# 1AC

### Innovation

#### Predatory pricing creates kill zones where innovation is completely stifled – Antitrust reform is key to solve

Nadler et al 20, Jerrold Nadler is the Chairman of the House Judiciary Committee. “Investigation of Competition in Digital Markets” House Judiciary Committee, 2020, https://fm.cnbc.com/applications/cnbc.com/resources/editorialfiles/2020/10/06/investigation\_of\_competition\_in\_digital\_markets\_majority\_staff\_report\_and\_recommendations.pdf

BACKGROUND A. Overview of Competition in Digital Markets The Role of Competition Online At a fundamental level, competition has been a key engine of economic activity in the United States,90 resulting in the “pioneering of entire industries that, in time, come to employ millions and generate trillions.” 91 This is especially true in the digital economy. As in other industries, competition in digital markets incentivizes incumbent firms and new entrants to build new technologies and improve business processes.92 It spurs capital investment and incentivizes firms to improve the quality of their offerings.93 In its absence, incumbent firms lack incentive to invest in research and development.94 This in turn slows the rate of innovation across industry.95 Disruptive new products or services are replaced with slow, incremental alterations96 “designed to protect [incumbent firms’] existing revenue streams.” 97 Slowly but surely, venture capitalists lose the incentive to invest in new entrants willing to challenge the dominance of incumbent firms through direct competition.98 What we are left with are so-called “kill zones”— the near-complete absence of competition. The benefits of robust competition in the digital economy goes beyond innovation and productivity. It can also spur firms to compete along other dimensions such as privacy and data protection. As a general matter, inadequate competition not only leads to higher prices and less innovation in many cases, but it can also reduce the quality of goods and services.99 Given that many digital products do not charge consumers directly for services, these firms often compete on quality.100 Along these lines, lack of competition can result in eroded privacy and data protection.101 Growing evidence indicates that a lack of competition goes hand in hand with just such quality degradation.102 Market Structure a. Winner-Take-All Markets Certain features of digital markets—such as network effects, switching costs, the self-reinforcing advantages of data, and increasing returns to scale—make them prone to winnertake-all economics.103 As a result, many technology markets “tip” in favor of one or two large companies,104 shifting the “the competitive process from competition in the market to competition for the market.” 105 In turn, high barriers to entry may diminish the ability of new firms to challenge incumbent firms, further undermining the competitive process and protecting the dominance of existing firms.106 As the United Kingdom’s Competition and Markets Authority explains: [I]f potential competitors face substantial barriers to entry and expansion, such that the market is no longer properly contestable, then a high market share can translate into market power, giving the platform the opportunity to increase prices, reduce quality or leverage market power to undermine competition in potentially competitive markets and deny innovative rivals the chance to bring new services to market.107 b. Market Concentration Consistent with winner-take-all dynamics, the digital economy is highly concentrated.108 A number of key markets online—such as social media, general online search, and online advertising— are dominated by just one or two firms.109 In some instances, this concentration is the result of a high volume of acquisitions by the dominant digital platforms. Together, the largest technology firms have acquired hundreds of companies in the last ten years. 110 Antitrust enforcers in the United States did not block any of these transactions,111 many of which eliminated actual or potential competitors.112 In some instances these acquisitions enabled the dominant firm to neutralize a competitive threat; in other instances, the dominant firm shut down or discontinued the underlying product entirely—transactions aptly described as “killer acquisitions.” 113 Evidence also suggests that the venture capital industry, which plays a critical role in funding innovative startups, contributes to market consolidation by encouraging startups to exit via a sale to an incumbent firm.114 As initial public offerings (IPOs) have become more expensive and timeconsuming in recent decades, venture capitalists have shown a preference for realizing their investments through acquisitions rather than through public markets.115 c. The Role of Online Platforms as Gatekeepers As Amazon, Apple, Facebook, and Google have captured control over key channels of distribution, they have come to function as gatekeepers. A large swath of businesses across the U.S. economy now depend on these gatekeepers to access users and markets. In interviews with Subcommittee staff, numerous businesses described how dominant platforms exploit this gatekeeper power to dictate terms and extract concessions that third parties would not consent to in a competitive market.116 According to these companies, these types of concessions and demands carry significant economic harm but are “the cost of doing business” given the lack of options. Their role as gatekeepers also gives the dominant platforms outsized power to control the fates of other businesses. Reflecting this fact, several major publicly owned firms that rely on the dominant platforms have noted in investor statements that this dependent relationship creates an inherent risk to their businesses.117 For example, Lyft, a ride-sharing company, has cited its use of Amazon’s cloud services and Google Maps as a potential risk to its business model.118 As Lyft stated in a filing, “Some of our competitors or technology partners may take actions which disrupt the interoperability of our platform with their own products or services.” 119 Pinterest, a photo-sharing service, likewise noted in a financial filing that changes to Google’s search algorithm may harm Pinterest. As it noted, Pinterest’s “ability to maintain and increase the number of visitors directed to our service from search engines is not within our control. Search engines, such as Google, may modify their search algorithms and policies or enforce those policies in ways that are detrimental to us.” 120 In submissions and interviews with Subcommittee staff, many companies reiterated the general concern that a single act or decision by one of the dominant platforms could wreck their business. Since the dominant platforms in many cases have also integrated into adjacent lines of business, these firms operate both as key intermediaries for third-party businesses as well as direct competitors to them. Numerous entrepreneurs, small businesses, and major companies told Subcommittee staff that the dominant platforms’ dual role raises significant competition concerns.121 In recent years, significant reporting has documented how the dominant platforms can exploit this dual role, through data exploitation,122 self-preferencing,123 appropriation of key technologies,124 and abrupt changes to a platform’s policies.125 The Subcommittee’s investigation uncovered numerous examples of this exploitative conduct, suggesting that these are increasingly systemic, rather than isolated, business practices. Barriers to Entry a. Network Effects Digital markets tend to be characterized by strong network effects, making them prone to concentration and monopolization.126 There are two types of network effects: direct and indirect. In markets with direct network effects, the more people who use a product or service, the more valuable that product or service becomes to other users.127 By contrast, indirect network effects arise when greater use of a product or service forms a new type of standard and increases the incentive for third parties to invest in developing compatible technologies, which in turn reinforces the popularity of the original product or service with users.128 Online platforms display strong network effects because they connect disparate market segments. For example, online commerce platforms like Amazon connect buyers and sellers. Just as with social networks, the value of Amazon marketplace increases as more users—both sellers and buyers—engage with the platform.129 Similarly, the value of online platforms that facilitate advertising, such as Google, increases with the number of users, as advertisers gain access to a larger consumer base and therefore to a larger trove of consumer data.130 Similarly, social networks like Facebook exhibit powerful direct network effects because they become more valuable as more users engage with the network—no person wants to be on a social network without other users.131 Meanwhile, once a firm captures a network it can become extremely difficult to dislodge or replace. As Mark Zuckerberg explained to then-CFO David Ebersman the benefits that would accrue to Facebook from acquiring Instagram: [T]here are network effects around social products and a finite number of different social mechanics to invent. Once someone wins at a specific mechanic, it’s difficult for others to supplant them without doing something different. It’s possible someone beats Instagram by building something that is better to the point that they get network migration, but this is harder as long as Instagram keeps running as a product.132 Strong network effects serve as a powerful barrier of entry for new firms to enter a market and displace the incumbent.133 When combined with other entry barriers such as restrictions on consumers or businesses easily switching services, network effects all but ensure not just market concentration but durable market power.134 b. Switching Costs Switching costs present another barrier for potential market entrants. In many cases, large technology firms can maintain market power in part because it is not easy for users to switch away from the incumbent’s technology. A market exhibits “lock-in” when switching costs are sufficiently high that users stay with an incumbent firm rather than switch to a firm whose product or service they would prefer.135 Over time, lock-in tends to reduce competition, deter market entry, and may even worsen data privacy.136 High switching costs are a central feature of digital search and social media platforms, such as Google and Facebook, where users contribute data to the platform but may not be able to migrate that data to a competing platform. For example, a user may upload a variety of data to Facebook, including photos and personal information, but may not be able to easily download that data and move it to another social media site; instead, the user would have to start from scratch, re-uploading her photos and re-entering her personal information to the new platform.137 An online seller who has generated hundreds of product reviews and ratings on Amazon may face a similar challenge when considering migrating to a different platform. Other significant factors that contribute to switching costs in digital markets include anticompetitive contracting terms and default settings and product design that favor dominant platforms.138 c. Data The accumulation of data can serve as another powerful barrier to entry for firms in the digital economy. Data allows companies to target advertising with scalpel-like precision, improve services and products through a better understanding of user engagement and preferences, and more quickly identify and exploit new business opportunities.139 Much like a network effect, data-rich accumulation is self-reinforcing. Companies with superior access to data can use that data to better target users or improve product quality, drawing more users and, in turn, generating more data—an advantageous feedback loop.140 In short, new users and or greater engagement brings in more data, which enables firms to improve user experiences and develop new products—in turn capturing more data.141 While data is non-rivalrous—meaning that one party’s use does not prevent or diminish use by another—firms may nonetheless exclude rivals from using their data through technical restrictions and legal contracts.142 These exclusionary tactics can close off markets and shield incumbents from competition.143 In addition to serving as a barrier to entry, superior access to data can enable and exacerbate anticompetitive conduct in digital markets. This is particularly true when a dominant platform operates as both a marketplace for third-party goods as well as a seller of its own products on that same marketplace.144 Through this dual role, a dominant platform can mine commercially valuable information from third-party businesses to benefit its own competing products.145 Additionally, a dominant platform can use its market power to extract more data from users, undermining their privacy.146 Persistent data collection can also create information asymmetries and grant firms access to non-public information that gives them a significant competitive edge. These insights include information on user behavior as well as on broader usage trends that enable the dominant platforms to track nascent competitive threats. In an interview with Subcommittee staff, a senior executive at a social media company referred to this ability as akin to having “a spy camera on the production floor” of a competitive threat.147 Roger McNamee, the Co-Founder of Elevation Partners, has noted that the dominant platforms’ role as digital infrastructure gives them both leverage and insights that other competitors lack: Essentially, the interplay of Google’s dominant position in … infrastructure elements [such as] ad tech infrastructure, Chrome browser, [and Nest] … collectively provide leverage over other market participants, which include not just startups, but also advertisers, and other would-be competitors. And the key thing is, it’s not just about Google’s infrastructure. When you add in Gmail, Search, Maps, apps, and all the other things that Google does so well … [t]hey provide further levels of user lock-in—further protective modes that really limit the opportunity of competitors and even, frankly, suppliers and advertisers, to do the things that they should be able to do in a freely competitive economy.148 This significant data advantage also enables dominant platforms to identify and acquire rivals early in their lifecycle. Leading economists and antitrust experts have expressed concern that serial acquisitions of nascent competitors by large technology firms have stifled competition and innovation.149 This acquisition strategy exploits dominant firms’ information advantages in order to acquire rapidly growing companies just before those companies become true threats.150 Lacking access to this same information or failing to appreciate its significance, enforcers may fail to identify these acquisitions as anticompetitive. This is more likely when the dominant platform buys a nascent threat before it has fully developed into a rival. In a briefing before Members of the Subcommittee, Jonathan Sallet, former Deputy Assistant Attorney General at the Antitrust Division, explained that data-driven acquisitions of nascent or potential rivals can significantly undermine competition while systematically evading antitrust scrutiny.151 One reason is that upstart competitors are often data-rich but cash-poor, a combination that is unlikely under a price-centric framework to trigger antitrust scrutiny if the acquisition is priced below the relevant threshold for merger review.152 For example, had Microsoft sought to exploit its monopoly power in the market for personal computer operating system by acquiring Netscape—rather than by foreclosing it—it is unlikely that antitrust enforcers would have taken action. He noted that this the type of acquisition can tip the market in favor of a dominant firm, having the same ultimate effect as monopolistic conduct but escaping the antitrust enforcement that monopolistic conduct has triggered in the past.153 d. Economies of Scale and Scope Increasing returns to scale are another feature of technology markets that make them prone to tip towards concentration and monopolization.154 In markets with increasing returns to scale, as sales increase, average unit cost decreases.155 Because entry into these markets requires significant up-front costs, the market favors firms that are already large, making it difficult for new firms to enter the market and challenge large incumbents.156 Likewise, a dominant firm that enjoys economies of scope can extend its reach across adjacent markets through an expansive ecosystem of its own products while incurring relatively low cost.157 For example, if a firm has sufficient technical expertise or access to consumer data, the cost of applying this resource into a new market is relatively low. Businesses that specialize in providing information, such as Google, frequently benefit from increasing returns to scale.158 These businesses require high upfront fixed costs, but then may scale with relatively low increases in cost. For example, “Google can update Google Calendar for 100 million users with similar fixed expenses as would be needed for only a fraction of such users.” 159 Facebook is another company that benefits from increasing returns to scale.160 Although building the Facebook platform required a large upfront investment, the platform was able to grow exponentially with relatively little increase in costs. With the benefit of increasing returns to scale, Facebook was able to grow from one million users in 2004, the year of its founding, to more than 350 million users in only five years.161 Recent economic evidence indicates that economies of scale achieved through data collection allow platforms to get more out of consumers than consumers get out of platforms.162 In exchange for “free” services, users provide valuable social data—information that may also shed light about other people’s behavior—in addition to their own personal information. For instance, a person’s location Effects of Platform Market Power Innovation and Entrepreneurship Competition is a critical source of innovation, business dynamism, entrepreneurship, and the “launching of new industries.” 165 Vigorously contested markets have been a critical competitive asset for the United States over the past century.166 While large firms with significant resources may invest in research and development for new products and services, competition forces companies to “run faster” in order to offer improved products and services.167 Without competitive pressure, some level of innovation may still occur, but at a slower, iterative pace than would be present under competitive market conditions.168 In recent decades, however, there has been a sharp decline in new business formation as well as early-stage startup funding.169 The number of new technology firms in the digital economy has declined,170 while the entrepreneurship rate—the share of startups and young firms in the industry as a whole—has also fallen significantly in this market.171 Unsurprisingly, there has also been a sharp reduction in early-stage funding for technology startups.172 The rates of entrepreneurship and job creation have also declined over this period. The entrepreneurship rate—defined as the “share of startups and young firms” in the industry as a whole— fell from 60% in 1982 to a low of 38% as of 2011.173 As entry slows, the average age of technology firms has skewed older.174 Job creation in the high-technology sector has likewise slowed considerably.175 In 2000, the job creation rate in the high-technology sector was approaching 20% year-over-year. Within a decade, the rate had halved to about 10%.176 Although the job creation rate in the high-technology sector has fallen substantially since the early 2000s, the job destruction rate in 2011 was roughly unchanged from 2000.177 As a result, in 2011 the rate of job destruction in the hightechnology sector was higher than the rate of job creation, a reversal from the year 2000, when the jobcreation rate far outpaced the job-destruction rate.178 In line with this trend, there is mounting evidence that the dominance of online platforms has materially weakened innovation and entrepreneurship in the U.S. economy.179 Some venture capitalists, for example, report that they avoid funding entrepreneurs and other companies that compete directly with dominant firms in the digital economy.180 Often referred to as an innovation “kill zone,” this trend may insulate powerful incumbent firms from competitive pressure simply because venture capitalists do not view new entrants as good investments.181 Albert Wenger, the managing partner of Union Square Ventures, commented that the “scale of these companies and their impact on what can be funded, and what can succeed, is massive.” 182 Paul Arnold, an early-stage investor and founder of Switch Ventures, commented at the Justice Department’s recent workshop on the intersection between venture capital and antitrust law that he considers markets dominated by large platforms to be kill zones.183 He explained: [T]here’s an incredibly, concentrated market share because of the economies of scale or because of network effects, it’s a really hard barrier to overcome. And sometimes there’s an answer and often, that will kill things. And I think that that’s my view, that’s my, sort of, lived experience as a venture investor, but I think it’s a common view of a lot of venture investors.184 In the same vein, Mr. Arnold said in a submission to the Subcommittee that: Venture capitalists are less likely to fund startups that compete against monopolies’ core products … As a startup investor, I see this often. For example, I will meet yet another founder who wants to disrupt Microsoft’s LinkedIn. They will have a clever plan to build a better professional social network. I always pass on the investment. It is nearly impossible to overcome the monopoly LinkedIn enjoys. It is but one example of an innovation kill zone.185 For example, the entrenched power of firms with weak privacy protections has created a kill zone around the market for products that enhance privacy online .186 To the extent that a firm successfully offers a service to give people tools to control their privacy, “Google or Facebook are going to want to pull that back as fast as they possibly can. They don’t want you aggressively limiting their extremely valuable information collection.” 187 Other prominent venture capitalists, such as Roger McNamee, the Co-Founder of Elevation Partners, have commented that these trends harm more than just startups. The advantage of dominant firms online—access to competitively significant sources of data, network effects, intellectual property, and excess capital—are “a barrier to a wide range of activities, not just startups, but actually a lot of other market participants.” 188 Merger activity may be another contributor to reduced venture capital investment of startups. In a recent study, several leading economists and researchers at the University of Chicago—Raghuram G. Rajan, Luigi Zingales, and Sai Krishna Kamepalli—found that major acquisitions by larger firms in sectors of the digital economy led to significantly less investment in startups in this same sector.189 As they note, in the wake of an acquisition by Facebook or Google, investments in startups in the same space “drop by over 40% and the number of deals falls by over 20% in the three years following an acquisition.” 190 The threat of entry from a large platform has had significant effects on other firms’ incentives to innovate,191 while the actual entry of the larger online platform can result in less innovation and an additional increase in prices.192 During the investigation, Subcommittee staff interviewed a prominent venture capital investor in the cloud marketplace who explained that this power imbalance creates a strong economic incentive for other firms to avoid head-on competition. As he noted: I think of Amazon as the sun. It is useful but also dangerous. If you’re far enough away you can bask. If you get too close you’ll get incinerated. So, you have to be far enough from Amazon and be doing something that they wouldn’t do. If you’re a net consumer of Amazon’s infrastructure, like Uber, then you’re okay. As long as Amazon doesn’t want to get into ridesharing. But it’s hard to predict what Amazon wants to get into. If they were going to stop at retail and computing, you’re safe. But you can’t know. 193 As discussed in this Report, other behavior by dominant firms—such as cloning the products of new entrants—may also undermine the likelihood that new entrants will be able to compete directly or that early adopters will switch to a new entrant’s product, lowering the valuation of these companies as well as their profitability.194 In July 2019, the Subcommittee held a hearing to examine the effects of market power on innovation and entrepreneurship. There, a panel of experts noted that the lack of competitive pressure in the U.S. economy has reduced innovation and business formation, while also allowing dominant firms to control innovation.195 Professor Tim Wu of Columbia Law School, a pioneer in internet policy, said that there is no question as to whether there were barriers to entry and whether the tech economies have, in fact, become a very difficult place for people to get started . . . the decline in the number of startups, almost unthinkable in the United States, which has always had a comparative advantage in being the place where startups will get their start.196 Professor Fiona Scott Morton of the Yale University School of Management reinforced this concept in her testimony, noting that insufficient competition has given dominant firms the ability to channel innovation in the direction they prefer “rather than being creatively spread across directions chosen by entrants.” 197 In addition to innovation harms in the digital marketplace, Stacy Mitchell, the Co-Director of the Institute for Local Self Reliance, explained that entrepreneurism among locally owned businesses has also suffered as a result of this power. As she noted, “Local businesses are disappearing and, with them, a pathway to the middle class. Producers are struggling to invest in new products and grow their companies. New business formation is down to historic lows.” 198 At the Subcommittee’s field hearing, senior executives representing different businesses across the economic spectrum offered similar testimony about the effects of market power on innovation and entrepreneurship. Patrick Spence, the CEO of Sonos, testified that the lack of fair competition diminishes innovation, particularly for firms that cannot afford to sell products at a loss.199 He explained: These companies have gone so far as demanding that we suppress our inventions in order to work with them. The most recent example of this is Google’s refusal to allow us to use multiple voice assistants on our product simultaneously. . . . I think the whole spirit of trying to encourage small companies, encourage new innovations and new startups is at risk, given how dominant these companies are.200 Furthermore, the ability of a dominant firm to extract economic concessions from smaller companies that rely on it to reach the market can also depress innovation. David Barnett, the CEO and Founder of PopSockets, testified at the field hearing that Amazon required his company “to pay almost two million in marketing dollars in order to remove illegal product from the Amazon marketplace.” 201 In response to questions from Representative Ken Buck (R-CO) on the effect of this policy on innovation, Mr. Barnett testified that this money could have been used to double the number of employees dedicated to developing innovative products at the company.202

#### 2 links

#### 2 – AWS

#### AWS stifles cloud computing innovation

Nadler et al 20, Jerrold Nadler is the Chairman of the House Judiciary Committee. “Investigation of Competition in Digital Markets” House Judiciary Committee, 2020, https://fm.cnbc.com/applications/cnbc.com/resources/editorialfiles/2020/10/06/investigation\_of\_competition\_in\_digital\_markets\_majority\_staff\_report\_and\_recommendations.pdf

Amazon Web Services a. Overview Amazon Web Services (AWS) is considered the pioneer of cloud computing and has sustained a first-mover advantage for over a decade.1985 AWS officially launched in 2006, featuring two of its core IaaS offerings, Simple Storage Service (S3) and Elastic Compute Cloud (EC2).1986 While Amazon.com was AWS’s first customer, in the early 2000s AWS began creating cloud offerings for third-party merchants, who could use AWS to “build online shopping sites on top of Amazon’s ecommerce engine.” 1987 For AWS, meanwhile, this partnership with third parties gave the company experience in creating well-documented APIs for internal developers.1988 Over the next few years, AWS rolled out additional programs to expand its network of third-party software vendors and implementation partners, including AWS Marketplace1989 and the AWS Partnership Network (APN) in 2012.1990 Over the last decade, AWS has also secured significant government contracts. Most notably, in 2014, AWS signed a $600 million Commercial Cloud Services (C2S) contract to build the AWS Secret Region, a cloud offering tailored for the U.S. intelligence community.1991 The deal marked the largest cloud infrastructure contract at the time and signaled the government’s shift from investing in onpremise server capacity to cloud services.1992 Today, AWS boasts work “with over 6,500 government agencies” and states that Amazon has been “among the first to solve government compliance challenges facing cloud computing,” while also “consistently help[ing] our customers navigate procurement and policy issues related to adoption of cloud computing.” 1993 AWS contributes immense value to Amazon’s overall business. In each quarter since Amazon began publicly reporting its financials for cloud, AWS has accounted for an outsized share of Amazon’s operating profits. While AWS contributes to less than 15% of Amazon’s annual revenue, it consistently accounts for over 50% of the company’s operating income. In 2017, AWS accounted for over 100% of Amazon’s operating income, due to losses in the company’s international business.1994 In the first quarter of 2020, AWS accounted for 13.5% of Amazon’s total revenues but 77% of its operating income.1995 Profits earned through its cloud services enable Amazon to invest heavily in expanding its cloud operation, as well as to support its other lines of business. Several market participants expressed concerns to Subcommittee staff that Amazon uses its high and steady profits from AWS to subsidize these other lines of business, including its retail operation.1997 In an internal document produced in response to the Committee’s requests for information, Amazon instructs its employees to rebut this claim by referring to it as a “myth.” 1998 However, Amazon failed to produce the financial data that would have enabled Subcommittee staff to make an independent assessment. As discussed earlier in this Report, AWS is the largest provider of cloud computing services, capturing approximately 24% of the U.S. spend in 2018 on cloud computing services, including IaaS, PaaS, and SaaS.2000 AWS represents close to half of global spending on cloud infrastructure services, with three times the market share of Microsoft, its closest competitor.2001 Its growth continues to soar. In the first quarter of 2020, AWS crossed $10 billion in quarterly revenue while growing 33% on an annualized basis.2002 Amazon has a “lion’s share of the government cloud infrastructure market.” 2003 Exact data on AWS’s share of government cloud expenditure is opaque because most of AWS’s public sector revenue comes through subcontracts, which are harder to track, and contracts related to the intelligence community, which are listed as classified spending and are rarely reported. Market participants, however, emphasize that AWS is considered a major player in federal cloud contracts.2004 In its submissions to the Subcommittee, Amazon describes itself as a relatively small player representing “less than 1% of IT spending globally and less than 2% in the United States.” 2005 Amazon states that AWS competes with a large array of offerings including on-premise computing.2006 In other contexts, however, Amazon has highlighted its leading position, describing itself as the “largest cloud software marketplace” and the “only cloud provider with existing classified infrastructure.” 2007 Through a careful review of Amazon’s internal documents and other evidence during the investigation, Subcommittee staff found that Amazon has a dominant position in cloud computing. Amazon’s dominance in cloud computing traces in part to its first-mover advantage and the high fixed costs and economies of scale associated with this market.2008 But evidence suggests that Amazon has also taken steps to lock in and extend this dominance in ways that risk harming customers, businesses, and the broader public. Network effects incentivized Amazon to build out AWS offerings quickly. As with other sectors of the digital economy, the value of Amazon’s cloud offerings increases with the number of businesses and customers that use it. Introducing more services and partnership programs draws more customers, attracts more developers and implementation partners, which, in turn, draws additional customers.2009 AWS is considered to have the largest collection of cloud offerings. Its AWS Management Console and supporting technologies span many categories, including storage and computing, databases, migration services, and machine learning tools.2010 Many of these products are based on open-source software or on the technology of companies that Amazon acquired.2011 In addition to selling cloud offerings directly, AWS also runs a cloud marketplace where third-party vendors can list their products. The AWS Marketplace enjoys over 1,300 vendors as of 2018, and over 9,000 products, functioning as the largest cloud marketplace in the sector.2012 The widespread adoption of AWS’s developer certification programs, partner networks, and student programs has meant that there are far more engineers familiar with AWS technology than with any other platform.2013 Several market participants listed the availability of AWS-trained engineers as a reason for selecting AWS over other cloud vendors and as a barrier for switching platforms or attempting to multi-cloud.2014 High switching costs reinforce Amazon’s dominance in the cloud market.2015 A cloud-based application company interviewed by Subcommittee staff explained these costs: We’ve looked at other services (Google, Microsoft, Oracle) but we’ve relied on AWS for so long that we couldn’t just flip a switch, and we’ve run down a lot of engineering problems with AWS . . . There are other providers we could go to, but it would take work. We could also build some functionality internally, but that would also take a lot of work.2016 For cloud-based application developers, whose entire product is dependent on AWS, the fears of lock-in are even greater. One marketplace participant said: “[A]ny transition of the cloud services currently provided by AWS to another cloud service provider would be difficult to implement and would cause us to incur significant time and expense and could disrupt or degrade our ability to deliver our products and services. Our business relies on the availability of our services for [users] and advertisers.2017 Amazon has also taken steps to lock-in its position, including through long-term contracts, volume minimums, and the use of fees to move data to other cloud providers, which are also known as egress fees. In submissions to the Subcommittee, numerous market participants noted that AWS often seeks multi-year contracts during negotiations.2018 These contracts are also commonplace in companies’ investor statements. For example, according to Lyft’s 2020 investor filing, they agreed to pay “an aggregate of at least $300 million between January 2019 and December 2021 on AWS services.” 2019 According to Slack’s investor filling, in 2018 it committed to a five-year contract with minimum annual commitments of $50 million.2020 Subcommittee staff also uncovered evidence that Amazon sometimes requires a volume agreement when a large company seeks to negotiate lower prices. In an internal email discussion on this topic, a senior executive at AWS wrote that Amazon has “a private rate card which has a commit level for bandwidth pricing. Rates at or above the private rate card are pre-approved. Anything below that has to be first approved by me and then the price goes to service GM.” 2021 When an Amazon customer chooses to move data to another cloud provider, they are charged an egress fee. Market participants told Subcommittee staff that they view these fees less as a cost for Amazon to transport data and more as friction imposed by Amazon for switching providers, noting that Amazon charges egress fees even when data is staying locally within the same data center.2022 The COVID-19 pandemic has underscored the centrality of cloud computing to the functioning of an increasing swath of businesses—highlighting how cloud services have come to resemble critical infrastructure. Reporting by The Information in April 2020 discussed how the major cloud providers are facing requests from many customers for financial relief, while the demand for cloud computing has increased.2023 As this reporting noted, “AWS has been the least willing to offer flexible terms on customer bills, according to numerous customers. That stands in contrast to Microsoft and Google which have shown some flexibility, partners say.” 2024 c. Merger Activity Amazon has acquired a significant number of cloud computing firms over the past decade. Although a full discussion of this activity is beyond the scope of this Report, Amazon’s acquisition activity in the cloud market appears to be part of a broader trend among dominant cloud providers to make serial acquisitions, any one of which may seem insignificant but which collectively serve to solidify and expand their dominance.2025 In some instances AWS has acquired cloud technologies that previously integrated with multiple clouds, only for AWS to make it an AWS-specific product after acquisition, foreclosing competitors and increasing consumers’ switching costs.2026 d. Competitive Significance of AWS to Amazon’s Other Lines of Business Amazon’s dual role as a dominant provider of cloud infrastructure and as a dominant firm in other markets creates a conflict of interest that Amazon has the incentive and ability to exploit. Amazon’s dominance in cloud computing alongside its integration across an array of businesses—online retail, music and video, and smart home devices—creates a core conflict of interest. Cloud computing customers like Netflix and Target are in the position of competing with Amazon while also relying on AWS. Firms in their position effectively have to choose between switching to one of the alternative cloud infrastructure providers or funding their primary competitor.2027 One venture capitalist described Amazon as “useful but dangerous” because “it’s hard to predict what Amazon wants to get into . . . you can’t know.” 2028 Similarly, a business-to-business application developer told Subcommittee staff that they felt pressure to switch their entire product to Microsoft Azure because of its client’s concerns with Amazon’s anticompetitive conduct in the online retail sector.2029 Amazon acknowledges that its cloud customers which are also its competitors are wary of using AWS. One internal document had guidance on how to discuss the issue with customers. One FAQ sheet listed, “What do you say to customers who are worried that using AWS services will support Amazon's competitive growth in the retail space?” Amazon’s sample answer stated, “How can you afford to not compete with the best possible tools in such a tough market like retail?”2030 Subcommittee staff also spoke with market participants that expressed concern about how this conflict of interest shapes Amazon’s behavior in its other lines of business. For example, in 2015, Amazon kicked Google Chromecast and Apple TV—direct competitors with the Amazon Fire Stick and Fire TV cube—out of its retail store.2031 AWS is also positioned to use customer and seller data from one line of business to inform decisions in other lines of business, analogous to its conduct in Amazon Retail. At least one market participant who spoke with Subcommittee staff had evidence that AWS engaged in this cross-business data sharing.2032 In another internal document with guidance for staff on “AWS Competitive Messaging,” employees were advised to offer the following response: Q. Walmart is warning its suppliers that they don’t want them to be running on AWS because they don’t want Amazon.com, a competitor of Walmart’s, to have access to their data. How are you addressing that? A: Even though Amazon’s consumer business has no access to any customer data in AWS, I can understand why Walmart would be paranoid in making sure that their data is private. So, I think it’s a pretty reasonable expectation for them to ask their suppliers to encrypt that data in AWS.2033 Engineers and market participants have also raised concerns that AWS employees may have access to Amazon’s Key Management Services (KMS), which customers can use to store encryption keys.2034 If an employee were able to access a customer’s encryption keys, they could potentially see the contents of a customer’s application, including proprietary code, business transactions, and data on their users. In response to questions from the Subcommittee, Amazon said that the company’s “policies prohibit employees from accessing and reading customer keys in KMS. KMS is designed such that customer keys in the service cannot be retrieved in plain text (unencrypted) form by anybody, including AWS employees.” 2035 Even if AWS employees can never access the content of their customers applications, AWS tracks a host of commercially sensitive metrics, including any changes in demand for storage and compute services, the components of their application’s architecture, the requests to a specific database per second, database size, and the types of requests.2036 One industry expert told Subcommittee staff: They don’t need to see the encrypted content of a movie to see that there are a ton of requests to particular data. If Netflix announced five new movies this weekend and there’s a ton of data to five new objects. So, you don’t need all the information to know what’s happening.2037 Finally, AWS provides Amazon with unparalleled insights into the trajectory of startups using its services, information that it can use to guide acquisitions and replicate promising technology. Data that AWS collects on cloud computing customers can provide unique business intelligence, information that investors, other firms, and entrepreneurs lack. A report from 2011 published in Reuters, profiling the AWS Start-up Challenge, describes cases where AWS has used insights gleaned from its cloud computing service to inform its venture capital investment decisions.2038 Adam Selipsky, then Vice President of AWS, told Reuters, “AWS has great relationships with many young companies and there have been cases where we’ve been able to help with investment opportunities.” 2039 Today, one way Amazon leverages AWS is through relationships with startups. The AWS Activate program provides startups with free credits, technical support, and training.2040 Subcommittee staff interviewed a startup and beneficiary of AWS Activate that had engaged in partnership conversations with Amazon. During these discussions, the startup shared information about how its product was built with AWS. Within a few years, the startup learned that Amazon had introduced a replica product. This company said that Amazon “had so many incentives. Rate cuts, and free services. Not having a lot of resources, it’s hard to turn that down. But fast forward, we basically helped them build their offering that they copied from us.” 2041 As part of its investigation, the Subcommittee asked Amazon whether it uses or has ever used AWS usage patterns or data to inform its investment decisions. Amazon responded: AWS uses data on individual customers’ use of AWS to provide or improve the AWS services and grow the business relationship with that customer. This data may inform AWS’s decisions about how AWS invests in infrastructure, such as data centers, edge networks, hardware, and related software solutions in order improve the customer experience.2042 Amazon’s response leaves unclear whether it would view it appropriate to use a firm’s AWS data to develop products competing with that firm, so long as Amazon could identify some benefit to the broader “customer experience.” Prior to 2017, Amazon also required that AWS customers agree “not to assert any intellectual property claim against any AWS service used by that customer.” 2043 Amazon removed that condition from the AWS online customer agreement on June 28, 2017.2044 In addition to creating a significant information advantage for Amazon, AWS may also reinforce its market power in other ways. Because startups often rely heavily on AWS, Amazon is a natural choice when pursuing a sale or seeking investment. In an internal email produced to the Subcommittee, Peter Krawiec, Amazon’s Vice President of Worldwide Corporate Development, recapped a meeting with a recently acquired company, noting that the company was, “[s]uper excited about Amazon and relieved that Walmart will not be the buyer. Engineering team thrilled that they won’t have to unplug from AWS under a Walmart world.” 2045 e. Conduct The leading position AWS enjoys in the market traces in part to its first-mover advantage, network effects, and steep investments that the company made in building out the physical infrastructure on which cloud resides. However, AWS has also engaged in a series of business practices designed to maintain its market dominance at the expense of choice and innovation. Through a combination of self-preferencing, misappropriation, and degradation of interoperability, Amazon has sought to eliminate cross-platform products with Amazon-only products. Amazon’s conduct has already led several open-source projects to become more closed, a move driven by a need for protection from Amazon’s misappropriation. If unchecked, Amazon’s tactics over the long-term risk solidifying lock-in and diminishing the incentive to invest. Because cloud is the core infrastructure on which the digital economy runs, ensuring its openness and competitiveness is paramount. i. Misappropriation of Data As described earlier in this Report, cloud platform vendors compete by expanding their firstparty cloud offerings, such as those offered through the AWS Management Console.2046 Market participants note that one way AWS has expanded its offerings is by creating proprietary versions of products that have been developed under open-source licenses.2047 Open-source licenses allow software to be freely used, modified, and shared.2048 Open-source software can run on any infrastructure, local machine, server room, or on the cloud, reducing lock-in to a specific hardware vendor.2049 Companies based on open-source software bring in revenue by selling additional features under proprietary licenses or services.2050 In recent years, open-source development has been a leading model for software development, attracting significant venture capital investment.2051 Market participants note that the rise of cloud computing services has led to a shift in the way open-source software is delivered and used. Many open-source software companies allowed engineers to download free versions of their software from their website, often without collecting any personal data about their users. As engineers outgrew the functionality of the free version, they would purchase more powerful versions.2052 As cloud computing grew in popularity, open-source software vendors began offering versions of their software on the AWS Marketplace, where application developers could easily integrate the software. Market participants explain that AWS was able to use the data collected on their customers, including usage metrics, to learn which third-party software was performing well and ultimately to create their own proprietary version offered as a managed service. Creating a “knock-off” version of software was particularly easy when the product was using an opensource license, which provides more visibility to the underlying code.2053 In interviews with Subcommittee staff, market participants repeatedly said that AWS relied on innovations from open-source software communities to gain dominance. A venture capitalist told Subcommittee staff that “open-source is critical for AWS getting market power. They’re standing on the shoulders of giants and they’re not paying the giants.” 2054 A long-time cloud vendor likewise said that “Amazon never built a database, never built cloud services, never built any of their AWS offerings. They took open source and offered it out on cloud. At the time that was innovative.” 2055 AWS has developed many of its offerings using this practice and has created products that are only accessible as first-party offerings through the AWS Management Console.2056 An example frequently cited by market participants is Amazon Elasticsearch Service (AESS), a tool for searching and analyzing data, and a first-party product listed on the AWS Management Console.2057 According to public reporting and interviews with market participants, this product is a copy of Elastic’s, Elasticsearch open-source product that was available for purchase on the AWS Marketplace.2058 According to public reporting, within a year of introducing the product, Amazon was generating more money from its replica of Elasticsearch than Elasticsearch itself was generating. One key advantage that Amazon’s “knock-off” had was that Amazon had given it superior placement in AWS Management Console.2059 Additionally, as described in the Elasticsearch vs Amazon case, AWS can name their open-source “knock-off” products in a way that can mislead customers into believing that the “knock-off” product is sponsored by the open-source software vendor.2060 The Subcommittee’s investigation uncovered evidence relating to numerous instances in which Amazon has offered proprietary managed services based on knock-offs of open-source code. One open-source market participant interviewed by Subcommittee staff said that because of this conduct, the benefits of open source “weren’t accruing to [the] open-source community. People were feeling, we develop all this work and then some large company comes and monetizes that.” 2061 MongoDB, a document-based database, has similarly commented that “once an open source project becomes interesting, it is too easy for large cloud vendors to capture all the value but contribute nothing back to the community.” 2062 When the Subcommittee inquired about this practice, Amazon responded, that “Projects where AWS has developed distributions on top of OSS [open-source software], like Open Distro for Elasticsearch and Amazon Corretto, add to, not supplant, the set of capabilities provided by the upstream open-source projects… it allows them to move between deploying OSS themselves and using managed services for open-source.” 2063 Market participants told Subcommittee staff, however, that in the instances when AWS creates a “knock-off” version of an open-source software by adding “additional developments,” those additional developments often only work with AWS infrastructure and are no-longer cross-platform—heightening the risk of lock-in.2064 As one third-party explains, “So, the earlier benefits of open-source go out the window as Amazon takes over each of these product areas.” 2065 For example, while MongoDB is an open-source document-based database project, Amazon offers a proprietary product called Amazon DocumentDB. According to AWS, DocumentDB implements the open-source MongoDB API and is designed to “emulate the responses that a MongoDB client expects from a MongoDB server.” 2066 When a cloud customer chooses to build an application using DocumentDB they are tied to AWS’s infrastructure. If they ever wanted to switch to another provider they would have to extensively re-engineer their product in another software, whereas, had they built their application using MongoDB—on AWS or any other cloud provider’s infrastructure—their applications could move to other platforms.2067 ii. Harms to Innovation Amazon’s practice of offering managed service versions of open-source software has prompted open-source software companies to make defensive changes, such as closing off advanced features and changing their open-source license to be less permissive.2068 One open-source vendor that recently started offering premium closed-sourced features said they were “paranoid” in light of Amazon cloning Elastic’s features, noting that if this had happened to them they “would not have a business.” 2069 Amazon’s conduct has also reduced the availability of features in open-source software. Confluent,2070 Redis Labs,2071 and CochroachDB,2072 along with several other open-source software vendors, have made similar license and business model changes, reducing the level of access to their software.2073 Market participants believe these changes significantly undermine innovation. Several noted that more closed-off licenses will result in fewer free, open-source features available to startups building prototypes and research labs that cannot afford access to paid features.2074 Subcommittee staff also spoke with cloud computing customers in the public sector who worry about the changes and ambiguity in open-source licenses. One cloud computing customer told Subcommittee staff that three pieces of open-source software that they use underwent license changes in the last year and that, due to strict “open source only” policies, they are “now stuck using older versions of the software [from] before the license change which requires additional work to improve the code base, implement the same functionality in-house or switch to a competitive product.” 2075 iii. Self-Preferencing According to market participants, once a product—based on open source or otherwise—is available in the AWS Management Console, it becomes an easier choice for existing AWS customers relative to purchasing a managed service from a third-party vendor or self-managing open-source software. In an interview with Subcommittee staff, one startup said they purchased software services through the AWS Management Console as opposed to identical or nearly identical software from a third-party vendor because they were a small company and “instead of us managing everything, it was hit a button . . . they are all in one, it was easier.” 2076 As with all cloud services offered through the AWS Management Console, customers benefit from a single sign-on with billing information already in place.2077 Market participants also note that Amazon makes certain functionality available to its firstparty products that it doesn’t make available to the companies managing the original version of the open-source software.2078 For example, AWS services can run inside Amazon’s Virtual Private Could (Amazon VPC) offering, which allows users to provision an “isolated section of the AWS Cloud,” but third-party services cannot do so. 2079 While Amazon failed to provide the Subcommittee with financial data identifying what AWS makes in revenue from individual cloud offerings, many marketplace participants believe that AWS makes more from managed versions of open-source software than the third-party vendors and managers of the software. In 2019, The New York Times reported that the Chief Executive of MariaDB, an open-source relational database company, estimated that “Amazon made five times more revenue from running MariaDB software than his company generated from all of its businesses.” 2080 Market participants suggest this multiple of difference in income is likely for other AWS products based on open-source projects.2081

#### Innovation in Cloud Computing is key to agricultural informatization which solves climate change and famine

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Climate-smart agriculture is an approach for guiding actions required to make agricultural activities more productive and sustainable with regard to resource sharing, cost saving, and efficient agro-system construction. Agricultural informatization, through the adoption of new technological trends such as cloud computing and Internet of Things (IoT), is an extensive prospect to realize sophisticated applications aiming in the development of services in rural areas for the benefit of climate-smart agriculture. Especially the integration of cloud computing and IoT technologies for applications in agriculture, through the automation and digital management of the entire agricultural production and food chain, is an innovative research field of significant concern. In this paper an attempt is made to survey the technological background of these technologies, as well as to review the main trends and identify the challenges regarding the adoption of cloud-based IoT applications in the agricultural sector for the benefit of sustainability in climate-smart agriculture. Agriculture is, beyond any doubt, one of the most important sectors of primary industry, yet it is characterized as sensitive, unstable, complex, dynamic, and highly competitive. In the twenty-first century, the sector of agriculture is going to face great challenges as, according to the Food and Agriculture Organization (FAO) of the United Nations, agricultural productivity should be increased by 60% in order to ensure a safe food supply which would adequately satisfy the nutritional needs of the constantly growing world population (Fig. 1). This goal has to be achieved despite the fact that the required resources are already stretched, as the amount of available agricultural land is declining due to increasing urbanization, soil erosion, and high salinity levels, while 70% of the world’s freshwater supplies is consumed for agricultural purposes. In addition, it is required for agriculture to address the issues which arise from the global climate change, concerning the reduction of its greenhouse gas emissions (the agricultural sector generates about one-quarter of global GHGs), as well as the adjustment to extreme weather conditions which impact the quantity and quality of the crops (FAO 2013). To successfully encounter the increased global nutritional needs as well as the climate change issues, the sector of agriculture has to become “climate-smart.” Climate-smart agriculture (CSA) was defined by Lipper et al. as “an approach for transforming and reorienting agricultural development under the new realities of climate change” (Lipper et al. 2014). Yet, the definition which is most commonly used was presented by FAO at the Hague Conference on Agriculture, Food Security and Climate Change in 2010 and describes CSA as “agriculture that sustainably increases productivity, enhances resilience (adaptation), reduces/ removes GHGs (mitigation) where possible, and enhances achievement of national food security and development goals.” According this definition, the main goal of CSA is food development and security, while productivity, adaptation, and mitigation may be characterized as the interlinked pillars which are required in order to achieve this goal (FAO 2013). CSA provides the means to relate actions both on-farm and beyond the farm, by incorporating elements concerning policies, institutions, investments, and technologies as follows (FAO 2013): Farm, cultivation, and livestock management for handling resources efficiently as well as increasing production and resilience Ecosystem and landscape management in conserving ecosystem services that are essential in order to increase resource efficiency and resilience at the same time Services for farmers and land managers so as to enable them to implement changes which are necessary for the efficient management of climate risks/impacts and mitigation actions Changes which enhance the benefits of CSA in the wider food system, including value chain interventions as well as demand-side measures One way of addressing these issues and increasing the quantity together with the quality of agricultural production is by using cutting-edge technologies in order to establish more “intelligent” and interconnected farms through agricultural informatization. The implementation of information communication technology (ICT) is a major asset for the sustainable growth in agriculture. Until the recent past decades, the research focused on agricultural infrastructure development and information services. In order for this situation to be changed and promote a rapid development of agricultural informatization, it is essential to apply technologies which provide reliable, cheaper, and user-friendly ICT tools in agriculture. Cloud computing , as a trend of future information technology applied in various fields, may play a significant role in agricultural informatization by bringing some new prospects to information management and services. Evolving cloud computing technology in agriculture is an extensive opportunity to carry out industry agricultural applications aiming in the sustainable development in rural areas. Meanwhile, the innovative technology of the Internet of Things (IoT) is highly related to cloud computing as IoT acquires compelling computing tools through cloud computing and cloud computing encounters the optimum channel of practice based on IoT. Thus, the integration of these technologies, using radio-frequency identification (RFID) and wireless sensor networks (WSN), for data acquisition and monitoring corresponding to cultivations, as well as cloud computing applications for transferring, storing, and processing these data using the Internet, is predicted to bring revolutionary changes to agriculture, through the automation of agricultural production. The theoretical and applied study of cloud computing for IoT agricultural applications in terms of sustainability appears to be of high significance. In this paper an attempt is made to review the technological background of cloud computing and IoT with emphasis in the most important approaches, regarding their application in the agricultural sector for the benefit of climate-smart agriculture toward the sustainable development in rural areas.

#### Warming is existential

\*written by 33 climate scientists and policy experts from 9 countries

Ramanathan et al. 17

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Climate change is **becoming an existential threat** with warming in excess of 2°C within the next three decades and 4°C to 6°C within the next several decades. Warming of such magnitudes will expose as many as **75% of the world’s population** to **deadly heat stress** in addition to **disrupting** the climate and **weather worldwide**. Climate change is an urgent problem **requiring urgent solutions**. This paper lays out urgent and practical solutions that are ready for implementation now, will deliver benefits in the next few critical decades, and **places the world on a path to achieving** the **longterm targets** of the Paris Agreement and near-term sustainable development goals. The approach consists of four building blocks and 3 levers to implement ten scalable solutions described in this report by a team of climate scientists, policy makers, social and behavioral scientists, political scientists, legal experts, diplomats, and military experts from around the world. These solutions will enable society to decarbonize the global energy system by 2050 **through efficiency and renewables**, drastically reduce short-lived climate pollutants, and stabilize the climate well below 2°C both in the near term (before 2050) and in the long term (post 2050). It will also reduce premature mortalities by tens of millions by 2050. As an insurance against policy lapses, mitigation delays and faster than projected climate changes, the solutions include an Atmospheric Carbon Extraction lever to remove CO2 from the air. The amount of CO2 that must be removed ranges from negligible, if the emissions of CO2 from the energy system and SLCPs start to decrease by 2020 and carbon neutrality is achieved by 2050, to a staggering one trillion tons if the carbon lever is not pulled and emissions of climate pollutants continue to increase until 2030. There are numerous living laboratories including 53 cities, many universities around the world, the state of **California**, and the nation of Sweden, who have **embarked on a carbon neutral pathway**. These **laboratories** have already created 8 million jobs in the clean energy industry; they have also shown that emissions of greenhouse gases and air pollutants **can be decoupled** from economic growth. Another favorable sign is that growth rates of worldwide carbon emissions have reduced from 2.9% per year during the first decade of this century to 1.3% from 2011 to 2014 and near zero growth rates during the last few years. The carbon emission curve is bending, but we have a **long way to go and very little time** for achieving carbon neutrality. We need institutions and enterprises that can accelerate this bending by scaling-up the solutions that are being **proven in the living laboratories**. We have less than a decade to put these solutions in place around the world to preserve nature and our quality of life for generations to come. The time is now. The Paris Agreement is an historic achievement. For the first time, effectively all nations have committed to limiting their greenhouse gas emissions and taking other actions to limit global temperature change. Specifically, 197 nations agreed to hold “the increase in the global average temperature to well below 2°C above pre-industrial levels and pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels,” and achieve carbon neutrality in the second half of this century. The climate has already warmed by 1°C. The problem is running ahead of us, and under current trends we will likely reach 1.5°C in the next fifteen years and **surpass the 2°**C guardrail **by mid-century** with a 50% probability of **reaching 4°C by end of century**. Warming in excess of 3°C is likely to be a global catastrophe for three major reasons: • Warming in the range of 3°C to 5°C is suggested as the threshold for several tipping points in the physical and geochemical systems; a warming of about 3°C has a probability of over 40% to cross over multiple tipping points, while a warming close to 5°C increases it to nearly 90%, compared with a baseline warming of less than 1.5°C, which has only just over a 10% probability of exceeding any tipping point. • Health effects of such warming are emerging as a major if not dominant source of concern. Warming of 4°C or more will expose more than 70% of the population, i.e. about 7 billion by the end of the century, to deadly heat stress and expose about **2.4 billion to vector borne diseases** such as Dengue, Chikengunya, and Zika virus among others. Ecologists and paleontologists have proposed that warming in excess of 3°C, accompanied by **increased acidity of the oceans** by the buildup of CO2 , can become a major causal factor for exposing more than **50% of all species to extinction**. 20% of species are in danger of extinction now due to population, habitat destruction, and climate change. The good news is that **there may still be time** to avert such catastrophic changes. The Paris Agreement and supporting climate policies **must be strengthened** substantially **within the next five years** to **bend the emissions curve down** faster, stabilize climate, and prevent catastrophic warming. To the extent those efforts fall short, societies and ecosystems will be forced to contend with substantial needs for adaptation—a burden that will fall disproportionately on the poorest three billion who are least responsible for causing the climate change problem. Here we propose a policy roadmap with a **realistic** and **reasonable chance** of limiting global temperature to safe levels and preventing unmanageable climate change—an outline of specific science-based policy pathways that serve as the building blocks for a three-lever strategy that could limit warming to well under 2°C. The projections and the emission pathways proposed in this summary are based on a combination of published recommendations and new model simulations conducted by the authors of this study (see Figure 2). We have framed the plan in terms of four building blocks and three levers, which are implemented through 10 solutions. The first building block would be fully implementing the nationally determined mitigation pledges under the Paris Agreement of the UN Framework Convention on Climate Change (UNFCCC). In addition, several sister agreements that provide targeted and efficient mitigation must be strengthened. Sister agreements include the Kigali Amendment to the Montreal Protocol to phase down HFCs, efforts to address aviation emissions through the International Civil Aviation Organization (ICAO), maritime black carbon emissions through the International Maritime Organization (IMO), and the commitment by the eight countries of the Arctic Council to reduce black carbon emissions by up to 33%. There are many other complementary processes that have drawn attention to specific actions on climate change, such as the Group of 20 (G20), which has emphasized reform of fossil fuel subsidies, and the Climate and Clean Air Coalition (CCAC). HFC measures, for example, can avoid as much as 0.5°C of warming by 2100 through the mandatory global phasedown of HFC refrigerants within the next few decades, and substantially more through parallel efforts to improve energy efficiency of air conditioners and other cooling equipment potentially doubling this climate benefit. For the second building block, numerous **subnational** and **city scale climate action** plans **have to be scaled up**. One prominent example is **California’s** Under 2 Coalition signed by over 177 jurisdictions from 37 countries in six continents covering **a third of world economy**. The goal of this Memorandum of Understanding is to catalyze efforts in many jurisdictions that are comparable with California’s target of 40% reductions in CO2 emissions by 2030 and 80% reductions by 2050—emission cuts that, **if achieved globally**, would be **consistent with stopping warming at about 2°C** above pre-industrial levels. Another prominent example is the climate action plans by over 52 cities and 65 businesses around the world aiming to cut emissions by 30% by 2030 and 80% to 100% by 2050. There are concerns that the carbon neutral goal will hinder economic progress; however, real world examples from California and Sweden since 2005 offer evidence that economic growth can be decoupled from carbon emissions and the data for CO2 emissions and GDP reveal that growth in fact prospers with a green economy.

#### 3 – Pharma

#### Authorized Generics exclude competitors

Peelish 20, Natalie Peelish is a law clerk to Thomas Ambro on the US Court of Appeals for the Third Circuit, “Antitrust and Authorized Generics: A New Predation Analysis”, Stanford Law Review, Volume 72, March 2020, https://review.law.stanford.edu/wp-content/uploads/sites/3/2020/03/Peelish-72-Stan.-L.-Rev.-791.pdf

Introduction Brand drug prices continue to rise at high rates and to increasingly high levels. In 2018, prices for 267 commonly used brand-name drugs rose by 5.8%— over twice the rate of inflation.1 While the rate at which prices increased over the past several years peaked at a whopping 15.9% in 2014,2 the still-lofty rate of rising drug prices means that Americans will pay more for their healthcare—through their own insurance plans or ultimately, as government spending on healthcare increases, through higher taxes.3 Examples of exorbitantly priced brand-name prescription drugs have dominated headlines recently—Humira, an immunosuppressant, costs $3,000 per month,4 while Zytiga, which treats prostate cancer, costs $10,000 per month.5 Even common drugs such as insulin can now cost over $300 for a single vial (triple what the price was in 2002).6 Patients lose when drug prices are high, especially as “cost-containment strategies” by insurance companies have shifted a greater share of prescription drug costs to patients themselves.7 In a recent poll, 29% of adults reported that cost prevented them from taking their medicine as prescribed at some point in the past year, and 8% reported that their condition worsened because of this.8 The main reason that prescription drugs cost so much is that “branded products [are] protected by market exclusivity provisions granted by the U.S. Patent and Trademark Office and the Food and Drug Administration (FDA).”9 While generic manufacturers have come under criticism as well for price spikes in certain generic drugs,10 generics are nonetheless critical to providing a low-cost drug option for consumers. Yet efforts by brand drug manufacturers to delay or deter generic entry can have a severely negative impact on consumer welfare in the form of higher drug prices.11 Competition between brand and generic drugs in the pharmaceutical industry has long been a topic of discussion for antitrust commentators. The unique nature of the regulatory environment and the patent protection afforded to most brand drug manufacturers makes the pharmaceutical market ripe for antitrust concerns. And indeed, antitrust violations have materialized across the industry as brand drug manufacturers seek to maintain their market exclusivity by delaying or deterring generic entry even after their patents have expired or have been invalidated.12 Recently, brand manufacturers have engaged in a more insidious form of exclusionary conduct: launching authorized, or branded, generics to compete with potential generic entrants. There is nothing inherently problematic under the antitrust laws with a brand drug manufacturer launching another product line—after all, antitrust laws encourage competition to lower prices for consumers, and an authorized generic may be just another competitor.13 An antitrust problem, however, begins to emerge when authorized generics are launched as a means to deter generics from entering the market before patent expiration. If authorized generics are priced in such a way as to effectively deter generics, this may be a form of predation meant to exclude generics from the market in order to maintain the brand manufacturer’s patent-induced monopoly. This monopolistic conduct harms consumers because it eliminates generic competitors with lower-priced drug options from the market, leaving consumers with a supracompetitively priced brand drug and an authorized generic that may be only temporarily available at a low price. And harm to consumer welfare is the exact problem the antitrust laws are meant to remedy. As other efforts by brand drug manufacturers to maintain their patentprotected monopolies over drug markets have faced increasing scrutiny by the courts,14 brand drug manufacturers may now rely more heavily on launching authorized generics in an effort to thwart generic entry and extend the length of their patent and market exclusivity, making this tactic a pressing problem for the antitrust laws. This Note argues that current antitrust doctrine is ill equipped to account for such practices and advocates for a new predation test using limit pricing, rather than below-cost pricing, as a mechanism for determining whether the launch of an authorized generic during a generic’s exclusivity period is anticompetitive. Part I provides an overview of the various competitors in the pharmaceutical market and the federal regulatory framework that governs the market, particularly the Hatch-Waxman Act. Part II describes competition within the Hatch-Waxman regulatory framework. Part III explains how the launch of authorized generics may be a form of price predation if certain conditions are met, but argues that the Supreme Court’s current predatory pricing doctrine is ill equipped to impose liability on this type of exclusionary action. Finally, Part IV puts forth a theory of limit pricing and argues that a limit-pricing test is better suited than the Court’s current below-cost test to account for predation by authorized generics.

#### Co-opetition is key to pharma innovation

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Coopetition OI Coopetition OI is defined as OI created between firms in the same industry, and this type of OI entails the simultaneous pursuit of collaboration and competition.39 Coopetition OI can occur between competing firms over different value chain functions or different phases of NPD.40 For instance, competitors can collaborate for upstream activities, such as Research and Development (R&D), but compete in downstream activities, such as sales.41 Research shows that this type of OI is particularly useful for focal firms when they lack the required project expertise and can learn from rivals’ expertise.42 The resource complementarity of firms in coopetition OI helps them jointly deal with complexity based on absorptive capacity because they share a common knowledge base regarding industry environments, product development processes, regulatory requirements, and general customer preferences.43 Studying collaborations between Sony and Samsung, Gnyawali and Park conclude that “even a giant cannot go it alone given the technological trends.”44 Tether reports that when a firm heavily invests in acquired technologies to deal with complexity, it is likely to collaborate with competitors.45 Science-Based OI Science-based OI is defined as collaborations between firms and research organizations including universities, government labs, and other research institutes, and it becomes an important source of scientific knowledge acquisition in NPD.46 Scientific knowledge is different from other types of knowledge because it contains fundamental properties and underlying mechanisms of particular phenomena rather than merely describes what occurred.47 Such scientific knowledge becomes more useful in complex NPD projects as it efficiently guides search processes on how to combine interconnected components. In the pharmaceutical industry, scientific knowledge originated from universities or government labs is an important source of new drugs and delivery systems.48 Research shows that science-based OI allows firms access to cutting-edge scientific and specialist knowledge.49 However, firms using science-based OI face obstacles and significant challenges.50 One of the challenges is related to transforming untested theory and raw science research into new products. High absorptive capacity is required to identify potential scientific knowledge that can be transformed into marketable products.51 Cockburn and Henderson empirically show that absorptive capacity is the main determinant of the productivity of science-based OI.52 Bishop, D’Este, and Neely found that the possession of relevant expertise can nurture the organization’s absorptive capacity and increase the benefits of science-based OI.53 In this regard, science-based OI is different from crowdsourcing and coopetition OI in that it requires the focal firm to possess relevant project expertise to utilize the external knowledge. When a firm has sufficient absorptive capacity, the science based OI model can help the firm deal with high levels of complexity and create breakthrough innovations. Network OI OI can take the form of networks, ecosystems, or consortia, where multiple players participate in NPD.54 Nambisan and Sawhney claim that network OI is a distinct form of OI in that it requires coordination processes between multiple organizations in the network.55 Vanhaverbeke and Cloodt explain that the network OI model (“value constellations”) is born to deal with increasing complexity in technological development.56 Ritter and Gemunden state that networking OI can be used to deal with problems created by complex, interconnected technologies.57 Several empirical studies support the idea that network OI is the most efficient form for dealing with high levels of complexity. For instance, Olsen, Sofka, and Grimpe explain that network OI is formed to jointly solve “grand challenges,” which are defined as the most significant complex and interdependent problems.58 Kapoor and Adner explain that network OI helps organizations solve complex problems and enhance their learning opportunities.59 Studying biopharmaceutical consortia, Allarakhia, Kilgour, and Fuller state that “consortia enable geographically separated researchers, facing the interconnectivity of large biological datasets, to develop tools to support complex upstream discovery research, and address the challenges associated with downstream product development.”60 Network OI models can be formed not only at the business level, but also at the regional, state, and national levels.61 Scholars report that network OI is strongly associated with participants’ technological specialization and expertise in their knowledge fields.62 This literature suggests that network OI can connect organizations that have specific project expertise in their fields and collectively solve highly complex problems. Research Design The Pharmaceutical Industry Pharmaceutical drug development is a multi-year, complex process starting from the discovery of compounds and ending with drug introduction. To introduce new drugs, pharmaceutical firms follow a similar process, as shown in Figure 1.63 First, the firm conducts research to identify a drug target (molecules associated with particular diseases that can potentially produce desirable therapeutic effects) and the lead (the most promising compound). After the drug target and lead are identified, the firm assesses them using in vivo and in vitro models at the lead optimization stage. After animal testing results show positive signs and the commercial potential of a lead, the lead becomes a drug candidate. At this point, a firm files an investigational new drug (IND) application to the Food and Drug Administration (FDA) and initiates three phases of clinical trials. The firm tests the efficacy and toxicity of the drug candidate through these trials: Phase I includes 20 to 100 individuals with or without the disease, Phase II includes several hundred patients with the disease, and Phase III includes 300 to 3,000 patients that have the disease. After the firm collects sufficient evidence that shows the efficacy and safety of its drug candidate, it files a new drug application (NDA) for FDA review to obtain market approval.64 The firm can sell the drug in market after approval. Pharmaceutical NPD requires the understanding of basic science, human diseases, drug mechanisms, pharmacokinetics and pharmacodynamics profiles, clinical trial designs, and mass-manufacturing processes. Components used in drug development are also interdependent (i.e., change in one component requires changes in other components). For instance, a drug candidate may show sufficient efficacy to treat a target disease, but have undesirable side effects associated with its drug delivery system. However, some components of the drug candidate only work with that particular delivery system and, thus, the firm cannot easily replace the delivery system. Such interdependencies between components in drug development require numerous iterations of development processes and create challenges for pharmaceutical firms. Data Collection We collected all prescription drugs approved during the period of 1990- 2000 from the FDA database including the Orange Book. Although these data are publicly available, the FDA deletes expired patents related to drugs when it updates the electronic Orange Book. Therefore, we directly requested the data on all FDA-approved drugs and related patents through a Freedom of Information Act request and created our sample based on the FDA-provided data. Although the Orange Book offers information to match patents to the drug sample, it does not contain detailed information on the patents, specifically whether those patents were internally developed by focal organizations or externally sourced. Detailed information on patents is collected from the National Bureau of Economic Research65 and the United States Patent and Trademark Office (USPTO). Firm-specific information such as R&D spending, firm age, and firm size were collected from Compustat. Information on marketing and sales executives was collected from the CorpTech Directory. Therapeutic market classes related to our drug sample are collected from the Physicians’ Desk Reference. Project-specific information, such as therapeutic experience, priority reviewed, and orphan drug, was collected from the FDA database. Our final sample includes 309 prescription drugs developed by 59 firms. Because our main variables (project expertise and complexity) vary between projects within firms, we use project-level (drug development project) as our unit of analysis. Variables We created our main variables (choice of open vs. closed innovation, project expertise, and complexity) based on methods used in existing literature. Following Ceccagnoli et al., we created the variable, open innovation choice, to indicate whether the drug development project utilized internal or external patents.66 If drug patents were originated from the drug developer, it means that the project utilized internal knowledge to develop the drug; therefore, it was coded as 0 (closed). If drug patents were originated from external entities, it means that the project utilized external knowledge to develop the drug, and, therefore, it was coded as 1 (open). We adopted Fleming and Sorenson’s measure of complexity. 67 To capture project expertise, we count the number of previous patents that a focal organization had in the same technological fields (USPTO subclasses) as the focal drug patents seven years prior to the drug introduction. We took seven-year lags given the pharmaceutical development process takes between two and 17 years (on average seven years).68 Table 1 summarizes our main and control variables. Method Because this research focuses on the choice between open and closed innovation, we use probit regression to examine our research questions. Given that the unit of our analysis is an NPD project and there are multiple projects within firms in our sample, we used probit regression with the robust standard errors clustered by firms. Findings We found that among the 309 prescription drugs in our sample, 211 drugs (68.28%) were developed through OI projects, and 98 drugs (31.72%) were developed through closed innovation projects. In OI projects, pharmaceutical and biotechnology companies accounted for 61.14% of all external knowledge sources, universities accounted for 5.21%, government organizations accounted for 3.79%, hospitals and research centers accounted for 5.69%, individual scientists accounted for 5.69%, and others accounted for 18.48%. Our data show that collaborations between pharmaceutical companies or between pharmaceutical and biotechnology companies are the most common form of OI models in this industry (coopetition OI). We also found that multiple organizations collaborate for new drug development. For instance, AstraZeneca introduced the drug Atacand (treatment for hypertension and heart failure) in collaboration with Takeda Chemical and Nokia Mobile. In this drug development project, Takeda Chemical provided its compounds for treating hypertensive heart disease, and Nokia Mobile provided its power saving technologies in data transmission. Table 2 provides examples of these different OI models in our data.

#### Pharma innovation is key to prevent extinction level pandemic

Walsh 17 (Bryan Walsh - contributor to TIME. Previously, he was TIME’s International Editor, its energy and environmental correspondent and was the Tokyo bureau chief, “The World Is Not Ready for the Next Pandemic” Time, May 4, 2017, <http://time.com/magazine/us/4766607/may-15th-2017-vol-189-no-18-u-s/>)

The consequences of a major pandemic would be world-changing. The 1918 flu pandemic killed 50 million to 100 million people–at the top end, more than the combined total casualties of World Wars I and II–and for a slew of reasons, humans are arguably more vulnerable today than they were 100 years ago. First of all, there are simply more of us. The number of people on the planet has doubled in the past 50 years, which means more humans to get infected and to infect others, especially in densely populated cities. Because people no longer stay in one place–nearly 4 billion trips were taken by air last year–neither do diseases. An infection in all but the most remote corner of the world can make its way to a major city in a day or less. Climate change also plays a role as warmer temperatures expand the range of disease-carrying animals and insects we’re exposed to, like the Aedes aegypti mosquitoes that transmit Zika. And if nature isn’t bloody-minded enough, genetic-engineering tools have made it easier for terrorist groups or lone madmen to unleash custom-designed killer germs. In the case of a new pandemic, modern medicine should provide some protection. But experts say it’s more likely that we’ll be caught without a vaccine to prevent it or a drug ready to treat it. That’s true even with many known viruses. When the last Ebola outbreak exploded, in 2014, eventually killing more than 11,000 people, the virus wasn’t a mystery to scientists; it was discovered in 1976. But even though it had been killing people on and off for decades, there were no drugs or vaccines approved to fight it–and there still aren’t today, chiefly because there’s little incentive for pharmaceutical companies to bring them to market. There are troubling economic implications as well. The 2003 SARS epidemic, which killed fewer than 800 people, cost the global economy $54 billion, much of it in lost trade, transportation disruption and health care costs. The World Bank estimates that the toll from a severe flu pandemic could hit $4 trillion. One saving grace is that the scientific understanding of that risk is better than ever. Research groups are working feverishly to predict the next pandemic before it even happens. They’re cataloging threats and employing next-generation genetic-sequencing tools to speed the discovery of new or mysterious viruses. They’re helping identify and track outbreaks as they happen. But microbes evolve about 40 million times as fast as humans do, and we are losing ground. “Of all the things that can kill millions of people in very short order,” says Dr. Ashish Jha, director of the Harvard Global Health Institute, “the one that is most likely to occur over the next 10 years is a pandemic.” The question is how policy–and the government dollars that back it–can catch up with the science and keep the world safe.

### China

#### Market dominance by tech giants fuels China’s international power ambitions, including its ability to export digital authoritarianism globally

Ganesh Sitaraman 20, Vanderbilt University Law School, 3/12/20, “The National Security Case for Breaking Up Big Tech,” <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3537870>

The claim that big American tech companies are somehow an alternative to Chinese dominance—or, in the more extreme form, that they are competing with China on behalf of the United States—is largely backwards. In fact, many big American tech companies are operating in China, working with Chinese companies, and seeking to expand. Because markets and the state are intertwined in China, interactions with Chinese companies and investments in China are likely to pass along operational and technological developments to the Chinese government and military, including in ways that advance its emerging surveillance state—and accelerate its ability to spread its model of digital authoritarianism around the world. In short, big tech companies that operate in China are likely assisting the rise of China, not acting as a hedge against it. Rather than competing with China, many big tech companies are integrating with China or attempting to deepen their integration with China. Google has announced an AI center in Beijing,8 and it is exploring a partnership with Tencent that involves using the Chinese tech giant’s cloud service as an alternative to Google Cloud.9 In 2018, the company also proposed Project Dragonfly, which would have created a search engine that would be in compliance with Chinese censorship regulations behind the Great Firewall.10 That endeavor created controversy within the firm and criticism from human rights groups.11 Other companies also operate in China or are seeking to do so. Microsoft is expanding data centers in China and has built an operating system, “Windows 10 China Government Edition,” for the Chinese government.12 After Alibaba, Amazon provides the largest cloud service in China, and its Amazon Web Services division works with local companies and is expanding its data centers.13 Apple, of course, famously designs its phones in California but makes them in China.14 In 2017, Apple announced a partnership with a Chinese firm with close ties to the government and a year later moved its Chinese iCloud and iCloud encryption services to China.15 Notably, Facebook isn’t operating in China—but not for lack of trying. The company has repeatedly attempted to gain access but has been blocked by government officials.16 Merely operating in China might not seem like it undermines the claim of U.S.-Chinese competition. After all, it might be that American companies are seeking to steal market share from Chinese companies in China. Global dominance requires, unsurprisingly, dominance around the globe, including in the world’s biggest markets. The problem is that, according to scholars, U.S. government officials, and even American business associations, any U.S. company that is developing AI in China, making significant technological investments in China, or simply operating in China is likely supporting the Chinese government and military. Chinese companies are often state-run, partly owned by the state, or have informal ties to state and Communist Party officials, as scholars have documented.17 Formal and informal ties allow the government to have influence over many companies, and they create an incentive for companies to comply with party preferences preemptively even without formal government pressure.18 Cooperation and partnerships with these companies therefore mean cooperation with state-directed aims. “No major Chinese company,” Senator Mark Warner has noted, “is independent of the Chinese government and Communist Party.”19 An official at the U.S. Chamber of Commerce goes even further, arguing that American firms going to China have “to please the Chinese government and the Communist Party.”20 Moreover, because artificial intelligence is a dual-use technology, ostensibly commercial innovations can also have military implications. China’s stated doctrine of “civil-military fusion” thus virtually guarantees that companies are indirectly assisting the military if they are working with Chinese entities.21 Under that doctrine, “any technologies held by the private or academic sectors—whether imported or developed in-house—must be shared with the Chinese military.”22 When combined with the corporate-state relationship in China, this means the technological innovations in the private sector are likely being shared with the government for military purposes. As former defense secretary Ash Carter has noted, “If you’re working in China, you don’t know whether you’re working on a project for the military or not.”23 The fact that Chinese companies and the state are intertwined means that American companies working in China are potentially helping accelerate the adoption of digital authoritarianism within China and its spread abroad. In general, the development of artificial intelligence “offers a plausible way for big, economically advanced countries to make their citizens rich while maintaining control over them.”24 Big data, combined with AI, enables governments and big tech companies not only to predict but also to shape what individuals will do. Politically, this means that governments will have the power to preempt dissenters to a far greater degree than authoritarian regimes of the past.25 Economically, it means that centralized economic planning might find greater success than in the past, because governments and companies can shape the behavior of individuals.26 And over time, behavioral changes shape beliefs, potentially building support for the regime itself.27 These dynamics suggest that the new “digital authoritarianism” may have greater staying power than its low-tech precursors.28 At home, China has long been concerned about domestic disharmony and has pursued a policy of “social management” to achieve “holistic” security—not just national security but party organization and the management of the social order.29 The Chinese State Council sees AI as “irreplaceable” in ensuring social harmony in the future.30 China has taken steps to develop a “social credit system,” in which individuals are assessed in every interaction to determine their trustworthiness, their compliance with laws and social norms, and the degree to which their social networks are also compliant. Chinese tech companies have reportedly agreed to share data with the government in support of this project.31 Local governments and tech companies are cooperating to develop “credit cities,” the local counterpart to a full-on national system.32 Chinese companies are also already exporting surveillance technologies abroad, including biometric censors and facial recognition software.33 Given that many big American tech companies are operating in China or seeking to do so and that engagement with Chinese entities likely means information is transferred to the government, the idea that big American tech companies are helping the United States vis-à-vis China in some kind of Cold War-style technology arms race makes little sense. It is just as likely, if not much more so, that firms operating in China are directly or indirectly furthering China’s emergent domestic surveillance capabilities, its military use of those technologies, and its spread of digital authoritarianism abroad as well.34

#### Breaking up the tech giants is key to U.S. success in great power competition - big tech’s market consolidation is integrated with China which provides geopolitical leverage over the U.S.

Ganesh Sitaraman 20, Vanderbilt University Law School, 3/12/20, “The National Security Case for Breaking Up Big Tech,” <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3537870>

In recent years, scholars, commentators, former tech company founders, and political leaders have made the case for breaking up and regulating big tech companies like Alphabet (the parent company of Google), Facebook, and Amazon. The proposals to break up and regulate big tech companies are specific: Unwind mergers, require tech platforms to separate from businesses that operate on the platform, regulate platforms with nondiscrimination principles drawn from public utilities and public accommodations laws, and adopt privacy regulations.1 Advocates for breaking up and regulating big tech hold that these companies have become a danger to the economy, society, and democracy.2 Opponents of breaking up and regulating big tech have put forward a variety of responses, but among them is the assertion that breaking up big tech is problematic in an era of resurgent great power competition, particularly between the United States and China.3 This argument takes different forms. Some commentators have argued that the United States and China are in a Cold War-style arms race over artificial intelligence (AI); big tech, they argue, is needed to win that contest.4 Alphabet’s former chief, Eric Schmidt, has thus highlighted U.S.-Chinese competition for technology in response to arguments that tech should be broken up.5 A second argument is that if big American tech companies are broken up and regulated, one consequence will be that the big Chinese tech companies will become dominant globally. Facebook’s Mark Zuckerberg and Sheryl Sandberg have taken this position, with Zuckerberg noting that the Chinese companies “do not share the values that we have.”6 Even Congressman Ro Khanna and Senator Mark Warner, who have both been critical of big tech companies, have expressed concerns along these lines, namechecking Alibaba, Baidu, and Tencent as potential global powerhouses.7 The claim that breaking up and regulating big tech might have consequences for great power competition deserves to be taken seriously. The problem is that upon serious consideration, the national security case against breaking up and regulating big tech is not just weak—it is backwards. Far from being a threat to the United States, breaking up and regulating big tech are necessary to preserve America’s competitiveness, national defense, and democratic freedoms in an era of great power competition. First, big tech companies are not competing with China in some kind of new Cold War arms race; rather, many are integrated with China, seeking to expand further into China, and cooperating with Chinese companies and (by extension) likely with the Chinese government. Big tech’s integration with China thus supports the rise and export of digital authoritarianism; deepens economic dependence that can be used as leverage against the United States in future geopolitical moments; forces companies to self-censor and contort their preferences to serve Chinese censors and officials; and makes profit-seeking corporations and their lobbyists less trustworthy in advocating for the interests of the United States in Washington, D.C. Second, in an era of great power competition, innovation and a strong defense industrial base are essential. But relying on a small number of big tech companies (and, in particular, failing to enforce antitrust laws and regulate the sector) means less competition— and that in turn means less innovation, particularly when compared with a system of robust competition and public investment in research and development. Concentration in the tech sector also weakens the defense industrial base by making the government dependent on a small number of contractors and redirecting taxpayer dollars from research to monopoly profits. Taking into account all of these dynamics, national security arguments do not favor protecting big tech companies from competition and regulation. American national security would be strengthened by breaking up and regulating big tech companies.

#### China’s post-COVID grand strategy is revisionist---they’ll seize on weakness to fulfill their foreign policy aims

Campbell & Rapp-Hooper ‘20 (Kurt M.; Mira; Chair and CEO of The Asia Group and former Assistant Secretary of State for East Asia and Pacific Affairs; Stephen A. Schwarzman Senior Fellow for Asia Studies at the Council on Foreign Relations; 7/15/20; “China Is Done Biding Its Time: The End of Beijing’s Foreign Policy Restraint?”; *Foreign Affairs*; <https://www.foreignaffairs.com/articles/china/2020-07-15/china-done-biding-its-time>)

Over the course of the novel coronavirus crisis, analysts have watched relations between the United States and China spiral to a historic nadir, with scant hope of recovery. There are many reasons for the slide, but Beijing, in a striking departure from its own diplomatic track record, has been taking a much harder line than usual on the international stage—so much so, that even the most seasoned observers are wondering whether China’s foreign policy has fundamentally changed. China’s approach to the world was, of course, never ironclad. Many factors determine a country’s diplomatic strategy, from its history, culture, and geography to the nature of its regime and its relative global power. If a government perceives one or more of these factors to have changed, so, too, may its diplomacy. But as COVID-19 has ravaged the globe, Chinese President Xi Jinping has appeared to defy many of his country’s long-held foreign policy principles all at once. It is too early to tell with certainty, but China—imbued with crisis-stoked nationalism, confident in its continued rise, and willing to court far more risk than in the past—may well be in the middle of a foreign policy rethink that will reverberate around the world. The Chinese Communist Party (CCP) started 2020 on the back foot, but it didn’t stay there for long. Accused of being insufficiently transparent about the origins of the coronavirus pandemic, Beijing rushed to defend its global image. And once it had brought the outbreak within its borders under control, it embarked on a brash campaign of “mask diplomacy,” casting itself as a new global health leader. But Beijing did not stop there. In the months since the pandemic first engulfed the world, China’s government has engaged in an unprecedented diplomatic offensive on virtually every foreign policy front. It has tightened its grip over Hong Kong, ratcheted up tensions in the South China Sea, unleashed a diplomatic pressure campaign against Australia, used fatal force in a border dispute with India, and grown more vocal in its criticism of Western liberal democracies. In the past, the CCP generally sought to maintain a relatively stable security environment, occasionally seizing opportunities to advance the country’s aims without provoking undue international backlash and carefully recalibrating whenever it overreached. Beijing’s recent actions, however, reveal no such conservatism or caution. China may simply be taking advantage of the chaos of the pandemic and the global power vacuum left by a no-show U.S. administration. But there is reason to believe that a deeper and more lasting shift is underway. The world may be getting a first sense of what a truly assertive Chinese foreign policy looks like. DIFFERENT IN WORD China’s shift is partly one of language and diplomatic style. Historically, Beijing has stuck to veiled, oblique language in official diplomatic statements, especially when criticizing Washington. In 2015, at the height of an international standoff over China’s island building in the South China Sea, for example, Chinese Vice Foreign Minister Zhang Yesui urged the United States to “cherish the overall peace and stability in the South China Sea [and] treasure the hard-won momentum of positive development in China-US relations”—hardly a pointed critique. But with the pandemic has come a new, harsher tone. “If someone claims that China’s exports are toxic, then stop wearing China-made masks and protective gowns, or using China-exported ventilators,” a foreign ministry spokesperson tweeted after China was found to have delivered substandard medical supplies to several European countries. Chinese diplomats have criticized Western democracies for mishandling the crisis and demanded praise from governments receiving Chinese supplies. Such has been the backlash in Europe and Africa that a leading Chinese think tank warned Beijing in April that its aggressive style risked undermining China’s global standing. That advice seems to have gone unheeded. If anything, Beijing appears less image conscious now than in the past. Xi has endured the reputational damage of his government’s “Wolf Warrior” diplomacy (named after a series of nationalistic action films), likely calculating that China will gain more by flexing its military and economic muscles even if it loses some of its soft power along the way. A series of diplomatic course changes by China—unusual for a government that is typically loath to backtrack on its public positions—likewise suggest a newfound confidence. In the past, Beijing avoided such reversals for fear of “losing face.” But after initially rejecting the idea of an international investigation into the coronavirus outbreak in China, Xi said at the World Health Assembly in May that the World Health Organization (WHO) should conduct a probe once the pandemic subsides. And although China initially refused to join a G-20 pledge to grant debt relief to low-income countries in the throes of economic crisis, it later changed its mind and signed on, albeit with a number of caveats. These shifts suggest that Xi believes he can manage both thorny processes in ways that preserve China’s interests. DIFFERENT IN DEED Beijing has not confined itself to bold rhetoric. Over the past few months, it has upped the ante in nearly all of its many territorial disputes and even provoked new ones, in another departure from past practice. The political scientist Taylor Fravel has shown that China has long prioritized among its territorial disputes, pressing ahead with some and putting others on the back burner to avoid courting too much tension at once. That restraint seems to have fallen by the wayside. Since March, China has stepped up its patrols near the Diaoyu Islands (known in Japan as the Senkaku Islands) in the East China Sea and doubled down on its maritime claims in the South China Sea, sending vessels to linger off the coasts of Indonesia, Malaysia, and Vietnam. It has conducted aerial reconnaissance near Taiwan, effectively ended Hong Kong’s semiautonomous status, ginned up a new border dispute with Bhutan, and by all appearances, provoked a deadly border clash with India in what was the People’s Liberation Army’s first use of force abroad in 30 years. Any one of these moves by Beijing might have been unsurprising on its own. Put together, however, they amount to a highly unusual full-court press. Once content to permit diversity and different sets of norms to persist inside China’s semiautonomous territories, the CCP has also reversed course when it comes to its national periphery. In the western province of Xinjiang, a government crackdown on the Muslim Uighur minority, initiated before the pandemic hit, has since turned into a campaign of ethnic cleansing. Meanwhile, a controversial new national security law has all but stripped Hong Kong of its unique legal status. The law contains provisions that could potentially transcend national boundaries and extend Chinese jurisprudence globally, marking a shift from China’s traditionally defensive conception of sovereignty to a more offensive approach to extend Beijing’s authority. China has long resisted international efforts that it saw as endangering national sovereignty, rejecting, for example, the responsibility to protect (R2P) doctrine, which aims to prevent genocide and humanitarian crises. Now, Chinese sovereignty appears to come in only one form—the one imposed by the CCP. China has upped the ante in nearly all of its many territorial disputes and even provoked new ones. Even beyond its immediate neighborhood, China now seems willing to court controversy, even open hostility. Its approach to Australia is a case in point. After Canberra called for an independent investigation into the origins of the pandemic, Beijing issued a harsh rebuke and imposed trade sanctions on Australia. It also appears to have carried out a series of cyberattacks against Australian government servers and businesses. Australian public opinion is rapidly turning against China as a result, with growing support for a more hard-line foreign policy, and Canberra has announced plans to boost its defense spending. Beijing appears undeterred, perhaps because it hopes to teach other states in the region to think twice before opposing it. But it will not soon win Canberra back. The stubbornness on display in China’s treatment of Australia—the determination to barrel through instead of recalibrating—is emblematic of a wider shift. Back in 2015, after China’s artificial islands in the South China Sea sparked outrage from other regional players, Beijing sensed it had overreached and changed tack. It temporarily scaled back its island building and began devoting more time to regional diplomacy and its Belt and Road Initiative. By contrast, there are few obvious signs that China is rethinking its approach this time around, at least so far. The world was already on already on alert when, in June, the National People’s Congress announced its sweeping new national security law for Hong Kong. But the global chorus of condemnation that followed the announcement did not keep the CCP from implementing the new law with zeal or from formally charging with espionage two Canadian citizens it had held in detention for 18 months. In this new Chinese foreign policy, there are few U-turns and no posted speed limits. Some of the most consequential changes are taking place on the inside, at the highest echelons of Chinese policymaking. When Beijing encountered unforeseen foreign policy challenges in the past, it followed a clear process of deliberation that was comprehensible to outside observers. That has not been the case of late. Xi is rumored to be making many of the most important decisions himself, without even a trusted cohort of advisers. This may help explain why China’s foreign policy has become less risk averse: with fewer voices pitching in, an undaunted Xi may have no one to dissuade him from pressing ahead. Past Chinese leaders, notably Deng Xiaoping and Jiang Zemin, believed in the institutionalized processes of collective leadership. Xi has ~~disabled~~ or neutralized many of these channels. The world may now be getting a sense of what China’s decision-making looks like when a singularly strong leader acts more or less on his own.PLUS ÇA CHANGE? What all these shifts amount to in the aggregate is still a matter of some debate. Some will argue that China’s strategy hasn’t changed but simply seized the moment, as it has done many times before: Xi is taking advantage of the United States’ stunning abdication of global leadership in a moment of crisis to advance his interests on many fronts. His imperious coronavirus diplomacy is just the latest instance of China’s long-standing tradition of foreign policy opportunism and improvisation—only scaled up to fit the gaping hole left by the United States. And perhaps three years of the Trump administration’s unilateral, zero-sum diplomacy have encouraged Beijing to push for foreign policy wins wherever it can, especially while the United States is busy gearing up for a contentious presidential election in November. But the United States has been divided and distracted before—at the height of its wars in the Middle East and during the global financial crisis of 2008, for example—without inviting so many bold advances from China. The current lack of U.S. leadership matters, no doubt, but so do Xi’s consolidation of power and his belief that China’s geopolitical moment has arrived. These are the true forces pushing Beijing toward action. The United States’ withdrawal from the world is merely giving China the space it needs to follow through. What is clear is that Beijing’s new foreign policy has already left its mark. Relations with Australia are at a low point, and European public opinion of China could suffer for years to come. The recent deadly border clash in the Himalayas may make India a more determined counterweight to China in the region. Familiar or not, Beijing’s bristling crisis diplomacy is costing it in novel and lasting ways. China’s diplomatic offensive is sure to preoccupy any future U.S. administration, too. Whether under former Vice President Joe Biden or Trump, the next White House will need to prepare for tough bilateral diplomacy with Beijing on many fronts at once, from Hong Kong to the South China Sea, India, and Europe, where Chinese attempts at pressure and intimidation will likely continue. American leaders should expect to face Chinese diplomats who engage in rhetorical bomb throwing even as Xi himself presents a calmer and more constructive face, as he and Foreign Minister Wang Yi have done in recent weeks. And they should expect to deal with a Chinese government that, for all the international blowback it has received, maintains the confidence, even brazenness, of a newly minted great power. Fortunately for the next U.S. president, the contours of a better American approach to China have been evident for some time. The United States must reject the punitive unilateralism that has become the norm in recent years and that has produced no trade or national security gains whatsoever. It must rejigger its relationship with allies in Europe and Asia, who provide its only remaining chance at balancing China in the decades ahead. It must reinvest in international institutions, such as the UN, the G-7, and the WHO, which are indispensable for crisis management and which China is all too happy to lead in the United States’ absence. And it must restore its own domestic health and prosperity to remain a viable competitor on the global stage. If there is a silver lining to the current crisis maelstrom, it may be that Beijing has pulled back its own curtain, giving the world an unsolicited preview of unconstrained Chinese might. By leaving a power vacuum in the world’s darkest hour, the United States has bequeathed China ample room to overreach—and to demonstrate that it is unqualified for a position of sole global leadership. If Washington does not return soon, however, it may not much matter how the world views China’s bumptious diplomacy—left with no alternative, strident excess will fill the void.

#### US-China war escalates to nuclear war

Talmadge 17—Caitlin Talmadge, Associate Professor of Security Studies at Georgetown University, Ph.D. in Political Science from MIT (“Would China Go Nuclear? Assessing the Risk of Chinese Nuclear Escalation in a Conventional War with the United States,” *International Security*, Vol. 41, No. 4, April 25th, Available Online)

Chinese nuclear escalation in the event of a conventional war with the United States is a significant risk, although for reasons not fully surfaced in the existing debate. A U.S. conventional campaign would indeed pose a large, though not total, threat to China's nuclear arsenal. More important than the purely military-technical implications of the U.S. campaign, however, is what China is likely to believe the campaign signals about U.S. intentions in a world where conventional deterrence has just failed. Reasonable Chinese fears that the United States might be attempting conventional counterforce, or considering or preparing for nuclear counterforce, could lead China to engage in limited nuclear escalation to gain military advantage or coercive leverage—despite China's no-first-use policy.

This conclusion, derived from the article's general framework, raises a host of questions for further research. One of the most important is whether China's efforts to alert its nuclear forces during a crisis in order to improve survivability could look to the United States like preparation for escalation, leading the United States to launch what it saw as a damage-limitation strike even if it had originally not intended to engage in counterforce at all.133 This possibility points to additional escalatory dynamics that might emerge in a future U.S.-China conflict, arising from U.S. interpretations of Chinese actions, especially as Chinese nuclear capabilities expand. Some expansion could be stabilizing, however. If China eventually develops a larger and more survivable nuclear arsenal, the threshold at which U.S. conventional operations could start to seriously erode that arsenal would increase, reassuring Chinese leaders in wartime. Whether such a development would be a net positive for the United States would depend among other things on how China's nuclear expansion affected other aspects of China's behavior, but on the escalation question, it could be beneficial.

More broadly, analysis of the China case raises the question of why the United States might adopt conventional military strategies that could increase risks of opponent nuclear escalation in the first place. Optimists often simply do not address the underlying drivers of such policies, whereas pessimists tend to characterize them as the inadvertent product of U.S. military planning run amok of civilian guidance.134 It seems more likely that such policies are not inadvertent, at least not in the sense that senior civilian policymakers are blindly unaware of the escalatory risks these policies entail. Rather, my interviews and conversations with senior policymakers, both military and civilian, suggest that they have long been generally cognizant of the fact that U.S. conventional military operations have the potential to create nuclear pressures on opponents.135

#### Antitrust reform is necessary to solve the advantage

Ganesh Sitaraman 20, Vanderbilt University Law School, 3/12/20, “The National Security Case for Breaking Up Big Tech,” <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3537870>

What does bigness have to do with integration? Or to put it differently, is the real problem integration with China rather than a weak antitrust and regulatory regime to govern big tech companies? The question of integration with China as a general matter is beyond the scope of this essay, but the size and dominance of American tech companies is part of the problem, and breaking up big tech should therefore be part of the solution. To see why, compare a concentrated ecosystem with a small number of big companies to a competitive ecosystem with a large number of small companies. In a concentrated ecosystem with few players, China will have far more leverage over the United States. A small number of big tech companies that are integrated with China will be more dependent on Chinese markets for consumers and profits—and, in turn, more vulnerable to pressure from the Chinese government. In contrast, in a fractured market with many players, it is much more likely that some will seek other sources for supply chains, develop domestic American capacities, or simply choose not to engage in the Chinese market—whether because of idiosyncratic preferences, competitive dynamics, product differentiation, higher costs, or other factors. It is theoretically possible that we might instead expect another outcome: A small number of tech firms making monopoly profits might not need Chinese markets and therefore would be more independent from that country’s fusion of politics and economics. Likewise, a multi-player ecosystem of smaller companies, each with razor-thin profit margins, might push all of these players to dependence on Chinese markets for consumers and profits (this is, of course, where debates over integration versus disentanglement are relevant). But theory is not reality, and this alternative hypothesis has not been borne out. In our current highly concentrated tech market, big tech companies are not forsaking Chinese markets out of a combination of morality, patriotism, and monopoly profits. They are operating in China and are desperate to integrate further. Concerns about censorship and distorted practices are also significantly reduced in a competitive ecosystem of smaller players because some companies and creative gatekeepers won’t aim to comply with Chinese government preferences. Consider the Hollywood context. Disney’s share of box office sales domestically, for example, approaches 40 percent, and the six biggest studios have 85 percent of box office sales.53 These companies produce fewer films and, because of their market power, can contractually require that those films be shown in theaters in ways that block other films.54 These companies are also increasingly integrating vertically across production and distribution: Netflix both produces shows and operates a streaming service, as does Amazon and now even Disney. The result is that smaller players are likely to face a tilted playing field because integrated behemoths can prioritize their own content over competitors and might not take chances on content that isn’t likely to maximize their viewership goals.55 If these big integrated companies comply with Chinese censors because of their ambitions in the Chinese market, then American consumers will not see content that doesn’t adhere to Chinese government preferences. In contrast, in a system with a large number of small studios, many would not have the size and scope to play to the Chinese market, let alone be dependent on the Chinese market. They also wouldn’t have the power and scale to preference their own content over competitors through vertical integration. The result would be an ecosystem in which Americans will have a range of content choices—including entertainment that might not accord with the views of foreign censors. Big tech companies are not likely immune from what is happening in Hollywood—as well as what has happened to Mercedes and other entities that seek to operate in China. Many of these companies, like Amazon and Google, seek access to Chinese markets and operate as both content producers and distributors or platforms. To the extent that they have divisions whose work is objectionable to censors in foreign countries (Amazon, of course, creates its own content; as does YouTube, which is a subsidiary of Google), they too will feel pressure to preemptively shape that content in ways that are palatable to censors. And because of their market power within the United States, U.S. consumers are likely to be left with fewer and fewer serious scalable alternatives. Finally, in a competitive ecosystem with many players, concerns about the ill effects of lobbying are mitigated as well. In a system with a few dominant players, efforts to lobby the United States government should be seen as highly questionable because of companies’ dependence on Chinese markets. A multi-player ecosystem addresses this challenge in two ways: First, many companies will not be dependent on Chinese markets. Second, in a multi-player ecosystem, differentiated companies are less likely to have shared interests and are more likely to end up on different sides of policy questions.56 This means that their lobbying efforts are less likely to cut in a single direction and thus less likely to capture government. This insight is not a new one—it is foundational to American political and constitutional thought. In Federalist 10, James Madison argued that in a political ecosystem with many groups with differentiated interests, no particular faction would be able to capture government.57 Instead, they would cancel each other out and enable policymakers to pursue the public good. Competition between interests, not the dominance of a few interests (particularly if foreign-influenced), preserves a free and democratic government.

#### Plan: The United States Federal Government should expand the scope of antitrust law by prohibiting predatory and limit pricing

#### Making predatory pricing per se illegal allows Courts to examine anticompetitive harms

Khan 17, Lina Khan is the Chair of the FTC she wrote this piece as a law student at Yale. “Amazon’s Antitrust Paradox”, January, 2017. The Yale Law Journal Volume 126, Number 3, 564-907, <https://www.yalelawjournal.org/note/amazons-antitrust-paradox>

A. Governing Online Platform Markets Through Competition Reforming antitrust to address the anticompetitive nature of platform markets could involve making the law against predatory pricing more robust and strictly policing forms of vertical integration that firms can use for anticompetitive ends. Importantly, each of these doctrinal areas should be reformulated so that it is sensitive to preserving the competitive process and limiting conflicts of interest that may incentivize anticompetitive conduct. 1. Predatory Pricing While predatory pricing technically remains illegal, it is extremely difficult to win predatory pricing claims because courts now require proof that the alleged predator would be able to raise prices and recoup its losses.405 Revising predatory pricing doctrine to reflect the economics of platform markets, where firms can sink money for years given unlimited investor backing, would require abandoning the recoupment requirement in cases of below-cost pricing by dominant platforms. And given that platforms are uniquely positioned to fund predation, a competition-based approach might also consider introducing a presumption of predation for dominant platforms found to be pricing products below cost. Several reasons militate in favor of a presumption of predation in such cases. First, firms may raise prices years after the original predation, or raise prices on unrelated goods, in ways difficult to prove at trial. Second, firms may raise prices through personalized pricing or price discrimination, in ways not easily detectable. Third, predation can lead to a host of market harms even if the firm does not raise consumer prices. Within a consumer welfare framework, these harms include degradation of product quality and sapping diversity of choice.406 Such harms may arise if Amazon uses its bargaining power to extract better terms from producers and suppliers, who, in turn, slash investments to meet its demands. Within a broader framework—which seeks to protect the full range of interests that antitrust laws were enacted to safeguard—the potential harms include lower income and wages for employees, lower rates of new business creation, lower rates of local ownership, and outsized political and economic control in the hands of a few.407 Introducing a presumption of predation would involve identifying when a price is below cost, a subject of much debate. The Supreme Court has not addressed the issue, but most appellate courts have said that average variable cost is the right metric.408 This Note does not advocate the adoption of one particular measure over others. Admittedly, “below cost” is an imperfect filter, especially since what constitutes the relevant cost may vary depending on the industry or cost structure. And the specific definition of “costs” that courts and enforcers adopt may ultimately be less significant if the test for predatory pricing also permits a business justification defense, which would help screen against false positives.409 A business justification defense could cover compensating a buyer for taking the risk of buying a new product, expanding demand to a level which will allow the entrant to achieve scale economies, keeping prices at competitive levels while expecting costs to decline, and matching competition.410 Whether a platform is dominant enough to trigger the presumption could be assessed through its market share: those holding greater than, say, 40% of the market in any given line of service (e.g., cloud computing, ride sharing) might be designated “dominant.” Rather than measuring this market share nationally, enforcers would look to levels of local control; a ride-sharing platform that held only 35% of the national market but 75% of the Nashville market would still be considered dominant for the purpose of price-cutting in Nashville.

#### Making Limit Pricing per se illegal solves the aff

Peelish 20, Natalie Peelish is a law clerk to Thomas Ambro on the US Court of Appeals for the Third Circuit, “Antitrust and Authorized Generics: A New Predation Analysis”, Stanford Law Review, Volume 72, March 2020, https://review.law.stanford.edu/wp-content/uploads/sites/3/2020/03/Peelish-72-Stan.-L.-Rev.-791.pdf

IV. Limit Pricing: A Better Measure of Predation for Authorized Generics Some scholars have argued that the Brooke Group test’s requirements for a predatory pricing claim of below-cost pricing and reasonable probability of recoupment “may be sufficient to make out a predatory pricing case, but they should not be necessary.”225 This means that there are other ways in which firms can engage in predatory pricing that ultimately harms consumer welfare. But, as demonstrated above, authorized generics will likely fail the below-cost element of the Brooke Group test given the patent context and regulatory framework of the pharmaceutical industry. Nonetheless, this framework enables the brand drug manufacturer to achieve the same goal (ensuring supracompetitive pricing by driving out rivals) without pricing below its own costs. Rather, a brand manufacturer need only employ limit pricing, or pricing below the cost necessary for a generic manufacturer to recoup its initial investment in the Paragraph IV certification and the resulting patent litigation. Thus, one solution to policing the predatory launch of authorized generics is through a limit-pricing test that penalizes authorized generics when they are priced below the first-filer generic’s entry costs. A. Theory Limit pricing describes the setting of a price “at a level just below that which a prospective entrant to the market would need to charge in order to sustain a successful entry.”226 Limit pricing occurs when an incumbent firm prices “below the short-run profit-maximizing price but above the competitive level” in order to deter or prevent would-be entrants.227 The limit price is “intended by the monopolist to impair the opportunities of rivals, and, if successful, it does prevent competition from arising.”228 While a monopolist without the fear of entrants can charge whatever price will maximize its immediate profit, monopolists facing potential entry threats are constrained in how they may price if they want to maintain at least some of their monopoly profits. For example, say a brand manufacturer’s profit-maximizing price for an authorized generic is $10 per unit, but this is high enough that it would encourage entry by other generics. If the brand manufacturer’s costs for producing the drug were only $7 per unit, but the generic entrant’s costs were $9 per unit, then the brand manufacturer could price the authorized generic at $8 in order to deter generic entry and sustain its monopoly because the generic manufacturer, if it matches the $8 price, would not be able to make a profit since its higher costs exceed the price charged.229 So long as the long-term profits from pricing at the lower price exceed those from pricing at the higher price, even while a brand manufacturer accepts an entrant and the resulting market share dilution, the brand manufacturer would rationally choose the lower price.230 The pharmaceutical market is an ideal market for brand manufacturers to engage in limit pricing because “the classical limit-pricing strategy is directed at potential entrants whose costs are higher than those of the incumbent,”231 making limit pricing a better test of predation. Limit pricing would trigger liability when a brand drug manufacturer prices its authorized generic below a reasonable measure of the generic manufacturer’s costs to enter the market,232 which would include the fixed costs of Paragraph IV certification, resultant patent litigation, and manufacturing. Using limit pricing, rather than belowcost pricing, as a measure of predation would more effectively penalize the type of conduct we want to deter as harmful to consumers, while still serving as an effective screen for those cases in which low costs truly represent competition on the merits. That is because predators who employ limit pricing would raise their prices once entry had been deterred, making the price cuts only temporary. Additionally, limit pricing offers courts a practicable and objective way to distinguish between legitimate and illegitimate pricing strategies by comparing the price charged per unit to the fixed costs of entry plus the marginal cost of each additional unit sold. Of course, expert economic analysis would be needed, as it is in nearly all antitrust cases, in order to determine the limit price and the brand manufacturer’s likelihood of recoupment in other markets. However, once that information was provided to the courts, they would have an objective metric of judging when an incumbent brand manufacturer was pricing below the generic manufacturer’s costs in a real attempt to deter generic entry in its other markets.233 There are several ways in which a monopolist can leverage its dominant position to introduce limit pricing to deter potential rivals.234 Incumbent monopolists that have a “significant cost or noncost advantage over entrants”235 can utilize these advantages to deter competitors from entering the market. Importantly, and distinct from predatory pricing as contemplated in the classic case such as Brooke Group, predation in this model does not require the predator to give up all of its monopoly profits in the short-term. Because “the predator’s cost is below the entrant’s at the margin, [if] the goods are homogeneous” and “competition is over prices” rather than quality, then “the incumbent’s shortrun [profit-]maximizing response” is to deter competitors from entering the market altogether.236 For the limit-pricing theory to hold, then, it must be the case that the monopolist incumbent has cost or noncost advantages over the rival such that it can price below the rival’s costs but above its own. Incumbent monopolists typically have several cost advantages. First, the monopolist has the sunk cost of its initial expenditure that has already been recovered from the sales of the monopoly-priced product and that, unlike the potential entrant, it need not incur again.237 If barriers to entry are high, then the one-time costs of entry matter even more because, while the monopolist was able to recoup its investment in entry by charging monopoly profits when it had the market to itself (before the entry of the first-filer generic), any potential entrants will necessarily lack the possibility of recoupment through supracompetitive pricing as they will still face the incumbent brand (and likely its authorized generic) as competitors. Second, the monopolist will frequently have lower variable costs than the entrant.238 This will continue to be the case so long as the marginal costs of the monopolist do not increase significantly, which would threaten to destroy any of its cost advantages.239 Additionally, there are several noncost advantages an incumbent monopolist may have over the potential entrant, such as brand loyalty and network effects.240 The upshot of this is that “incumbents with cost advantages may find predation rational and even short-run maximizing, even in a full information setting.”241 Another key factor that makes this scenario different from that in Brooke Group is that once a monopolist has gained a reputation for predatory pricing, potential rivals will be deterred ex ante from entering the market because the incumbent monopolist is signaling to the potential entrant that entry would be futile.242 At that point, an incumbent monopolist may not need to engage in limit pricing at all, since these rivals will be deterred from entering the market altogether, knowing that the monopolist may at any point again engage in such limit pricing to deter entry. B. Application The patent and regulatory framework of the pharmaceutical market puts the brand manufacturer, as the incumbent monopolist, in an excellent position to launch authorized generics using a strategy of limit pricing to deter potential generic rivals ex ante. As described above, at least two factors must be present for limit pricing to be a successful predation strategy: (1) an incumbent monopolist and (2) cost or noncost advantages of the monopolist over the potential entrants. First, brand drug manufacturers are incumbent monopolists by virtue of their patents, which give them a legal monopoly over a particular drug market until the patent expires or a first-filer generic launches a successful Paragraph IV challenge triggering the exclusivity period. Second, brand manufacturers have significant cost advantages over potential generic entrants. The brand manufacturer has already expended the sunk cost of obtaining the patent and conducting the clinical trials and research necessary for NDA approval by the FDA. Thus, the marginal cost of creating and marketing an authorized generic is substantially lower for the brand manufacturer because it need only increase the quantity of its current output. Because authorized generics can take advantage of state generic substitution laws,243 the brand manufacturers need not invest in marketing and product placement as they would for a brand drug. Here, the brand manufacturer has greater financial staying power because it already has one successful product—the brand drug—on the market that will continue to attract a customer base. While the generic manufacturers need not incur the same initial costs of conducting research and clinical trials (after all, avoiding these costs is the entire point of the ANDA), they must still invest in the research and testing necessary to prove bioequivalence, along with the infrastructure and supplies necessary to create and scale a new drug product. Additionally, there are significant barriers to entry for first-filer generics that do not exist for the brand drug because the litigation costs associated with a first filer’s Paragraph IV certification erect a significant entry hurdle for the first-filer generic.244 What is more, while the first-filer generic cannot sell its product during the thirty-month stay triggered by the patent litigation, the brand manufacturer will continue reaping a profit. The brand drug manufacturer also possesses significant noncost advantages over the potential generic entrants. These noncost advantages include brand loyalty, mistrust of generic drugs by consumers, and in certain instances high switching costs, whereby once a consumer begins taking a brand drug, it is difficult to incentivize that same consumer to switch to the generic version of the drug.245 Additionally, studies “suggest that to the extent that a generic market has first mover advantages, an authorized generic would be particularly well positioned to obtain those advantages.”246 With these requisite factors met, exploring two hypothetical scenarios demonstrates when a brand manufacturer would face liability under a limit pricing test for launching an authorized generic and when it would not. In the unlawful scenario, assume that brand manufacturer BM is a major pharmaceutical company with numerous patent-protected drugs spread across various markets. BM is facing generic competition in the market for its brand drug B1—a first-filer generic has already made a Paragraph IV certification and is about to enjoy its exclusivity period. BM launches an authorized generic, AG1, for B1 at the start of the first filer’s exclusivity period and prices it below the first filer’s costs. The first filer is unable to recoup its entry and other costs given the steep price competition with AG1 and suffers significant losses. Seeing this behavior in the market for B1, another generic manufacturer wishing to challenge the patents for BM’s B2, a smaller market, changes course and decides to wait until the patent for B2 expires, knowing that it would not be able to recoup the entry costs of a Paragraph IV certification if BM were to launch an authorized generic in the market for B2. Because BM, a monopolist brand manufacturer, launched an authorized generic priced below its competitor’s costs and deterred generic entry in B2, BM’s launch of AG1 would satisfy the limit-pricing test. Assuming BM recouped its investment in launching AG1 by the deterrence in the market for B2, this conduct would also satisfy the recoupment prong, and thus BM should be liable under section 2 of the Sherman Act for predatory pricing.247 Now, assume the same facts except that BM’s other drugs were all in large markets in which a generic’s entry costs constituted only a small portion of its total profits. Even seeing the launch of AG1, the authorized generic in the market for B1, generic manufacturers are not deterred from filing Paragraph IV certifications in the other drug markets because they know that even if BM launches an authorized generic priced below their costs in these markets, the resultant profit they would make even after exclusivity would still be enough to recoup their investment. Thus, because there is no entry deterrence, this would fail the predation test, and BM would not be held liable under the antitrust laws.