# 1AC---NDT

## 1AC---NDT

### 1AC---Innovation

#### Advantage One is Innovation:

#### 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.

#### Capacity for innovation solves invisible thresholds for existential pandemics – they’re coming now – new 400 year study + statistical methods

Penn 21 (Michael Penn, Director of Communications, Marketing and Alumni Relations, Duke Global Health Initiative, citing William Pan, Ph.D., associate professor of global environmental health at Duke, Marco Marani, adjunct professor at Duke department of Global Health, where he previously was a professor of civil and environmental engineering and Anthony Parolari, Ph.D., of Marquette University, is a former Duke postdoctoral researcher, Gabriel Katul, Ph.D., the Theodore S. Coile Distinguished Professor of Hydrology and Micrometeorology at Duke, “Statistics Say Large Pandemics Are More Likely Than We Thought” Duke Global Health Institute, <https://globalhealth.duke.edu/news/statistics-say-large-pandemics-are-more-likely-we-thought>) CULTIV8

The COVID-19 pandemic may be the deadliest viral outbreak the world has seen in more than a century. But statistically, such extreme events aren’t as rare as we may think, asserts a new analysis of novel disease outbreaks over the past 400 years.

The study, appearing in the Proceedings of the National Academy of Sciences the week of Aug. 23, used a newly assembled record of past outbreaks to estimate the intensity of those events and the yearly probability of them recurring.

It found the probability of a pandemic with similar impact to COVID-19 is about 2% in any year, meaning that someone born in the year 2000 would have about a 38% chance of experiencing one by now. And that probability is only growing, which the authors say highlights the need to adjust perceptions of pandemic risks and expectations for preparedness.

“The most important takeaway is that large pandemics like COVID-19 and the Spanish flu are relatively likely,” said William Pan, Ph.D., associate professor of global environmental health at Duke and one of the paper’s co-authors. Understanding that pandemics aren’t so rare should raise the priority of efforts to prevent and control them in the future, he said.

The study, led by Marco Marani, Ph.D., of the University of Padua in Italy, used new statistical methods to measure the scale and frequency of disease outbreaks for which there was no immediate medical intervention over the past four centuries. Their analysis, which covered a murderer’s row of pathogens including plague, smallpox, cholera, typhus and novel influenza viruses, found considerable variability in the rate at which pandemics have occurred in the past. But they also identified patterns that allowed them to describe the probabilities of similar-scale events happening again.

In the case of the deadliest pandemic in modern history – the Spanish flu, which killed more than 30 million people between 1918 and 1920 -- the probability of a pandemic of similar magnitude occurring ranged from 0.3% to 1.9% per year over the time period studied. Taken another way, those figures mean it is statistically likely that a pandemic of such extreme scale would occur within the next 400 years.

“ The most important takeaway is that large pandemics like COVID-19 and the Spanish flu are relatively likely. WILLIAM PAN — ASSOCIATE PROFESSOR OF GLOBAL ENVIRONMENTAL HEALTH

In the case of the deadliest pandemic in modern history – the Spanish flu, which killed more than 30 million people between 1918 and 1920 -- the probability of a pandemic of similar magnitude occurring ranged from 0.3% to 1.9% per year over the time period studied. Taken another way, those figures mean it is statistically likely that a pandemic of such extreme scale would occur within the next 400 years.

But the data also show the risk of intense outbreaks is growing rapidly. Based on the increasing rate at which novel pathogens such as SARS-CoV-2 have broken loose in human populations in the past 50 years, the study estimates that the probability of novel disease outbreaks will likely grow three-fold in the next few decades.

Using this increased risk factor, the researchers estimate that a pandemic similar in scale to COVID-19 is likely within a span of 59 years, a result they write is “much lower than intuitively expected.” Although not included in the PNAS paper, they also calculated the probability of a pandemic capable of eliminating all human life, finding it statistically likely within the next 12,000 years.

That is not to say we can count on a 59-year reprieve from a COVID-like pandemic, nor that we’re off the hook for a calamity on the scale of the Spanish flu for another 300 years. Such events are equally probable in any year during the span, said Gabriel Katul, Ph.D., the Theodore S. Coile Distinguished Professor of Hydrology and Micrometeorology at Duke and another of the paper’s authors.

“When a 100-year flood occurs today, one may erroneously presume that one can afford to wait another 100 years before experiencing another such event,” Katul says. “This impression is false. One can get another 100-year flood the next year.”

As an environmental health scientist, Pan can speculate on the reasons outbreaks are becoming more frequent, noting that population growth, changes in food systems, environmental degradation and more frequent contact between humans and disease-harboring animals all may be significant factors. He emphasizes the statistical analysis sought only to characterize the risks, not to explain what is driving them.

But at the same time, he hopes the study will spark deeper exploration of the factors that may be making devastating pandemics more likely – and how to counteract them.

“This points to the importance of early response to disease outbreaks and building capacity for pandemic surveillance at the local and global scales, as well as for setting a research agenda for understanding why large outbreaks are becoming more common,” Pan said.

#### 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

### 1AC---Plan

#### The United States Federal Government should substantially increase prohibitions on anticompetitive business practices by the private sector immunized by use of state action immunity.

### 1AC---Federalism

#### Advantage Two is Federalism:

#### Scenario 1 is Tech:

#### 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

#### Effective regulations solve extinction

Matus 14 [Kira Matus, PhD, Havard University. Associate Head and Associate Professor, Division of Public Policy, Hong Kong University of Science and Technology. "Existential risk: challenges for risk regulation." Risk and Regulation (Winter 2014). https://futureoflife.org/data/documents/Existential%20Risk%20Resources%20(2015-08-24).pdf?x93895]

There is a trend in many areas towards attention to ‘big’ risks. Financial regulation has become increasingly concerned with so‐called systemic risks. Others, and not just Hollywood blockbusters, have been attracted to the study of civilization‐destroying catastrophic risks. Indeed, the OECD has become increasingly interested in ‘high level’ risks and ways in which different national governments seek to prepare for and manage actual events, such as the aftermath of major earthquakes, or the response to a terrorist attack. The notion of ‘existential’ risk might be adding to the cacophony of emerging ‘big’ risk concerns. However, existential risk deserves special attention as it fundamentally adds to our understanding of particular types of risks, and it also challenges common wisdom regarding actions designed to support continued survival.

What is existential risk? We can approach this question by looking at several attributes. The first attribute is what, in fact, is at risk. One set of existential risks are those that threaten survival. These are the acute catastrophes, i.e. the idea that particular events’ impacts are likely to extinguish civilization. Such risks have been identified when it comes to asteroids, nuclear war, and other largescale events that undermine the possibility for survival in general, or, at least, in large regions. A second set is based on the idea that existential risks are not just about physical survival, but about the survival of ways of life. In other words, certain risks are seen as threatening established ways of doing things, cultures, social relationships, and understandings of the ‘good life’. There is, of course, much disagreement about what the good life constitutes, and therefore there will always be disagreement as to what exactly an existential risk constitutes.

A second attribute is the degree to which an existential risk is triggered by a single catastrophic incident. Existential risks arise not merely from one‐off large incidents, such as earthquakes, tsunamis, nuclear meltdowns or, indeed, asteroid hits. Rather, existential risks are about complex, inter‐related processes that result in cascading effects that move across social systems. The overall impact of these system changes could result in the types of physical or cultural destruction that is the focus of the first two perspectives.

Whether triggered by catastrophic events or complex cascades, standard operating procedures are unlikely to be sufficient for dealing with existential risks; instead, this is a space in which improvisation and creativity are required. A third attribute of existential risks is the challenge they present to standard approaches to risk regulation. Existential risks are defined by their cross‐systematic nature; a failure within one system (say, finance) has not just catastrophic implications for the sector in question, but threatens the survival of another system (say, the environment, as funding for particular measures dries up). In other words, the focus of existential risks is not just on the systemic level, it focuses on the cross‐ systemic dimension that is even more difficult to predict and assess than attempts aimed at establishing activities that are of ‘systemic’ relevance by regulatory systems that tend to be narrowly focused and independent from each other. Existential risks are characterized by a fourth feature, namely the idea that existential risks lead to responses based upon fear. Individuals are confronted with fears about their survival (death) and about the meaning of their lives. This aspect of existential risk is particularly troublesome in an age of low trust in authority and, consequently, a political style that is intolerant of ‘blame free’ spaces. In the absence of confidence in public authority, few options remain. For some, the solution will rely on framework plans, pop intellectuals and other fashionable ideas that seem to offer redemption from the fear of extinction. Others will prefer to ‘go it alone’ and seek to develop their own plans for survival, noting that risk taking is, after all, an individual choice. Others, again, will deny the legitimacy of public authority and veer towards those choices that have been legitimized by their own communities. Finally, some will deny that existential risks exist in the first place. In other words, individual responses to existential risks vary considerably and pose challenges for any risk management and communication strategy.

#### 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]

#### Unregulated nanotech risks extinction.

Behreandt 22 (Dennis Behreandt, MA from St. Norbert’s College, BA from Ripon College, cites Luis Del Monte, Award-winning physicist, author of *Nanoweapons: A Growing Threat to Humanity*, CEO of Del Monte & Associates, Inc.,; “Nanotechnology: A Double-Edged Sword;” 01-31-22, The New American, Vol. 38, No. 02, <https://thenewamerican.com/nanotechnology-a-double-edged-sword/>, TM) [language modified, denoted by brackets]

“Gray goo” is not a current threat, and likely won’t be, at least for the near-term future. More likely is that nanotech innovations could be used for evil purposes. “Unfortunately, as with nuclear technology, it is far easier to create destructive uses for nanotechnology than constructive ones,” wrote famed computing pioneer and Sun Microsystems co-founder Bill Joy in a now-famous essay for Wired magazine in April 2000. In that essay, titled “Why the Future Doesn’t Need Us,” Joy wrote, “Nanotechnology has clear military and terrorist uses, and you [can] ~~need not be suicidal to~~ release a massively destructive nanotechnological device — such devices can be built to be selectively destructive, affecting, for example, only a certain geographical area or a group of people who are genetically distinct.”

Scientists and researchers concerned with “existential risks” continue to point to nanotechnology as one innovation that poses distinctly significant threats to the survival of human civilization.

Physicist and author Luis Del Monte, who reports he was previously “a Honeywell Executive Director,” states that during his career “he led hundreds of physicists, engineers, and technology professionals engaged in micro to nanotechnology development for the Department of Defense (DoD) and commercial applications.” In 2017 he authored the book Nanoweapons: A Growing Threat to Humanity.

According to Del Monte, the first “singularity” of the sort envisioned by Ray Kurzweil — when general AI exceeds human cognitive capabilities — will lead to a second singularity involving self-replicating nanobots. Writing for HuffPost in 2017, Del Monte argued, “Given the strong symbiotic relationship between computer power and nanotechnology, we may see both technologies progressing faster than their historical trends. My rationale is that an advance in one technology fosters advances in the other.” He continued, “I judge this synergy may accelerate the advancement of both technologies.”

On his own website, Del Monte described what he foresaw as the outcome of the development of self-replicating nanobots. His vision differs from Drexler’s gray goo (which Drexler in recent years has backed away from a bit), but is likely more realistic.

“Self-replicating nanobots are the ultimate invention,” Del Monte said, pointing out that they would help solve problems on one hand, while proving extremely dangerous on the other. “In medicine,” he pointed out, “they will flow through our blood preventing diseases and curing injuries. In military applications, they will have the capability to completely destroy an adversary, from its populace to its structures.”

Unfortunately, he noted, nanobots could escape control, presenting considerable risks as artificial analogues to biological microbes such as bacteria and viruses. More complex biological systems, including mammals such as humans, have developed sophisticated immune systems in parallel with the existence of biological pathogens, and thus have an innate ability to protect themselves — if not always successfully — from them. There would be no such protection from artificial microbes — nanobots — if they escaped control.

Enter the extra-factual: In Total Recall, the blockbuster film adaptation of the Philip K. Dick short story We Can Remember It for You Wholesale, a future technology was used to implant realistic memories into the human mind. With nanotechnologies such as those being explored by several DARPA-funded labs, such a future might not be far off.

“Strategic nanoweapons, like their nuclear counterparts, pose a threat to humanity,” Del Monte argues. “The major issue is control. Will we be able to deploy strategic nanoweapons and maintain control over them? If, for example, we lost control of self-replicating nanobots, we would face a technological plague, one that we currently have no way of stopping.”

Nanotechnology is used widely today in many diverse applications, and continuing research promises near-term future innovation resulting in outcomes likely to be similar to forecasts from early innovators and researchers in the technology. Tied directly to AI and enabled by advanced 5G communications technologies, nanotechnologies are both a boon and a danger to mankind. While they will allow fabulous advances — especially in medicine and in materials science — they also have direct application to reality-distorting and reality-obliterating outcomes such as the metaverse plan outlined by Facebook.

#### Unregulated AI risks extinction---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.

**Scenario 2 is Privacy:**

**Effective state experimentation is vital to privacy, secure development of IOT, and cybersecurity – under or over regulation causes existential threats**

McNabb 18 [Joanne McNabb formerly Director of Privacy Education and Policy in the California Attorney General’s Office, Certified Information Privacy Professional, with specializations in Government and Information Technology, a Fellow of the Ponemon Institute, a research center on privacy, data protection and information security policy, and a member of the Consumer Interest Forum of the American National Standards Institute. 4-5-2018 https://tcf.org/content/report/can-laboratories-democracy-innovate-way-privacy-protection/]

Today more data—our data, data about us—is in more hands, being used for more purposes than ever before. The Internet economy is fueled by personal information, yet it is largely a black box, whose inputs and outputs are not understood by most individuals or even regulators. One thing we do understand is that organizations that collect other people’s information—online retailers and apps, banks, credit bureaus and even government agencies—often have a hard time keeping a tight grip on it, as evidenced by a steady stream of data breaches.The TJX breach of the credit card numbers of 94 million customers in 2006, Anthem’s breach of the medical information of 79 million in 2015, and the massive Equifax breach reported in 2017 that exposed Social Security numbers, driver’s license numbers, and other sensitive information of over 143 million Americans are just a few of the larger data breaches in recent years.1

Where is all this data coming from? Companies and other organizations are collecting information not only from our visits to websites and our use of mobile apps, along with our travels through the world using credit cards and passing video cameras, but also from inside our very own homes. Smart appliances, burglar alarms, utility meters, and a burgeoning market of connected consumer devices—even toys in the hands of our children2—are collecting data from us and about us: where we are and where we’ve been, whom we’re with or near, what we’re doing, waking or sleeping, around the clock, seven days a week. We’re becoming nodes in the network of everything, with increasingly less ability to disconnect.

The recent Facebook–Cambridge Analytica incident raises many issues about the use of this very personal data in the marketplace. Reporters are still attempting to untangle the web of players who extracted and used the personal data of more than 87 million, and potentially all, Facebook users.3 Among the concerns articulated in news reports are the effectiveness of terms of service, whether the incident constitutes a data breach, and the ethics of online political manipulation. More important—and less talked about—the incident reveals a lack in the United States of legal standards for data privacy as a fundamental human right.

Neither the market nor the law is working to protect privacy in our world of Big Data and complex data flows. In fact, the legal framework to protect privacy in the United States is flimsy and has been outpaced and outdated by technological developments. At the same time, the federal government is actually scaling back regulatory and enforcement actions regarding privacy, as on other consumer protection and civil liberties issues.

In the face of this federal retrenchment, states can and should step up their legislative efforts to protect privacy. The advent of a new privacy regulation in the European Union provides an opportunity for states to “harmonize” or modify key state privacy laws to align better with the standards that most companies that do business online will soon have to meet for their European customers.

Big Data and Its Harms

We live in an increasingly connected and data-driven world. Last year, the market intelligence company IDC forecast that by 2025, the global datasphere of all digital data created will grow to 163 zettabytes, a tenfold increase over the 2016 volume.4 (A zettabyte is 1021 bytes. If everyone in the United States took a digital photo every second of every day for over a month, all of those photos together would amount to about one zettabyte.5)

It’s not just the volume of data collected and stored that makes Big Data big, it’s also the capacity to do things with the data—Big Analytics. Big Analytics visionaries believe that the analysis of large volumes of formerly unavailable data holds the promise of providing new insights into and solutions for individual and societal problems, from personalized medicine to improved energy efficiency, detecting the dispersion of infectious diseases and more effective policing.6

We are part of the datasphere. Over half the world’s population was connected to the Internet in 2017, and estimates for 2025 put the figure at 75 percent.7 And our digital dossiers are growing. From online searches on a PC or mobile phone, to using a GPS in a car, being recorded by an ATM video camera, and heart rate monitoring by a fitness wearable, the average person is estimated to have experienced 218 data-driven interactions per day in 2016, a number projected to increase to nearly 5,000 transactions per day by 2025.8

Dataism

In 2008, Chris Anderson, then-editor of Wired, wrote an article articulating a viewpoint that has come to be called Dataism. Anderson asserted that data had supplanted the scientific method:

This is a world where massive amounts of data and applied mathematics replace every other tool that might be brought to bear. Out with every theory of human behavior, from linguistics to sociology. Forget taxonomy, ontology, and psychology. Who knows why people do what they do? The point is they do it, and we can track and measure it with unprecedented fidelity. With enough data, the numbers speak for themselves.9

Do numbers speak for themselves? Is the invisible hand of dataflow a panacea for all individual and societal ills? There is no doubt that data is transforming our lives, but this phenomenon is taking place in an environment of uncertainty and rapid technological change, and so decisions on how our data can be used has implications for our future. We need to ensure that Big Data works for us, not just on us.

Behind the Electronic Curtain

The basic Internet business model today is to collect all possible information from and about individual users and monetize that data for use in targeting ads at the individual level. Just how this happens is largely invisible to consumers, who are unaware of evolving browser tools and technologies that enable companies to track an individual’s activities across multiple devices such as smartphones, tablets, desktop computers, and other connected devices, and even link that data with offline activities such as purchases in brick-and-mortar stores and information in public records.

One of the touted benefits of data-driven online businesses is that they can deliver personalized content. With the power of Big Analytics, websites and companies can target consumers with content designed to appeal to them, based on their interests as inferred from captured data streams. Of course, the prime objective of this expansive collection of personal information and employment of sophisticated algorithms is profit from targeted advertising. Targeted, data-based advertising is more effective—generates more clicks and sales—than advertising addressed to broad demographic categories of viewers.10

Privacy Harms

Consumers vaguely understand that being inundated with advertisements online is the price of “free” access to the Internet’s trove of information and services, but most are not happy about this deal. In a nationwide survey of adults conducted online by the National Cyber Security Alliance, respondents ranked concern about not knowing how their personal information is being collected or used higher than becoming a victim of crime or not being able to get health care. The same survey found 65 percent of Americans somewhat or strongly agreed that they are not able to control how their information is used or shared online, and two-thirds would accept less personalized content, including fewer discounts, in order to keep their personal information private.11

While some individuals may view advertising “personalized” for them as of more interest or less annoying than non-targeted ads, there are also privacy harms resulting from the use of personal information in this way. Someone who has been followed around the web by an ad for a pair of shoes or Viagra or another product previously clicked on may experience a certain level of discomfort or anxiety from realizing he or she is being surveilled; this is one type of intangible privacy harm.12 Someone who receives ads based on a medical condition revealed by online searches may feel very uncomfortable indeed.

Such concern is not unjustified. Businesses know about all our online activities, but we remain in the dark about what information they’re collecting, what they’re inferring from it, and what they’re doing with it. The results of this information asymmetry can be tangible as well as subjective. Mathematician Cathy O’Neill, author of Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy, warns that companies are using data to direct people to certain goods and services and to offer prices based on how much they think an individual can pay: “Travel sites show fancier hotels to Mac users, auto insurance companies charge more to customers who are less likely to comparison shop, payday lenders focus on people whose search queries show signs of desperation.”13

O’Neil and other researchers also describe the use of secret algorithms to profile and sort individuals into groups based on weaknesses and vulnerabilities identified by their online activities. These individuals may then be targeted with predatory ads for for-profit colleges or payday loans.14 In 2016, the California Attorney General won a $1.1 billion judgment against Corinthian Colleges for their predatory and unlawful practices. The complaint included Corinthian’s practice of targeting a low-income demographic which it describes in internal company documents as composed of “isolated,” “impatient” individuals with “low self-esteem,” who have “few people in their lives who care about them” and who are “stuck” and “unable to see and plan well for future,” through aggressive and persistent internet and telemarketing campaigns and through television ads on daytime shows like Jerry Springer and Maury Povich.15

Big Data can also be used by websites to steer consumers to particular products or to set prices based on their inferred willingness or ability to pay, in ways that can be unfair or even discriminatory. In 2012, a Wall Street Journal investigation found that the Staples website set different prices based on what it inferred to be the user’s location.16 Legal scholar Ryan Calo has written about the power of digital market manipulation, the result of information asymmetry, where companies are able reach out to consumers even before they come to market and use what they know about individuals to take advantage of their vulnerabilities.17

Even when we think we are anonymous online—when we haven’t registered with a website for example—we likely are not. The sheer volume of data coming in from different sources makes it possible to link individual data to specific people, even when some datasets have been intentionally de-identified by removing key elements such as names or Social Security numbers. One example of the process of re-identification was reported by Professor Latanya Sweeney of Harvard. She purchased de-identified hospital discharge data from the State of Washington and was able to correlate that dataset with newspaper accounts of accidents in the same time period. She was able to re-identify 43 percent of a sample of 81 accident victims in the hospital discharge data by matching fields common to both sources. Sweeney also noted that predictive analytic companies were big buyers of publicly available health data.18

In the service of commerce, the algorithms of Big Analytics are increasingly exposing and monetizing some of the most intimate aspects of our lives—details about our health, who we know, what we think, what we do in the privacy of our homes. In the midst of this assault, how do various privacy laws in the United States and abroad attempt to address these invasive practices?

Privacy Law and Market Failure

The majority of nations protect privacy as a fundamental human right, but the U.S. Constitution does not provide an express guarantee of privacy.19 Privacy rights in our Constitution are “penumbral”; that is, they are implied by the Bill of Rights rather than explicitly stated. For example, privacy in speech, reading, and association is seen as being protected by the First Amendment, and the privacy of the home against quartering soldiers and unreasonable search and seizure by the Third and Fourth Amendments. Notably, these individual rights are only protected against government action, not against infringing actions of businesses or other organizations.20

The United States also differs from other developed countries in Europe, Asia, and the Americas in its statutory law on privacy. Many other countries have comprehensive privacy laws, but the United States does not. Since the 1990s, the federal government has avoided enacting broad privacy laws and instead relied on market mechanisms, notably the failed notice-and-choice regime to regulate the Internet and its related businesses.21 (As will be discussed later, “notice and choice” is the practice whereby a website or app notifies consumers of its privacy practices with a posted “privacy policy” statement, and consumers then have some degree of choice about the terms offered.)

Federal privacy law, where it does exist, is narrowly sectoral. It is made up of statutes, regulations, and judicial decisions that apply only to certain industries (such as finance, or health care) or certain types of data (such as children’s data, drivers’ records, video rental data). In the absence of specific privacy laws, the default in the United States is that when it comes to flows of information, the free market prevails, including the market for personal information.

By contrast, the EU considers privacy as a human right essential to the respect for human dignity. In the European Conventions of Human Rights of 1950, privacy is addressed as the “right to respect for private and family life.” Similarly, in the EU Charter of Fundamental Rights in 2000, privacy is conceived as respect for private and family life, the home and communications, as well as the protection of personal data. This right is implemented in comprehensive privacy laws intended to protect the rights of individuals over their own personal data. The default in the EU is that personal data should not be processed (that is, collected, stored, used, and so on). Any data processing that does take place must meet standards of transparency, legitimate purpose, and proportionality.22

An update of EU privacy law, which will take effect on May 25, 2018, seeks to strengthen and harmonize the law across all member nations. The General Data Protection Regulation (GDPR) creates new individual privacy rights and extends its application to companies that process personal data about EU individuals, even when a company is not located in the EU. The new privacy rights include the “right to be forgotten” (have one’s personal data erased in certain situations), data access and rectification (access to or a copy of one’s own personal data and correction of inaccuracies) and data portability (transfer one’s personal data from one company or platform to another).23

While the EU approach has been criticized by some as overly rule-bound, resulting in companies in some countries focusing more on paper compliance than on practical privacy practices,24 it has often proven more effective in protecting data privacy than the U.S. approach of light-touch regulation and reliance on market forces.

Regulatory Failure: Unnoticeable Notice and Illusory Choice

The foundational principles of data privacy law are actually U.S. in origin, first formulated in 1973 by the U.S. Department of Health, Education, and Welfare in its Fair Information Practice Principles (FIPPs).25 The FIPPs were then expanded and codified by the Organisation for Economic Co-operation and Development (OECD) in 1980, with the agreement of member countries, including the United States. Intended to support the control of individuals over their own personal data in the hands of organizations, the FIPPs form the basis of many modern international privacy agreements and national laws. The eight FIPPs in the OECD version are Collection Limitation, Data Quality, Purpose Specification, Use Limitation, Security Safeguards, Openness or Transparency, Individual Participation, and Accountability.26 In most U.S. privacy law, these eight principles have devolved to just two, which have come to be called Notice (Openness or Transparency) and Choice (Use Limitation). A company notifies consumers of its policies and practices regarding personal information, and then consumers choose whether or not to accept the terms. The failure of this approach is evident, both in the privacy notices that are difficult to notice and understand, and in the choices that are illusory. In a best practices guide on crafting meaningful privacy policies, the Office of the California Attorney General described their current shortcomings: Dissatisfaction with the effectiveness of privacy policy statements has grown over time. As the use of personal information in commerce has expanded in scope and complexity, comprehensive privacy policy statements have tended to become lengthier and more legalistic in style, yet often fail to address data handling practices of concern to consumers or offer them meaningful choices about the collection and use of their data. The typical policy’s ineffectiveness as a consumer communication tool has been borne out by research findings that consumers do not understand, and many do not even read, the privacy policies on the web sites they visit. 27 Where they are available, privacy policies usually fail to address critical issues, such as what a company does with the personal information it collects, what entities it shares the information with, what those entities do with it, and how long the information is retained. The choices offered to consumers regarding the collection and use of their personal information generally boil down to take it or leave it, all or nothing. That is, all too often, the only choice consumers are given is either to accept a company’s privacy policy, however unsatisfactory it may be, or decline to use their product. If any specific choice is offered, it tends to be the choice to opt out of allowing the company to share the consumer’s personal information with other companies for use in marketing. But the default is to let companies share the data. Since the consumer is unlikely to have read the policy providing this choice and thus likely to fail to opt out, this lack of action is regarded as consent to sharing of the data. Furthermore, some websites and apps start collecting information the moment a user lands on the site or opens the app, before privacy policy notifications have even been given.

Moving Beyond Notice and Choice

One approach to a new privacy framework beyond unnoticeable notice and illusory choice is to offer consumers a full, robust spectrum of privacy settings to choose from, rather than the all-or-nothing approach. Such a framework would be based on three elements: more privacy choices, default to privacy, and a reasonable standard of care for data. More choices means offering consumers gradations of choice, options between all and nothing. For example, consumers now sometimes have choices about the geolocation information collected by their mobile devices: (1) allowing an app no access to geolocation, (2) allowing access only when the app is being used, or (3) allowing the app to access geolocation data at all times. Rather than simply offering option 3 or nothing, this policy would mean providing additional options as well. Default to privacy means calibrating default settings to limit the collection of personal information. Even when an online service provides a privacy policy, it generally comes too late; only after our information has been collected are we able to learn about it. This “grab it first, explain later” approach seems unfair in the growing network of sensors that are collecting information on us as we move through our neighborhoods and even inside our own homes. A better architecture for choice is to set privacy-respectful defaults and give the user the choice to change the setting. This type of architecture not only gives consumers more real control, but also serves as an incentive for companies to provide a privacy notice that is easier to find and easier to understand than we generally see today. Data security is an essential condition for privacy protection: we can’t have privacy without it. The Internet of Things is increasing the volume of data collected and stored, and daily reports of data breaches have made us all aware of the challenges of securing information and of the costs of failing to do so. A clear articulation of a reasonable standard of care for data, based on existing laws, jurisprudence, and technical standards, would go a long way to define at least a basic level of security. Such a framework could inform efforts to update U.S. privacy laws, to move beyond mere notice and choice.

Market Failure: IoT Insecurity

Security guru Bruce Schneier is among many who have called the insecurity of the Internet of Things (IoT) a market failure, with no market solution, because the insecurity is to a large extent an externality, affecting neither buyers nor sellers but other people.28 Of course, an insecure device can also be turned against the consumer who purchased it, who was focusing on price and features rather than on security.

This is a vitally important matter for privacy (security is a necessary component of privacy) and for cybersecurity. The insecurity of the Internet of Things—made up of smart TVs and toys, electric meters and thermostats, webcams and alarm systems, fitness wearables and smart watches—imperils not just individuals’ personal information, but puts their health and safety and that of society as a whole at risk.

The IoT is also one of the sources contributing to the phenomenal growth of the datasphere. The number of Internet-connected devices has been increasing rapidly in recent years. In early 2017, Gartner, the IT research and advisory firm, estimated that the number of devices would surpass global population that year, with 8.4 billion connected devices for 7.6 billion people. Other estimates put the number of devices even higher, forecasting as many as 20 billion of them by 2025.29

Connected devices are used in business and industry, on streets and highways and in public buildings. But the biggest component of the IoT is consumer devices, connected things in our homes, our cars, and on—or even in—our bodies. These billions of things are collecting and transmitting information in a space traditionally regarded as private and protected. The interaction of all these devices with each other and with the companies that sell them and those that carry their data is making our home networks ever more complex. And we may not realize it, but we are in the position of being the chief information officer (and the chief information security officer and chief privacy officer) of our own networks, a responsibility for which few of us are equipped.

The IoT has significant privacy implications. For example, smart meters collect data about gas and electricity consumption at the household level that can reveal information about activities in the home, including when residents are away and whether the home has an alarm system and how often it is activated.

Siemens in Europe has summarized the privacy threat represented by the smart grid: “We, Siemens, have the technology to record it (energy consumption) every minute, second, microsecond, more or less live. From that we can infer how many people are in the house, what they do, whether they’re upstairs, downstairs, do you have a dog, when do you habitually get up, when did you get up this morning, when do you have a shower: masses of private data.”30

Medical devices and other connected wearables collect very sensitive information, which raises questions of who is getting this data, and what they are doing with it.31 Smart toys, digital personal assistants, TVs and other devices that use speech recognition may record and store conversations in our homes, including those with guests who are unlikely to have consented, even if we passively and unknowingly have.

IoT devices have user interface constraints that make it difficult or impossible to provide notice of privacy practices, consumer choices or controls. Imagine trying to find or read a privacy notice on a router or a smart appliance. Furthermore, the companies that make these devices tend to lack experience with privacy and security. In summer 2017, the possibility that the makers of Roomba, the robot vacuum, would share the floor plans the device makes of the homes its device cleans made headlines. The public reaction led the company to speak to privacy issues, ultimately saying that they would not share data with third parties without the informed consent of customers. Exactly how they might advise consumers of the possibility and get their consent was not disclosed.32

The privacy concerns related to the IoT are not insubstantial, but it is their insecurity that imperils individuals’ health and safety and puts our society as a whole at risk. The Homeland episode in which the vice president is killed by a hacker who remotely manipulates his pacemaker is not pure fiction. In recent years, medical device manufacturers have become aware of security bugs in pacemakers, defibrillators, and insulin pumps. In October 2016, Johnson & Johnson warned patients of security vulnerability in one of its insulin pumps that a hacker could exploit to cause patients to receive a dangerous overdose of insulin.33

Another danger of insecure IoT devices was demonstrated in 2016 by the spread of the Mirai malware that took down websites and entire networks in fall 2016. The large-scale attack was carried out by a botnet of enslaved consumer devices: insecure security cameras, routers, and DVRs whose owners were unware that their devices were responsible for spreading the malware.34

Botnets of insecure IoT devices have the potential to put vast computing power at the disposal of criminals and nation states. The financial services sector, a target because that’s where the money is, recognizes IoT as a top vector for cyber-security attacks.35 The IoT weak link poses a similar threat to other sectors, including the hydroelectric power industry. The vulnerability of the sector to cyberattacks was made public in a March 2016 indictment by U.S. Attorney General Loretta Lynch of Iranian-government-sponsored hackers who were able to penetrate the controls of a small New York dam. The indictment also charges the same Iranian hackers with cyberattacks on major U.S. banks.36

As Schneier explains, the manufacturers of IoT devices have neither the expertise nor the financial incentives to make their products more secure. They are designed and built for features and low price, not for security. And unlike other computer hardware, these devices are not configured to receive updates with security patches. We update our phones and computers by installing patches and we replace them every few years. This is not the case with DVRs, or connected TVs, thermostats, or other appliances; we replace them at much longer intervals. The only feasible way to update most IoT devices is to toss them and buy a new model.

We know what the vulnerabilities of IoT devices are and how they can be addressed. A report published by the Broadband Internet Technical Advisory Group (BITAG) in November of 2016, in the wake of the Mirai botnet, outlined the privacy and security improvements needed to prevent the devices from allowing unauthorized users to take them over, mount cyberattacks, conduct surveillance and monitoring, induce device or system failures, leak data, and harass authorized users.37

It’s not that we don’t know what to do; it’s that the market isn’t letting it happen.

Big Tech and Federal Retrenchment

As discussed above, evidence of the failures of the law and the market to protect privacy abound. The speed of technological evolution outpaces and outdates the law, and the role of the tech industry in resisting efforts to update the law has become significant. In recent years, the tech industry has been active in Washington and increasingly in state legislatures, and has had considerable success in defeating stronger privacy legislation on the grounds that it will stifle innovation.38 For example, in California last year, the tech industry mounted a vigorous campaign that successfully stalled, if it did not quite kill, a privacy bill for Internet service providers (ISPs) that would provide for more effective notice and more meaningful choice.39

The Electronic Communications Privacy Act (ECPA) is a prime example of a law that has been rendered inconsistent and irrational by technological developments. Enacted in 1986, before the Web, the Cloud, and social media existed, ECPA now gives government very broad access to online communications stored on third-party servers, as opposed to, say, private storage devices in an individual’s home. This result is inconsistent with ECPA’s original purpose of achieving “a fair balance between the privacy expectations of citizens and the legitimate needs of law enforcement”; updating the ECPA so that it more closely strikes that balance has been the goal of privacy advocates and tech companies for years.40 Unfortunately, these efforts have been unsuccessful to date, with opposition coming both from law enforcement and from civil agencies.41

Data security, an essential component of privacy protection, is another issue on which industry opposition has long stymied Congressional action. In spite of years of well-publicized data breaches, Congress has not been able to pass legislation setting data security standards for companies that handle personal information. Not only were such proposals opposed by industry, but the Chamber of Commerce resisted even a voluntary program of cybersecurity for critical infrastructure companies developed in response to Executive Order 13636 by President Obama, arguing against any new regulatory regime.42

While Congress has remained gridlocked on addressing the shortcomings in U.S. privacy law, the Trump Administration has been pursuing retrenchment, rolling back existing privacy regulations and reining in enforcement agencies.

The most obvious move to date is the repeal of the broadband privacy rule, which imposed privacy obligations on broadband Internet access service providers (commonly known as ISPs). The rule was adopted by the Federal Communications Commission (FCC) in 2016. Urged by the newly installed FCC chair, Ajit Pai, Congress invoked the Congressional Review Act to hurriedly pass S.J. Res. 34 in March 2017, overturning the broadband privacy rule before it had taken full effect. The repeal also prohibited the FCC from introducing similar rules in the future.

The FCC had adopted the broadband privacy rule after a long battle between cable, telecom, and other technology companies on the one hand, and consumer privacy and civil liberties advocates on the other. The FCC held public hearings and published a draft version that received public comments for six months. The hasty action to nullify the rule, under cover of Congress’s effort to repeal the Affordable Care Act, contrasts strongly with the public deliberation accorded its passage.43

This action was a serious blow to privacy protection. The broadband privacy rule recognized the privileged position ISPs hold as gatekeepers to the Internet, a position that provides them with a broad and deep view into every aspect of their customers’ online activities. The rule outlined a reasonable privacy regime to give individuals strong data security protections and more control over the use of their personal information by their ISPs. As noted in comments from the California Attorney General,

the privacy rule responds to this situation by providing privacy-respectful defaults and more effective user-centric privacy notices, which together enable meaningful customer choices. The schema for customer choice in the proposed rule is based on alignment with customer expectations, with the greatest control granted for uses of customer [personal information] that are not required for the provision of the broadband service and are thus likely to be unexpected by the customer.44

States Can Lead the Way

In the face of inaction and retrenchment at the federal level, can we look to the states to move the ball on privacy? States have been the source of numerous privacy innovations in past years, including laws on identity theft victim rights, data breach notification, limitations on the use of Social Security numbers, cell phone data privacy, cybersecurity, and cyber-exploitation (sometimes known as “revenge porn”). States have served as laboratories in the privacy arena, with legislative innovations that originated in one state often being picked up in other states and sometimes—as in cases of identity theft victim rights, Social Security number restrictions, and data breach notification—in federal laws or regulations.

The new regulatory development occurring in the EU provides an opportunity for states to rebuff the industry critique of state privacy regulation as a patchwork and instead work to harmonize state privacy laws upward. When it takes effect in May 2018, the GDPR will apply not only to any companies based in Europe, but also to many U.S. companies that do business online that results in their collecting, processing, or maintaining information on European residents. With penalties for violation of up to 4 percent of global gross revenues, the GDPR is being taken seriously by U.S. companies.45 As it turns out, the policies and procedures these companies are implementing to protect their European customers and employees can also benefit Americans as well—provided action is taken.

This report does not propose a comprehensive federal privacy law similar to that in the EU. Nor does it propose a new quasi-self-regulatory approach, such as the “information fiduciaries” concept described by Yale law professor Jack M. Balkin and Harvard law professor Jonathan Zittrain. They propose that companies could choose to be governed by a set of privacy practices based on the FIPPs in exchange for exemption from state privacy laws preempted by the federal government.46 Either of these approaches would require significant legislative action at the federal level, which is highly unlikely in the present environment.

Rather, this report recommends that states continue to be innovative in privacy law, crafting legislation with an eye to taking advantage of the GDPR’s requirements to enact stronger state privacy protections. Such an approach could result in a degree of “harmonization upward,” ensuring that proposed legislation provides a level of privacy protection roughly equivalent to that of the GDPR. While this would not constitute a total harmonization—that is, it would not replace tenets of existing U.S. state laws with the rules embodied in the GDPR—it would have the advantage sought in many harmonization efforts of simplifying compliance for any businesses that are subject to EU regulation.

Among the most pressing privacy issues needing to be addressed are broadband privacy, IoT insecurity, and the need for interstate harmonization of data breach notification laws.

Broadband Privacy

Since the repeal of the FCC’s broadband privacy rule in late 2017, nearly half the states have introduced legislation to fill the void, according to the National Conference of State Legislatures.47 Several of the pending bills are patterned generally after the FCC rule, aiming to provide the same level of protection for the broad swath of personal information available to ISPs.48 They would require ISPs to get the consent of their customers before disclosing or selling personal information. States should craft legislation that, rather than seeking the same level of consent for all customer information, should adopt the tiered approach to consent found in the now-repealed FCC rule. Customers should be given greater control over sensitive information, such as precise geolocation, financial and health information, web browsing and app usage history; the use or sharing of this type of information should require the affirmative, opt-in consent of the customer. The use or sharing of non-sensitive personal information, such as email address and type of service, should be allowed, unless the customer says no and opts out. And exceptions should be made for the use of information necessary for providing the contracted service and certain other emergency situations. While this degree of individual control is not currently provided by most U.S. privacy laws, the central and privileged position of ISPs certainly justifies moving in this direction. In other countries, individuals are afforded more control over their own personal information. The GDPR sets a very high standard for consent to the processing of personal data. An individual’s consent must be “freely given, specific, informed and unambiguous” and a clear affirmative action is required.49 The requirements of the former FCC rule regarding the contents of the notice describing the choices available to customers and for the mechanism by which customers can exercise or revoke their choices went a long way to providing for meaningful consent approaching the GDPR level. State broadband privacy laws should incorporate the consent provisions that had been part of the FCC rule. This approach is in line with the new privacy framework outlined above, providing consumers with more choices and setting privacy-respectful defaults.

Securing the IoT

Cybersecurity has been a hot topic in Congress for a number of years, with ever-larger data breaches keeping it on the front burner, but numerous efforts to enact broadly applicable cybersecurity legislation have failed. There have also been some congressional hearings and legislative proposals for cybersecurity for the IoT. Even though the attack of the Mirai botnet of consumer devices increased policy makers’ awareness of the problem, it remains unlikely that Congress will act anytime soon. And the threat that this insecure attack vector poses continues to grow with the increase in the number of connected devices. This is an issue on which states might innovate, looking for legislative approaches to correct the market failure by setting minimum security requirements for connected devices. Legislation might narrow the focus to consumer devices, those intended for “personal, family or household purposes,” in the language of laws regulating consumer products and services. This would exclude IoT used in business, industry, and government, where organizations have far greater resources and expertise to address the security issues than do consumers on their own. A narrower focus would also somewhat reduce the political burden of passing the legislation. Legislation might look to the BITAG report discussed above, which outlines the major security vulnerabilities and recommends current best practices for securing IoT devices. The report’s recommendations include the following: ensure that devices have a mechanism for automated secure software updates, a capability that does not currently exist for most IoT devices; use strong authentication by default, to prevent unauthorized parties from accessing devices or changing their code or configuration; test and harden all possible device configurations, not just the default configuration, to ensure that any customization by consumers is secure; and protect data with security and cryptography best practices, to protect against data leaks both from the cloud and between devices.50 These requirements would constitute privacy defaults and an appropriate standard of care for data, components of the new privacy framework discussed above. The GDPR might also be consulted on this issue. One of its requirements is data protection by design and default, whereby companies must consider data protection at the outset, when designing systems for processing personal data.51 The data security requirement in the GDPR would also be relevant. It is risk-based: organizations must implement appropriate technical and administrative measures to ensure a level of security appropriate to the risk.52

Harmonizing State Data Breach Notification Laws

One of the most innovative and influential privacy laws originated in a state. In 2003, California enacted the first law requiring organizations to notify individuals of a security breach of personal information. The law made an economic adjustment, shifting most of the burden and cost of data insecurity from individual data subjects to the organizations responsible for it. In addition to alerting individuals that their information is at risk so that they can take defensive action, breach notification requirements have provided an incentive for companies and other organizations to pay attention to and devote resources to data security and privacy. California’s law was followed by similar laws in forty-seven other states, as well as federal regulations and guidelines for health care entities and financial institutions.53 It has also been taken up by other countries, and will be a requirement of the impending GDPR.54 Urged by industry complaints about the compliance burden created by multiple laws, Congress has attempted for over a decade to pass a federal data breach notification law that would preempt state laws. In addition to having an overly broad preemptive scope, some of these federal proposals would have negated not just state data breach laws, but also longstanding consumer protection provisions, and thus would have lowered the level of consumer protection and prevented further improvements. In the current situation, the protections of the strongest state laws—the highest common denominator—are generally afforded to the residents of all states in a multi-state breach. In the current situation, the protections of the strongest state laws—the highest common denominator—are generally afforded to the residents of all states in a multi-state breach. State data breach notification laws make a good candidate for harmonization across state jurisdictions, particularly as an alternative to federal preemption,55 because it would not be that difficult to simplify the pattern in the patchwork of state breach laws. State breach laws are in fact very similar, following in most respects the original California law.56 Like California’s, the other state laws require organizations to notify individuals when personal information is breached, prefer notification by mail but allow alternative “substitute notice” in some situations, permit a law enforcement delay, and offer an exemption from notification if the breached data is encrypted. The significant differences between state laws are in three provisions: (1) the notification trigger, (2) notification timing, and (3) the definition of covered information. This is where harmonization efforts should be directed. Such an effort by state policy makers could result in simplifying compliance while preserving consumer protection and other benefits of state regulation. Below is a proposal for approaching the harmonization of state breach laws, with the added benefit of aligning more closely with federal and European breach notification requirements.

Toward a Harmonic Convergence

On the important issue of the trigger for notification, the state laws take one of two approaches: over three quarters of the state laws have a harm trigger, requiring notification only if the breached entity judges that the incident poses a risk of harm to individuals; the others have an acquisition trigger, requiring notification if the data was acquired or reasonably believed to have been acquired by an unauthorized person. In a sense, both approaches are based on a risk of harm, with acquisition by an unauthorized person seen as constituting such a risk. These approaches could be harmonized by using an acquisition trigger and adding a presumption that the breached entity must notify when a breach of personal data has occurred—unless the entity finds through a risk assessment that the incident is very unlikely to result in harm to affected individuals. This would also necessitate reporting incidents to the state Attorney General or other government agency, as is currently required in over half the state laws, which would have the authority to review decisions not to notify. Setting a breach size threshold to trigger reporting to regulators—but not for notifying individuals—would help reviewing agencies to prioritize the deployment of their limited resources. Currently, over half of state breach laws set such a threshold, ranging from 250 to 500 individuals affected. This formulation of a notification trigger would also align with the Health Insurance Portability and Accountability Act (HIPAA) and the GDPR. Since 2009, HIPAA has required covered health care entities and their business associates to notify individuals in case of any impermissible use or disclosure of protected health information, unless the entity conducts a risk assessment and determines that there is a low probability that the information has been compromised. Similarly, the GDPR requires notification to individuals of a breach of personal data if the incident is determined to pose a high risk of harm to individual rights or freedoms. (The GDPR also requires notifying data protection authorities of breaches when there is any likelihood of harm to the rights or freedoms of individuals, even if the higher threshold for notifying individuals has not been reached.) The other factor in a harm-based trigger is the definition of harm, which should be left as a general term to allow for different types of harm posed by different types of personal data and by evolving technologies and business practices. While some states limit harm to identity theft or financial harm, the majority of the state laws with a harm trigger employ a broad concept, using the terms “harm” or “misuse of the data.” The GDPR also speaks broadly of “physical, material, or non-material damage,” including being deprived of control over personal data.57 Harmonizing state laws on the timing of notification should not be difficult. A harmonized law using a formula such as “in the most expedient time possible, without unreasonable delay” could explicitly allow time for securing the system and determining the scope of the breach and for conducting a risk assessment in order to determine whether notification is required. This would align with the GDPR, which requires notification of individuals “without undue delay” and allows time to assess the level of risk to individuals. While existing state laws do not provide for a risk assessment, essentially all of them do require notification “in the most expedient time possible” or “without unreasonable delay” and allow for time to secure the system and determine the scope of the breach. Nine states specify an outer limit of 30 to 90 days from discovery of the breach. Similarly, the HIPAA regulation requires notification “without unreasonable delay,” allowing up to 60 days. The problem with specifying an outside time limit is that it tends to become the norm. The flexibility of a “without unreasonable delay” standard encourages timely notification of very different incidents. What is considered a reasonable delay in the case of notifying of a breach involving a data owner and one or more contracted service providers and many data subjects whose contact information is not readily available would likely be considered an unreasonable delay in the case of a breach of a single system involving fewer data subjects. The pressure to notify promptly is felt by organizations, as they are faced with justifying the time they took to the public when the incident is reported in the news. Harmonizing on the definition of covered information for breach notification laws is more challenging. There is diversity among the states on this point. While all state breach notification laws have basic data types in common (name plus Social Security number, driver’s license number, or financial account number), after these, the picture becomes more complicated. A third of the state laws also include medical information, a third of the laws include biometric data, nearly a third include online account credentials, and the same number add other data elements (such as passport number, taxpayer ID number, mother’s maiden name).

More nimble than Congress, state legislatures have adapted the definition of personal information in breach notification laws to respond to changing circumstances affecting their residents. The original California law contemplated financial identity theft as the risk to be addressed by notification, and therefore limited the types of personal information covered to those sought by identity thieves. Five years later, with the burgeoning of medical privacy and medical identity theft, the definition was expanded to include medical and health insurance information. Two years later, the California law was amended again to add online account credentials to the definition of covered information, in response to the targeting of that data by criminal organizations. This evolution is an example of laboratories of innovation at work.

Allowing continuing updating of the law on this issue is important to keeping breach notification effective. Before adding new types of data, however, states would be wise to consider the purpose served by the law: transparency. While the requirement to notify serves as an incentive to organizations to improve their privacy and security practices, that is a secondary effect of the law. (An information security statute that prescribes specific security standards is another matter.) The authors of the original breach notification law stated that its intent was to give consumers early warning that their personal information was at risk of being abused, allowing them to take action to protect themselves.58 Bearing this purpose in mind, certain types of information might be excluded from or not added to the definition in the state laws, if knowing that it has been breached does not enable individuals to take defensive action.

Certainly differences in state breach laws can complicate compliance for companies that experience a breach affecting residents of many states. In response, charts and matrices of state breach laws have been developed and are readily available to assist in navigating the terrain.59 Smaller companies, such as medical and other professional practices and local merchants, often have personal data only on the residents of their state, and thus need comply with only a single law.

Conclusion

While the present political environment at the federal level is unlikely to produce a radical strengthening of data privacy law, there are privacy problems that should not await federal action at some unknown future date. The lack of privacy protections for the ISPs that have access to the broadest swath of our online activities, the insecurity of the IoT devices in our homes, and the possibility of companies gaining legal justification for hiding some breaches that put our data at risk of misuse are issues that state legislatures can address.

States have been responsible for some of the most innovative and effective privacy laws. Today, states have the opportunity to take advantage of a far-reaching European privacy law to enact laws requiring U.S. companies to provide their domestic customers and employees with at least some of the same privacy protections that they accord Europeans. Functioning as the laboratories of democracy that U.S. Supreme Court Justice Louis Brandeis envisioned, states can respond to changing conditions and evolving technologies with new approaches to privacy protection. They can also learn from each other, adopting provisions and laws that prove effective.

**Cyber-attacks trigger retaliation and false readings---nuclear war.**

Klare 19 [Michael; November 19; Professor Emeritus of Peace and World Security Studies at Hampshire College, Senior Visiting Fellow at the Arms Control Association; Arms Control Today, “Cyber Battles, Nuclear Outcomes? Dangerous New Pathways to Escalation” <https://www.armscontrol.org/act/2019-11/features/cyber-battles-nuclear-outcomes-dangerous-new-pathways-escalation>]

Yet another pathway to escalation could arise from a cascading series of cyberstrikes and counterstrikes against vital national infrastructure rather than on military targets. All major powers, along with Iran and North Korea, have developed and deployed cyberweapons designed to disrupt and destroy major elements of an adversary’s key economic systems, such as power grids, financial systems, and transportation networks. As noted, Russia has infiltrated the U.S. electrical grid, and it is widely believed that the United States has done the same in Russia.[12](https://www.armscontrol.org/act/2019-11/features/cyber-battles-nuclear-outcomes-dangerous-new-pathways-escalation#endnote12) The Pentagon has also devised a plan known as “Nitro Zeus,” intended to immobilize the entire Iranian economy and so force it to capitulate to U.S. demands or, if that approach failed, to pave the way for a crippling air and missile attack.[13](https://www.armscontrol.org/act/2019-11/features/cyber-battles-nuclear-outcomes-dangerous-new-pathways-escalation#endnote12)

The danger here is that economic attacks of this sort, if undertaken during a period of tension and crisis, could lead to an escalating series of tit-for-tat attacks against ever more vital elements of an adversary’s critical infrastructure, producing widespread chaos and harm and eventually leading one side to initiate kinetic attacks on critical military targets, risking the slippery slope to nuclear conflict. For example, a Russian cyberattack on the U.S. power grid could trigger U.S. attacks on Russian energy and financial systems, causing widespread disorder in both countries and generating an impulse for even more devastating attacks. At some point, such attacks “could lead to major conflict and possibly nuclear war.”[14](https://www.armscontrol.org/act/2019-11/features/cyber-battles-nuclear-outcomes-dangerous-new-pathways-escalation#endnote14)

These are by no means the only pathways to escalation resulting from the offensive use of cyberweapons. Others include efforts by third parties, such as proxy states or terrorist organizations, to provoke a global nuclear crisis by causing early-warning systems to generate false readings (“spoofing”) of missile launches. Yet, they do provide a clear indication of the severity of the threat. As states’ reliance on cyberspace grows and cyberweapons become more powerful, the dangers of unintended or accidental escalation can only grow more severe.

**Dam hacks wreck waterway biodiversity**

Bruk 16 [Rosemary A. Burk & Jan Kallberg, Burk, U.S. Fish and Wildlife Service, Carlsbad Fish and Wildlife Office; Kallberg, Army Cyber Institute, “Cyber Defense as a Part of Hazard Mitigation: Comparing High Hazard Potential Dam Safety Programs in the United States and Sweden,” Journal of Homeland Security and Emergency Management, vol. 13, no. 1, 01/01/2016, DOI.org (Crossref), doi:10.1515/jhsem-2015-0047]

1 Purpose of the Study The cyber security of critical infrastructure is a top priority in the industrialized world, but tends to only address the technical intrusion in the information and control systems instead of evaluating or considering the factual impact on society, humans, urban areas, and ecosystems, if cyber security fails. This is visualized in the allocation of research funds: cyber security is focused on the technical implications and to a lesser degree environmental and societal implications. This study investigates dam safety programs and emergency preparedness in the United States and Sweden as a gage of these countries’ resiliency and preparedness in the event of a successful cyberattack that would jeopardize the functionality of the dam controls. A failed cyber defense that impacts critical infrastructure could result in loss of human lives. Environmental and ecological damages can be far costlier and difficult to mitigate than the information systems and computer damages from cyberattacks. 1.1 Statement of the Problem The lack of considerations for environmental long-range implications of failed cyber security planning and measures, especially in the protection of critical infrastructure and industrial control systems, have created ecological risks that are largely unaddressed. The study compares dam safety arrangements in the United States and Sweden. The US dam safety are in a set of states highly regulated, but inconsistent over the nation. The Swedish approach has been self-regulating dam safety. The study investigates the weaknesses and strength in these regulatory and institutional arrangements from a cyber security perspective. If ecological and environmental concerns were a part of the risk evaluation and risk mitigation processes for cyber security the hazard could be limited. Successful environmentally-linked cyber defense mitigates the risk for significant damage to domestic freshwater, aquatic and adjacent terrestrial ecosystems, and protects ecosystem function. 1.2 State Sponsored Cyberattacks Adversarial nation states have the technical and financial capacity to launch complex attacks. In preparing a cyber defense system, it is imperative to acknowledge that potential adversaries do not subscribe to the same standards or code of ethics. To further complicate the ability to attribute a successful cyberattack is the potential for cyber weapons to be released or used by a proxy other the nation state that manufactured it. The risk posed by a hypothetical cyberattack is difficult to assess due to the number of factors, but presents a rich reward for covert adversaries if successful. A successful cyber attack targeting high hazard dams could accomplish two key elements of a major terrorist or covert action: 1. high societal impact, 2. infliction of harm or induction of fear in the target population and societal lifelines. Societal impact would likely influence policy. 1.3 The Embedded Vulnerability Cyberattacks have been extended beyond the Internet to target Supervisory Control and Data Acquisition (SCADA) (Stouffer et al. 2011), which are a subset of industrial control systems. SCADA systems are a part of industrial control systems that are widely used in industry, transportation, lights, and signal and the energy sector. SCADA systems, therefore are a critical component of societal technical infrastructure. These systems control the industrial processes that run our industries, chemical refineries, railroads, traffic lights and control processes in electricity generation and regulate water releases in dams by switch on or off process and electro-mechanical parts such as valves, drains, lights, electric motors, and information display. Aside from SCADA systems developed with Internet protection features in the last decade, SCADA were not intended or designed to be connected to any other computer, let alone linked to a global information network as the Internet conduit. The failure to look beyond computer systems and not include the human as well as environmental hazards of a failed cyber defense is concerning. 2 Review of the Literature A nation’s infrastructure defense from cyberattacks is not only protecting information, network availability, or the global information grid, it is also safeguarding the lives of citizens and property and protecting ecosystems and the ecosystem services that we rely upon. Attacks on the environment and the quality of life of the citizenry directly affect the confidence the population has in the government’s ability to govern (Kallberg et al. 2013). For an adversarial nation that seeks to influence a population and inject fear, cyber-created environmental damages have a high payoff, especially if the cyber operations are covert and are unlikely to be attributed. Successful environmentally-linked cyber defense mitigates the risk for significant damage to domestic freshwater, aquatic and adjacent terrestrial ecosystems, and protects ecosystem function. The lack of considerations for environmental long-range implications of failed cyber security planning and measures, especially in the protection of critical infrastructure and industrial control systems, have created ecological risks that are unaddressed. If ecological and environmental concerns were a part of the risk evaluation and risk mitigation processes for cyber security the hazard could be limited. State-sponsored cyberattacks are likely to be perpetrated by probing IT systems well in advance of a systematic attack. These early attempts by perpetrators provide an opportunity for cyber defense by information sharing and creation of a coordinated defensive effort. The United States learned of Al-Qaeda’s intentions to target dams through a series of cyberattacks in 2002 (Harnden 2002; Gellman 2002). Evidence obtained from an Al-Qaeda member’s laptop computer in Afghanistan revealed logs and an internet history that offer software and programming tutorials for controlling digital switches (assumed SCADA) that control water and power facilities and during interrogations of al-Qaeda prisoners they told CIA integrators of their intent to use these switches to launch cyberattacks in America (Harnden 2002). A two-pronged approach of a cyberattack launched simultaneously with a physical attack, for example, detonation of explosives at a dam, referred to as kinetic weapons, could lead to massive destruction. Ronald Dick, FBI’s National Infrastructure Protection Center, stated in a Washington Post interview in 2002, “The event I fear most is a physical attack in conjunction with a cyberattack on the responder’s 911 system or on the power grid (Harnden 2002).” In January 2013, the US Army Corps of Engineers National Inventory of Dams had a cyber breach of dam data not available to the general public. The NID contains sensitive information about dams including their vulnerabilities. Michelle Van Cleeve, a former consultant to the CIA and adviser to the Executive Agent for Homeland Security and Department of Defense was interviewed after the breach was made public and her assessment of the breach was that it was an attempt to gather information about US vulnerabilities for future cyber or military attacks (Zetter 2013). “In the wrong hands, the Army Corps of Engineers’ database could be a cyberattack roadmap for a hostile state or terrorist group to disrupt power grids or target dams in this country,” Van Cleeve stated (Zetter 2013). To illustrate the evolving threat to dam security it is important to recall the British Royal Air Force (RAF) offensive Operation “Chastise” in 1943. To disrupt the industrial complex within the Ruhr Valley and munitions manufacturing and minimize Germany’s ability to prolong World War II, the RAF sought to precision bomb the Mohne and Sorpe dams (Webster 2005). Plans began in 1937 to develop dam busting weaponry and refine the operational aspects of deploying bombs to achieve the maximum effectiveness in exploding high capacity concrete dams. RAF bombing of the dams resulted in breaching of the dams, widespread flooding downstream, loss of over 1250 German lives, and disruption of the Ruhr Valley’s industry (Webster 2005). British RAF lost eight planes and 54 aircrew members in the mission (Webster 2005). Although the relative success of Operation “Chastise” is still debated, key among its successes were the disruption to German transport infrastructure, and diversion of Germany’s labor from Atlantic defenses to dam defenses (Webster 2005). More difficult to quantify, but perhaps as important to the aim of the mission were: 1) the value of the attack as a propaganda material and to demonstrate Britain’s ability to precision bomb and “bring the war to Germany” to their allies, 2) Britain dropped leaflets featuring their success into occupied Europe, 3) the likely psychological impact the attack had upon undermining Hitler’s confidence and the move to dedicate the equivalent of a regular air-defense division to aerial defense of dams out of fear of repeat attacks (Webster 2005). A potential adversary is likely less restrained from attacking civilian dams, even if it would be against international law, because several of the potential adversaries are totalitarian regimes that have less restraints and do not subscribe to the values that created the rules of engagement in just war. The effects of a successful cyberattack could release massive amounts of water in a short timeframe that increases the stress and likelihood for failure for dams further downstream. For example, a series of dam failures in a large watershed could result in high loss of human lives, significant property damage, widespread environmental impacts and disruption to societal infrastructure. Hydroelectric dams and reservoirs are controlled using different computer networks, either cable or wireless, and the control networks connect to the Internet. “A breach in the cyberdefenses of an electric utility company could lead all the way down to the logic controllers that instruct the electric machinery to open the floodgates” (Kallberg and Burk 2014). Commonly, hydroelectric dams and reservoirs are built in a series along the river’s length to maximize the capacity for electricity generation and take advantage of power generated by sharp declines in elevation. A cyberattack on one or more dams in the upper watershed could release water that would rapidly increase pressure on downstream dams. With rapidly diminishing storage capacity, downstream dams would be vulnerable to breach. Eventually, the attack could have a cascading effect, literally and figuratively, through the river system and result in a catastrophic flood. The traditional cybersecurity approach is to focus on the loss of function and disruption in electricity generation – overlooking the potential environmental effect of an inland tsunami (Kallberg and Burk 2014). This is especially troublesome where the population and the industries are dense along a river, such as in Pennsylvania, Germany, and other areas with cities built around historic mills. If the cyberattack occurred during a heavy rain when the dams were already stressed, any rapid increase in water level could trigger successive dam collapses. This could lead to high casualties and a critical loss of hydroelectric capacity. In nations seeking to maximize their hydropower capacity and deliver electricity to other countries via elaborate international electricity grids. Ensuring dam safety for these countries, such as in Sweden, becomes an issue of domestic and international importance.

**Prevents extinction---North American waterways are key because of unique taxonomic diversity**

Walsh et al. 11, Dr. Stephen J. Walsh, Ph.D., research biologists with the U.S. Geological Survey and co-chairs of the American Fisheries Society’s Endangered Species Committee, Howard L. Jelks, M.Sc., and Noel M. Burkhead, M.Sc., “The Decline of North American Freshwater Fishes”, August 2011, *American Currents*, <http://www.nanfa.org/ac/freshwater-fishes-decline.pdf>

North America has a broad array of freshwater ecosystems as a result of the continent’s complex geography and geological history. Within a multitude of habitats that include streams, large rivers, natural lakes, springs, and wetlands reside rich assemblages of fishes that represent diverse taxonomic groups and with unique ecological requirements. In the last few decades, the inland fishes of North America have been declining at an alarming rate. Although extinctions have occurred and many species and populations are in critical trouble, the fish biota of the continent as a whole remains diverse and there are societal actions that can stem further precipitous declines. Fish biodiversity Globally, fishes outnumber all other vertebrates combined and have the highest rate of discovery of new species. Fishes exhibit a remarkable diversity of morphological attributes and biological adaptations, and occur in most aquatic habitats on Earth. Even in North America, where scientific knowledge of the fauna is advanced, new species are described every year. These discoveries are the combined result of applied technologies such as gene sequencing, which increases recognition of biodiversity at all scales, and the physical documentation of new, morphologically distinct forms and populations. Biological taxonomy is the discipline of classifying and naming organisms using an internationally accepted system or code. Because of the dynamic nature of fish taxonomy and the presence of vast, unex- plored areas of the planet with potentially many undescribed species, statements or conclusions about numbers and percentages of species occurring in particular habitats or geographical regions are but rough approximations. Nevertheless, overall trends are evident. • Fresh water constitutes only about 1% of the Earth’s surface area and less than 0.01% of its water by volume. • A conservative estimate is that as many as 32,500 extant (living) fish species may exist in the world.1 However, this number may eventually prove greater, with approximately 30,000 currently recognized as valid and over 300 new species described each year.2 • About 12,000 species, or approximately 43% of all currently named fishes, occur exclusively in fresh waters. A small number are diadromous, regularly living part of their lives in rivers, streams, or lakes and part in the oceans. • North America has the greatest taxonomic richness of freshwater fishes among temperate regions of the world, although greatly surpassed in number of species by less documented areas of the tropics, especially the biological hotspots of South America, Africa, and southeast Asia.3,4 Currently, there are approximately 1,200 recognized fish species that occur in inland waters of the continental United States, Canada, and Mexico. • Collectively, the fish fauna (ichthyofauna) of North America’s freshwater ecosystems is in serious decline as more species and distinct populations have become increasingly imperiled over time. • Worldwide, historical and emerging trends in the conservation of fishes and fishery stocks portray gloomy conditions, yet there are reasons for optimism and potential for recovery and protection of these declining resources given societal resolve.5 Environmental threats Media coverage of conservation issues about the world’s animals is often greatest for species that are particularly endearing to humans, such as mammals and birds, whereas perils to aquatic faunas, including fishes, are often much less publicized. This disparity is due, in part, to taxonomic bias in research and funding in the field of conservation biology. Based on published scientific literature, fishes, amphib [[FIGURE 1 OMITTED]] ians, reptiles, and invertebrates are underrepresented in conservation studies relative to the proportion of species of each group known worldwide,6 and organisms in the freshwater and marine realms receive much less coverage than those in terrestrial environments.7 Among invertebrates, however, it is notable that mollusks and crustaceans, of which many species are aquatic, are generally better studied than the vast diversity of arthropods—especially insects, with the exception of butterflies and moths. Major deficits in funding for faunal surveys, monitoring, and basic research, and the general lack of public awareness about the conservation status of fishes across taxonomic groups and ecosystems is a significant problem. Given the myriad of threats to aquatic habitats throughout the world, the degree to which degradation of these habitats is accelerating, and the overall proportion of biodiversity represented, extraordinary resources are in unprecedented danger of being significantly diminished or lost. In particular, freshwater habitats are some of the most threatened in the world.8,9,10 Moreover, aquatic systems are inextricably linked to terrestrial habitats, and pollutants and sediments from perturbed landscapes flow downhill into lakes, streams, and rivers. Threats to freshwater ecosystems are so pervasive that many endemic species, those naturally restricted to a single drainage or ecoregion, are greatly imperiled simply because restricted geographic distribution makes them more vulnerable to human modification of landscapes. Among the most important threats to fishes in freshwater habitats are: • Destruction or modification of habitat resulting in reduced range size and/or loss of populations. Examples include dam construction, channelization, mining, clearing of natural forests for agriculture, urban development, and other intensive land-use practices. • Water depletion. Some desert fishes have become extinct as a result of human exploitation of limited groundwater resources. • Pollution from identified point and non-point source contaminants. Runoff from urban areas, and the compound effects of multiple pollutants, often reduces water quality to the point that only the most tolerant species remain in receiving water bodies. • Erosion and sedimentation. Fine sediments can smother bottom substrates, to the detriment of many bottom-dwelling (benthic) species, whose prey and reproductive success are dependent on clean substrates and good water quality. • Over-exploitation for commercial, recreational, scientific, or educational purposes. Examples of fishes that have been over-harvested include salmons, whitefishes, trouts, Striped Bass, and sturgeons. • Disease or parasitism. For instance, whirling disease, a microscopic parasite introduced from Europe, has ravaged many wild and hatchery populations of trouts and salmon in the U.S. and Canada. • Other anthropogenic factors including introduction of non-native species, which may result in hybridization, competition, and predation. Numerous introductions of fishes, both from outside of North America and intra-continental transplants, have had severe negative impacts on native species11 including some that have caused extinction. • Climate change. Regional variation in rainfall patterns, storm events, and droughts can affect habitats and potentially have negative consequences for rare species. Conservation status of North American freshwater and diadromous fishes The Endangered Species Committee of the American Fisheries Society (AFS-ESC) has tracked the plight of imperiled fishes in North America for over 30 years, with the explicit aim of providing objective and unbiased status assessments independent of the influence of policy or regulatory considerations. Recently the AFS-ESC, represented by 16 scientists from the United States, Canada, and Mexico, with the assistance of numerous colleagues, evaluated the conservation status of the entire continental fish fauna12. In the latest assessment, approximately 40% of described North American freshwater and diadromous fish species were documented as imperiled or extinct, representing a substantial increase over previous assessments. A taxon (taxa, plural) is a unit used in biological classification and is defined on the basis of a natural relationship, formally recognized as one or more lineages (=clades) of descendants sharing a common ancestry. Past conservation assessments by the AFS were limited to determining status of distinct species and subspecies. Undescribed forms, or those not named in the scientific literature using classic Linnaean binomial nomenclature, were included where sufficient data [[FIGURES 1-5 OMITTED]] [[FIGURE 3 OMITTED]] were available to document taxonomic distinctiveness, as evidenced by unique morphological, genetic, or other attributes. In the most recent assessment, additional infraspecific taxa were included in the form of distinctive populations, or what are sometimes referred to in the scientific community as evolutionarily significant units (ESUs) or distinct population segments (DPSs, although this term has certain legal connotations under the Endangered Species Act within the U.S.; see http://www.fws.gov/endangered/POLICY/Pol005.html). Taxa were ranked in a hierarchical arrangement of imperilment that corresponds to equivalent categories recognized by many public agencies and conservation organizations: • Endangered (E): in imminent (fewer than 50 years) danger of extinction, or extirpation (loss of populations) throughout most portions of a taxon’s range. • Threatened (T): in imminent danger of becoming endangered. • Vulnerable (V): in imminent danger of becoming threatened; comparable to a designation of “Special Concern” by many agencies and conservation organizations. • Extinct (X): a taxon that has not been observed for over 50 years. Two subcategories were included: Possibly Extinct (Xp), a taxon suspected to be extinct, as evidenced by more than 20 but less than 50 years since living representatives were observed, and Extirpated in Nature (Xn), where all populations in natural habitats are presumed eliminated but surviving individuals are maintained in captivity. There are 700 fish taxa currently considered to be imperiled in North America’s inland waters, representing 133 genera in 36 families. The majority of taxa are named species (63%), followed by named subspecies (13%), populations (12%), undescribed species (7%), and undescribed subspecies (5%). Of the total, 280 are endangered, 190 threatened, 230 vulnerable, and an additional 61 taxa (mostly described species or subspecies) are presumed to be extinct or extirpated in the wild. The number of imperiled fishes represents a 92% increase over a nearly 20-year period dating to 1989. Of those taxa currently listed and also recognized as imperiled in 1989, 89% have the same or a more severe conservation status, only 6% have improved, and 5% were delisted for various reasons, in most cases not associated with recovery of populations. The list of imperiled taxa encompasses fishes that span a remarkable diversity of lineages, morphologies, lifehistories, and habitats. A taxonomic breakdown of the list and comparison to known, described species reveals disparities by family. Nearly one quarter of all imperiled taxa belong to the most species-rich family of North American freshwater fishes, the Cyprinidae, represented by the minnows and their allies. Another 15% is represented by the second-most diverse family, the Percidae, which includes a large number of darters—small, colorful fishes that have their greatest diversity and abundance in clear-flowing streams of the central and eastern U.S. The Salmonidae—trouts, salmons, ciscoes, and their allies—comprise nearly 12% of all imperiled taxa, but are disproportionally represented in comparison to other families by large numbers of infraspecific taxa. The nomenclature (scientific and common names) of North American fishes is tracked by a joint committee of the AFS and American Society of Ichthyologists and Herpetologists, the Committee on Names of Fishes.13 An analysis of imperiled, described species (i.e., excluding unnamed taxa, subspecies, and populations) revealed noteworthy levels of at-risk status for several fish families and the fauna in general. Of 1,188 described species, a staggering 40% were found to be in jeopardy or extinct. Groups with especially large numbers of imperiled species, relative to total number in each family, include: Acipenseridae, sturgeons (75% of species imperiled); Cyprinodontidae, pupfishes (81%); and Goodeidae, goodeids, a primarily Mexican group of small-bodied fishes (77%). The Ictaluridae (North American catfishes) and Catostomidae (suckers)—both families with over 50 described species—have significant levels of imperilment; 54% and 38%, respectively. The Salmonidae has 7 of 38 species imperiled, but another 16 species have populations or subspecies in trouble. There are distinct geographic trends evident for imperiled North American fishes based on distributions within natural hydrologic units, or ecoregions (defined by a combination of physical drainage features and faunal similarity10). The greatest number of at-risk species are in the southeastern U.S., the mid-Pacific coast, the lower Rio Grande, and coastal and south-central inland regions of Mexico.12 Of particular note is the distribution of imperiled fishes in North America within ecoregions; 80% of all taxa are confined (endemic) to a single ecoregion, and another 10% are limited to two ecoregions. A combination of limited range size and habitat degradation is attributed to much of the imperilment of the inland continental fish fauna. Editor’s Note: A color map showing the number of imperiled North American taxa by ecoregion can be found on page 14. Why be concerned about the decline of fishes in North America’s inland waters? Loss of biodiversity on planet Earth arguably ranks as the greatest impending environmental crisis currently facing humanity. The decline of North American fish species and populations, as with elements of biodiversity throughout the world, directly or indirectly impacts other faunas, is detrimental to freshwater ecosystems in general, and affects humankind in a variety of ways. Freshwater fishes are important sentinels of environmental conditions and play a crucial role in the ecology and sustainability of natural ecosystems. The natural [[FIGURE 4 OMITTED]] balance of both aquatic and terrestrial communities is dependent on fish populations that provide critical functions such as cycling nutrients and serving as prey to a large variety of carnivores, including birds, mammals, reptiles, and other fishes. The larvae of native freshwater mussels, called glochidia, require fish hosts in order to complete their life cycles. Some migratory fishes, such as shads, smelts, chars, and salmons, serve as keystone species of entire ecosystems. For instance, a variety of predators and scavengers feed on salmon adults, eggs, fry, and decaying carcasses, and nutrients transferred from the sea and incorporated into the food chain may contribute to the health of forests adjacent to streams in which salmon spawn, thereby illustrating the linkage between terrestrial and aquatic habitats.5,14,15 Herbivorous species provide important functions in terms of cropping algae and plants or disseminating seeds and fruits. Humans derive immeasurable recreational, commercial, and intangible benefits from fish and fishery resources, and our welfare is directly linked to their protection and sustainability. Conversely, degraded aquatic ecosystems with simplified communities and altered food webs can lead to an increase in vectors, such as mosquitoes and snails, of water-related diseases like malaria, schistosomiasis, and cholera.16

#### 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.

#### 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.

#### No link turns – knee-jerk defenses of Parker on federalism grounds are under-theorized – the aff’s links are more robustly aligned with federalism

Meese 21 [Alan J. Meese, Ball Professor of Law, William & Mary Law School and Co-Director, William & Mary Center for the Study of Law and Markets. 16 Va. L. & Bus. Rev. 115, Fall 2021, Lexis]

The Court has repeatedly and unanimously claimed that considerations of "federalism and state sovereignty" justify state action immunity and thus counsel against Sherman Act preemption of state-imposed or state-authorized restraints. Numerous scholars agree. In particular, the Court and its academic defenders claim that applying the Act to state-imposed restraints would unduly interfere with states' ability to serve as laboratories of democracy, choosing how to regulate their own economies, contrary to the principles of federalism. The vast post- Wickard reach of the Sherman Act reinforces this argument, by facilitating application of the Act to local restraints - including those imposed by state governments - that produce no interstate harm. Indeed, aside from Parker itself, all state action controversies that have reached the Supreme Court, including the Court's most recent pronouncement on the topic, involve local restraints that produce harm confined to a single state. 17 Thus, some have claimed that, given the expansive scope of the Sherman Act, application of the Act to state-imposed restraints would implicitly resurrect the Lochner era, during which the Court invalidated state legislation that unduly restricted private economic autonomy. The state action doctrine, it is said, leaves regulatory choices over local economic activity where they belong, with the people's elected representatives instead of federal judges.

Although the Court decided Parker more than seven decades ago, the "federalism and state sovereignty" rationale for state action immunity remains under-theorized. Some academic articulations of this rationale invoke the Constitution itself, suggesting that preemption of state-imposed restraints [\*121] would be unconstitutional. Other articulations by the Court and scholars vaguely invoke "federalism," "state sovereignty," or both, without claiming that the Constitution prevents Sherman Act preemption of state-imposed restraints. Some scholars have suggested that Parker reflects the application of a federalism canon, albeit without identifying any particular canon. Thus, objective evaluation of Parker's state action defense requires scholars to identify the doctrinal vehicles through which federalism and state sovereignty might influence the meaning of the Act and to determine whether Parker and its progeny constitute faithful application of such principles.

This article evaluates and rejects the claim that considerations of federalism and state sovereignty somehow rebut the strong case for Sherman Act preemption of state-imposed restraints. Instead, consistent application of federalism principles bolsters the case for preemption of state-imposed restraints, like those in Parker, that directly burden interstate commerce and impose interstate harm. At the same time, considerations of federalism also counsel retraction of the scope of the Act and concomitant allocation to the states of exclusive authority over restraints that produce only intrastate harm. The resulting allocation of authority over trade restraints would nearly eliminate the potential conflicts between local regulation and the Sherman Act, conflicts that many claim justify the state action doctrine.

The article identifies two broad categories of arguments that supposedly support the state action doctrine. First, Parker's proponents could claim that one or more constitutional doctrines that protect federalism or state sovereignty somehow prohibit outright Sherman Act preemption of state-imposed restraints. Second, these proponents could argue that such considerations find expression in one or more canons of statutory construction and thereby militate against reading the Sherman Act to preempt such restraints, despite Congress's admitted authority to do so.

The article evaluates the arguments in each category and finds all such arguments wanting. Beginning with the first category, the article demonstrates that no doctrine of constitutional law requires Parker's state action doctrine. Indeed, the Supreme Court has repeatedly concluded that the Framers and Ratifiers adopted the Commerce Clause precisely because of their experience with state-imposed restraints that unduly burdened interstate commerce and imposed harm on out-of-state citizens. According to this historical account, the Clause was designed to empower Congress to prohibit such parochial state legislation, thereby removing barriers to a well-functioning national market and establishing free trade as the rule governing interstate commercial activity.

[\*122] While affirmative statutory preemption was relatively rare during the Nineteenth and early Twentieth Centuries, the Supreme Court read the Commerce Clause to authorize implied preemption of otherwise valid state legislation that directly burdens interstate commerce. Moreover, as the scope of the power has expanded over the past several decades, Congress has repeatedly exercised this authority to preempt state laws regulating local matters in numerous settings. To be sure, independent considerations of state sovereignty can constrain Congress's exercise of the commerce power. However, Sherman Act preemption of state-imposed restraints does not interfere with a state's organization or regulation of itself, officers, or employees and thus does not interfere with any cognizable aspect of state sovereignty protected by the Tenth Amendment, Eleventh Amendment, or inferred from the structure of the Constitution. Thus, preemption of state-imposed restraints like those challenged in Parker is a garden-variety exercise of Congress's commerce power.

To evaluate arguments in the second category, the article identifies three canons of statutory construction that could serve as vehicles for implementing concerns regarding federalism and state sovereignty: (1) the avoidance canon; (2) the federal-state balance canon, and (3) the anti-preemption canon. None of these canons, it is shown, supports Parker's state action doctrine. The article concludes that Sherman Act preemption of state-imposed restraints is so plainly constitutional that the avoidance canon is simply inapposite. The article then applies the federal-state balance and anti-preemption canons. Both canons protect traditional state regulatory spheres from inadvertent national intrusion, whether by regulation of local private conduct or preemption of state exercise of historic police powers. Far from bolstering the state action doctrine, the application of these two canons reveals that Parker's invocation of federalism and state sovereignty is selective, purporting to solve a problem that the Court itself created. Consistent application of these canons and the federalism principles that inform them actually strengthens the case for Sherman Act preemption, albeit within a much narrower sphere than the Sherman Act currently operates. The federal-state balance canon addresses statutory regulation of private conduct and thus does not speak directly to state action cases such as Parker, where a state itself displaced free competition. 18The canon could, however, apply to hybrid restraints, private agreements encouraged or enforced by the [\*123] state. Academic and judicial proponents of the state action doctrine have expressed concern about possible Sherman Act preemption of state and municipal regulation, including hybrid restraints, of local activities that produce no interstate harm. Such federal oversight, they say, would deprive state and local governments of their status as laboratories of democracy that try out novel solutions, such as hybrid restraints, to local problems. Application of the federal-state balance canon to prevent preemption of laws authorizing such restraints would apparently vindicate these concerns. However, such concerns have much wider application than Sherman Act treatment of state-imposed or state-encouraged restraints. If states are to be sovereign laboratories that experiment with novel solutions to economic problems, they must also retain discretion regarding how to regulate all private restraints - not just hybrid restraints - that produce no interstate harm. Indeed, principled application of the federal-state balance canon would have required the Court to reject the post- Wickard expansion of the Sherman Act to reach all private restraints that produce no interstate harm. The Court instead ignored this canon, vastly expanding the reach of the Act vis a vis private restraints the state has not authorized. This expansion raised the prospect of Sherman Act preemption of local regulation, including regulation authorizing hybrid restraints. Parker and its progeny thwarted such preemption, protecting - to this extent anyway - traditional state regulatory prerogatives. Consistent application of the federal-state balance canon offers a different and more principled solution, namely, restoration of the pre- Wickard boundary between state and federal power over trade restraints and retraction of the scope of the Sherman Act. Such revision of the boundaries between state and federal authority over such activity would nearly eliminate the potential clash between the Sherman Act and local regulation that purportedly induced Parker and its progeny to announce and maintain the state action doctrine. States would remain free to act as laboratories with respect to such restraints, unmolested by the Sherman Act. Restoration of the original federal-state balance in the antitrust context would not eliminate the prospect of Sherman Act preemption of state-imposed or state-encouraged restraints. States could authorize hybrid restraints that directly burden interstate commerce, thereby injuring out-of-state consumers. However, Sherman Act invalidation of such restraints would in fact protect the original federal-state balance, by interdicting the sort of direct burdens on interstate commerce preempted by the Court's pre- Wickard Commerce Clause jurisprudence. The anti-preemption canon fares no better as a justification for the state action doctrine. To be sure, this canon establishes a presumption against [\*124] applying federal statutes in a manner that supersedes the exercise of "historic police powers" over "an area traditionally regulated by the states." However, this canon would not protect the scheme in Parker itself. The scheme in no way exercised historic police powers but instead regulated a domain - interstate commerce - over which Congress traditionally possessed exclusive authority. California's regulation of the price of interstate raisin sales produced substantial interstate harm and thus would not have survived the doctrine of implied preemption in place when Congress enacted the Sherman Act. Preemption of the Parker scheme would have restored the traditional federal-state balance, by invalidating self-interested legislation that directly burdened interstate commerce and imposed substantial harm on out-of-state citizens. What, though, about Parker-like regulation that produces only intrastate harm? Sherman Act preemption of such restraints would certainly interfere with the exercise of historic police powers. Here again, however, application of the anti-preemption canon would solve a problem the Court itself created when it ignored the federal-state balance canon and applied the Sherman Act to private restraints that produced no interstate harm. As noted above, however, principled application of federalism concerns as reflected in the federal-state balance canon would preclude application of the Sherman Act to such restraints - public or private. Restoration of the Sherman Act to its original and more limited scope would eliminate the putative conflict between federal antitrust law and local regulation producing no interstate harm and thus obviate any need to apply the anti-preemption canon. Application of both federalism canons reveals that federalism in this context should be an all-or-nothing proposition. Consistent regard for federalism requires uniform treatment of private contracts "in restraint of trade" and state-imposed restraints that produce the same results. There are two possible forms of consistent treatment: (1) invalidation of all such local restraints, public or private, "across the board," or (2) reducing the scope of the Sherman Act, so that the Act only reaches those restraints - public or private - that produce interstate harm. Recognition that the Court's Sherman Act jurisprudence reflects inconsistent regard for federalism does not itself reveal which consistent approach the Court should take. The article ends by identifying several considerations suggesting that the Court should resolve the modern inconsistency in favor of federalism. Consistent reduction in the scope of the Sherman Act would produce a regime governing interstate commerce that best replicates the regulatory framework that the 1890 Congress - jealous to protect free competition from all threats - anticipated. Proponents of Parker [\*125] who see states as laboratories for economic experimentation should welcome such reform, which, ironically, would result in less preemption of state-created restraints than current law. Part I of this article reviews the content and scope of the Sherman Act during the pre- Wickard era, when the Supreme Court enforced meaningful limits on the scope of the commerce power and the Sherman Act. Part II describes the facts and holding of Parker as well as subsequent decisions elaborating on the scope of state action immunity. This part also details the considerations of federalism and state sovereignty that both the Court and academic proponents of Parker have invoked. Part III reviews the federalism-based objections to Sherman Act preemption that several scholars have raised. Part IV evaluates and rejects the constitutional arguments against such preemption. Part V evaluates and rejects claims that certain canons of statutory construction counsel in favor of Parker's state action immunity. This part concludes that Parker and its progeny rest on a selective respect for federalism and concludes that a principled Sherman Act jurisprudence would consistently enforce or ignore federalism considerations. Part VI briefly contends that the Court should resolve modern doctrinal inconsistency in favor of federalism and reform the scope of the Sherman Act accordingly.

I. The Commerce Power and the Sherman Act: 1890-Present

Passed in 1890, Section 1 of the Sherman Act forbids "contracts, combinations ... and conspiracyies in restraint of trade or commerce among the several States ..." 19Section 2 prohibits monopolization of any "part of the trade or commerce among the several States." 20Each Sherman Act controversy thus requires courts to resolve two questions. Under Section 1, courts must ask: (1) Is the challenged agreement "in restraint of trade" and (2) does the agreement also restrain "commerce among the several States." 21Under Section 2, courts must ask: (1) does the challenged conduct "monopolize" a relevant market and (2) is that monopolized market "part of the trade or commerce among the several States." 22 [\*126] The Sherman Act was an exercise of the commerce power, and Congress drafted the Act against the backdrop of a well-developed jurisprudence defining the scope and nature of that authority. 23While Congress rarely exercised this power before 1890, the Supreme Court had enforced what became known as the "dormant" Commerce Clause. 24The Court constructed a quasi-statutory framework that invalidated all state legislation that regulated "inherently national" subjects of interstate commerce, even absent Congressional action. 25These decisions inferred from Congressional silence that Congress intended that such subjects be "free and untrammeled" from state regulation. 26 State legislation "regulated" such commerce and thus exercised an exclusive power of Congress if it imposed a "direct burden" on such commerce. 27Impacts were "direct" if they imposed economic harm on citizens in other states, raising the prospect that state regulation would produce self-interested results. 28Legislation that impacted such commerce only "indirectly" exceeded the scope of the commerce power and thus survived this regime. 29The result was the allocation of regulatory authority into mutually exclusive spheres, enforced by a doctrine of implied preemption that invalidated state enactments exercising authority reserved for Congress. 30 [\*127] The Court's earliest Sherman Act decisions drew upon this jurisprudence to answer both questions necessary to resolve Sherman Act controversies. 31Agreements were "in restraint of trade" if they directly impacted commerce by producing supracompetitive prices. 32Such agreements only restrained "commerce among the several States" if these direct impacts injured out-of-state consumers. 33Indeed, in Addyston Pipe & Steel Co. v. United States, the Court opined that the Commerce Clause authorized Congress to regulate private agreements producing such direct effects because these restraints produced the same impact on interstate commerce as analogous state-imposed restraints deemed invalid under the Court's Commerce Clause precedents. 34 In 1911, the Court famously reformulated its interpretation of "restraint of trade," in Standard Oil v. United States. 35There the Court held that the Sherman Act only reaches agreements or conduct that restrain trade "unreasonably." 36Soon thereafter, the Court announced that this same standard governed Section 2 analysis. 37Although a different verbal formulation, this Rule of Reason, like the direct/indirect standard, focused on the propensity of a restraint or conduct to produce monopoly or the consequences of monopoly, namely, higher prices, reduced output, or inferior quality. 38However, the Court retained the direct/indirect standard for [\*128] answering the second question posed in Sherman Act controversies, that is, whether a contract in restraint of trade or monopolistic conduct also restrained "commerce among the several States" or monopolized any "part" of "trade or commerce among the several States." 39Thus, the Act reached only those unreasonable restraints or monopolistic conduct that also directly burdened interstate commerce by exercising market power to the detriment of out-of-state consumers. 40 By 1911, then, the Rule of Reason, combined with the direct/standard governing the Act's scope, protected "the free movement of trade ... in the channels of interstate commerce" 41or, as the Court soon put it, "free competition in interstate commerce," from private restraints. 42At the same time, the Court's quasi-statutory Commerce Clause jurisprudence invalidated state legislation that imposed "direct burdens" on interstate commerce. 43This coherent legal regime protected free interstate trade from threats posed by the self-interested public and private actors. 44Implementation of each regime required the Court to ask the same economic question when applying the direct/indirect standard, viz., did the challenged private conduct or legislation directly obstruct or burden interstate commerce. This regime left states and private parties free to adopt regulations or restraints that imposed [\*129] indirect burdens on such commerce, as such provisions posed no threat to out-of-state consumers. This unified competition-protecting regime survived into the 1930s, invalidating private and public direct burdens on interstate commerce. 45Indeed, the Court had no occasion to consider whether the Sherman Act preempted state legislation that directly burdened interstate commerce precisely because the Court's quasi-statutory Commerce Clause jurisprudence itself preempted such restraints, rendering any Sherman Act involvement superfluous. The Court adjusted application of the direct/indirect standard over time in light of changed facts that suggested the existence of interstate harm that prior Courts had not perceived. 46For instance, early decisions, such as United States v. E.C. Knight, held that the Sherman Act did not reach intrastate monopolies, even if such firms sold products across state lines. 47However, beginning with Standard Oil, the Court read the Act (and the commerce power) to reach activities that, while nominally local, "directly" affected interstate commerce by exercising market power to the detriment of out-of-state consumers, narrowing E.C. Knight accordingly. 48While the effective reach of the commerce power and the Sherman Act changed, the interstate harm principle that governed the boundary between state and national power - and the concomitant economic inquiry - remained fixed and unchanging. 49A robust regime of competitive federalism generated regulatory policy, including antitrust policy, governing economic activity that [\*130] produced no interstate harms and thus fell within the exclusive authority of states. This coherent regime and resulting allocation of regulatory power did not survive the 1940s. In Wickard v. Filburn, the Supreme Court famously jettisoned the direct/indirect test as the standard governing the scope of the commerce power, claiming that the standard was mechanical, formalistic and unduly restricted the authority of Congress. 50Instead, the Court said: the Commerce Clause empowered Congress to reach any activity that produced a "substantial economic effect" on interstate commerce, even if the effect was incidental or indirect. 51This novel standard empowered Congress to regulate conduct that produced no interstate harm and thus could not prompt legislation favoring a state's citizens over those of other states. 52 Wickard also implied that state and federal power over local activity was coextensive and thus not mutually exclusive, as the Court had previously maintained for several decades. 53 Wickard was not an antitrust case. However, before the decade was out, in Mandeville Island Farms v. American Crystal Sugar, the Court engrafted Wickard's substantial effects test onto the Sherman Act, overruling five decades of precedent. 54As a result, the Act reached any restraint of trade that induced a "substantial effect" on interstate commerce, even if the restraint's harms were confined to a single state. The Court has applied the Act to intrastate conspiracies between liquor wholesalers, 55a monopolistic scheme to prevent expansion of a single hospital, 56an agreement between lawyers setting title search fees in one county, 57and a trade association's conspiracy to restrict entry by subcontractors working on local building projects. 58 [\*131] Most recently, the Court affirmed the Federal Trade Commission's condemnation of an agreement excluding some individuals from the practice of teeth whitening in one state. 59The Commission had found that the challenged conduct substantially impacted interstate commerce because some affected firms purchased out-of-state equipment and supplies. 60Numerous other decisions have also involved restraints that produced harmless but fortuitous interstate effects. 61 Mandeville Island Farms read a novel principle into the Act, a principle that authorized application of the statute to restraints that threatened no interstate harm. While initially developed to govern private restraints, Mandeville Island Farms' substantial effects test created broad potential to interdict state-imposed restraints of local trade previously deemed beyond the commerce power. 62

II. Parker and its Progeny

Parker v. Brown evaluated the post- Wickard claim that the Sherman Act preempted anti-competitive state regulation. This part describes the facts and holding of Parker as well as subsequent decisions expanding the scope of state action immunity and elaborating upon its rationale. The part ends by detailing the considerations of federalism and state sovereignty that both the Court and academic proponents of Parker have invoked. A. Parker v. Brown Decided shortly after Wickard but before Mandeville Island Farms, Parker v. Brown considered a challenge to California's "Agricultural Prorate Act," as applied to the state's raisin industry. 63The Court properly described the Act as an effort to "restrict competition among growers and maintain prices in the distribution of their commodities to packers[.]" 64The statute empowered a State Agricultural Prorate Commission to propose to growers so-called "pro-rate marketing plans" limiting output and thus raising the prices of agricultural commodities. Proposals became law if 65 percent of growers owning 51 percent or more of acreage devoted to a particular crop voted to approve it. California farms produced 100 percent of the nation's raisin output, and imports accounted for one-sixth of one percent of national raisin consumption. 65Growers generally sold their output to local "packers," who packaged the raisins and sold 90-95 percent to out-of-state purchasers. 66In 1940, the Commission proposed and producers adopted a raisin pro-rate plan. The plan required the state's growers to deliver 70 percent of their output of "standard raisins" to a "program committee" which could only sell raisins at "prevailing market prices" or hold them off the market indefinitely. 67Growers were free to sell the remaining crop through "ordinary commercial channels" at whatever price they wished, albeit only after purchasing a "marketing certificate" authorizing such sales. 68The Act imposed civil penalties, fines and/or imprisonment for violation. 69Thus, the Act coercively replaced the pre-existing regime of free competition between private individuals with market outcomes determined by the State. A dissenting farmer who was both a grower and a packer challenged the program under the Commerce Clause and the Sherman Act. 70The plaintiff [\*133] sought to enjoin officials from enforcing the Act against him, thereby allowing him to continue setting whatever price and output maximized his profits in a free market. 71He argued that such equitable relief was necessary because the Act's "unusual, oppressive and unreasonable" criminal penalties deterred him from waiting to be prosecuted under state law before invoking the Commerce Clause and Sherman Act as "defensive tactics," i.e., as affirmative defenses. 72In short, the plaintiff invoked two possible sources of federal preemption: the Sherman Act and the Commerce Clause. 73 Writing before Wickard, a three-judge district court enjoined the Act. 74The court held that the Prorate Act, while regulating local activity, directly burdened interstate commerce and thus contravened the quasi-statutory regime of implied preemption derived from the Commerce Clause. 75The court invoked with approval various decisions implementing the pre- Wickard regime dividing authority over commercial subjects between states and the national government. 76Given the court's Commerce Clause holding, it did not address the Sherman Act. 77 California appealed to the Supreme Court, which, after oral argument, ordered re-argument and additional briefing, including from the United States [\*134] as Amicus Curiae, on the possible application of the Sherman Act. 78In a brief co-authored by antitrust hawk Thurmond Arnold, the United States argued that both the Sherman Act and the quasi-statutory regime derived from the Commerce Clause preempted California's scheme. The whole point of the Act, the government said, was to ensure that "competition, not combination, should be the law of trade." 79The "end sought," the government continued, was "the prevention of restraints of free competition in business and commercial transactions, which tended to restrict production, raise prices or otherwise control the market to the detriment of purchasers of goods or services." 80While the Sherman Act did not expressly refer to state enactments, the Court's precedents established that a federal statute preempted any state law "that stands as an obstacle to the accomplishment and execution of the full purposes and objectives of Congress." 81 Invoking pre- Wickard antitrust decisions applying the direct/indirect standard, the government contended that California's regulation of local activity, in fact, monopolized the national raisin market and thus increased ( i.e. regulated) the price of raisins sold in interstate commerce. 82There was "no doubt," the government said that "the plan involved in this case controls the market price," which increased thirty percent one year after the adoption of the scheme. 83It did not matter that the growers sold their output to California packers. 84Sherman Act precedent established that agreements to "restrain or control the supply ... entering and moving in interstate commerce" were "a "direct violation'" of the Act. 85Because the plan reduced output and increased the prices paid by packers, the scheme would "undoubtedly directly affect and restrain the supply and price of raisins in interstate commerce." 86The pro-rate plan was "inconsistent with the policy embodied in the Sherman Act" and thus preempted. 87 [\*135] The government's Commerce Clause argument echoed similar themes. "Inherently national subjects" of interstate commerce, the government said, were subject to exclusive congressional control. 88The Court's precedents "regarded as a matter of great consequence whether the burden of a statute fell primarily upon persons outside of the regulating state." 89"If anything was of national commercial importance," the government continued, "the supply and price level of a commodity moving in interstate commerce falls into that category." 90Moreover, the program plainly regulated that subject, granting to a state agency the power to "monopolize the entire national supply of raisins, determine the quantity to be shipped in interstate commerce, and to control the interstate price structure." 91The benefits of the scheme "accrued to California Producers," with the result that "the action of the state is not likely to be subjected to the normal political restraints upon legislation." 92The program did not merely govern a matter of local concern but instead "determined the quantity of raisins which may go to market - and the market is the national interstate market." 93Based on these and other considerations, the government concluded, "the California raisin program is unconstitutional." 94 A unanimous Court rejected both challenges. The Court properly assumed that the Sherman Act would condemn such a program if adopted and enforced solely by private agreement. 95While the scheme limited the output of "local" crops, the resulting harm fell almost entirely on out-of-state [\*136] citizens. These direct and predictable interstate harms justified application of the Act to nominally "local" conduct, even under pre- Wickard precedents. 96 Beginning with the Sherman Act, the Court conceded for the sake of argument that Congress could preempt state-imposed restraints like California's plan. 97In particular, the Court noted with approval several decisions holding that Congressional legislation had occupied a "legislative field" and thus "suspended" state laws. 98Suspension, of course, was synonymous with preemption, and such decisions exemplified what the Court now calls "field preemption." 99The Court did not mention decisions invoked by the United States recognizing "conflict preemption," which invalidated state laws creating obstacles to the accomplishment of federal objectives. 100 Still, the Court found that the Sherman Act did not "suspend" California's pro-rate plan. The plan was not, the Court said, a private agreement but "derived its authority and its efficacy from the legislative command of the state, and was not intended to operate or become effective without that command." 101Neither the Act's language nor its legislative history, the Court said, evinced any purpose "to restrain a state or its officers or agents from activities directed by its legislature." 102 [\*137] The Court expressly invoked federalism considerations to support this conclusion, contending that the Constitution's division of sovereignty between national and state governments counseled against application of the Sherman Act to such restraints: In a dual system of government in which, under the Constitution, the states are sovereign save only as Congress may constitutionally subtract from their authority, an unexpressed purpose to nullify a state's control over its officers and agents is not lightly to be attributed to Congress. 103 The statute's legislative history contained no indication that the Act would apply to such state action, the Court said, and the main sponsor of the bill, Senator Sherman, had asserted that it "prevented only "business combinations.'" 104 Having rejected the Sherman Act challenge, the Court went on to reverse the lower court's Commerce Clause holding that invalidated the scheme. 105The Court conceded that California's regulation of "matters of local concern" was "so related to interstate commerce that it also operated as a regulation of that commerce," that is, the interstate sale of raisins. 106Under pre-1890 (and pre- Wickard) case law, this conclusion that a state was regulating the price of interstate transactions or transportation sufficed to invalidate the scheme. 107However, Congress had not, the Court said, exercised its commerce power (given the Court's Sherman Act holding!), with the result that the Court [\*138] should "reconcile[]" Congressional and state power. 108Such "reconciliation," the Court said, required "the accommodation of competing demands of state and national interests involved." 109 Analogizing to Wickard, the Court rejected the direct/indirect standard for assessing the validity of the restraints, signaling that even direct restraints of interstate commerce could survive Commerce Clause scrutiny. 110The inquiry was not, the Court said, whether the restraint was "direct," (as it assuredly was), but instead whether "the matter is one which may appropriately be regulated in the interest of safety, health and well-being of local communities and, because of its local character, and the practical difficulties involved, may never be adequately dealt with by Congress." 111Because of the activity's "local character," the Court said, there might be a "wide scope for local regulation without substantially impairing the national interest in the regulation of commerce by a single authority and without materially obstructing the free flow of commerce." 112The Court did not explain why the impact of California's self-interested control over the nation's entire raisin supply was "immaterial." 113Nor did it mention various decisions invalidating state regulation of the price and output of products subsequently sold across state lines because they "directly impacted" such commerce. 114 The Court confined its Sherman Act holding to state-imposed restraints on market actors. Such restraints coercively restricted the rights of individuals to engage in the sort of free competition the Sherman Act [\*139] ensures. 115By contrast, the Court said, a state could not "give immunity to those [private parties] who violate the Sherman Act by authorizing them to violate it, or by declaring that their action is lawful." 116Nor, Parker said, could a state participate in otherwise unlawful agreements or combinations with private parties. 117The Court thereby conceded that the Act would preempt some state laws, presumably because such state endorsed conduct or conduct of the state itself would nonetheless conflict with federal law. 118 Thus was born antitrust's "state action doctrine," whereby state-imposed restraints of interstate commerce are "immune" from the Sherman Act, regardless of their economic effects. 119 Parker has remained good law without question for more than seven decades, despite the Court's flexible approach to stare decisis in the antitrust context. 120 B. Parker 's Progeny: Hybrid and Municipal Restraints While Parker purported only to immunize restraints imposed by "a state or its officers or agents," subsequent decisions expanded the doctrine. These cases protected restraints that private parties adopted pursuant to otherwise valid state regulatory programs, reasoning that the threat of private antitrust liability would deter parties from participating in such schemes. 121Indeed, [\*140] some such regimes require all parties in a particular industry to adhere to prices set by a subset of the industry's firms. 122For instance, a statute might require liquor dealers to set retail prices equal to wholesale prices plus a specified mark up. 123Some scholars have dubbed such agreements "hybrid restraints," whereby "the government empowers private firms to make choices, or to exercise discretion, as to the nature or level of consumer injury." 124Such restraints "cede[] to private actors "a degree of private regulatory power' that results in a restraint of trade" 125States can immunize such private restraints from the Sherman Act, and thus escape preemption, if: (1) the legislature clearly articulates a policy to restrict competition and (2) the state "actively supervises" the outcomes ( e.g. price and output) of resulting restraints. 126The liquor regulation just described would satisfy the first part of this test because the state has expressly supplanted competition. Thus, the scheme's validity would depend upon how closely the state scrutinized resulting prices. 127 Such "hybrid" restraints are a small subset of the universe of unreasonable private restraints. Indeed, states' own antitrust laws generally ban unreasonable private restraints. 128When it comes to private restraints, hybrid restraints are the exception and not the rule. [\*141] The Court has applied a similar regime to restraints imposed by municipalities, holding that such entities do not possess the sovereignty possessed by states. 129Restraints imposed by municipalities are fully subject to the Sherman Act, unless the state has clearly articulated a policy displacing competition. 130There is, however, no "active supervision" requirement for such restraints. 131 Thus, Parker and its progeny recognize three distinct types of state-created restraints that thwart free competition but may still escape Sherman Act preemption. First, there are cases like Parker itself, where states coercively displace free competition, expressly setting price or output. Such restraints are without exception immune from the Act, and thus escape preemption. Second, there are hybrid restraints, where the state authorizes or compels private actors to engage in anticompetitive behavior. 132These restraints are immune from the Act if the state satisfies the elements of clear articulation and active supervision. Third there are those cases where a municipality coercively displaces free competition. 133Such restraints are immune if the state satisfies the "clear articulation" requirement. 134 Failure to establish the prerequisites of state action immunity for hybrid or municipal restraints results in two legal consequences: (1) Sherman Act liability for private parties who comply with such restraints and (2) preemption of state or local enactments that authorize or compel such agreements. 135It will be useful to distinguish between these categories of [\*142] state action immunity when evaluating the arguments against preemption of state interference with free competition.

C. The Federalism and State Sovereignty Rationales for the State Action Doctrine

The Court has repeatedly reiterated the federalism and state sovereignty rationales for Parker and its progeny , invoking Parker's reference to our "dual system." 136If anything the Court has increased the emphasis on these rationales for the doctrine; modern decisions identify no other normative justification. It is no surprise that jurists supportive of these values in other contexts have invoked such considerations. 137However, jurists hostile to such values in other contexts have also endorsed Parker and its progeny on identical grounds. 138

Numerous scholars have endorsed Parker's understanding of the Sherman Act. 139

[Footnote 139] See, e.g., William H. Page & John E. Lopatka , Parker v. Brown, the Eleventh Amendment, and Anticompetitive State Regulation, 60 WM. L. REV . 1465, 1472 (2019); James R. Saywell, The Six Sides of Federalism in North Carolina Board of Dental Examiners v. FTC, 76 OHIO ST. L. J. FURTHERMORE 1, 4-9 (2015); Jean Wegman Burns, Embracing Both Faces of Antitrust Federalism: Parker and ARC America Corp., 68 ANTITRUST L. J. 29, 38 (2000); Merrick B. Garland, Antitrust and State Action: Economic Efficiency and the Political Process, 96 YALE L. J. 486 (1987); William H. Page, Antitrust, Federalism, and the Regulatory Process: A Reconstruction and Critique of the State Action Exemption, 61 B.U.L. Rev. 1099, 1101 (1981); Handler, supra note 118, at 19-20; Paul R. Verkuil, State Action, Due Process and Antitrust: Reflections on Parker v. Brown, 75 COLUM. L. REV. 328 (1975).

These scholars echo Parker's invocation of the nation's "dual system" [\*143] and contend that Sherman Act preemption of state-created restraints would trench unduly upon what they characterize as "constitutional" values of state sovereignty and federalism. 140

[Footnote 140] See Page & Lopatka , supra note 139, at 1468-69; Saywell, supra note 139, at 4-9; Burns, supra note 139, at 38-39 (invoking Supreme Court decisions recognizing the "fundamental dual-government structure of the Federal Constitution" to justify Parker); id. (contending that the "dual structure of the federal Constitution ... "requires that Congress treat the States in a manner consistent with their status as residuary sovereigns and joint participants in the governance of the Nation [sic].'") (quoting Alden v. Maine, 527 U.S. 706, 709 (1999)); id. at 38 ("When applied to antitrust, these [recent federalism] rulings make crystal clear that, as a practical matter, antitrust federalism is here to stay. Even if Congress tried to override or limit the Parker shield, such an attempt likely would fail."); Page, supra note 139, at 1102-1107 (describing and endorsing "constitutional basis of the Parker doctrine"); id. at 1128-30 (contending that "active supervision" requirement for hybrid restraints contravenes Parker's constitutional foundation); James F. Blumstein & Terry Calvani, State Action as a Shield and a Sword in a Medical Services Antitrust Context: Parker v. Brown in Constitutional Perspective, 1978 DUKE L. J. 389, 419-24 n.193 (grounding state action doctrine in Tenth Amendment case law); Mark L. Davidson & Robert D. Butters, Parker and Usery: Portended Constitutional Limits on the Federal Interdiction of Anticompetitive State Action, 31 VAND. L. REV. 575, 597-604 (1978) (same); Handler , supra note 118, at 7 n.35 (contending that preemption of state-imposed restraints would "breach[] the basic tenets of the federalism upon which rests our constitutional form of government."); id. at 15 (contending that Sherman Act scrutiny of such restraints "is plainly at war with the fundamental principles of American federalism"); see also Brief Amicus Curiae for the Am. Dental Ass'n, N.C. Bd. of Dental Exam'rs v. FTC, 574 U.S. 494 (2015) (No. 13-534) (criticizing preemption of state's anticompetitive regulation as "trampling upon the sovereignty of the states in our federal system"); Allensworth , supra note 62, at 1402-04 (discussing academic literature contending that Parker rests on constitutional limits on Congress's authority to override state regulation).

Several have also elaborated upon Parker's rationale, contending that the Constitution contemplates that states should be entitled to "regulate their own economies." 141

Several such scholars argue that post- Wickard expansion of the Act to reach local restraints producing no interstate harm bolsters the case for immunity. 142Reversal of Parker, they say , would ensure federal antitrust [\*144] scrutiny of innumerable garden-variety police power regulations, many governing purely local subjects, because such regulations restrain activity with fortuitous but substantial impacts on interstate commerce. 143Federal judicial scrutiny of local regulation would, it is said, replicate the supervision of state economic regulation under the Due Process Clause during the Lochner era. 144These fears have a strong empirical basis. Aside from Parker itself, every Supreme Court decision applying the state action doctrine has involved regulation of local activity that produced only intrastate harm. 145

According to several proponents of Parker, a well-functioning federal system requires states to serve as laboratories of democracy that experiment with various approaches to local economic problems. 146

[Footnote 146] See Saywell, supra note 139, at 7-8 (invoking laboratory metaphor to contend for relaxed definition of active supervision and broader Parker immunity); Burns, supra note 139, at 44 (contending that antitrust federalism, including Parker, protects the existence of "fifty state laboratories, in which ideas can be implemented and tested."); Handler, supra note 118, at 5-6 & n.26 ("To stay experimentation in things social and economic is a grave responsibility. Denial of the right to experiment may be fraught with serious consequences to the Nation. It is one of the happy incidents of the federal system that a single courageous State may, if its citizens choose, serve as a laboratory; and try novel social and economic experiments without risk to the rest of the country.") (quoting New State Ice Co. v. Liebmann, 285 U.S. 262, 311 (1932) (Brandeis, J., dissenting)) ; see also Note, supra note 144, at 2561-62 (arguing that respect for states' role as laboratories militates in favor of respecting diverse state antitrust regimes).

The modern theory [\*145] of competitive federalism predicts that, under certain conditions, rivalry between such sovereigns can produce optimal legislation. 147Preemption, by contrast, would displace these laboratories as sources of novel economic policies responsive to local needs.

Indeed, some have argued that, properly understood, federalism and state sovereignty require more robust immunity from Sherman Act preemption. Some, for instance, have criticized the requirement that states "actively supervise" private parties' implementation of anticompetitive agreements. 148

[Footnote 148] See Saywell, supra note 139, at 6 ("The federal government must respect [state] sovereignty - not redefine it by requiring active supervision of a state's own agencies."); Page, supra note 139, at passim (criticizing this requirement as inconsistent with federalism); Handler, supra note 118, at 9 n.45 and 18 (criticizing proposals that would condition immunity on sufficient "state supervision").

Others contend that restraints imposed by municipalities should enjoy absolute immunity. 149These scholars contend that states should remain free to allocate authority between their respective subdivisions as they see fit, without satisfying procedural requirements imposed under the aegis of the Sherman Act. 150If Parker rests on respect for "federalism and state sovereignty," they say, the Court should respect the otherwise constitutional process that states employ to authorize localities and private parties to impose anticompetitive restraints. 151These arguments would immunize any restraint on competition that a state or its subdivision authorizes under a state's own [\*146] constitutional processes and shield such authorization from Sherman Act preemption. 152

Parker's proponents recognize that anticompetitive state legislation may sometimes impose economic harm on other states. 153Some contend that dormant Commerce Clause jurisprudence will interdict such enactments, obviating any need for Sherman Act intervention, while leaving states free to regulate local activity nominally within the scope of the Act. 154Any succor from the Commerce Clause appears illusory, however. Parker itself rejected the plaintiff's dormant Commerce Clause challenge, even though nearly all the harm produced by the challenged program fell on out-of-state consumers. 155None of these scholars has questioned that holding or identified any decision invalidating Parker-type restraints. Given Parker's deferential Commerce Clause review of state-imposed restraints, the Sherman Act is the only plausible source of preemption. 156Thus, these scholars effectively contend that each state's internal democratic processes should constitute the sole remedy for such wealth-destroying regulation, even when out-of-state voters bear most of the resulting harm. 157

[Footnote 157] See, e.g., Saywell , supra note 139, at 7-8 (contending that Sherman Act preemption of squelches local experimentation and innovation a deprives states of their position as laboratories); Page, supra note 139, at 1107 ("Deference to considered state economic choices thus constitutes the touchstone of the Parker doctrine. This approach draws doctrinal support from the Madisonian model of representative government and dictates judicial restraint as long as the "process of representation' affords interested parties an opportunity to influence the formulation of policy."); Handler, supra note 118, at 19 ("There are democratic processes by which unwarranted laxity of the states can be rectified."); id. at 20 ("I would not substitute preemption for substantive due process to achieve a federal censorship of state legislation; I would turn to the states as the forum for the correction of the mischief[.]").

III. Federalism-Based Objections to Sherman Act Preemption

As the United States explained in its Parker brief, state-imposed restraints of interstate commerce pose obstacles to achieving the central policy of the Sherman Act, namely, reliance upon free competition to allocate the nation's economic resources. 158To be sure, California's scheme imposed significant economic harm on out-of-state citizens, unlike nearly all other state-created restraints. 159However, Mandeville Island Farms expanded the object of the Act to include protecting free competition from local restraints producing no interstate harm. Straight-forward application of the Court's preemption doctrine would thus seem to establish that the Sherman Act preempts all state-created unreasonable restraints - regardless of interstate harm - that produce a substantial effect on interstate commerce, because they pose obstacles to achieving this objective. 160

However, some scholars and the Court contend that principles of constitutional federalism and state sovereignty bolster if not require Parker's rejection of Sherman Act preemption. 161Invocation of "federalism," or "state sovereignty," does not resolve concrete cases. Presumably such considerations must manifest themselves within some doctrinal frameworks, and not as a judicial talking point. The Sherman Act, after all, is a statute, and only the Constitution can restrict its reach.

Still, despite repeated claims that considerations of federalism and state sovereignty justify Parker's state action doctrine, neither the Court nor most of Parker's academic proponents have specified the nature of their federalism or state sovereignty concerns with doctrinal precision. 162

[Footnote 162] See, e.g., Handler, supra note 118, at passim (endorsing Parker without identifying any constitutional doctrine militating against preemption); id. at 7 n.35 (contending that preemption of state economic regulation would "breach[] basic tenets of federalism upon which rests our constitutional form of government is based.").

At best, some proponents have invoked the Tenth and Eleventh Amendments as possible [\*148] sources of such immunity, usually without elaboration. 163

[Footnote 163] See, e.g., Page & Lopatka , supra note 139, at 1468 (the Court has derived the Parker doctrine "from the principle of sovereign immunity"); Burns, supra note 139, at 38 (invoking Supreme Court's then-recent Eleventh Amendment jurisprudence as supporting Parker); Page, supra note 139, at 1105 n.36 (suggesting that Parker could be interpreted as resting upon "the eleventh amendment or, perhaps, ... the tenth amendment."); Davidson & Butters, supra note 140, at 597-604 (contending that Tenth Amendment case law justifies Parker's state action doctrine).

As a result, academic evaluation of the supposed federalism and state sovereignty rationales for Parker's rejection of preemption requires identification of possible doctrinal bases for such concerns, one or more of which could help justify Parker and its progeny.

Such concerns could manifest themselves in two broad categories. First, federal preemption of state-imposed restraints could be outright unconstitutional. 164

[Footnote 164] See Burns, supra note 139, at 38 (asserting that the Tenth and Eleventh amendments prevent Congress from expressly preempting local state legislation otherwise subject to the commerce power); Davidson & Butters, supra note 140, at 597-604.

Second, preemption of such restraints could contradict one or more canons of construction that courts employ to discern the original meaning of ambiguous texts. The remainder of this article will identify and then evaluate the possible arguments in these two categories that may conceivably militate against Sherman Act preemption of state-imposed restraints. As will be seen, evaluation of arguments in the first category will help inform evaluation of arguments that one or more canons of statutory construction justify Parker's interpretation of the Sherman Act.

#### 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.

#### Enforcement high now and thumps links

Ingrassia 1-4 [John Ingrassia, Proskauer Rose LLP, 1-4-2022 https://www.law360.com/articles/1452119/how-to-navigate-the-coming-antitrust-policy-tests]

2021 will be remembered in antitrust law. Not since the 1970s has there been so much chatter over the fundamental purposes of antitrust policy, or such potential for actual sea change.

Half a century ago, Robert Bork and the Chicago School argued that antitrust law had lost its way and should focus on consumer welfare. Bork's view was that antitrust enforcement was getting in the way of legitimate competition, and the U.S. Supreme Court was quick to embrace the consumer welfare standard.

Now, Federal Trade Commission Chair Lina Khan and the new Brandeisians argue that antitrust law has again lost its way and must shed the constraints of the consumer welfare standard.

Khan's view is that consolidation has gone unchecked in the American economy, resulting in structural harms to competition that the consumer welfare standard is unable to address.

She believes the agency has historically defined markets too narrowly to effectively police broader economic impacts of sustained consolidation, and favored gerrymandered remedies over outright challenges.

Khan has imposed sweeping changes aimed at chilling merger activity and shaping the future of merger enforcement. Against dissents from Republican Commissioners Christine Wilson and Noah Phillips, and charge of going rogue from the U.S. Chamber of Commerce, the FTC stripped away long-standing exemptions and interpretations that streamlined merger review.

The action came in response to an unprecedented merger wave — 3,845 acquisitions filed with the agencies in the first 11 months of 2021, substantially more than most full years.

The changes are having an impact, making investigations more intrusive, lengthy and less predictable. Still, policy precedes practice, and while the FTC has been heavy on policy, it has yet to test those policies in the courts.

The tests may come in the next year. Meanwhile, we can also expect the FTC and the U.S. Department of Justice under Assistant Attorney General Jonathan Kanter's leadership, to not only continue the trajectory of policy changes but also begin the task of entrenching them in agency practice.

Here, we review the year in FTC policy moves, what they mean and how to navigate the newly laid minefields.

Warning Letters After the Close of HSR Waiting Periods

In an unprecedented move, the FTC recently began issuing letters to parties in transactions the agency may intend to investigate after expiration of the Hart-Scott-Rodino Act waiting period. According to the agency in an Aug. 3, 2021, blog, this is the result of "a tidal wave of merger filings that is straining the agency's capacity to rigorously investigate deals ahead of the statutory deadlines." Wilson, however, said on Twitter on Aug. 12, 2021, that she was "gravely concerned that the carefully crafted HSR framework is suffering a death by a thousand cuts," following her Aug. 9 statement that said "For the HSR Act to retain meaning, it cannot be that the FTC will keep merger investigations open indefinitely, as a matter of routine, every time there is a surge in filings." The FTC's jurisdiction to review transactions is independent of the HSR reporting requirements, with the power to investigate any transaction before or after closing, whether subject to reporting or not, and whether the HSR waiting period has expired or not. There are examples of the agencies reviewing nonreportable transactions, and even investigating reportable transactions after expiration of the HSR waiting period, though they are rare. The warning letters do not assert new authority not already existing under law, but notifying parties that an investigation may remain open post-HSR clearance implicates finality and certainty of investigations, but not every transaction gets a warning letter. Those with no issues go through unscathed. Those with clear issues are investigated. The deals that might pose some issues, but not enough to draw an investigation, might trigger the newly minted warning letter. To show the letters have teeth, the FTC will sooner or later have to challenge a deal post-HSR waiting period, putting it to the test before courts, where it is likely to face hurdles to the extent the deal did not warrant a full investigation in the first instance. Still, the practice is ushering a change in how provisions are drafted in deal documents. A buyer asserting that it is not required to close over the — arguably — still-pending investigation may face an uphill battle depending on how the closing conditions are drafted, for they typically point to the expiration of applicable waiting periods and not the absence of potential ongoing investigations or issuance of warning letters. So careful buyers seek closing requirements that no investigations are threatened and that no warning letters have been issued. Recent examples include the 3D Systems Corp.'s agreement to acquire Oqton Inc. and Universal Corp.'s agreement to buy Shank's Extracts Inc. The parties' agreements provided that if a warning letter is issued, the investigation would be treated as closed 30 days after receipt of such letter. Buyers may want to consider similar provisions until more emerges on how the FTC will proceed with warning letter transactions.

More Intensive Merger Investigations

The FTC announced plans on Aug. 3, 2021, to make the second request process both "more streamlined and more rigorous." The changes include the following: Merger investigations will address additional potentially impacted competition, such as labor markets, cross-market effects, and the impact on incentives of investment firms. Modifications to second requests will be more limited. The agency will require parties to provide more information relating to their use of e- discovery in responding to the investigation. Additional information will be required with respect to privilege claims. The FTC said these changes are in recognition that "an unduly narrow approach to merger review may have created blind spots and enabled unlawful consolidation." Possibly in response to such steeped up investigative techniques and resistance to find common ground with merger parties, Sportsman's Warehouse Holdings Inc. and Great Outdoors Group LLC abandoned their proposed merger at the end of 2021, citing indications that the FTC would be unlikely to approve the outdoor sporting goods transaction. The changes, though, do little to streamline the second request process. They make it more complex, burdensome and time-consuming. Perhaps most notable is the use of the process to delve into labor markets. Republicans Wilson and Phillips argued that FTC leadership may have themselves to blame for the merger review crunch, saying in a Nov. 8, 2021 statement: If the agency is lowering thresholds of concern and broadening theories of harm, this certainly would explain why the FTC is unable to conduct merger reviews in a timely manner while our sister agency remains capable of addressing the same increased filing volumes within statutory timeframes.

More Onerous Consent Decree Provisions

Where merger parties settle a challenge rather than litigate, the consent decree process sets out the parties' obligations. Historically, such consent decrees, among other things, required parties to notify the agency prior to certain future acquisitions. The FTC rescinded this long-standing policy, noting that it: Returns now to its prior practice of routinely requiring merging parties subject to a Commission order to obtain prior approval from the FTC before closing any future transaction affecting each relevant market for which a violation was alleged. The agency will also require divestiture buyers to agree to prior approval for any future sale of the assets they acquire. Khan explained the move was to avoid "drain[ing] the already strapped resources of the Commission" on "repeat offenders." The FTC included the new provision in its Oct. 25, 2021, consent decree settling a proposed transaction by DaVita Inc., a dialysis service provider. DaVita is now required to receive prior approval from the FTC of 10 years before any new acquisitions, a dialysis clinic business in Utah being in question. This is a significant change and will chill not only settlements with the FTC, but also M&A transactions at the outset where such provisions are commercially untenable. Wilson and Phillips noted in dissent that "a prior approval requirement imposes significant obligations on merging parties and innocent divestiture buyers." The FTC clearly aims to chill M&A activity, and merger agreements that provide more optionality to abandon deals will become more common, though parties intent on pushing their deal through may see a consent decree with 10-year approval provisions as less palatable than litigating, and force the FTC to cave or go to court.

Withdrawal of the Vertical Merger Guidelines

In another party-line vote, the FTC withdrew the vertical merger guidelines, which were issued just last year. Democratic commissioners criticized the guidelines as based on "unsound economic theories that are unsupported by the law or market realities," and reflecting a "flawed discussion of the purported procompetitive benefits (i.e., efficiencies) of vertical mergers." Vertical transactions are between firms at different levels in the supply chain. Historically, antitrust enforcement of exceptional vertical mergers were rare and difficult given the previously presumed efficiencies. Vertical mergers can eliminate double marginalization, in which firms at each level mark up prices above marginal cost. Elimination of one markup results in lower prices and can be pro-competitive. Khan, however, argues the guidelines' "reliance on [elimination of double marginalization] is theoretically and factually misplaced." Going forward, "the FTC will analyze mergers in accordance with its statutory mandate, which does not presume efficiencies for any category of mergers." This too drew a strong rebuke from the Republican commissioners, who said "The FTC leadership continues the disturbing trend of pulling the rug out under from honest businesses and the lawyers who advise them." The commission's challenges to chipmaker Nvidia Corp.'s $40 billion acquisition of U.K. chip design provider Arm Ltd. alleged the transaction would combine one of the largest chip producers with a firm that has essential design technology — critical inputs. In a Dec. 2, 2021, statement, the FTC said the acquisition "would distort Arm's incentives in chip markets and allow the combined firm to unfairly undermine Nvidia's rivals." The FTC's lawsuit should "send a strong signal that we will act aggressively to protect our critical infrastructure markets from illegal vertical mergers that have far-reaching and damaging effects on future innovations," FTC Bureau of Competition Director Holly Vedova said in the statement. Given that vertical mergers will be closely scrutinized as a matter of course, parties need to consider concerns the FTC may identify and prepare strong counters — other than elimination of double marginalization. For example, parties could argue that the transaction expands access to products and expands consumer choice. Parties willing to go the distance with a vertical merger should also remain mindful that the guidelines have never been cited or relied on by a court, and it is the established jurisprudence on vertical transactions that will carry the day.

Rescinding the Consumer Welfare Standard

In July 2021, the FTC rescinded its policy interpreting its statutory mandate to root out "unfair methods of competition" as coterminous with promoting consumer welfare under the Sherman and Clayton Acts. In a July 19, 2021, statement, the FTC called the rescinded policy was "bind[ing] the FTC to liability standards created by generalist judges in private treble-damages actions under the Sherman Act." Still, the consumer welfare standard has been entrenched in antitrust jurisprudence for decades, and the FTC cannot change that. The immediate impact is thus more likely to be seen in administrative actions in the FTC's own court. In a dissenting statement, Republican commissioners countered that FTC leadership does not propose a replacement standard and "that efforts to distance Section 5 from the consumer welfare standard are a recipe for bad policy and adverse court decisions," adding that, "unlike those in academia, the FTC will have to defend its interpretation of Section 5 in court, where it should expect a hostile reception if it cannot offer clear limiting principles."

Labor Market Scrutiny

Government investigations and private litigation relating to no-poach and wage-fixing agreements are ballooning, and criminal indictments are now a reality. Encouraged by President Joe Biden's executive order on competition, the FTC and the DOJ have doubled down on investigating labor markets. Merger investigations now routinely include requests for employee compensation data, inquiries regarding noncompete and nonsolicit agreements, and are more likely to delve into both the merger's effects on labor, and the parties' prior labor practices. The DOJ's challenge to Penguin Random House LLC's proposed acquisition of Simon & Schuster Inc. focuses on harm to the labor market — for authors. In his first public comments, the DOJ's Kanter said: We will fight for American workers including in connection with illegal mergers that substantially lessen competition for laborers. Going forward, you can expect efforts like these not only to continue but to increase. Khan echoed the sentiment, saying: Competition and conduct can hurt us not just as consumers who buy products from a shrinking number of large firms, but also as workers who are especially vulnerable and subject to the whims of a boss we can't equally or practically escape. Antitrust compliance policies now must extend to addressing practices with respect to employee recruiting and compensation. Antitrust compliance training must extend beyond the sales team, and include HR. Businesses are reviewing and revising their compliance policies, and beginning new antitrust training programs to ensure that they are not subjected to claims of depressed wages and barriers to worker mobility.

Looking Ahead to the Year to Come

The year 2021 has been like no other for antitrust enforcement. While the FTC's various policy pronouncements are clearly intended to chill merger activity, it does not appear to have had the intended outcome.

HSR filings continue at off-the-charts levels. Amid this strong showing of M&A activity, the advice is to keep moving transactions forward, stay ahead of the new tacks the agencies might take, and account for newly injected risk and uncertainty.

Looking ahead, expect another energetic year. So far, the FTC's policy changes have not seemed to slow the pace of merger activity, but the frenzy cannot last forever. Nonetheless, merging parties are now going into the merger review process with eyes open, knowing it is likely to be more intense and uncertain. Parties to vertical transactions will no longer ride easy on double marginalization theories, and parties will be handing over their HR and payroll files.

At the same time, the heavy resistance to these changes will continue, if not strengthen, and will play out not just in courts and the halls of Congress, but will also spill into the political mainstream.

The U.S. Chamber of Commerce is planning to spend hundreds of thousands of dollars on an ad campaign across 10 states denouncing what it calls the FTC's overstepping of regulatory authority.

#### 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.