges, rather than affiliated presidents, to rein in outliers and conduct constitutional maintenance. The latter are saddled with controlling opposition political figures, satisfying short-term political demands, and navigating intraregime gridlock and political thickets. Furthermore, because of their electoral accountability, politicians engage in position-taking, credit-claiming, and blame-avoidance behavior. By contrast, their judicial counterparts are relatively sheltered from political pressures and have more straightforward decisional processes. Activist Courts can take the blame for advancing and legitimizing constitutional commitments that might have electoral costs. In short, a division of labor exists between politicians and judges affiliated with the dominant regime.

#### Plan’s announced in June

Freeman 16 – Jody Freeman, Professor of Law and Director of the Environmental Law Program at Harvard Law School, “Update on the Clean Power Plan: The Knowns and Unknowns”, American College of Environmental Lawyers, 3-2, http://www.acoel.org/post/2016/03/02/Update-on-the-Clean-Power-Plan-The-Knowns-and-Unknowns-.aspx

Next Steps and Timing of Litigation

Whatever the composition of the D.C. Circuit panel, however, and whatever it decides, the losing parties might seek en banc review in the D.C. Circuit. The State and industry challengers would be almost certain to do so, because delay favors their side. This is because the Supreme Court took the unusual step of staying the rule not just until the D.C. Circuit rules on the merits, but for longer: until the Supreme Court either denies certiorari or grants review and decides the case. Delay means the Stay remains in force, which means the deadline for filing compliance plans keeps being pushed off, which means momentum slows, which favors those opposed to the CPP. En banc review is rarely granted, however, and the D.C. Circuit may be reluctant to further delay things by providing it when the Supreme Court has already associated itself with the case (by granting the Stay and making it all but certain review will be granted).

What all of this means is that the earliest the Supreme Court could decide the case--given the time necessary for the cert petition, briefing, argument and deliberation--is likely to be June 2017, and the latest the Court is likely to decide the case is June 2018. That means the Stay could remain in place for more than two years.

### Infrastructure/Reconciliation – 2AC

#### Won’t pass and watered down

LaChance 10-28 [Mike LaChance, covering politics and higher ed for @LegInsurrection,10-28-2021 <https://legalinsurrection.com/2021/10/democrats-slash-more-programs-from-still-massive-spending-bill-to-get-manchin-and-sinema-votes/amp/>]

Last week Joe Biden warned progressive Democrats that free college probably isn’t going to make the final cut of their spending bill. Now they are cutting other items from the bill.

They’re trying very hard to get Sinema and Manchin on board, but it’s still not clear if it’ll work.

Michael Lee reports at FOX News:

Senate Democrats cut paid family and medical leave from spending package: reportSenate Democrats have dropped the paid family and medical leave proposals from the social spending package after negotiations with moderate Democrats failed to reach a compromise on a pared-down version of the proposals, according to a report.Democrats decided to drop the proposals on Wednesday despite that they were a key campaign promise of President Biden, according to reporting from Politico. Sen. Kirsten Gillibrand, D-N.Y., one the senate’s leading advocates for the benefits, had tried to reach a last-minute deal with Sen. Joe Manchin, D-W.Va., who has resisted the overall cost of the package.But Gillibrand told Fox News Wednesday that reports about the benefits being dropped are “premature,” signaling hope that some sort of pared-down version could still be in play.Manchin has argued that the cost of the proposals is too high when some social programs are already in jeopardy of running low on funds.”I’m talking to everybody, but I’ve been very clear: to expand social programs, when you have trust funds that aren’t solvent — they’re going insolvent — I can’t explain that … It doesn’t make sense to me … I just can’t do it,” Manchin said Wednesday.

Some people on the left are starting to think the bill has been gutted beyond the point of even passing it.

There’s been so much infighting among Democrats over this. They keep putting out the message that they’re so close to a deal, but it keeps falling apart.

Politico reports:

Liberal frustration imperils quick Dem social spending deal A flurry of cuts to Democrats’ domestic priorities endangered a quick deal on President Joe Biden’s agenda on Wednesday after a frenetic 24 hours of negotiating between the president and two moderate senators. An axed paid leave program and a proposed elimination of a tax on billionaires, as well as the tenuous state of prescription drug reform and Medicare expansion, slowed down progress between Biden and Sens. Kyrsten Sinema (D-Ariz.) and Joe Manchin (D-W.Va.). After meeting with Biden on Wednesday afternoon, Sen. Bernie Sanders (I-Vt.) said there’s “no way” a deal is reached before Thursday.“The problem is not with the president, the problem is with members here who, although they are very few in number … that think they have a right to determine what the rest of the Congress should be doing. And I strongly disagree,” Sanders said. “It’s not conceivable to me that we’re going to have a deal today.”

If this stretches beyond November 2nd, and it looks like it will, and if Youngkin defeats McAuliffe, which he could, Biden’s political capital will be severely diminished.

### Cyber Impact – War – 2AC

#### No impact – redundancy solves

Rid 12 (Thomas, writer for Foreign Policy, “Think Again: Cyberwar,” March, [http://www.foreignpolicy.com/articles /2012/02/27/cyberwar](http://www.foreignpolicy.com/articles%20/2012/02/27/cyberwar))

Just because there's more malware, however, doesn't mean that attacks are becoming easier. In fact, potentially damaging or life-threatening cyberattacks should be more difficult to pull off. Why? Sensitive systems generally have built-in redundancy and safety systems, meaning an attacker's likely objective will not be to shut down a system, since merely forcing the shutdown of one control system, say a power plant, could trigger a backup and cause operators to start looking for the bug. To work as an effective weapon, malware would have to influence an active process -- but not bring it to a screeching halt. If the malicious activity extends over a lengthy period, it has to remain stealthy. That's a more difficult trick than hitting the virtual off-button. Take Stuxnet, the worm that sabotaged Iran's nuclear program in 2010. It didn't just crudely shut down the centrifuges at the Natanz nuclear facility; rather, the worm subtly manipulated the system. Stuxnet stealthily infiltrated the plant's networks, then hopped onto the protected control systems, intercepted input values from sensors, recorded these data, and then provided the legitimate controller code with pre-recorded fake input signals, according to researchers who have studied the worm. Its objective was not just to fool operators in a control room, but also to circumvent digital safety and monitoring systems so it could secretly manipulate the actual processes. Building and deploying Stuxnet required extremely detailed intelligence about the systems it was supposed to compromise, and the same will be true for other dangerous cyberweapons. Yes, "convergence," standardization, and sloppy defense of control-systems software could increase the risk of generic attacks, but the same trend has also caused defenses against the most coveted targets to improve steadily and has made reprogramming highly specific installations on legacy systems more complex, not less.

#### Cyber impacts inevitable absent AI

Calderon 19 (Ricardo, M.S. in cybersecurity and Penetration Tester for Comcast, La Salle University “The Benefits of Artificial Intelligence in Cybersecurity” <https://digitalcommons.lasalle.edu/cgi/viewcontent.cgi?article=1035&context=ecf_capstones> Published 1-15-2019 MSU-MJS)

Everybody is at risk for a cyberattack. According to Myriam Dunn Cavelty (2018), cybersecurity “…refers to the set of activities and measures, technical and non-technical, intended to protect the ‘real geography’ of cyberspace but also devices, software, and the information they contain and communicate, from all possible threats” (Cavelty 2010). As technology advances every day, cybercriminals are becoming more sophisticated and getting ahead of current cybersecurity controls. In order to get ahead of cybercriminals, experts are beginning to use Artificial Intelligence (AI) to counter new cyberattacks (Harel, Gal, and Elovici, 2017). AI is a discipline in computer science that uses complex mathematical algorithms to imitate human thinking (Lidestri 2018). The term Artificial Intelligence was proposed in 1956 by John McCarthy and other researchers. The first steps in AI achieved games such as the checkers game that was able to learn through training. The game was capable of playing better than an average player. As it was the end of the first decade for AI, the achievement was a great step in digital computing. The problem was how to apply AI to solve real-world problems. The researchers lacked a vast amount of knowledge which prevented them from understanding the problems (Tecuci, 2011). Although real AI has not been achieved yet, it has grown at a faster pace and has revolutionized various fields and industries including automotive, medicine, and astronomy. The increased demand to stop cyberattacks led to the application of AI-based techniques in cybersecurity. AI has multiple branches or subsets. One AI-based technique is Machine Learning (ML). Machine Learning is a subset of AI that teaches machines how to make decisions (Feizollah, Anuar, Salleh, Amalina, & Shamshirband 2013). The growth of ML has helped researchers to develop techniques to detect tumors, and enhance cybersecurity techniques to detect malware in networks and phishing emails. Another branch of AI is Deep Learning (DL) which researchers describe as a type of ML that performs pattern recognition and predictions (Polson, 2017). DL is capable of handling humongous datasets. This allows its application in a large array of fields such as image rendering, stock market prediction, and agriculture. DL improves areas of cybersecurity such as intrusion detection and botnet detection due to the high processing power that it has to examine data and learn from experience. The goal of this paper is to inform readers about the possibilities of using AI in cybersecurity by showing both the benefits and the risks. Cybersecurity experts are using ML and DL to solve problems in the areas of Botnet Detection, and Intrusion Detection and Prevention Systems (IDPS). However, the integration of AI-based technologies in organizations may have implications which cybersecurity experts need to address to ensure cyber safety. AI may also impact technology consumers who are using devices that, in one way or another, are already using the technology. Cybersecurity problems that AI can solve With technological advancements in the cyberspace, cybersecurity faces new problems. Some problems have existed for decades but cybersecurity experts need to find new ways to defend networks from existing problems. Two of the existing problems are botnets, that are used to launch Distributed Denial of Service (DDoS) attacks, and IDPS that generate large numbers of false alarms which distract cybersecurity experts from finding real threats. A botnet is a network of computers and other devices which are referred to as bots. Computers that are part of a botnet connect to it by malware infection. After the infection in launched, a “botmaster” sends commands to the bots via a network channel. Usually the botmaster encrypts the channel to avoid detection. The botmaster uses a Command and a Control (C&C) server to push commands and patches. Botnets play a major role in DDoS attacks. In fact, the larger the botnet, the more effective the DDoS attack will be. Additionally, botnets are also used for identity theft and stealing data (Mathur, Raheja, & Ahlawat 2018). In 2016, the Mirai malware infected Internet of Things (IoT) devices and created a botnet that connected approximately 500,000 IoT devices together. The botnet was used to unleash devastating DDoS attacks on sites and services (De Donno, Dragoni, Giaretta, and Spognardi 2018). In addition, Mirai malware is open-source, which means that other cybercriminals may add new features to the malware, and create new variations of Mirai. AI has the capability to detect botnets inside networks. The detection of botnets will help prevent the infection of more devices and stop DDoS attacks, and data leakage. An IDPS is a technology that network and system administrators use to detect intrusions. After the IDPS detects intrusion, the authorized administrators may receive email alerts. This technology not only detects intrusions but also prevents intrusions when an attacker tries to gain unauthorized access to a network (Whitman and Mattord 2017). To achieve a higher security level, network administrators need to properly configure IDPS tools. Developers have created hardware and software-based Intrusion Detection and Prevention Systems. Network administrators may install a system on a host, which they call Host-based IDPS, or on the network, which they refer to as Network-based IDPS. One of the main problems is setting up and configuring an IDPS is time-consuming because a standard configuration does not exist. Network traffic differs organizations. Due to that, IDPSs generate a large number of false alerts or “false positives.” With AI, cybersecurity and network administrators hope to filter out false alarms and increase detections rate.

Intrusion Detection and Intrusion

Prevention IDPS systems come in two categories. Intrusion Detection System (IDS), and Intrusion Prevention System (IPS). Currently, IDPS technology relies on Signature-based and on Anomaly-based systems. Signature-based detection systems rely on databases of known threats to detect intrusions. Signature-based systems examine incoming packets and retrieve the signatures from network packets and compare them against the database. If there is a match, the system assumes that an intrusion has been detected. It is an effective method to detect intrusions that have been previously detected, but one of the major problems is that it only works against threats that it knows (Jean-Philippe 2018). For example, after Mirai botnet spread, developers created patches to protect IoT devices from the malware. In the process, a signature was identified for Mira. If an attacker attempts to infect a patched IoT device the signature-based system will prevent it. However, a signature-based system cannot detect a variation of Mirai because the signature differs from the database. On the other hand, there are anomaly-based detection systems. Unlike signature-based detection systems, anomaly-based detection systems signal intrusions or attempts by assessing the behavior in a network. For example, if a new malware makes its way into a network, the signature-based detection system would not categorize that malware as legitimate whereas the anomaly-based detection system will analyze its behavior and determine whether it is a threat. Detecting threats because of the behavior rather than by the signatures indicates that the anomaly-based detection system is more efficient because it does not need previous information about the incoming threat. In order to detect new threats, researchers and administrators need to protocols within the system which will function as validators. Those protocols determine what normal or legitimate network traffic resembles (Jose, Malathi, Reddy, and Jayaseeli 2018). The anomaly-based systems rely on human interaction to have new rules. They cannot find the threat if the rule that detects it does not exist.

Machine Learning Approach As cybercriminals become more sophisticated, cybersecurity experts need more sophisticated tools and techniques to be able to defend their networks. ML-based IDPS may enhance defenses and at the same time reduce false positives. There are six different types of Machine Learning methods, and each one has unique characteristics and values that cybersecurity experts may benefit from. According to Ruth Jean- Philippe (2018), all ML methods are not alike, therefore, researchers need to provide the correct data for the ML-based system to work to its fullest. Among the six ML methods, two of them are outstanding for cybersecurity. The first method is Artificial Neural Networks (ANN). ANN are nodes that imitate the human brain. This method uses processing nodes or neurons that connect to each other, and also connect to a hidden layer (Jean-Phillipe, 2018). According to Jean-Phillipe’s research, ANNs are capable of recognizing patterns that are very complex for humans to recognize. Also, ANNs are able to recognize unprecise patterns. The application of ANN in IDPS enhances network security. Cybercriminals have learned to evade security controls. They are capable of deploying attacks that do not trigger alerts in the system which makes their detection a harder task for cybersecurity experts. For example, if cybercriminals perform a port scan, passively, this mimics a legitimate connection in order to detect open ports. However, ANN would be capable of detecting when a connection is legitimate and when it should trigger a security alert due to the connection patterns. Usually, passive scans start a connection and then closes them before the connection reaches the end and thing would be detected as malicious. The second ML method is Genetic Algorithm (GA). GA detects threats by learning from experience given to previous anomaly behavior. Similar to the human brain, humans know that fire is dangerous because of the experience of ancestors. GA is useful to detect common threats with common patterns. So, GA uses the previous patterns to make decisions on new patterns that the system cannot recognize (Jean-Phillipe, 2018). Applying this method to ML-based IDPS systems, researchers would be able to increase detection rates for new anomalies. For example, if a ransomware manages to penetrate the firewall, via email or other vector, when it intends to spread and encrypt files, the ML-based IDPS using GA will detect it and prevent the encryption of a large cluster of devices across the network. Unlike signature-based systems, ML-based systems do not need databases with signatures (Jean-Philippe, 2018). Feeding supervised machine learning algorithms with a dataset which contains information about what normal network traffic should look like and providing a whitelist that the ML-based IDPS will use to detect threats. The ML-based IDPS system can make decisions against different new patterns. Regular IDPSs do not have these capabilities as they rely on previous configurations to protect networks.

Deep Learning Approach

In attempt to increase detection accuracy, other methods have been proposed. Deep Learning is a branch of ML with a higher level of complexity. Researchers define DL as a neural network that contains at least three hidden layers as Figure 1 demonstrates (Roosmalen, Vranken, & Eekelen, 2018). Researchers provide data in the input layer of the deep learning neural network. The input layer then sends the data towards several hidden layers that perform algorithms to produce possible outputs. In 2006, Geoffrey Hinton proposed a data processing model which was named deep Belief Network (DBN). DBN has been successfully applied in areas such as speech and object recognition. DBN is capable of processing large amount of data which makes it effective for DLbased intrusion detection tools. Researchers from CRRC Qingdao Sifang co., LTD carried out studies to determine the impact DBN had on intrusion detection (Qu, Zhang, Shao, & Qi, 2017). They divided their intrusion detection model in two steps: The first step trains the Restricted Boltzmann Machine (RBM) which is the foundation of DBN and is a hidden layer that has a connection with a visible layer. RBM benefits DBN because it uses large a number of visual and hidden layers. This allows DBN to process more data that it then sends to the second step, which is the Back Propagation (BP) neural network. The second step adds BP neural network, which receives the data from the previous step and monitors the network (Qu, Zhang, Shao, & Qi, 2017). BP is the last layer in a DBN which decides and attempts to identify false positives and discards them in order to provide a more accurate result. Qu, Zhang, Shao, and Qi (2017) have proposed an IDS that integrates with DBN to detect threats. In their model, when the IDS scans the network, the DBN receives the raw data that the IDS has produced. The DBN processes the data and estimates the number of layers that it would need. Then it creates a training dataset to start the process in which the DBN uses that dataset to perform its calculations and determine if it is a false positive or a threat. Prior to determining if the data belongs to a threat, the DBN calculates the errors in addition to the results it expects. That process is a constant loop that stops when it obtains the results expected by DBN. Figure 2 depicts the flow. A comparison with current intrusion detection systems, false positives are common. Researchers from CRRC Qingdao Sifang co., LTD (2017) concluded with the simulations they ran that the accuracy rate was 92.25%. The remaining 7.75% is a smaller window for false positives to exists. Often, when current IDS systems trigger alerts, cybersecurity experts need to spend valuable time to analyze the alert in order to determine whether it is a false positive. With DL methods, false positive rates will decrease which at the same time will increase performance and detection.

Botnet detection

Xuan Dau Hoang and Quyng Chi Nguyen (2018) describe a botnet as a changing environment. Bots are constantly sending lookup queries. The goal of the queries is to obtain the IP address of the Command and Control (C&C) server in the DNS system. C&C servers very often change DNS and IP addresses to avoid detection. Hoang and Nguyen proposed a two-phase detection model that uses machine learning algorithms to increase the possibilities of detecting botnets (Xuan and Nguyen 2018). Figure 3 demonstrates the workflow of the botnet detection by using DNS queries by Hoang and Nguyen. The first phase is the training or learning phase. The training phase uses a labeling and classification system. In this phase, the ML algorithm will collect data about the DNS queries from the bots in the botnet. During the training phase, the ML algorithm extracts the domain names from the queries for the training phase. The domain names belong to botmasters that control devices in the botnet. This is the pre-processing step. The ML system then uses the data from the pre-processing step for the training that it needs to undergo in order to learn the pattern and detect the botnet. The training produces classifiers and when the first phase reaches this point, it is ready to pass to the detection phase. The second phase is the detection phase. The detection phase analyzes the results from the training phase. The analysis of the domain names produces a classifier that determines the legitimacy of the domain name. The classifier determines if the DNS queries are legitimate or belong to a botnet. Aymen Awadi and Bahari Belaton (2015) proposed a similar multi-phased approach. Their approach relies heavily on an Intrusion Detection Systems to detect botnets. However, Awadi’s and Belaton’s phase one uses a signature-based database algorithm unlike Hoang’s and Nguyen’s; Awadi’s and Belaton’s phase two gathers data from the botnet and detects attacks that the botnet is launching whereas Hoang’s and Nguyen’s gathers botnet data in phase one and focuses on detection in phase two (Awadi, and Belaton 2015). Awadi’s and Belaton’s process is effective for attack detection, but, without the use of ML, it does not create data that it can use to detect IP address changes and seemingly legitimate behaviors. Xuan and Nguyen demonstrated through experimentation the accuracy or their botnet detection model. They used common machine learning algorithms that function under supervision. Some of the algorithms that they used in their model were k-Nearest Neighbor (kNN), Random Forest (RF), Decision Trees (DT), and Naïve Bayes (NB). The tests provided impacting results, but the most outstanding algorithms they tested were kNN and RF (Xuan and Nguyen 2018). kNN algorithm was on average 90% accurate detecting botnets, and RF averaged 88% accuracy. Machine Learning and Deep

Learning Example

Companies such as Fortinet are applying machine learning and deep learning for threat detection systems. Fortinet users a Self-Evolving Detection System (SEDS) that uses both ML and DL to detect unknown threats. ML and DL train SEDS which improves its accuracy for threat detection. SEDS learn from the data that it accumulates, which allows it to detect a variety of threats such as intrusions, botnets, and malware. Fortinet’s product requires humongous amounts of data for training, and not only that, it also requires some hardware capacity to function at its fullest. For training, SEDS involves training algorithms such as supervise and unsupervised learning (Fortinet). Due to its high capacity from enormous amounts of data, SEDS becomes more precise to detect threats. Fortinet claims that their product is capable of detecting zero-day threats. For organizations, this means that they will see vectors ahead of cybercriminals before they can exploit them. When organizations discover these vectors, they may be able to develop their own patches to cover the network holes

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### Interp

**Antitrust means Sherman, FTCA, and Clayton**

**COC 20**—“Antitrust Laws.” 2020. U.S. Chamber of Commerce. July 7, 2020. https://www.uschamber.com/antitrust-laws.

Antitrust laws ensure competition in a free and open market economy, which is the foundation of any vibrant economy. And healthy competition among sellers in an open marketplace gives consumers the benefits of lower prices, higher quality products and services, more choices, and greater innovation.

The core of U.S. antitrust law was created by three pieces of legislation: **the Sherman Antitrust Act, the Federal Trade Commission Act, and the Clayton Antitrust Act**. These laws have evolved along with the market, vigilantly guarding against anti-competitive harm that arises from abuse of dominance, bid rigging, price fixing, and customer allocation.

#### ‘Private sector’ includes subsets.

TD 21 – The Definition, ‘private sector’, https://the-definition.com/term/private-sector

Private sector refers to an umbrella term that may be applied to any or all of the nonpublic or commercial individuals and businesses, specified nonprofit organizations, most of academia and other scholastic institutions, and selected nongovernmental organizations.

#### “The” is a reference to a thing generically.

**Encarta 9** (World English Dictionary, “The”, http://encarta.msn.com/encnet/features/dictionary/DictionaryResults.aspx?refid=1861719495)

2. indicating generic class: used to refer to a person or thing considered **generically** oruniversally  
bullettransExercise is good for the heart.  
bullettransShe played the violin.  
bullettransThe dog is a loyal pet.

## Cap

### Impact

#### No extinction from warming

Farquhar 17 – Sebastian Farquhar, Leader of the Global Priorities Project (GPP) at the Centre for Effective Altruism, et al., “Existential Risk: Diplomacy and Governance”, https://www.fhi.ox.ac.uk/wp-content/uploads/Existential-Risks-2017-01-23.pdf

The most likely levels of global warming are very unlikely to cause human extinction.15 The existential risks of climate change instead stem from tail risk climate change – the low probability of extreme levels of warming – and interaction with other sources of risk. It is impossible to say with confidence at what point global warming would become severe enough to pose an existential threat. Research has suggested that warming of 11-12°C would render most of the planet uninhabitable,16 and would completely devastate agriculture.17 This would pose an extreme threat to human civilisation as we know it.18 Warming of around 7°C or more could potentially produce conflict and instability on such a scale that the indirect effects could be an existential risk, although it is extremely uncertain how likely such scenarios are.19 Moreover, the timescales over which such changes might happen could mean that humanity is able to adapt enough to avoid extinction in even very extreme scenarios. The probability of these levels of warming depends on eventual greenhouse gas concentrations. According to some experts, unless strong action is taken soon by major emitters, it is likely that we will pursue a medium-high emissions pathway.20 If we do, the chance of extreme warming is highly uncertain but appears non-negligible. Current concentrations of greenhouse gases are higher than they have been for hundreds of thousands of years,21 which means that there are significant unknown unknowns about how the climate system will respond. Particularly concerning is the risk of positive feedback loops, such as the release of vast amounts of methane from melting of the arctic permafrost, which would cause rapid and disastrous warming.22 The economists Gernot Wagner and Martin Weitzman have used IPCC figures (which do not include modelling of feedback loops such as those from melting permafrost) to estimate that if we continue to pursue a medium-high emissions pathway, the probability of eventual warming of 6°C is around 10%,23 and of 10°C is around 3%.24 These estimates are of course highly uncertain. It is likely that the world will take action against climate change once it begins to impose large costs on human society, long before there is warming of 10°C. Unfortunately, there is significant inertia in the climate system: there is a 25 to 50 year lag between CO2 emissions and eventual warming,25 and it is expected that 40% of the peak concentration of CO2 will remain in the atmosphere 1,000 years after the peak is reached.26 Consequently, it is impossible to reduce temperatures quickly by reducing CO2 emissions. If the world does start to face costly warming, the international community will therefore face strong incentives to find other ways to reduce global temperatures.

#### Try or die for sustainable growth – only innovation can solve in time – prefer new IPCC report

King and Lichtenstein 21 (David King, Founder and Chair, Centre for Climate Repair at Cambridge, University of Cambridge; and Jane Lichtenstein, Associate, Centre for Climate Repair at Cambridge, University of Cambridge; “Surviving the next 50 years is an existential crisis – 3 things we must do now,” The Print, 8-14-2021, https://theprint.in/opinion/surviving-the-next-50-years-is-an-existential-crisis-3-things-we-must-do-now/715069/)

The challenge of surviving the next 50 years is now seen as a planet-wide existential crisis; we need to work together urgently, just to secure a short-term future for human civilisation. Global weather patterns are violently disrupted: Greece burns; the south of England floods; Texas has had its coldest weather ever, while California and Australia suffer apocalyptic wild fires. All of these violent, record-breaking events are a direct result of rapid heating in the Arctic – occurring faster than in the rest of the world. A warm Arctic triggers new ocean and air currents that change the weather for everyone. The only way to reverse some of these catastrophic patterns, and to regain a kind of stability in climate and weather systems, is “climate repair” – a strategy we call “reduce, remove, repair” – which demands that we make very rapid progress to net zero global emissions; that there is massive, active removal of greenhouse gases from the atmosphere; and, in the first instance, that we refreeze the Earth’s poles and glaciers to correct the wild weather patterns, slow down ice-melt, stabilise sea level, and break the feedback loops that relentlessly accelerate global warming. There are no either/or options. Reducing emissions About 70% of world economies have net zero emissions commitments over varying timescales, but this has come too late to restore climate stability. The IPCC has asked for accelerated progress on this trajectory, but whatever happens, current emission rates of atmospheric greenhouse gases imply global warming of 1.5℃ by 2030 and well over 2℃ above pre-industrial level by the end of the century – a devastating outcome. In particular, melting ice and thawing permafrost are considered inevitable even if rapid and deep CO2 emissions reductions are achieved, with sea-level rise to continue for centuries as a result. In every area of the world, climate events will become more severe and more frequent, whether flooding, heating, coastal erosion or fires. There are definitely important steps that can still reduce the scale of this devastation, including faster and deeper emissions reductions. However, this is not enough on its own to avert the worst. Together there is real evidence that the massive removal of greenhouse gases from the atmosphere and solutions such as repairing the Earth’s poles and glaciers could help humanity find a survivable way out of this crisis. Removing greenhouse gases Taking CO2 and equivalent greenhouse gases out of the atmosphere, with the aim of getting back to 350ppm (parts per million) by 2100, involves creating new CO2 “sinks” – long-term stores from which CO2 cannot escape. Sinks operate at many scales, with forest planting, mangrove restoration, wetland and peat preservation all crucially important. Very large projects, such as the restoration of the Loess Plateau in China demonstrate scalable CO2 removal, with multiple add-on benefits of food production, bio-diversity enhancement and weather stabilisation. Habitat restoration can also make economic sense. In the Philippines, mangrove is the focus of a cost-benefit analysis. Mangrove captures four times more carbon than the same area of rainforest, provides numerous ecosystem services and protects against flooding, conferring socio-economic benefits and significantly reducing the cost of dealing with extreme weather events. Big new carbon sinks must be created wherever safely possible, including in the oceans. Interventions that mimic natural processes, known to operate safely “in the wild”, are a workable starting point. Promotion of ocean pastures to restore ocean diversity and fish and whale stocks to the levels last seen 300 years ago is one such possibility – offering new sustainable food sources for humans, as well as contributing to climate ecosystem services and carbon sinks. In nature, sprinklings of iron-rich dust blow from deserts or volcanic eruptions, onto the surface of deep oceans, generating – in a matter of months – rich ocean pastures, teeming fish stocks and an array of marine wildlife. Studies of ocean kelp regeneration show the full range of real-life impacts, from increased protein sources for human consumption, to restoration of pre-industrial levels of ocean biodiversity and productivity, and extensive carbon sequestration. Extending the scale and number of ocean pastures could be achieved by systematically scattering iron-rich dust onto target areas in oceans around the world. The approach is intuitively scalable, and could sequester perhaps 30 billion tons per year of CO2 if 3% or so of the world’s deep oceans were to be treated annually. Large-scale carbon-sink creation of this kind is pivotal if the atmosphere is to return to pre-industrial CO2 levels. A billion tons per year of sequestration is the minimum threshold coordinated by the Centre for Climate Repair at Cambridge given the intensity of the climate crisis. While the scale of intervention is sometimes called “geoengineering”, the approach is closer to forest planting or mangrove restoration. The aim is to remove CO2 from the atmosphere using natural means, to return us to pre-industrial levels within a single generation. Repairing the planet The immediate challenge is to stabilise the planet, achieving a manageable equilibrium that gives a last chance to shift to renewable energy and towards a circular global economy, with new norms in urban, rural and ocean management. “Repairing” systematically seeks to draw the Earth back from climate tipping points (which, by definition, cannot happen without direct effort), providing a supporting framework in which “reduce” and “restore” can happen. Political and societal will is needed. The most urgent effort is to refreeze the Arctic, interrupting a bleak spiral of accelerating ice loss, sea-level rise – and the acceleration of climate change and violent global weather changes that they cause. Arctic temperatures have risen much faster (and increasingly so) than global average temperatures, when compared with pre-industrial levels. Figure 1 shows this clearly from 1850 to the present day. Melting Arctic ice embodies a powerful feedback force in climate change. White ice reflects the Sun’s energy away from the Earth before it can heat the surface. This is known as the albedo effect. As ice melts, dark-blue seawater absorbs increasing amounts of the Sun’s energy, warming increases, and ever-larger areas of ice disappear each summer, expanding the acceleration. Arctic temperatures govern winds, ocean currents and weather systems across the globe. A tipping point is passing: sea-ice loss is becoming permanent and accelerating; Greenland ice will follow and will eventually raise global sea-levels by over seven metres. Total loss may take centuries but, decade by decade, there will be relentless incremental impacts. By mid-century the melting will be irreversible, and sea-level rise alone will leave low-lying countries like Vietnam in desperate circumstances, with reductions to global rice production a certainty, many millions of climate refugees and no obvious pathway forward for such nations. Figure 1: comparison between average global temperature change, and change in the Arctic region from 1850 to present day. Provided by Nerilie Abram using IPCC data, ANU, Australia, 2021 The rapid Arctic temperature increase is matched by the rapid and accelerating loss in minimum (summer) sea-ice volume (Figure 2), which further accelerates the temperature rise in a spiral of reinforcing feedback loops. Figure 2: decline in annual minimum Arctic Sea ice volume 1980-2020. Provided by Nerilie Abram using IPCC data, ANU, Australia, 2021 It is vital to pivot the world back from this ice-melt tipping point, and to repair the Arctic as rapidly as possible. Marine cloud brightening in which floating solar-powered pumps spray salt upwards to brighten clouds and create a reflective barrier between the Sun and the ocean, is known to cool ocean surfaces and is a promising way to promote Arctic summer cooling. It mimics nature, and can be scaled up or down in a flexible way. Studies of marine cloud brightening, its climate impacts and interactions with human systems, are underway. As with promotion of ocean pastures, such solutions must be critically analysed, but there is no longer any doubt of their crucial importance. What we do in the next five years determines the viability of humanity’s future. Even if we narrow our aspirations to “survival”, fixing on a timescale of 50 years or so, the challenges are daunting. Humanity deserves better. We know what to do to be able to imagine thousands of years of human civilisation ahead, as well as behind us.

#### Dedev can’t solve warming and transition dooms billions to mass poverty

\*answers Hickel

Piper 21 (Kelsey, writing with Vox, citing Zeke Hausfather, climate scientist at the Breakthrough Institute, and Michael Mann, climatologist at Penn State, “Can we save the planet by shrinking the economy?,” 8/3/21, <https://www.vox.com/future-perfect/22408556/save-planet-shrink-economy-degrowth)//NRG>

The tension at the heart of degrowth: Can we fix global poverty without economic growth? One big problem with degrowth is this simple fact: In the coming decades, most carbon emissions won’t be coming from rich countries like the US — they’ll be happening in newly middle-income countries, like India, China, or Indonesia. Already, developing nations account for 63 percent of emissions, and they’re expected to account for even more as they develop further and as the rich world decarbonizes. Even if emissions in rich countries go to zero very soon, climate change is set to worsen as poorer countries increase their own emissions. That will, of course, have deeply negative climate impacts. But the alternative is a nonstarter — should the world really prioritize curbing emissions and economic growth if it meant suppressing the growth of those countries? Degrowthers see no dilemma here. What Hickel envisions is global movement in two directions: Poor countries could develop up to a certain level of prosperity and then stop; rich countries could develop down to that level and then stop. Thus, climate catastrophe could be averted, all while making the world’s poor more prosperous. “Rich countries urgently need to reduce their excess energy and resource use to sustainable levels so our sisters and brothers in the global South can live well too,” Hickel put it. “We live on an abundant planet and we can all flourish on it together, but to do so we have to share it more fairly, and build economies that are designed around meeting human needs rather than around perpetual growth.” From a climate change perspective, though, there’s a problem. First, it means that degrowth would do nothing about the bulk of emissions, which are occurring in developing countries. Second, the global economy is more interconnected than Hickel implies. When Covid-19 hit, poor countries were devastated not just by the virus but by the aftershocks of virus-induced slowdowns in consumption in rich countries. There’s some genuine appeal to the idea of an end to “consumerism,” but the pandemic offered a taste of how a sudden drop in rich-world consumption would actually affect the developing world. Covid-19 dramatically curtailed Western imports and tourism for a time. The consequences in poor countries were devastating. Hunger rose, and child mortality followed.

#### Covid proves transition fails – society turns back to growth

McAfee 20 (Andrew, principal research scientist at MIT, “Why Degrowth Is the Worst Idea on the Planet,” 10/6/20, <https://www.wired.com/story/opinion-why-degrowth-is-the-worst-idea-on-the-planet/)///NRG>

Thanks to Covid-19, we have an inkling of how this would feel. A “degrowth recession” wouldn't have the virus’ deaths and sickness, and it wouldn't require us to practice social distancing. But it would have all the economic contractions’ job losses, business closures, mortgage defaults, and other hardships and uncertainties. And it would have them without end—after all, growth can't be allowed to restart. Corporate and government revenue would decrease permanently, and therefore so would innovation and R&D. How many of us would be willing to accept all of this in exchange for somewhat less pollution and resource use? To sharpen the question, how many of us would be willing to accept this recession if it wasn’t necessary—if it were clear that we could get environmental improvements while continuing to grow and prosper? The ecomodernist argument is that that is in fact clear. Unlike the degrowth argument, it's supported by a great deal of evidence. What's at least important is that it will be supported by a great deal of the world's people, who will eagerly sign up to climb our new green path to prosperity.