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### K---Artificial Intelligence

#### The AI “arms race” is a scam: prefer an “arms control” paradigm. Framing AI as a military asset corrupts its utility as a social good, accelerating endless conflict and crushing the true pillars of national security.

Skolnik 21 – Jon Skolnik is a staff writer at Salon. His work has appeared in Current Affairs, The Baffler, AlterNet, and The New York Daily News, March 16th (“Big Tech is fueling an AI "arms race": It could be terrifying — or just a giant scam”, Salon, Available online at <https://www.salon.com/2021/03/16/big-tech-is-fueling-an-ai-arms-race-it-could-be-terrifying--or-just-a-giant-scam/>, Accessed 10-05-2021)

Early in the 2020 presidential campaign, Democratic candidates Pete Buttigieg and Andrew Yang tried to build political momentum around the claim that the United States is losing ground in a new arms race with China — not over nuclear missiles or conventional arms but artificial intelligence, or AI. Around the same time, former President Trump launched the American AI Initiative, which sought to marshal AI technologies against "adversarial nations for the security of our economy and our nation," as Trump's top technology adviser put it.

Buttigieg, Yang and Trump may have agreed about little else, but they appeared to go along with the nonpartisan think tanks and public policy organizations – many of them funded by weapons contractors – that have worked to promote the supposedly alarming possibility that China and Russia may be "beating" the U.S. in defense applications for AI. Hawkish or "centrist" research organizations like the Center for New American Security (CNAS), the Brookings Institution and the Heritage Foundation, despite their policy and ideological differences in many areas, have argued that America must ratchet up spending on AI research and development, lest it lose its place as No. 1.

Just last week, the National Security Commission on Artificial Intelligence (NSCAI) published a sweeping 756-page report, culminating two years of work following the 2019 National Defense Authorization Act, asking Congress to authorize a $40 billion federal investment in AI research and development, which the NSCAI calls "a modest down payment." The commission also urged President Biden to reject the push for a global ban on AI-enabled autonomous weapons — a ban proposed by thousands of scientists and thought leaders in an open letter written in 2015.

Concerned about the threat of increasing AI sophistication in Russia and China, the commission warned lawmakers that America "will not be able to defend against AI-enabled threats without ubiquitous AI capabilities and new warfighting paradigms." It offered a laundry list of recommendations to put these paradigms into action, including a "Steering Committee on Emerging Technology" within the Defense Department, an accredited university designed to produce and recruit tech talent for the defense sector, and a ramped-up investment in semiconductor manufacturing designed to keep the U.S. "two generations" ahead of China.

One question, however, was not directly answered in the NSCAI's gigantic report or in all the think-tank policy papers that preceded it: Is this science fiction-flavored arms race against largely imaginary Chinese and Russian techno-weapons of the future really necessary? Is it remotely a good idea, or likely to improve the lives of any human beings on the planet? (Excepting, that is, those who stand to profit from it.)

Jim Naureckas, the editor of Fairness and Accuracy in Reporting (FAIR) and a frequent critic of military spending, told Salon in an interview that framing of AI development as an "arms race" is irresponsible, but in the larger sweep of history is also nothing new. "The whole military industry is driven by fear as a motivator," he said. "There's a logic to an arms race that's different from the logic of arms control."

After its release, the NSCAI report was greeted with a deluge of largely uncritical media coverage, most of it echoing concerns about the U.S. losing the "AI arms race" — a term not mentioned in the report itself, but certainly evoked by its framing.

"Unless America acts now," a Washington Post headline read, "China could trounce it in artificial intelligence."

"Which country is emerging as the global leader in AI?" echoed TechHQ.

"America wakes up to the China threat," chimed the Wall Street Journal.

As Naureckas pointed out, the notion that that the U.S. will soon fall behind its global competitors in military technology is a tried-and-true scare tactic, employed at various times in slightly different registers by both Democrats and Republicans. In reality, U.S. military spending remains mind-bogglingly high. For the 2020 fiscal year, the Trump administration approved a military budget of $738 billion, a $21 billion increase from the previous year and it passed with overwhelming bipartisan support, facing only 48 "no" votes in the House and eight in the Senate. In 2019, the militarized budget accounted for 64.5 percent of all federal discretionary spending.

The U.S. has 800 military bases on foreign soil, far more than any other country in the world. According to Military.com, America is the world leader in every significant category of military hardware, and has roughly 1.4 million active-duty military personnel. In 2020, the Stockholm International Peace Research Institute (SIPRI) found that the U.S. allocated more to its military budget than the next 10 nations combined. American military spending is about 2.7 times greater than that of China — which has a much larger population — and more than 10 times higher than Russia's, or that of any other single country.

Meanwhile, bureaucratic and operational waste within the defense budget abound. In 2016, for example, it was discovered that the Pentagon had buried an internal study finding that it had spent some $125 billion in wasteful business operations. More recently, it was discovered that the Pentagon's F-35 fighter jet program — which costed taxpayers somewhere in the neighborhood of $1.5 trillion — has been riddled with software glitches and operational failures since 2006, rendering an untold number of fighter jets (each one costing $100 million) not flight-ready.

In spite of all its administrative bloat and operational dysfunction, the military remains exceptionally well-funded. Why, then, would the NSCAI insist it needs billions more for a hypothetical arms race against badly underfunded opponents? The report's authors may tell a better story than the report itself.

Jack Poulson, a former Google employee who resigned over the company's plan to launch a censored version of its search engine in China, told Salon that profit motives is deeply entrenched in the NSCAI report.

"It should not come as a surprise that a commission packed with tech billionaires would call for increased intellectual property protections, oppose regulation (including on Lethal Autonomous Weapons), propose toothless ethics principles, and call for more federal funding of their industry," Poulson said in a statement.

Indeed, many commission members are past and present tech executives of companies on the fore of AI — companies that have much to gain from future contracting deals with the Pentagon.

The commission's chair, for example, is Eric Schmidt, the former CEO of Google, who remains — as Poulson pointed out — a major shareholder in Alphabet, Google's parent company. Google's head of AI, Andrew Moore, is also a member of the NSCAI.

Google already has an extensive history of working with the Pentagon. According to The Intercept, in a federally-funded $70 million program called Project Maven, Google developed "algorithmic warfare initiative to apply artificial intelligence solutions to drone targeting." The company expecting that revenue would steadily rise from $15 million to $250 million a year for such defense projects.

In April of 2018, however, 3,000 Google employees signed an open letter decrying the company's involvement in defense technology, a move that eventually led to Google's ultimate decision to back out of the deal. Schmidt strongly objected to Google's decision, calling it an "aberration" within the tech industry, which he felt was otherwise inclined to collaborate with the Defense Department. Former Undersecretary of the Navy Robert Work, the vice chairman of NSCAI, called Google's decision "hypocritical," using language that suggested a new cold war is already underway: "Anything that's going on in the AI center in China is going to the Chinese government and then will ultimately end up in the hands of the Chinese military."

Other members of the commission include Oracle CEO Safra Catz, Microsoft chief scientific officer Eric Horvitz, and Andrew Jassy, the future CEO of Amazon Web Services, all of whom received cloud awards as part of the CIA's Commercial Cloud Enterprise (C2E), as Poulson noted.

Oracle, Amazon and Microsoft, in fact, are currently involved in an acrimonious legal battle over a $10 billion cloud-computing contract called the Joint Enterprise Defense Initiative (JEDI). The deal was initially considered to be "gift-wrapped" for Amazon until Oracle butted in, alleging improprieties. In an odd turn of events, the Pentagon awarded the contract to Microsoft, prompting Amazon to sue the federal government for anti-Amazon bias, based on ex-President Trump's overheated rhetoric.

When it comes to securing Big Tech's enormous future contracts with the Pentagon, it appears that Jassy, Catz and Horvitz have set aside their mutual grievances for the time being

Other board members of NSCAI include Gilman Louie and Christopher Darby, who are the founder and vice president (respectively) of a CIA-funded nonprofit called In-Q-Tel, which invests money in private companies who are developing technologies that might be useful to the intelligence community. According to a Wall Street Journal investigation from 2015, half of In-Q-Tel's trustees were financially connected to private companies in which In-Q-Tel had invested.

Another board member, William Mark, a vice president of SRI International, has served on the Defense Advanced Research Projects Agency (DARPA), a government-run program that partners with a variety of private companies and research institutions to "make pivotal investments in breakthrough technologies for national security." DARPA has awarded SRI numerous contracts for the development of speech recognition, translation and, most recently, deep-fake recognition systems.

In other words, nearly everyone involved in preparing or supporting the NSCAI report would seem likely to benefit from the perception that the U.S. is falling behind other nations in vital defense technology.

The Defense Department, Poulson told Salon, "prefers to run the race as if it is losing — which happens to increase military budgets, justify post-government consulting careers and help tech CEOs oppose regulation."

It's only natural that government authorities would seek out industry experts to consult on AI projects — it's a fast-developing field that almost no one outside the tech world understands. Poulson wonders, however, "whether the U.S. will give human rights organizations — such as Human Rights Watch and the Campaign to Stop Killer Robots — as much of a seat at the table as it does tech billionaires."

The very fact that the NSCAI is stacked with panel members with an obvious incentive to weaponize new technologies raises the question whether there needs to be an AI "arms race" at all. That term, of course, harkens back to Cold War hysteria surrounding the threat of nuclear annihilation, which led U.S. lawmakers to grow unduly concerned with the "missile gap," a widely held misconception that the Soviet Union was outpacing the U.S. with superior ballistic missile capabilities. (As intelligence sources knew even at the time, the Soviet nuclear arsenal was in bad shape and much smaller than advertised.)

Arms control strategies, in fact, may be a more effective strategy in the AI realm, just as it was with nuclear missiles, especially given that America already collaborates heavily with China in AI research. As Graham Webster wrote recently in MIT Tech Review:

Unlike the US and USSR, in which science and technology developed on largely independent tracks, the US and China are part of a globally intertwined ecosystem. Even if the US and China cut off trade with each other, both countries would still have to worry about security risks from components, since risks along the supply chain exist everywhere.

For example, Alibaba, a tech giant on the forefront of AI, has multiple offices in the U.S., and Google AI chief Jeff Dean is an adviser at China's Tsinghua University, which opened an Institute for Artificial Intelligence in June 2018. Stanford University's Artificial Intelligence lab has a partnership with one of China's biggest retailers. In other words, an arms race in which the two nations are locked in silos of information, research and development is not just ethically dubious but logistically impossible.

Will China and Russia explore uses of AI in weapons of the future? Almost certainly — both countries have already signaled movement in that direction. But if American politicians and scientists want to maximize the potential of AI, framing its development in terms of an international "arms race" seems like a strategic and philosophical mistake on a huge scale. AI has the potential to revolutionize health care, education, climate science and many other fields — and those things all play a fundamental role in national security. But these new technologies will not make America more secure if they are understood as weapons of international combat.

#### Capitalism causes extinction. Malevolent AI drives us to the end of humanity.

Pueyo 18

(Salvador Pueyo, PhD in Biology and Ecology from University of Barcelona, Dept. Evolutionary Biology, Ecology, and Environmental Sciences, Universitat de Barcelona, “Growth, degrowth, and the challenge of artificial superintelligence,” *Journal of Cleaner Production 197*, 1731-1736)

We could be approaching a technological breakthrough with unparalleled impact on the lives of every reader of this paper, and on the whole biosphere. It might seem fanciful to suggest that, in a near future, artificial intelligence (AI) could vastly outperform human intelligence in most or all of its dimensions, thus becoming superintelligence. However, in the last few years, this position has been endorsed by a number of recognized scholars and key actors of the AI industry. Several research institutions have been created to explore the implications of superintelligence, for example at Oxford and Cambridge Universities. For details on how this idea emerged and is becoming established, see the chronological table in the Supplementary Material, and for a thorough understanding of the current discussions see Bostrom (2014) or Shanahan (2015). Artificial intelligence (AI) is defined as computational procedures for automated sensing, learn-ing, reasoning, and decision making (AAAI, 2009, p. 1). AIs can be programmed to pursue some given goals. For example, AIs programmed to win chess matches have been defeating human world champions since 1997 (Bostrom, 2014). Current AIs have narrow scopes, while a hypothetical superintelligence would be more effective than humans in pursuing virtually every goal. AI experts surveyed in 2012/13 assigned a probability of 0.1 to crossing the threshold of human-level intelligence by 2022, 0.5 by 2040 and 0.9 by 2075 (median estimates; Muller et al., 2016). The European Commission recently launched the e1 billion Human Brain Project with the intent of simulating a complete human brain as early as 2023, but its chances of success have been questioned (Nature Editors, 2015), and superintelligence is thought to be more easily attainable by engineering it from first principles than by emulating brains (Bostrom, 2014). Following Yudkowsky (2001), the current discussion on the implications of superintelligence (Bostrom, 2014; Shanahan, 2015) is framed around two possibilities: the first superintelligences to emerge will be either hostile or friendly (depending on their programmed goals). In most authors' views, these would result in either the worst or the best imaginable consequences for humanity, respectively1. Much subtler distinctions apply to weaker forms of AI, but it is argued that intermediate outcomes are less likely for an innovation as radical as superintelligence (Bostrom, 2014, p. 20). Hostile superintelligence is imagined as a result of failure to specify and program the desired goals properly, or of instability in the programmed goals, or less frequently as the creation of some illicit group. Therefore, it is framed as a technical rather than a political challenge. Most of the research is focused on ways to align the goals of a hypothetical superintelligence with the goals of its programmer (Sotala and Yampolskiy, 2015), without questioning the economic and political system in which AI is being developed. Kurzweil (2005, p. 420) is explicit in that an open free-market system maximizes the likelihood of aligning AI with human interests, and is leading a confluence of major corporations to advance an agenda of radical techno-social transformation based on this and other allied technologies (Supplementary Material). The benefits imagined from friendly superintelligence find an economic expression in rates of growth at an order of magnitude above the traditional ones or more (Hanson, 2001, 2008; Bostrom, 2014). This view is akin to that of some authors within sustainability science, who take seriously the environmental challenges posed by economic growth, technological innovation and the functioning of capitalist markets, but seek solutions based on these same elements. Opposed to this position is the idea of degrowth (D'Alisa et al., 2014). Degrowth advocates hold a diversity of views on technology (see the Introduction to this special issue), but agree that indefinite growth is not possible if measured in biophysical terms, and is not always desirable if measured as GDP, both for environmental and for social reasons. Also, they are critical of capitalist schemes: to foster a better life in a downsized economy, they would rather support redistribution, sharing, democracy and the promotion of non-materialistic and prosocial values. The challenges of sustainability and of superintelligence are not independent. The changing fluxes of energy, matter, and information can be interpreted as different faces of a general acceleration 2. More directly, it is argued below that superintelligence would deeply affect production technologies and also economic decisions, and could in turn be affected by the socioeconomic and ecological context in which it develops. Along the lines of Pueyo (2014, Sec. 5), this paper presents an approach that integrates these topics. It employs insights from a variety of sources, such as ecological theory and several schools of economic theory. The next section presents a thought experiment, in which superintelligence emerges after the technical aspects of goal alignment have been resolved, and this occurs specifically in a neoliberal scenario. Neoliberalism is a major force shaping current policies on a global level, which urges governments to assume as their main role the creation and support of capitalist markets, and to avoid interfering in their functioning (Mirowski, 2009). Neoliberal policies stand in sharp contrast to degrowth views: the first are largely rationalized as a way to enhance efficiency and production (Plehwe, 2009), and represent the maximum expression of capitalist values. The thought experiment illustrates how superintelligence perfectly aligned with capitalist markets could have very undesirable consequences for humanity and the whole biosphere. It also suggests that there is little reason to expect that the wealthiest and most powerful people would be exempt from these consequences, which, as argued below, gives reason for hope. Section 3 raises the possibility of a broad social consensus to respond to this challenge along the lines of degrowth, thus tackling major technological, environmental, and social problems simultaneously. The uncertainty involved in these scenarios is vast, but, if a non-negligible probability is assigned to these two futures, little room is left for either complacency or resignation. 2 Thought experiment: Superintelligence in a neoliberal scenario Neoliberalism is creating a very special breeding ground for superintelligence, because it strives to reduce the role of human agency in collective affairs. The neoliberal pioneer Friedrich Hayek argued that the spontaneous order of markets was preferable over conscious plans, because markets, he thought, have more capacity than humans to process information (Mirowski, 2009). Neoliberal policies are actively transferring decisions to markets (Mirowski, 2009), while firms' automated decision systems become an integral part of the market's information processing machinery (Davenport and Harris, 2005). Neoliberal globalization is locking governments in the role of mere players competing in the global market (Swank, 2016). Furthermore, automated governance is a foundational tenet of neoliberal ideology (Plehwe, 2009, p. 23). In the neoliberal scenario, most technological development can be expected to take place either in the context of firms or in support of firms3. A number of institutionalist (Galbraith, 1985), post-Keynesian (Lavoie, 2014; and references therein) and evolutionary (Metcalfe, 2008) economists concur that, in capitalist markets, firms tend to maximize their growth rates (this principle is related but not identical to the neoclassical assumption that firms maximize profits; Lavoie, 2014). Growth maximization might be interpreted as expressing the goals of people in key positions, but, from an evolutionary perspective, it is thought to result from a mechanism akin to natural selection (Metcalfe, 2008). The first interpretation is insufficient if we accept that: (1) in big corporations, the managerial bureaucracy is a coherent social-psychological system with motives and preferences of its own (Gordon, 1968, p. 639; for an insider view, see Nace, 2005, pp. 1-10), (2) this system is becoming techno-social-psychological with the progressive incorporation of decision-making algorithms and the increasing opacity of such algorithms (Danaher, 2016), and (3) human mentality and goals are partly shaped by firms themselves (Galbraith, 1985). The type of AI best suited to participate in firms' decisions in this context is described in a recent review in Science: AI researchers aim to construct a synthetic homo economicus, the mythical perfectly rational agent of neoclassical economics. We review progress toward creating this new species of machine, machina economicus (Parkes and Wellman, 2015, p. 267; a more orthodox denomination would be Machina oeconomica). Firm growth is thought to rely critically on retained earnings (Galbraith, 1985; Lavoie, 2014, p. 134-141). Therefore, economic selection can be generally expected to favor firms in which these are greater. The aggregate retained earnings4 RE of all firms in an economy can be expressed as: RE = FE(R;L;K) 􀀀 w   L 􀀀 (i + )   K 􀀀 g: (1) Bold symbols represent vectors (to indicate multidimensionality). F is an aggregate production function, relying on inputs of various types of natural resources R, labor L and capital K (including intelligent machines), and being affected by environmental factors5 E; w are wages, i are returns to capital (dividends, interests) paid to households, is depreciation and g are the net taxes paid to governments. Increases in retained earnings face constraints, such as trade-offs among different parameters of Eq. 1. The present thought experiment explores the consequences of economic selection in a scenario in which two sets of constraints are nearly absent: sociopolitical constraints on market dynamics are averted by a neoliberal institutional setting, while technical constraints are overcome by asymptotically advanced technology (with extreme AI allowing for extreme technological development also in other fields). The environmental and the social implications are discussed in turn. Note that this scenario is not defined by some contingent choice of AIs' goals by their programmers: The goals of maximizing each firm's growth and retained earnings are assumed to emerge from the collective dynamics of large sets of entities subject to capitalistic rules of interaction and, therefore, to economic selection. 2.1 Environment and resources Extreme technology would allow maximizing F in Eq. 1 for some given R and E, but would also alter the availability of resources R and the environment E indirectly. Would there still be relevant limits to growth? How would these transformations affect welfare? To address the first question, let us consider growth in different dimensions:   Energetic throughput: It is often thought that the source that could allow energy production (meaning tapping of exergy) to keep on increasing in the long term is nuclear fusion. This will depend on whether it is physically possible for controlled nuclear fusion to reach an energy return on energy investment EROI >> 1 (Hall, 2009). Even in this case, new limits would be eventually met, such as global warming due to the dissipated heat by-product (Berg et al., 2015). This same limit applies to other sources, such as space-based solar power. It is not known how global warming and other components of E would affect F in a superintelligent economy, or the potential for mitigation or adaptation with a bearable energetic cost. Whatever the sources of energy eventually used, the constraints on growth are likely to become less stringent right after the development of superintelligence, but this bonus could be exhausted soon if there is a substantial acceleration of growth. Other components of biophysical throughput: Economies use a variety of resources with different functions, subject to their own limits. However, extreme technological knowledge would allow collapsing the various resource constraints into a single energetic constraint, so energy could become a common numeraire. The mineral resources that have been dispersed into the environment can be recovered at an energetic cost (Bardi, 2010). Currently, many constraints on biological resources cannot be overcome by spending energy (e.g., the overexploitation of some given species), but this will change if future developments in nanotechnology, genetic engineering or other technologies are used to obtain goods reproducing the properties that create market demand for such resources.   Information processing: Information processing has a cost in terms of resources. Operating energy needs pose an obstacle to brain emulations with current computers (Sandberg, 2016), but the hardware requirements (Sandberg, 2016) could be met soon (Hsu, 2016), and other paths to superintelligence could be more efficient (Sandberg, 2016). However, current ICT relies on a variety of elements that are increasingly scarce (Ragnarsd ottir, 2008). In principle, closing their cycles once they are dispersed in the environment has an enormous energetic cost (Bardi, 2010). The resource needs of future intelligent devices are unknown, but could limit their proliferation. This does not have to be incompatible with a continued increase in their capabilities: When ecosystems reach their own environmental limits, biological production stagnates or declines, but, often, there is a succession of species with increasing capacity to process information (Margalef, 1980).   GDP: Potentially, it could continue to increase without need of growth in biophysical throughput, e.g., through trade in online services. It is argued in Sec. 2.2 that this could well happen without bene ting human welfare. Superintelligence holds the potential for extreme ecoefficiency: In the terms of Eq. 1, firms could not only increase F given R, but also decrease depreciation   (which, however, would only be viable for assets that do not need quick innovation because of competition). Increasing resource efficiency and decreasing turnover are common in maturing ecosystems (Margalef, 1980). However, ecoefficiency does not suffice to prevent impacts on the environment E (which does not only affect production but also the welfare of humans and other sentient beings). With firms maximizing their growth with few legal constraints (as corresponds to the type of society envisaged in Sec. 2.2), extreme resource efficiency could well entail an extreme rebound effect (Alcott, 2015), which is tantamount to generalized ecological disruption. 2.2 Society The literature on superintelligence foresees enormous benefits if superintelligent devices are aligned with market interests, including tremendous profits for the owners of capital (Hanson, 2001, 2008; Bostrom, 2014). By simple extrapolation of shorter-term prognoses (Frey and Osborne, 2013; see also van Est and Kool, 2015), this literature also anticipates huge technological unemployment, but Bostrom (2014, p. 162) claims that, with an astronomic GDP, the trickle down of even minute amounts in relative terms would result in fortunes in absolute terms. However, if there were astronomic growth (e.g., focused on the virtual sphere) while food or other essential goods remained subject to environmental constraints and competition between basic needs and other uses, resulting in mounting prices, a minute income in relative terms would be minute in its practical usefulness, and most people might not benefit from this growth, or even survive (think, e.g., of the role of biofuels in recent famines; Eide, 2009). In fact, there are even more basic aspects of the standard view that are debatable. This section presents a different view, building on the assumption that firms generally tend to maximize growth under environmental constraints. The following points discuss the resulting changes in each of the social parameters in Eq. 1, and relate them to broader changes in society:   L: A continuing trend toward L = 0 is plausible, but it could also be reversed because of resource scarcity. Following Sec. 2.1, energetic cost could be the main factor to decide between humans or machines in functions that do not need large physical or mental capacities. Humans are made up of elements that follow relatively closed cycles and are easily available, while most current machines use nonrenewable materials whose availability is declining irreversibly (Georgescu-Roegen, 1971). Intelligent devices could thus become quite costly (Sec. 2.1). A variety of responses are imaginable, from finding techniques to build machines with more sustainable materials to creating machine-biological hybrids or modified humans; yet, it cannot be taken for granted that human work would be discarded. Initially, one extra reason to use human workers would be the big stock available. Even if human labor persisted, some major changes would be foreseeable: (1) Pervasive rationalization maximizing the output extracted from labor inputs. Current experience with digital firms point to insidious techniques of labor management to the detriment of workers' interests (Mosco, 2016). (2) AIs replacing humans in important functions that need large mental capacities. These include the senior managers of big corporations and other key decision makers (as well as people devoted to economically relevant creative or intellectual tasks). A few unmanned companies already exist (Cruz, 2014).   w: Thus far, w and L seem to have been affected similarly by IT, via labor demand (Autor and Dorn, 2013). However, it is worth noting that firms also have an impact on human wants (Galbraith, 1985), and that this impact is being enhanced by AI. Every user of the Internet is already interacting daily with forerunners of Machina oeconomica that manage targeted advertising (Parkes and Wellman, 2015). Relational artifacts (Turkle, 2006) promise an even more sophisticated manipulation of human emotions. There is empirical evidence that, as it would be expected, the compulsion to consume induced by advertising results in longer working hours and depressed wages (Molinari and Turino, 2015). Furthermore, consumption is not the only motivation to work (Weber, 1904); e.g., some firms induce workers to identify with them (Galbraith, 1985). If these trends continued to the extreme, humanity would become extremely addicted to consumption and to work, and wages would drop to the minimum needed to survive and work (assuming that human labor remains competitive; otherwise, w would be reduced to the zero vector 0).   i: Like work, having capital invested in firms is not just motivated by the wish to consume (Weber, 1904). Procedures like inducing identification (Galbraith, 1985) could magnify the other motivations and reduce i. Consumption advertising acts in this case as a conflicting pressure (Molinari and Turino, 2015), but firms paying profits to households would probably be outcompeted by firms with no effective ownership (technically, nonprofits) or owned by other firms, which would allow reducing i to 0 (note that dividends and interests paid to other firms, including banks, cancel out because Eq. 1 refers to the aggregate of all firms). The owners of capital might currently have an economic function by allocating resources, but automated stock-trading systems have already determined between half and two thirds of U.S. equity trading in recent years (Karppi and Crawford, 2015), making human participation increasingly redundant.   Demand: This is not an explicit term in Eq. 1, but is implicit in F to the extent that production is addressed to the market. In an economy in which humans receive minimum wages and no profits, or in an economy without humans, demand would be basically reduced to firms' investment demand. This would serve no purpose, but would result from economic selection favoring firms with the greatest growth rate. Given the complex interactions mediated by demand, it is unclear whether or not a maximization of each firm's growth should translate to a maximization of aggregate growth.   g: For a strict neoliberal program, the main role of governments would be to serve markets, and this function would determine some g negotiated with firms. Directly or indirectly, governments would continue to exert functions of surveillance and coercion, aided by vast technological advances. Their decisions would be increasingly automated, whether or not they maintained some nominal power for human policy makers. Even elections are starting to be mediated by intelligent advertising (Mosco, 2016). Therefore, a range of negative impacts can be expected, and they are unlikely to spare senior managers or capital owners. Let us consider some moderate deviations from this political extreme. For example, these effectively selfish automated firms could coordinate to address shared problems such as resource limitations, but this does not mean that they would seek to benefit society, such as by ceding resources for people's use with no benefit for firms' growth. Or, before superintelligence is fully developed, governments could try to implement some model combining market competition as a force of technological innovation and wealth creation with economic and technological regulations to ensure that humans (in general, or some privileged groups) obtain some share of the wealth that is produced. However, this project would meet some formidable obstacles: 1. Ongoing neoliberal globalization is making it increasingly difficult to reverse the transfer of power to markets. A reversal will also be increasingly unlikely as computerization permeates and creates dependence in every sphere of life and the capacity of firms to shape human preferences increases. 2. The mere prohibition of some features in AIs poses technical problems that could prove intractable. In the words of Russell (interviewed by Bohannon, 2015): The regulation of nuclear weapons deals with objects and materials, whereas with AI it will be a bewildering variety of software that we cannot yet describe. I’m not aware of any large movement calling for regulation either inside or outside AI, because we don’t know how to write such regulation. 3. The objective role of humans obtaining profits from this type of firms would be parasitic. Parasites extract resources from organisms that surpass them in information and capacity of control (Margalef, 1980). In nature, parasites generally have high mortality rates, but persist by reproducing intensively. No equivalent strategy can be imagined in this case. The transfer of profits to humans would be an ecological anomaly, likely to be unstable in a competitive framework. A much more likely departure from strict neoliberalism would result from structural mutations that would carry the system even further from any human plan, in unpredictable manners. Such mutations were excluded from the definition of this scenario, but not because they should be unlikely. In particular, they could provide a path to forms of hostile superintelligence more similar to those in the literature. Marxists believe that societies dominated by one social class can be the breeding ground for newer hegemonic social classes. In this way bourgeois would have displaced aristocrats, and they expect proletarians to displace the bourgeois (Marx and Engels, 1888). However, the bourgeoisie represented an advance in information processing and control, unlike the proletariat. AIs are better positioned to become hegemonic entities (even if unconsciously). This would not be just a social transition, but a biospheric transition comparable to the displacement of RNA by DNA as the main store of genetic information. So far, there is nothing locking future superintelligences in the service of human welfare (or the welfare of other sentient beings). Whether and how this future world would be shaped by the type of society from which it emerges is extremely uncertain, but neoliberalism can be seen as a blueprint for a Kafkaesque order in which humans are either absent or exploited for no purpose, and ecosystems deeply disturbed. 3 Degrowth as a viable alternative Criticisms to the environmental and social impacts of the capitalist market are often answered with appeals to the gains in efficiency and long-term growth brought about by a free market. The above thought experiment shows how misleading it is to assume that efficiency and growth are intrinsically beneficial. The economic system as a whole may become larger and more efficient, but there is nothing in its spontaneous order guaranteeing that the whole will serve the interest of its human parts. This becomes even more evident when approaching the point in which humans could cease to be the most intelligent of the elements interacting in this complex system. Even though the thought experiment assumes neoliberal policies, as one of the purest expressions of pro-capitalist policies, Sec. 2.2 also lists some reasons to be skeptical of reformist solutions. Here, a response to this challenge is outlined. This involves, first of all, to disseminate it and integrate it into a general criticism of the logic of growth and a search for systemic alternatives, in contrast to the technocratic (sensu Kerschner and Ehlers, 2016) strategies to keep the management of this issue within limited circles (Supplementary Material). This awareness could initially permeate the social movements that originated in reaction to a variety of environmental and social problems caused by the current growth-oriented economy (including the incipient resistances to labor models introduced by digital firms; Mosco, 2016). This will not just be one more addition to a list of dire warnings like resource exhaustion, environmental degradation and social injustice: While the economic elites now have the means to protect themselves from all of these threats, it is shown above that intelligent devices could well end up replacing them in their roles, thus equating their future to that of the rest of humanity. This alters the nature of the action for system change. It means that, in fact, this action does not oppose the interests of the most influential segments of society. A new role for social movements is to help these elites (and the rest of humanity) understand which policies are really in their best interest. In the kind of alternatives outlined below, such elites will gradually lose their privileges, but they will gain a much better life than if the loss of privileges occurs in the way that Sec. 2 suggests. Initially, few in the elites will be ready for such a radical change in their worldview, but these few could start a snowball effect. This is a game-changer creating new, previously unimaginable opportunities. A key step will be to reform the process of international integration. Rather than democracy controlled by the global market, markets will need to be democratically controlled (there has been a long-standing search for alternatives, e.g., The Group of Green Economists, 1992). This will not necessarily have to be followed by a trajectory toward a fully planned economy: a lot of research needs to be done on new ways to benefit from democratically tamed self-organization processes (Pueyo, 2014). What does not suffice, however, is the old recipe of setting some minimum constraints with the expectation that, then, the forces of market competition will be harnessed for the general interest. If, as suggested in Sec. 2.2, there is no way for governments to control a mass of entities evolving in undesirable ways, an alternative is to deflect the forces that drive such evolution. This entails nothing less than moving from an economic system that promotes self-interest, competitiveness, and unlimited material ambitions in firms and individuals to a system that promotes altruism, collective responsibility, and sufficiency. In short, moving from the logic of growth to the logic of degrowth (see D'Alisa et al., 2014). Thus, besides regulations setting constraints of various types, there is a need for methods to align economic selection with the collective interests. The application of such methods would, for example, cause demand (which affects production F in Eq. 1) to become positively correlated with wages (i.e., with each firm's contribution to w), negatively correlated with resource use (R), and properly correlated with other more subtle parameters (not explicit in Eq. 1). The common good economy (Felber, 2015) is an approach worth considering because it aims explicitly to remove pressures that propel growth, and is already expanding with the involvement of many businesses. In this approach, a key tool is the common good balance sheet, a matrix of indicators of firms' social and environmental performance designed by participatory means, completed by the firms and (ideally) revised by independent auditors. Its function is to ease the application of ethical criteria by private and public agents interacting with firms in every stage of production and consumption. Felber (2015) envisions an advanced stage in which firms and the whole economy transcend their current nature (e.g., big firms would be democratized). While the common good balance sheet would serve mainly as an aid to change firms' general goals, it could also incorporate some explicit indicator of the perilousness of the software that these firms develop or use. Hopefully, changing values in firms, governments, and social movements will also ease the change in individual values. This will further reduce the risk of having people engaged in the development of undesirable forms of AI. Furthermore, for those still engaged in such activities, there will be an increased chance of others in their social networks detecting and interfering with their endeavor. This reorientation at all levels (from the individual to the international sphere) will also help to address forms of AI distinct but no less problematic than Machina oeconomica, such as autonomous weapons. Even with such transformations, it will not be easy to decide democratically the best level of development of AI, but the types of AI should become less challenging. (Also, these transformations could moderate the pace of technological change and make it more manageable, by relaxing the competitive pressure to innovate). However, they will only be viable if they take place before reaching a possible point of no return, which could occur well before superintelligence emerges (considering irreversibility, obstacle 1 in Sec. 2.2). 4 Conclusions There is little predictability to the consequences that superintelligence will have if it does emerge. However, the thought experiment in Sec. 2 suggests some special reasons for concern if this technology is to arise from an economy forged by neoliberal principles. While this experiment draws a disturbing future both environmentally and socially, it also opens the door to a much better future, in which not only the challenges of superintelligence but many other environmental and social problems are addressed. This pinch of optimism has two foundations: 1) The thought experiment suggests that nobody is immune to this threat, including the economically powerful, which makes it less likely that the action to address it gets stranded on a conflict of interests. 2) The neutralization of this threat could need systemic change altering the very motivations of economic action, which would ally the solution of this problem with the solution of many other obstacles to a sustainable and fair society, along the lines of degrowth. One of the main dangers now lies in our hubris, which makes it so difficult to conceive of anything ever defying human hegemony.

#### National security justifications for growth are a sham. Even a cursory glance at the numbers quickly dismantles the fear of “rising challengers”.

Kwet 1/11 – Michael Kwet, PhD in Sociology and Visiting Fellow at Yale's Information Society Project, 2022 (“The Digital Tech Deal: a socialist framework for the twenty-first century”, *Race and Class*, Available online at <https://journals.sagepub.com/doi/abs/10.1177/03063968211064478>, Accessed 01-20-2021)

‘New Cold War’ narratives often suggest the United States and China are locked into a battle for supremacy in the global economy, as if there is close parity between the two. Tech is said to be central to this war. Advocates of this position often point out that China’s GDP is close to that of the US and when adjusted for purchasing power parity, it already exceeds the US.6

However, a closer look at the global economy demonstrates that the US remains overwhelmingly dominant, both in terms of economic and technological power. As economist Sean Starrs points out, in the post-second world war period, US economic power didn’t decline – it globalised.7 Among the Forbes Global 2000, US firms dominate eighteen out of twenty-five sectors as of 2013, a configuration which had not changed much by the year 2020. These include categories in tech and investment, where the US is overwhelmingly dominant.

China has gained a little ground since Starrs published his findings, but is still far behind the United States. In 2020, Starrs re-tabulated the Forbes Global 2000 data as follows:

For ‘IT Software & Services’, US profit-share is 76% vs China 10%; for ‘Technology Hardware & Equipment’, US is 63% vs China 6%, more than Taiwan’s 5.7% and nowhere near South Korea’s 14%, and less than Japan’s 7.9%. For Electronics: US is 43%, Japan 15%, Taiwan 12%, South Korea 12%, China 10%. So China has increased its profit-share by over 300%, but US has also increased and China is still only the 5th highest profit-share in the world in 2020, after being the largest electronics exporter continuously from 2004.8

In other words, China not only lags well behind the US in the tech sector, but it also often falls behind Japan, South Korea and Taiwan. In terms of investment, Starrs shows that the United States is also well ahead of the rest of the world.9 Starrs also gives an estimate of wealth by national share, concluding that the US houses only 4 per cent of the world population, yet it holds about 40 per cent of the world’s household assets – a number on a par with its post-second world war share of GDP.10

Because the economy has globalised, the use of GDP as a measure of national wealth confuses the situation.11 Starrs uses the profits of transnational corporations as a more accurate indicator of national economic wealth and power. As a result, the picture is one of American hegemony. What is more, in the domain of tech, American dominance seems understated, as most data comparing US and Chinese tech giants – including Starrs’s figures – fails to disaggregate wealth and market share outside of both the US and mainland China borders.12 This is a serious problem because in contrast to the United States, China’s tech economy is largely localised.

In most countries, US-based transnational corporations dominate most products and industries, including search engines (Google); web browsers (Google Chrome); smartphone and tablet operating systems (Google Android, Apple iOS); online advertising (Facebook, Google); desktop and laptop operating systems (Microsoft Windows, macOS); office software (Microsoft Office, Google Workspace); cloud infrastructure and services (Amazon, Microsoft, Google, IBM); social media platforms (Facebook, Twitter, Snapchat); transportation (Uber, Lyft); business networking (Microsoft); streaming video (Google, Netflix, Hulu); streaming audio (Google, YouTube, Apple); and computer chips (Intel, Nvidia, AMD) – among other products and services.13

There are some other countries with market share in these areas, such as Sweden’s Spotify for streaming audio and Japan’s ARM for chips (which may be purchased by Nvidia). While China has offerings for some of these products (e.g., Baidu for search engines, Tencent’s WeChat and Sina Weibo for chat and social media, Alibaba’s Youku Tuduo for video streaming), most are confined to their borders. Moreover, China often relies upon US tech and IP, such as computer chips and Google Android for its smartphones. In many cases, China doesn’t even offer a competitor (e.g., desktop/laptop operating system or office software). Thus, any time a person is firing up their computer or using the internet, by and large, they are paying the Americans. This is largely why American tech transnationals are so wealthy, and it’s why they dominate the figures Starrs tabulated.

Indeed, though it’s rarely discussed, colonialism is the central business model of Big Tech. When we observe that GAFAM – Alphabet/Google, Amazon, Meta/ Facebook, Apple, Microsoft – is worth over $9 trillion dollars collectively,14 much of that $9 trillion is coming from abroad.15

To be sure, Chinese firms have made considerable gains outside of their national borders, and they have substantial market share in a few areas, such as 5G (Huawei), CCTV cameras (Hikvision, Dahua), safe and smart cities (Huawei, especially in the Global South), ride-hailing (Didi) and social media (TikTok). China is also active in exploiting labour for minerals in places like the Congo.16 Yet even in some of these instances, countries foreign to China are dominant or play a substantial part, as with Chinese smartphones largely assembled by corporations using foreign-owned parts and software.

Moreover, the same colonial impulses characterise European firms (e.g., European investors in Jumia; Estonia-based Bolt in Africa) and Global South giants (e.g., MTN in Nigeria). Yet on the whole, global competitors are far behind the US in the global tech economy.

#### It’s a pretext for permanent wage slavery.

Kwet 1/11 – Michael Kwet, PhD in Sociology and Visiting Fellow at Yale's Information Society Project, 2022 (“The Digital Tech Deal: a socialist framework for the twenty-first century”, *Race and Class*, Available online at <https://journals.sagepub.com/doi/abs/10.1177/03063968211064478>, Accessed 01-20-2021)

Digital colonialism and the battle for the global tech economy

Under classic colonialism, European settlers violently colonised the land, dominated the sea lanes, built infrastructure like railroads designed for military power and economic plunder, enslaved and exploited indigenous labour, imposed brutal military and policing regimes often rooted in surveillance, monopolised the heavy machinery and scientific knowledge for economic and military exploitation, extracted material resources back to the core countries for manufacturing and often shipped back cheap manufactured goods to the peripheral countries, undermining local markets in return, thereby creating dependency and an unequal global division of labour.1 Missionaries and secular thinkers generated racist versions of religion and science to rationalise colonial conquest and manufacture consent.2

Digital colonialism evolved out of the status quo set in place over the past five centuries. Under digital colonialism, Big Tech transnationals, primarily based in the United States, make use of digital technology for political, economic and social control of another territory or group. Instead of colonising the land through violent conquest, these firms colonise the digital ecosystem and markets central to twenty-first century society. They own the software, hardware and network connectivity, as well as the platforms, data and intellectual property.3 Like the railroads of empire, they design their tech for the purpose of profit and plunder.

An unequal division of labour and exchange of goods and services ensues, whereby the rich countries do the higher-level ‘thinking’ and own the intellectual property and data, as well as the means of computation (such as computer chips and cloud-server farms) upon which every society depends. American firms exercise political control (e.g., decisions to shape and censor social media posts) and fashion new technologies for use by military, police and intelligence agencies. Those in the Global South continue to fulfil their role as exploited menial labour for the North: they dig in the dirt for minerals, cultivate cash crops for export, assemble smartphones in sweatshops, cleanse social media for disturbing content, troubleshoot for Big Tech corporations as call-centre workers and annotate data to train artificial intelligence models.4

Digital colonisation took off over the past four decades as computer technology spread and changed the nature of global power. In 2004, the top ten global corporations by market capitalisation featured just two tech giants: Microsoft and Intel. By 2021, the top ten featured seven tech giants: Microsoft, Amazon, Apple, Alphabet/Google, Facebook, Nvidia and Tencent (eight if you count Tesla).5 The concentration of market power into the hands of a few corporations in the tech sector follows more general trends of concentrated wealth and corporate power in the neoliberal era that preceded it.

#### The alternative is a multi-paradigmatic disruption of homo economicus. That averts extinction.

Urbina and Ruiz-Villaverde 19 – Dante A. Urbina is a Professor at the University of Lima in Heterodox economics, Alberto Ruiz-Villaverde, Profesor Titular de Universidad, January 23rd (“A Critical Review of Homo Economicus from Five Approaches”, American Journal of Economics and Sociology, Volume 78, Issue 1, pp. 63-93, Available online via USC Libraries, Accessed 07-09-2021)

The neoclassical scheme of homo economicus is clearly inadequate and deficient in portraying the complexity of human behavior. We have used not one, but five approaches to criticize the notion of homo economicus, which underlies the entire framework of neoclassical economics.

From the study of psychology, behavioral economics has shown that there is no perfect rationality or criterion for optimization; on the contrary, our perceptions and decisions are systematically affected by biases and cognitive limitations.

From an analysis of the way behavior is shaped by social norms, institutional economics has established that we are not isolated subjects with given preferences but are constitutively formed by norms and social structures. Even our apparent individuality and preferences themselves are influenced by social factors.

From the perspective of social and power relationships, political economy finds that individuals do not exist separately and independently. Humans exist in social groups or classes within a hierarchical scheme. The self-interested nature of homo economicus is not universal; on the contrary, it is a social construction of capitalism itself.

From the historical study of cultural development, economic anthropology calls into question the universality of homo economicus by showing that, in pre-capitalist economies, schemes of social interaction based on cooperation and solidarity cannot be reduced to self-interested motivations. The complexity of motivation involves deeper and transcendental connotations.

Finally, from the broader vision of conceptualizing human beings as part of a large ecosystem, ecological economics considers the environment not as something exogenous that can be addressed as a subsidiary issue in economic theory. Conversely, it should be considered endogenous, as something that needs to be consistently addressed from a holistic perspective and not from the limited neoclassical scheme.

Despite these critical perspectives, the defense of homo economicus remains in force because it legitimizes and rationalizes the functioning of the current market society. A series of contradictions have emerged in market societies and reveal the pressing need to transcend the approach created by adherence to the logic of homo economicus.

The first contradiction involves the hedonistic principles of homo economicus, which tie happiness or well-being to consumption of goods and services. We seriously question the validity of that connection. As we have shown, the quality of life for the population may actually be declining in relation to food, clothing, and housing.

Second, the optimizing logic of production and consumption in an increasingly competitive environment of capitalist accumulation lowers the price of commodities. In neoclassical theory, this result is treated as an indicator of the success of capitalism. However, the logic of optimization has also caused the deterioration of working conditions and a reduction of the remuneration of the working class. The failure of neoclassical economics to address this trend reveals an enduring alliance between mainstream economics and the capitalist class.

Third, the model of market society in the industrial metropolis (the rich nations of the Global North) is not generalizable on a global scale. The level of production achieved in these metropolitan centers is built on the increasing use of energy and nonrenewable raw materials. That process can be sustained only through the appropriation of energy and the raw materials from countries of the Global South and through practices of ecological colonialism, such as operating the most polluting industries in their territory.

Finally, ecological economics shows us how the expansion of the current model of society and its growing dependence on the degradation of energy and nonrenewable raw materials has already met the limits offered by our small planet. Thus, it is becoming more urgent to keep in mind the relatively short deadlines for the exhaustion of a whole series of nonrenewable raw materials and the rupture of the basic ecological balances that make life on earth possible (Naredo 2015: 87).

The notion of homo economicus continues to dominate the thinking of mainstream economists and, by extension, of other agents of the capitalist economy. In order to obtain consistent and genuine progress toward a more just and sustainable economy, a multi-paradigmatic vision is required. We have sought to call attention to several types of paradigms that would need to be incorporated in this new perspective. More critical knowledge would enable us to construct an alternative economics and an alternative economy. We close with the inspiring thought of Pierre Bourdieu (1993: 944) that a new world is truly possible: “What the social world has done, it can, armed with this knowledge, undo.”

### 1NC---FinTech

#### The US can track bitcoin now.

Bohannon 16 – John Bohannan, Science contributing correspondent and has written for Wired and other magazines, 2016 (“Why criminals can't hide behind Bitcoin”, Science, Available Online at <https://www.science.org/content/article/why-criminals-cant-hide-behind-bitcoin>, Accessed 04-03-2022)

But even mixing has weaknesses that forensic investigators can exploit. Soon after Silk Road shut down, someone with administrative access to one of the newly emerging black markets walked away with 90,000 Bitcoins from user escrow accounts. The thief tried to use a mixing service to launder the money, but wasn't patient enough to hide the tracks, Meiklejohn says. "It's difficult to push large amounts of Bitcoin through mixing services secretly. It's extremely noticeable no matter how you do it." Thomas Jiikovský, the man under investigation by Czech police, is suspected to be the thief in question.

The beauty of Bitcoin, from a detective's point of view, is that the blockchain records all. "If you catch a dealer with drugs and cash on the street, you've caught them committing one crime," Meiklejohn says. "But if you catch people using something like Silk Road, you've uncovered their whole criminal history," she says. "It's like discovering their books."

Exactly that scenario is playing out now. On 20 January of this year, 10 men were arrested in the Netherlands as part of an international raid on online illegal drug markets. The men were caught converting their Bitcoins into Euros in bank accounts using commercial Bitcoin services, and then withdrawing millions in cash from ATM machines. The trail of Bitcoin addresses allegedly links all that money to online illegal drug sales tracked by FBI and Interpol.

#### Iran has already banned cryptocurrency – No reason they would use it to avoid sanctions.

\*Their evidence says terrorists want to use bitcoin to avoid sanctions, NOT Iran.

Motamedi 21 – Maziar Motamedi, Tehran-based journalist who covers Iran, 2021 (“Bitcoin backlash: Iran cracks down on crypto exchanges”, Al Jazeera, March 12th, Available Online at <https://www.aljazeera.com/economy/2021/3/12/bitcoin-backlash-iran-cracks-down-on-crypto>, Accessed 04-03-2022)

Trying to control bitcoin trades

Last month, Mojtaba Tavangar, the head of the Digital Economy Commission of Iran’s hardline parliament, wrote a letter to President Hassan Rouhani, his ministers and the Central Bank of Iran calling for a complete halt to the use of the rial to buy and sell bitcoin and other cryptocurrencies on crypto exchanges.

Tavangar warned that trading cryptocurrencies could foster large-scale financial scams and fraud – several of which involving traditional assets have dogged the country over the past decade.

His letter followed in the wake of an announcement in February by Iran’s Central Bank Governor Abdolnaser Hemmati that a select number of crypto exchanges would soon be designated strictly to facilitate sale transactions for miners whose coins will be spent to import goods into the country.

Days later, Shaparak, Iran’s payment settlement network under the Central Bank, tightened the noose further, telling local payment facilitating companies to stop offering services that allow “illegal” conduct, including “selling cryptocurrencies, selling VPNs [virtual private networks], and betting and gambling websites”.

The order, which targeted mostly private online crypto exchanges, comes as a vague blanket ban on the use of cryptocurrencies issued three years ago still remains in effect.

#### Iran is not an attractive place to mine bitcoin – Energy prices are too high.

Terner 20 – Steven Terner, Writer for the Atlantic Council, 2020 (“Iran’s muddled relationship with cryptocurrency is self-inflicted”, Atlantic Council Organization, Available Online at <https://www.atlanticcouncil.org/blogs/iransource/irans-muddled-relationship-with-cryptocurrency-is-self-inflicted/>, Accessed 04-03-2022)

Regardless, other companies remain deterred from operating in Iran because its crypto laws are murky, if not contradictory, and change frequently. In 2018, Iran’s civilian crypto community addressed these issues. They noted that the policies at the time were so convoluted that they gave the impression that policymakers did not understand the technology they were trying to regulate, let alone how to entice businesses to want to become involved. Today, there are still a lot of kinks to work out. For one thing, crypto policy is under the purview of the Ministry of Industry and Mining, but should arguably be regulated by Iran’s Central Bank.

Furthermore, on May 21, the electricity tariff for cryptocurrency mining increased 300 percent, effectively shutting down virtually all mining operations in the country. This was likely the intended goal, as the demand for household consumption of electricity increases in the summer months due to high temperatures and the government would like to avoid electricity blackouts. Nonetheless, it throws yet another wrench into the works of Iranian cryptocurrency mining.

#### Fintech is growing – Statistics prove.

Wiwanto 20 – Frans Wiwanto, Forbes Council Member, 2020 (“Three Factors Driving The Rise Of Fintech And What The Banking Industry Can Learn From Them”, Forbes Magazine, Available Online at <https://www.forbes.com/sites/forbesfinancecouncil/2020/04/02/three-factors-driving-the-rise-of-fintech-and-what-the-banking-industry-can-learn-from-them/?sh=7ba6e90d6d76>, Accessed 04-02-2022)

Over the past several years, this sector has grown rapidly. According to a 2019 EY fintech report, the global adoption of fintech services has moved upward from 16% in 2015 to 64% in 2019. The awareness of fintech is also extremely high. Of 27,000 consumers surveyed, 96% showed awareness of a fintech transfer or payments offering, and three-fourths had used one before.

If one needs further evidence of this rise in awareness, simply look at the growing number of universities offering courses focused on fintech. Oxford University and Harvard University are just a couple of the schools offering such courses, and the list continues to grow.

#### Fintech is outcompeting traditional banking.

Wiwanto 20 – Frans Wiwanto, Forbes Council Member, 2020 (“Three Factors Driving The Rise Of Fintech And What The Banking Industry Can Learn From Them”, Forbes Magazine, Available Online at <https://www.forbes.com/sites/forbesfinancecouncil/2020/04/02/three-factors-driving-the-rise-of-fintech-and-what-the-banking-industry-can-learn-from-them/?sh=7ba6e90d6d76>, Accessed 04-02-2022)

1. Their Focus On Underserved Areas Of Banking

Incumbent players in the finance industry have traditionally focused on high-margin business, while lower-margin businesses are often deemphasized. Many banks have scaled down their retail banking business to focus on more profitable commercial and investment banking businesses. Even within the commercial banking business, many have focused almost exclusively on large corporations, underserving small and medium enterprises. The reduction of retail banking and underserving of small and medium enterprises have aided the rise of fintech players focused in these areas.

Financial providers should not look solely at current profitability numbers and fail to look at the big picture. Instead, we should think strategically by considering the long-term impact and growth potential of the various businesses within the ecosystem.

2. A Lack Of Trust In The Traditional Banking Industry

According to regtech provider Fenergo, since the 2008 financial crisis, incumbent players have been fined $36 billion for noncompliance with global anti-money laundering, know-your-customer and sanctions regulations. Furthermore, 12 of the world’s top 50 banks received fines in 2019.

In Australia, the government established a Royal Commission in 2017 to investigate the alleged misconduct in the finance industry. The subsequent Deloitte Trust Index for Banking 2018 highlighted the public’s opinion of the industry, with just 21% of respondents saying they thought banks had customers’ best interests at heart.

As a result, a healthy dose of skepticism now pervades the finance industry. This has benefited fintechs, which have offered tools that augment what banks have historically offered. The lesson here is that while trust takes time to be built, it can be destroyed instantly with one mistake. We should never forget that trust is the foundation upon which the finance industry was built and that it requires a continuous effort to maintain.

#### Fintech focus outpaces legacy institutions.

Wiwanto 20 – Frans Wiwanto, Forbes Council Member, 2020 (“Three Factors Driving The Rise Of Fintech And What The Banking Industry Can Learn From Them”, Forbes Magazine, Available Online at <https://www.forbes.com/sites/forbesfinancecouncil/2020/04/02/three-factors-driving-the-rise-of-fintech-and-what-the-banking-industry-can-learn-from-them/?sh=7ba6e90d6d76>, Accessed 04-02-2022)

3. Their Sharp Focus

Fintech players have three main advantages over incumbent players: Focus, focus and focus.

First, they usually focus only on one product or service. As they are, in most cases, smaller and nimbler, they usually have lower operating costs. This translates to the ability to concentrate more on customer experience by providing their product or service cheaper and more resourcefully than banks.

Second, they have a clear focus on the customer. Without cumbersome legacy systems operated by incumbent players, they can better focus on solving customer problems and enhancing customer experiences. The dwindling pool of legacy system specialists further exacerbates the problem as it is difficult and often expensive to find people with the coding skills necessary to maintain and fix legacy systems.

Third, they focus on new technology that gives them an edge. One example is the use of artificial intelligence technology in traditional processes, like price forecasting, fraud prevention, risk management and customer service. Another example is the use of blockchain technology in traditional processes, which offers greater transparency, increased efficiency, better security and improved traceability.

The scalpel-like focus of fintech companies helps them respond more quickly to the changing needs of customers. The lesson here is not to lose focus on our core mission objectives as we grow and expand. We should never forget why the company was created in the first place.

While some incumbent players may be late to respond to the rise of fintech, others are starting to create their own services or partnering with established fintech players. The effects of fintech reach widely across the finance industry. I see the optimal equilibrium to be one where instead of engaging in costly price wars, incumbent players collaborate with fintech players to produce better products and services. This form of cooperative competition or “coopetition” will move the industry from a zero-sum game to an environment in which the end result benefits the whole and makes all players more profitable.

I believe the finance industry is a dynamic one and the ecosystem has sufficient capacity for both fintech and incumbent players to coexist in a state of “coopetition.”

#### No Middle East Impact.

al-Gharbi 15 – Musa al-Gharbi is a senior fellow with the Southwest Initiative for the Study of Middle East Conflict, May 1st (“Iran’s nuclear threat is a myth,” Al Jazeera, Available online at http://america.aljazeera.com/opinions/2015/5/irans-nuclear-threat-is-a-myth.html)

On April 21, Iran and six world powers resumed the final phase of nuclear talks after a preliminary framework deal reached earlier this month. Iran and the P5+1 countries — Britain, China, France, Germany, Russia and the United States — are expected to reach a final accord by the end of June. Yet **hawks** in Washington and Israel continue to oppose the negotiations. They argue that Iran cannot be allowed to obtain a nuclear weapon or even remain within sprinting distance of acquiring one. A nuclear Iran would be an existential threat to Israel, they claim, and would likely provoke a nuclear arms race in the troubled Middle East. Others have suggested that a nuclear-armed Iran may even precipitate World War III, pushing the world closer to a nuclear winter. Most of these fears are simply unfounded. In fact, even if Iran wanted a nuclear weapon and managed to obtain one, it would **not be able to carry out a successful nuclear strike** against Israel or the United States. No ballistic missile option Iran’s primary challenge in targeting the U.S. or Israel would be geographic. Roughly **1,100 miles separate the Islamic Republic** from Israel’s borders. Jordan, Saudi Arabia and Turkey, which maintain joint missile-defense pacts with Israel, occupy much of the intervening space. This means that a missile from Iran could easily be intercepted by one of these countries before it reaches Israel. Even if this first line of defense failed, Israel has three complementary missile defense systems that are among the most sophisticated in the world. Israel has the **strongest military** in the region and has recently quadrupled its air force’s striking power, which would allow the country to quickly intercept incoming projectiles. Moreover, launching a surprise attack would be extraordinarily difficult, given Israel’s superior intelligence capabilities, which are focused almost entirely on Iran — not to mention its unprecedented cooperation with the United States. Israel also has other geographical advantages: It would be nearly **impossible for Iran to strike** Israel without killing large numbers of Palestinians in the process. Iran has been one of the most vocal and consistent supporters of the Palestinian cause. Thus it is unthinkable that Tehran would carry out a nuclear strike, which could annihilate the Palestinian territories. Nuclear fallout from such a strike could **prove devastating** to southern Lebanon and western Syria, causing immense harm to two of Iran’s **key regional allies**, Hezbollah and the Syrian regime.

#### No prolif impact.

Mueller 20 – John Mueller is an Adjunct Professor of Political Science, Ohio State University; Senior Fellow, Cato Institute, June 24th ("Nuclear Alarmism: Proliferation and Terrorism", Cato Institute, Available online at https://www.cato.org/publications/nuclear-alarmism-proliferation-terrorism, Accessed 5-8-2021)

Consequences

Although we have now suffered through two-​thirds of a century during which there has been great hysteria about the disasters inherent in nuclear proliferation, the consequences of the proliferation that has occurred have been substantially benign. The few countries to which the weapons have proliferated have quietly kept them in storage and haven’t even found much benefit in rattling them from time to time. And even the deterrence value of the weapons has been questionable — the major Cold War participants, for example, scarcely needed visions of mushroom clouds to conclude that any replication of World War II, with or without nuclear weapons, was a decidedly bad idea.18

Moreover, there has never been a militarily compelling — or even minimally sensible — reason to use the weapons, particularly because of an inability to identify suitable targets or ones that could not be attacked about as effectively by conventional munitions. And it is difficult to see how nuclear weapons benefited their possessors in specific military ventures. Israel’s presumed nuclear weapons did not restrain the Arabs from attacking in 1973, nor did Britain’s prevent Argentina’s seizure of the Falklands in 1982. Similarly, the tens of thousands of nuclear weapons in the arsenals of the enveloping allied forces did not cause Saddam Hussein to order his occupying forces out of Kuwait in 1990. Nor did possession of the bomb benefit America in Korea, Vietnam, Iraq, or Afghanistan; France in Algeria; or the Soviet Union in Afghanistan.

Proliferation alarmists may occasionally grant that countries principally obtain a nuclear arsenal to counter real or perceived threats. But many go on to argue that the newly nuclear country will then use its nuclear weapons to dominate the area. That argument was repeatedly used with dramatic urgency for the dangers supposedly posed by Saddam Hussein, and it is now being applied to Iran.

Exactly how that domination business is to be carried out is never made clear.19 But the notion apparently is that should an atomic Iraq (in earlier fantasies) or North Korea or Iran (in present ones) rattle the occasional rocket, other countries in the area, suitably intimidated, would supinely bow to its demands. Far more likely, any threatened states will make common cause with each other and with other concerned countries against the threatening neighbor. It thus seems overwhelmingly likely that if a nuclear Iran brandishes its weapons to intimidate others or to get its way, it will find that those threatened, rather than capitulating to its blandishments or rushing off to build a compensating arsenal of their own, will ally with others (including conceivably Israel) to stand up to the intimidation — rather in the way they coalesced into an alliance of convenience to oppose Iraq’s invasion of Kuwait in 1990.

It is sometimes said, or implied, that proliferation has had little consequence because the only countries to possess nuclear weapons have had rational leaders. But the weapons have proliferated to large, important countries run by unchallenged monsters who, at the time they acquired the bombs, were certifiably deranged: Josef Stalin, who in 1949 was planning to change the climate of the Soviet Union by planting a lot of trees, and Mao Zedong, who in 1964 had just carried out a bizarre social experiment that resulted in an artificial famine in which tens of millions of Chinese perished.20 It is incumbent on those who strongly oppose an Iranian bomb to demonstrate that the regime there is daffier than these.

The few countries to have acquired nuclear weapons programs seem to have done so sometimes as an ego trip for current leaders and, more urgently (or perhaps merely in addition), as an effort to deter a potential attack on themselves: China to deter the United States and the Soviet Union, Israel to deter various enemy nations in the neighborhood, India to deter China, Pakistan to deter India, and now North Korea to deter the United States and maybe others.21 Insofar as nuclear proliferation is a response to perceived threat, it follows that one way to reduce the likelihood of such countries’ going nuclear is a simple one: stop threatening them.

#### No Russia impact.

Trenin 18 [Dmitri Trenin is director of the Carnegie Moscow Center. Fears of World War III are overblown. July 20, 2018. https://www.politico.eu/article/donald-trump-vladimir-putin-nato-crimea-fears-of-world-war-iii-are-overblown/]

Europeans fretted about the end of NATO. But seen from Moscow, the military alliance still appears to be very much alive. Trump's harsh words to his allies on spending haven't changed that. Russia is all too aware that the alliance is focused on its eastern flank, and not only rhetorically. Since it rediscovered Russia as a threat in 2014, there have been new deployments, a higher degree of mobility, and more military exercises along the Russian border, from the Barents to the Black Seas. Hardly a boon for Russia.

It was clear at last week's NATO summit that allies agree on the need to upgrade the bloc’s military efforts. Germany, Italy, France, the U.S. — they all agree members’ defense spending should go up. Whether by 2 percent of GDP as agreed in Wales, or by 4 percent as now demanded by Trump, is, of course, important. However, with Russia’s GDP often likened to that of Spain, or the state of New York, either figure is considered significant in Moscow, given that the money will be spent with Russia in mind.

NATO allies also worry about Trump’s comment this week that it is problematic for the U.S. to come to the defense of smaller NATO allies such as Montenegro. But let’s not forget that at the height of the Cold War it was never 100 percent certain what the U.S. would do in case of an attack on West Germany. Former Chancellor Helmut Schmidt would not have asked for U.S. medium-range missiles in Europe in the 1970s had he had full confidence in NATO's largest member. Nor is NATO enlargement off the table completely. Macedonia has just crossed a major hurdle in its push for membership.

Predictions that Trump would recognize Crimea at the Helsinki meeting were also overblown. There was never any question of the U.S. accepting Crimea’s status as part of Russia, or Washington leaning on Kiev to fulfill its side of the Minsk II accords. In Helsinki, Trump and Putin simply acknowledged the issue, and moved on. The U.S. continues to support both Ukraine and Georgia in their conflicts with Russia and to promote their eventual membership in NATO, which most in the West privately regard as increasingly dangerous.

NATO is still very much exerting pressure on Russia. It's considered more of an annoyance than an immediate threat in Moscow, but also keeps the country in permanent "war mode" vis-à-vis the U.S. Because Moscow is focused on Washington, this means Europeans usually get a pass.

As for Russia’s own intentions, two things are clear. There is no interest in Moscow in attacking the Baltic states or Poland. These countries are as safe now as they were before 2014. Suggestions otherwise simply point to the deep wounds in both nations' psyche, which will not be healed for many decades.

Should Ukraine's leaders decide to repeat Mikheil Saakashvili’s mistake in 2008 and launch a major offensive to retake Donbas — however unlikely — the Russian response could indeed be devastating and lead to Ukraine's loss of sovereignty, as Putin recently stated. But does this mean Russia will move on Ukraine unprovoked? Most certainly not.

Putin's main concerns are largely domestic. He has an ambitious program that logically calls for more economic ties with the West. To move forward, he is looking to ease tensions with the EU and the U.S. What Putin wanted to get out of Helsinki was mainly to start a dialogue with Washington.

Those hopes are now visibly going up in smoke. It is safe to bet that Russia will continue to face the same opposition from a coalition of U.S. and EU interests.

The first détente in the hybrid war between Russia and the West was indeed nipped in the bud by Trump's behavior and the vehemence of his domestic critics. So be it.

Moscow will not capitulate, and will indeed push back. But it's not likely to take the form of an aggressive, overt military attack. Fears of new wars are far from accurate.

### 1NC---Conduct

#### No Cyber Impact:

#### Resilient systems.

Borghard and Lonergan 19 -- Erica Boghard, Assistant Professor at the Army Cyber Institute at the United States Military Academy at West Point and a research fellow at the Saltzman Institute of War and Peace Studies at Columbia University, PhD in political science from Columbia University, Shawn Lonergan, Research affiliate of the Army Cyber Institute at the United States Military Academy at West Point and a cyber officer in the US Army Reserve currently assigned to 75th Innovation Command, PhD in political science from Columbia University, 2019 (“Cyber Operations as Imperfect Tools of Escalation”, *Strategic Studies Quarterly*, Fall Issue 2019, Available Online through University of Southern California Libraries, Accessed 01-17-2021)

Third, these limitations become even more salient when we consider how strategic interactions are likely to play out over time during repeated crisis interactions. Because the virtual domain is changeable in a way that the physical world is not, actions taken by defenders in the context of a crisis can radically and unpredictably alter an attacker’s ability to deliver and sustain effects against a target over time.30 Access and capabilities are neither guaranteed nor indefinite—they have a shelf life.31 Footholds into a target’s network that were time intensive to develop can unexpectedly disappear as vulnerabilities in a network are patched. Exploits may have a short shelf life as revealing information about them enables targets to identify indicators of compromise (IOCs) and use these to prevent further damage from specific malware strains or quarantine malicious traffic using known malware signatures. An example of the latter is the US Cyber Command initiative, beginning in 2018, to share information about adversary malware by uploading samples to VirusTotal.32 Therefore, a target can “transition from vulnerability (to a particular attack) to invulnerability in, literally, minutes.”33 Third-party disclosure about software vulnerabilities by governments or private actors can also unintentionally precipitate the loss of access as exposure about vulnerability information enables network defenders to take measures to remedy them.34 For instance, the disclosures that began in 2016 by the group Shadow Brokers of purportedly pilfered US National Security Agency exploits and zero days ostensibly put US government accesses at risk.35 Put simply, a vulnerability upon which an access relies may in theory be only one update or disclosure away from being patched.

Thus, in the context of an ongoing crisis interaction between an attacker and defender, the former’s operational tempo is likely to be interrupted by the latter’s behavior, forcing the attacker to devote additional time to find or acquire new vulnerabilities and exploits in the midst of an offensive operation or campaign. As Inglis notes, to succeed in an offensive cyber campaign that unfolds over time, attackers must be able to sustain “the efficacy of tools under varying conditions caused by the defender’s response and the natural variability and dynamism of cyberspace.”36 The ability to build or acquire new accesses and capabilities “in real time” during a crisis is highly limited.37 Indeed, General Paul Nakasone remarked in a January 2019 interview on the radical difference in shelf life between conventional and cyber capabilities:

Compare the air and cyberspace domains. Weapons like JDAMs [ Joint Direct Attack Munitions] are an important armament for air operations. How long are those JDAMs good for? Perhaps 5, 10, or 15 years, sometimes longer given the adversary. When we buy a capability or tool for cyberspace . . . we rarely get a prolonged use we can measure in years. Our capabilities rarely last 6 months, let alone 6 years. This is a big difference in two important domains of future conflict.38

Therefore, as a 2013 Defense Science Board report notes, “offensive cyber will always be a fragile capability” when pitted against network defenders who are “continuously improving network defensive tools and techniques.”39

Each side can take defensive measures to blunt the impact and effectiveness of the other’s access and capabilities—particularly as information about them is revealed. Consequently, strategic accesses and capabilities are likely to become more vulnerable and less reliable over time, shrinking the set of cyber escalatory response options for all parties. This cycle is likely to generate temporal breaks in the pace of adversarial engagements in cyberspace, where states must regroup and develop or rebuild accesses and capabilities during an ongoing interaction. These pauses are likely to diffuse the pressure that typically accompanies—even defines—crisis situations, creating breathing space and, by extension, room for decisionmakers to deliberate alternative courses of action, for domestic political tensions to cool down, for intent to be communicated to adversaries, and for de-escalation pathways to be determined.

#### Empirics and reversible consequences.

Borghard and Lonergan 19 -- Erica Boghard, Assistant Professor at the Army Cyber Institute at the United States Military Academy at West Point and a research fellow at the Saltzman Institute of War and Peace Studies at Columbia University, PhD in political science from Columbia University, Shawn Lonergan, Research affiliate of the Army Cyber Institute at the United States Military Academy at West Point and a cyber officer in the US Army Reserve currently assigned to 75th Innovation Command, PhD in political science from Columbia University, 2019 (“Cyber Operations as Imperfect Tools of Escalation”, *Strategic Studies Quarterly*, Fall Issue 2019, Available Online through University of Southern California Libraries, Accessed 01-17-2021)

Limited Costliness of Offensive Cyber Effects

Even under circumstances in which a state may possess the right cyber response capabilities at the desired time, its response may not generate sufficient costs against the target to be perceived as escalatory.41 Fundamental limits on the cost-generation potential of offensive cyber operations stem from the fact that cyber capabilities lack the physical violence of conventional and nuclear ones. Cyber weapons target data; they disrupt, manipulate, degrade, or destroy data resident on networks and systems or in transit.42 Moreover, aside from those cyber capabilities that permanently destroy data and for which there are no backups to which a target can revert, cyber effects are temporary and often reversible.

The utility of military instruments of power for the purposes of coercion or brute force inheres in their abilities to inflict—or credibly threaten to inflict—significant damage and harm against a target state (its civilian population or its military forces) to achieve a political objective.43 Cyber weapons could be (and have been) used to disrupt an adversary’s networks and systems—overwhelming them such that they temporarily lose the ability to function or the target loses confidence in their reliability—or even to produce destructive effects by destroying data resident on these systems or, in rarer circumstances, producing effects in the physical realm.44 While conducting multiple cyberattacks against a targeted state’s critical national infrastructure, for example, could in theory generate significant economic and national security consequences, the temporal aspects of offensive cyber operations as described above limit the ability of even the most capable states to sustain persistent, high-cost effects against multiple strategic targets over time. There is simply no guarantee that a state can generate significant costs against a target in the context of an unfolding crisis. This reality starkly contrasts with the relative predictability and reliability of conventional effects. Indeed, the empirical record has largely validated this claim; “the vast majority of malicious cyber activity has taken place far below the threshold of armed conflict between states, and has not risen to the level that would trigger such a conflict.”45 This is why, in Lin’s parlance, “going cyber is pre-escalatory” and countervalue cyberattacks (those that target civilian, rather than military, assets) occur “all the time now and are at the BOTTOM of the escalation ladder” [emphasis in original].46 Rather than their ability to wreak permanent, destructive effects, cyber operations are often prized for their temporary and reversible nature.47

One metric to assess the cost-generation potential of offensive cyber is in terms of loss of life. By this measure, cyber operations are unlikely to inflict significant harm. While theoretically possible that cyber operations could lead directly to a loss of life, no one has reportedly died to date as a direct result of a cyberattack despite over 30 years of recorded cyber operations.48 Even in hypothetical catastrophic scenarios, the cost in terms of human casualties is minimal. For instance, common worst-case scenarios of cyberattacks revolve around the loss of power stemming from a cyberattack on an electric grid.49 However, even in this instance, the conceivable damage from the loss of power over an extended period is far less than that which could be wreaked using basic, limited conventional capabilities. To draw a comparison, when Hurricane Sandy hit the United States’ eastern seaboard in late October 2012, over 8.5 million people were left without power—with many going weeks and even months before it was brought back online.50 Yet a US National Hurricane Center postmortem of Hurricane Sandy reported that of the 159 people in the United States killed either directly or indirectly, only “about 50 of these deaths were the result of extended power outages during cold weather, which led to deaths from hypothermia, falls in the dark by senior citizens, or carbon monoxide poisoning from improperly placed generators or cooking devices.”51 If a cyberattack took out power of a similar magnitude and duration of Hurricane Sandy, it is conceivable that an equivalent number of casualties would result. The 2015 synchronized cyberattacks against Ukrainian power companies, attributed to Russia, was the first known example of an offensive cyber operation targeting a state’s power grid. Its cost was ultimately low—service was temporarily disrupted to 225,000 customers for several hours, and energy providers operated at a limited capacity for some time after service was restored.52 There were no reported casualties from this power outage. While any casualty resulting from a cyberattack would certainly be lamentable, even worst-case scenario figures are minor in comparison to the cost in human lives stemming from other, even limited, kinetic military operations.

#### This system is not inevitable. Coupled with a clear critique of digital capitalism, resistance can emancipate a shift from the industrialized information economy.

Kwet 1/11 – Michael Kwet, PhD in Sociology and Visiting Fellow at Yale's Information Society Project, 2022 (“The Digital Tech Deal: a socialist framework for the twenty-first century”, *Race and Class*, Available online at <https://journals.sagepub.com/doi/abs/10.1177/03063968211064478>, Accessed 01-20-2021)

Conclusion

The tech justice movement needs a new framework organised around the principles of eco-socialism, anti-imperialism, class abolition, identity-based intersectional equality and bottom-up democracy. A Digital Tech Deal goes hand-in-hand with Red and Green Deals for the environment. Tech justice advocates and ecosocialists must join hands if they are to achieve their visions for a different world.

It is essential that environmentalists and tech activists educate themselves and exchange ideas within and across communities so they can co-create a new framework for the digital economy. In order to do this, a clear critique of digital capitalism and colonialism is needed. People from all walks of life could come together to figure out a concrete plan for transformation. With a DTD, some workers – such as those in the ad industry – would lose their jobs, so there would have to be a just transition for workers in the advertising industry. Workers, scientists, engineers, sociologists, lawyers, educators, activists and the public could collectively brainstorm how to make such a transition practical.

While unions have been a source of worker agitation against Big Tech, there is a catch. Unions are essential to resist exploitation, yet unionising Big Tech is much like unionising the East India companies. Moreover, there is a difference between low-skilled labourers receiving little pay and overpaid skilled labourers with a stake in securing their material privilege. It remains to be seen if the latter would be open to dissolving their place of employment, reducing their pay and assisting the transition to a socialist digital economy.

It is impossible to challenge power at a fundamental level without a mass movement from below. The powerful will not concede their property and power without a serious fight, and will mobilise every resource at their disposal to uphold the status quo. A movement to socialise the digital economy will be fiercely resisted at every level, including at the ideological level.

The current collection of reforms proposed by tech left intellectuals – anti-trust, a handful of bans on worst practices, limited privacy laws, unionisation and worker well-being (without challenging private property or colonialism), better content moderation and digital infrastructure as a public option within in a mixed economy – will only lead to modest changes. These are solutions generated from above by those in elite academic, government and media institutions.

A People’s Tech movement that agitates directly against the status quo can help drive change from below. Boycott, divestment and sanctions were used by anti-apartheid activists in South Africa against the tech giants of their day, such as IBM and Hewlett Packard. In the short run, activists could draw inspiration from this tradition and launch a #BigTechBDS campaign against Big Tech itself. Boycotts could take the form of cancelling contracts with Big Tech products and services in the public sector (like schools and government facilities) and replacing them with commons-based FOSS solutions. Divestment could entail demanding universities divest from Big Tech corporations. Targeted sanctions could be directed at the United States and other countries for the use of technology in the service of exploitation and human rights violations.

A combination of education and activism is needed to change the digital society. A DTD, co-created across borders, global in scope and connected to the environmental justice and broader socialist movement, provides a way forward for the twenty-first-century economy.70

#### Interpret the 1AC as a speech act, not a genuine policy proposal – they clearly have no intention of passing this policy. You should see their speech as endorsing an interpretation of reality that incidentally suggests the benefits of competition law.

Miola 16 – Iagê Zendron Miola, Universidade São Judas Tadeu (USJT) and Law and Democracy Nucleus of the Brazilian Center for Analysis and Planning (Cebrap), São Paulo, Brazil, 2016 (“Competition law and neoliberalism: the regulation of economic concentration in Brazil”, Direito and Praxis, Available online at <https://www.e-publicacoes.uerj.br/index.php/revistaceaju/article/download/26512/18947#:~:text=The%20central%20rationale%20of%20neoliberalism,42>, Accessed 06-12-2021)

3. The critical political economy of competition law in action

How, then, to study the connections between competition law and neoliberalism without incurring in the identified shortcomings? The authors I mobilized to present the critique above give a hint on how to build an alternative framework. They converge in proposing a tenet of the sociology of law as a useful means to do so: the analysis of the “law in action”7 . As Halliday and Osinsky (2006, p. 466) suggest, “[t]he criterion of impact must be law in action, not law on the books”. In a similar line, Twining (2005a, p. 33) argues that the analysis of impact involves a necessary “shift from legislation to enforcement”.

In subscribing to the distinction between the “law on the books” and the “law in action”, I am not affiliating with perspectives that are preoccupied with “discrepancies between legal rules and legal practice” (my italics), i.e. to study the “gap” between how the law should operate and how it actually operates (Nelken 1981, 1984, p. 169-170) 8 . Instead, this proposal implies understanding that the law is not monolithic and explicit, but rather that it “is made as it is enforced” (Suchman and Edelman 1996, p. 933-934). The focus of research is thus repositioned to the “politics of enforcement”, that is, to study how the malleability and indeterminacy of the law is “resolved”, how and what decisions are actually made (Suchman and Edelman 1996, p. 934). In the specific case of competition law, it implies asking what does it mean, in practice, to “promote competition” and to “protect consumers”; what corporate behaviors are permitted and what are considered illegal; and what concentrations are perceived as harmful or not. Since these concepts are considerably broad to enable an array of interpretations, inquiring into the “law in action” means searching for the interpretations that actually emerge in decision-making.

Since the main goal of this article is to assess how competition law relates to neoliberalism, it is necessary to make explicit the “substantive” elements of what I understand to be the defining characteristics of the neoliberal project of transforming the economy. Based on a critical political economy of neoliberalism, I identify a set of trends that serve as parameters to analyze the competition law in action.

Despite nuances of scope and emphasis, it is possible to identify relatively consensual elements around what would be basic features of neoliberalism9 . A first point of convergence is that neoliberalism entails, on the one hand, a theory (Saad-Filho and Johnston 2005; Harvey 2007; Kotz 2002), a “thought collective” (Mirowski 2009, p. 428-431; Plehwe 2009, p. 4). The neoliberal intellectual tradition, as it developed since the 1940s, unites several theories about how the market, the state and society should work. A basic assumption of neoliberal thinking, which distinguishes it from classic liberalism10, is that the conditions for its model of a “good society” “must be constructed and will not come about ‘naturally’ in the absence of concerted political effort and organization” (Mirowski 2009, p. 434). In neoliberal thinking, the definition of a “good society” has often been accompanied by the notion of freedom: for individuals, markets, corporations, contract and trade. In this sense, neoliberalism is a theory that enunciates the conditions in which the market and society as a whole should be “set free” from what would be the harmful ties of state interventionism and the even more dangerous chains of socialism.

What is to be constructed, in turn, entails a specific understanding of the market and the state. In neoliberal thinking, “the market always surpasses the state’s ability to process information”, and thus a “market society must be treated as a ‘natural’ and “inexorable” (Mirowski 2009, p. 435). Governmental intervention, in this sense, harms the efficient functioning of the market and as a consequence jeopardizes liberty (Munck 2005, p. 61). The central rationale of neoliberalism is that of an orthodox theory of free trade that maintains that if economic agents are free to compete, this competition will automatically generate benefits for all the economy (Shaikh 2005, p. 42).

This assumption has two corollaries. First, if the market, in detriment of the state, is the best setting to “process information”, then “capital has a natural right to flow freely”, without governmental interventions (Mirowski 2009, p. 438). Second, if the free movements of capital are a necessary condition for a “good society”, “corporations can do no wrong, or at least they are not to be blamed if they do” (Mirowski 2009, p. 438). If let to compete freely, corporations will eventually generate a healthy market. At this point it is possible to identify an illustrative divergence between classic liberalism and neoliberalism. While the first was highly suspicious of intense economic concentration (represented by monopoly), neoliberalism maintains that monopoly is not necessarily harmful to the functioning of the economy (Mirowski 2009, p. 438)11

## 2NC

### 2nc---ov

#### Not insulated from the second scenario.

Harrell and Rosenberg 19 – Peter E. Harrell is an adjunct senior fellow at the Center for a New American Security; former Deputy Assistant Secretary for Counter Threat Finance and Sanctions at the U.S. State Department. Elizabeth Rosenberg is a senior fellow and director and director of the Energy, Economics, and Security Program at the Center for a New American Security.

Peter E. Harrell and Elizabeth Rosenberg, “Economic Dominance, Financial Technology, and the Future of U.S. Economic Coercion,” *Center for a New American Security*, 2019, pp. 25-26, http://files.cnas.org.s3.amazonaws.com/documents/CNAS-Report-Economic\_Dominance-final.pdf.

Developments in financial technology also have the potential to affect the availability and strength of coercive economic measures over the longer term. The movement to develop blockchain-based, decentralized payments platforms and new digital currencies or tokenized assets that feature anonymity can undermine the strength of coercive economic measures. However, financial technology developments, such as the development of artificial intelligence/machine learning (AI/ML) compliance technologies, also present potential means to better detect and stop evaders and avoiders of U.S. economic coercion throughout global chains of financial interconnectivity.

Financial technologies are not themselves the drivers of potential future changes to the sources of coercive economic leverage. However, they may enable foreign governments to develop better tools to insulate transactions from U.S. jurisdiction. And, regardless of the actions of foreign governments as they spread commercially, they may help evaders duck U.S. coercive economic power in limited but meaningful ways. Conversely, new AI/ML or other technologies may help U.S. policymakers implementing economic coercion to better do their job.

Financial technology can be a facilitator of rapid transformation in the financial services sector. Importantly, financial technology developments will not happen just in the United States; a number of other countries, from China to Singapore to Switzerland, are promoting themselves as financial technology leaders. There is no guarantee that financial technology innovators and investors will be centered in the United States in the future—which represents a vulnerability to U.S. economic prominence.

Maintaining U.S. Leverage

The extent to which the United States will maintain coercive economic leverage in a world where financial technology disrupts aspects of the traditional financial architecture will depend to a significant degree on the extent to which U.S. firms, and large global firms, continue to play a dominant role in the development of the technology. To put it bluntly, a blockchain-based clearing mechanism that enables trade between foreign countries without financial transactions touching the dollar would likely undermine U.S. leverage if the technology were developed and operated by a foreign company that had no need to adhere to U.S. law. The United States would maintain at least some leverage if the technology were developed or operated by a U.S. company obliged to adhere to U.S. sanctions, technology-export restrictions, and other relevant laws, or a foreign company with significant U.S. exposure.

### 2nc---fw

#### “Should” not “could”. Policy is not just a matter of possibility but purpose. The criteria they’ve established for assessing a “better state of the world” is itself an advocacy and must be debated.

Daly and Farley 11 – Herman E. Daly and Joshua Farley, 2011 (*Ecological Economics: Principles and Applications*, Island Press, Available online at via USC Libraries, Accessed 02-04-2022)

Ends and Means: A Practical Dualism

Ecological economics has at least as much in common with standard economics as it has differences. One important common feature is the basic definition of economics as the study of the allocation of scarce means among competing ends (though we will explain in later chapters why focusing on scarce resources is necessary but not sufficient). There are disagreements about what is scarce and what is not, what are appropriate mechanisms for allocating different resources (means), and how we rank competing ends in order of importance—but there is no dispute that using means efficiently in the service of ends is the subject matter of economics. Using means in the service of ends implies policy. Alternatively, policy implies knowledge of ends and means. Economics, especially ecological economics, is inescapably about policy, although the rarefied levels of abstraction sometimes reached by economists may lead us to think otherwise.

If economics is the study of the allocation of scarce means in the serv- ice of competing ends, we have to think rather deeply about the nature of ends and means. Also, policy presupposes knowledge of two kinds: of possibility and purpose and of means and ends. Possibility reflects how the world works. In addition to keeping us from wasting time and money on impossibilities, this kind of knowledge gives us information about tradeoffs between real alternatives. Purpose reflects desirability, our ranking of ends, our criteria for distinguishing better from worse states of the world. It does not help much to know how the world works if we cannot distinguish better from worse states of the world. Nor is it useful to pursue a better state of the world that happens to be impossible. Without both kinds of knowledge, policy discussion is meaningless.1

To relate this to economic policy, we need to consider two questions. First, in the realm of possibility, the question is: What are the means at our disposal? Of what does our ultimate means consist? By “ultimate means” we mean a common denominator of possibility or usefulness that we can only use up and not produce, for which we are totally dependent on the natural environment. Second, what ultimately is the end or highest purpose in whose service we should employ these means? These are very large questions, and we cannot answer them completely, especially the latter. But it is essential to raise the questions. There are some things, however, that we say by way of partial answers, and it is important to say them.

### 2nc---at: competition policy

#### Insufficient. It’s not enough to be “against” monopolies.

Ashoff 19 – Nicole Aschoff is on the editorial board at Jacobin. She is the author of The Smartphone Society: Technology, Power, and Resistance in the New Gilded Age and The New Prophets of Capital, November 21st (“It’s Not Enough to Be Against ‘the Monopolies’”, Jacobin Magazine, Available online at <https://jacobinmag.com/2019/11/monopolies-antitrust-goliath-book-review-matt-stoller>, Accessed 07-24-2021)

How to Rein in the Corporations

Stoller frames the struggle between democracy and monopoly as one not between left and right, but rather between populists and elitists. Indeed, he places equal blame on progressives, arguing that the Left – captained by elitist scholars Hofstadter and Galbraith – was a huge proponent of monopoly firms in the postwar decades, helping to lay the groundwork for the disastrous inequality that we see today.

Stoller is correct in the sense that there was, in the two decades following the Second World War, a broad understanding among progressives that big corporations could be instrumental in building working-class power. But it wasn’t because workers, union leaders, and labor scholars loved bigness and despised mom-and-pop stores (though small business were often just as exploitative as large ones). In the face of the Taft-Hartley Act and the vicious crackdown on the shop-floor democracy movement that had blossomed in the 1930s and ’40s, workers and their representatives had few illusions about the benevolence of big companies.

For genuine labor advocates, the focus on big corporations was rooted in a struggle to build lasting working-class power. As a result of the 1930s sit-down strikes at some of the country’s largest corporations, American workers won concrete and meaningful gains. For the first time, working people got a heady taste of their potential power if they worked together toward a shared goal. By forcing large companies to the bargaining table, workers could impact working conditions across entire sectors and industries, benefiting all workers and their families.

By the 1960s, the limits of this strategy were clear. The fundamentally contradictory position of unions in capitalism, the Cold War, and the hard line taken by companies toward anything beyond bread-and-butter offerings limited the transformative potential of organized labor. Meanwhile, the deeper impact of giant corporations (which, though reined in, continued to grow in the 1950s and ’60s) on society as a whole became a topic of much discussion on the left. Paul Baran and Paul Sweezy (Monopoly Capital) and, later, Harry Braverman (Labor and Monopoly Capital) were just a few of the scholars grappling with the deep shifts occurring in capitalism and what these shifts meant for working people.

But anti-capitalist critique of monopoly power and corporate abuse doesn’t find its way into Goliath. It is gestured toward in a couple of breezy paragraphs about the pitfalls of “inevitabilism.”

Toward the end of the Obama administration, a left-wing type of criticism emerged, an argument that the financial crisis and the response to it was all just an inevitable unspooling of capitalism with booms and busts and rampant inequality, a simple fact of life under a free market system. This critique, though appearing to present a radical challenge to the status quo, actually bore the same logic of the officials in charge during the financial crisis. It had an elitism of its own, a naivete similar to that of the Watergate Baby generation, an unwillingness to think hard about commerce and markets. Inevitabilism, whether oriented around the sin of capitalism or the glory of it, reflects a refusal to entertain free will.

We can give Stoller the benefit of the doubt here and assume he’s aware that “a left-wing type of criticism” of capitalism predates Obama. We can also admit that there are some Marxists who see the breakdown of capitalism around every corner.

But in consigning the rich body of anti-capitalist critique to the useless lump of “inevitabilism,” Stoller misses the chance to actually answer the question that purportedly prompted him to write Goliath: Why did the US government bail out the bankers instead of regular folks? Answer: the US Treasury was not only in charge of managing the US economy, but also global capitalism — it was the “lender of last resort.” With no working-class power to push it in a different direction, it managed the US crisis the same way it had managed dozens of crises around the world in the previous two decades.

Stoller’s dismissiveness of the value of an anti-capitalist critique also causes him to write off the social movements of the 1970s as a bunch of misguided, affluent “babies.” Even a cursory glance at radical scholarship about the ’70s highlights how the deep contradictions of US-led capitalism, in combination with the limitations of previous social movement formations, created an incredibly difficult terrain for progressives trying to grapple with a profound, society-wide crisis.

Antiwar protestors weren’t just spoiled college kids engaging in a pet project. The antiwar movement was, at its peak, an international, cross-class movement protesting America’s genocidal campaign against the Vietnamese people. It embodied a deep critique of both US corporations and the US government. It was a call for a different global model in which the economic and political sovereignty of countries, particularly poor countries in the Global South, was respected.

The antiwar movement was intertwined with a constellation of other movements, made up of rank-and-file workers, people of color, women, students, the elderly — ordinary people from all walks of life. These movements were trying out new strategies in the face of an entrenched racist, sexist, homophobic, and anti-worker status quo. The limitations of the “old left” pushed these movements in new directions, some fruitful and some decidedly not. But chalking up these attempts as little more than a bucket of mistakes isn’t all that helpful.

Finally, Stoller’s insistence on the irrelevance of an anti-capitalist critique prevents him from asking hard questions of his own narrative, such as: Why were antitrust principles, despite showing strong results and being enshrined in US law, already coming under attack by the 1950s, and ultimately incapable of constraining the power of capital?

The failure of antitrust wasn’t simply because people forgot that these laws were a useful tool. Antitrust failed because it didn’t fundamentally alter the drives of corporations, nor was it part of a broader project to democratize the economy and the state. The success of antitrust rested on a shaky foundation of strong labor and progressive liberal hegemony — both of which proved short-lived.

This doesn’t mean antitrust had no value or isn’t something that should be featured in a democratic populist program today. It is simply to say that antitrust is, and was, an extremely limited strategy for reining in corporations. The only way to challenge the power of corporations is to change the terrain on which they operate through a broad socialist movement rooted in an alternative vision of society.

### 2nc---solvency

#### No automation impact: needs human operators.

Lloyd 20 – Mike Lloyd is chief technology officer of RedSeal, and has 25 years of experience in the modelling and control of fast-moving and complex systems, and holds 21 security patents, as well as a PhD in stochastic epidemic modelling and a pilot’s licence, August 1st ("Don’t believe the hype: AI is no silver bullet", ComputerWeekly, Available online at https://www.computerweekly.com/opinion/Dont-believe-the-hype-AI-is-no-silver-bullet, Accessed 4-18-2021)

You could be forgiven for thinking the entire world is now powered by artificial intelligence (AI) systems. McKinsey predicted a couple of years ago that the technology would add $13tn (€10.8tn/£9.7tn) to the global economy by 2030, and it’s currently easier to list the cyber security firms that aren’t shouting about their AI and machine learning capabilities than those that are.

Unfortunately, the reality of how it’s currently used doesn’t map to the marketing hyperbole. We want to believe in the narrative because, like flying cars and jetpacks, the technology is so appealing to us. The cold, hard truth is very different.

Chief information security officers (CISOs) looking for new security partners must therefore be pragmatic when assessing what’s out there. AI is helpful, in limited use cases, to take the strain off stretched security teams, but its algorithms still have great difficulty recognising unknown attacks. It’s time for a reality check.

A one-sided battle

We live in a world where cyber attackers seem to hold all the cards – or, if they don’t, they’re certainly on an impressive winning streak.

The Identity Theft Resource Center (ITRC) revealed a 17% increase in data breaches in 2019 versus 2018, with more than 164 million records exposed across virtually every vertical you can imagine. The vast cyber crime economy that supports these endeavours is estimated to be worth $1.5tn annually, almost as much as the GDP of Russia.

Covid-19 has only made things more challenging for CISOs. An explosion in unmanaged home-working endpoints, distracted employees, stretched IT support staff, overloaded virtual private networks (VPNs), and unpatched remote access infrastructure has ramped up cyber risk levels. Skilled security professionals remain worryingly hard to find – there’s now a global shortage of more than four million.

All of this sets the scene for AI to ride in and save the day. But while intelligent algorithms have been developed to beat the world’s best Go players, power the voice assistants in our homes, and unlock our smartphones via facial recognition, a breakthrough remains as elusive as ever when it comes to cyber security.

What can it do?

Let’s be clear. Machine and deep learning are good at some things. Give the system plenty of data and train it to spot subtle patterns and it can do so quite successfully. This could be useful in flagging known security threats and misconfigurations that human eyes may otherwise miss.

It’s good in areas like anti-fraud tooling, for example, because scammers usually riff off the same underlying ideas when trying to defraud banks and businesses. By spotting these needles in the haystack, AI can help in-demand security professionals to do their jobs more efficiently and effectively.

Yet in this respect, AI is similar to a Google search engine, filtering through large volumes of data that humans couldn’t possibly sort. What we haven’t achieved yet is the creation of independent learning machines that can draw new conclusions from patterns. The much-touted capability of baselining “normal” and then being able to spot abnormalities that could indicate suspicious patterns is actually much harder than it sounds.

Networks are incredibly complex – and the bigger they are, the harder they are to map. Add to this the fact that commercial networks are constantly changing and developing new behaviours and interactions, and you have even more complexity. That means AI systems end up flagging even just the regular evolution of a healthy network as “suspicious”, resulting in an overwhelming number of false positives.

Cyber criminals also have a few tricks up their sleeve. By making their behaviour appear as normal as possible they could trick these “intelligent” systems. On the other hand, well-documented adversarial techniques can trick AI into making the wrong decisions by creating the digital equivalent of optical illusions.

What happens next?

So where do we go from here? Can we design improvements into AI systems to make them more effective in cyber security? The single biggest challenge in this field is transparency: the ability of a system to explain why it arrived at a particular decision.

Unfortunately, those AI systems that can explain how they came up with an answer are less effective than the more inscrutable “black boxes”. Users don’t trust results from these opaque systems and find it challenging to follow up leads which simply say “something unusual happened” without explaining what made it worth flagging and why it matters to the business.

The lesson here for CISOs is ‘buyer beware’. Absolutely invest in AI systems for spotting well-established patterns that can make your security team more productive. But don’t imagine the tech will be able to achieve sophisticated detection of new and unknown threats or replace human security analysts.

AI doesn’t automate the work humans were already doing because there was never any way they could search through vast datasets in the first place. Your human experts will still need to take the lead, albeit with some help.

For what seems like the past 50 years, we have been a decade away from a breakthrough into artificial general intelligence (AGI). Despite the industry hype, this vision remains as elusive today as it ever was.

#### Material military advantage outweighs.

Nye 21 – Joseph S. Nye, Jr. is a professor at Harvard University and author of Do Morals Matter? Presidents and Foreign Policy from FDR to Trump, March 2nd ("What Could Cause a US-China War?", Project Syndicate, Available online at https://www.project-syndicate.org/commentary/what-could-cause-us-china-war-by-joseph-s-nye-2021-03, Accessed 3-3-2021)

CAMBRIDGE – When China’s foreign minister, Wang Yi, recently called for a reset of bilateral relations with the United States, a White House spokesperson replied that the US saw the relationship as one of strong competition that required a position of strength. It is clear that President Joe Biden’s administration is not simply reversing Trump’s policies.

Some analysts, citing Thucydides’ attribution of the Peloponnesian War to Sparta’s fear of a rising Athens, believe the US-China relationship is entering a period of conflict pitting an established hegemon against an increasingly powerful challenger.

I am not that pessimistic. In my view, economic and ecological interdependence reduces the probability of a real cold war, much less a hot one, because both countries have an incentive to cooperate in a number of areas. At the same time, miscalculation is always possible, and some see the danger of “sleepwalking” into catastrophe, as happened with World War I.

History is replete with cases of misperception about changing power balances. For example, when President Richard Nixon visited China in 1972, he wanted to balance what he saw as a growing Soviet threat to a declining America. But what Nixon interpreted as decline was really the return to normal of America’s artificially high share of global output after World War II.

Nixon proclaimed multipolarity, but what followed was the end of the Soviet Union and America’s unipolar moment two decades later. Today, some Chinese analysts underestimate America’s resilience and predict Chinese dominance, but this, too, could turn out to be a dangerous miscalculation.

It is equally dangerous for Americans to over- or underestimate Chinese power, and the US contains groups with economic and political incentives to do both. Measured in dollars, China’s economy is about two-thirds the size of the US economy, but many economists expect China to surpass the US sometime in the 2030s, depending on what one assumes about Chinese and American growth rates.

Will American leaders acknowledge this change in a way that permits a constructive relationship, or will they succumb to fear? Will Chinese leaders take more risks, or will Chinese and Americans learn to cooperate in producing global public goods under a changing distribution of power?

Recall that Thucydides attributed the war that ripped apart the ancient Greek world to two causes: the rise of a new power, and the fear that this created in the established power. The second cause is as important as the first. The US and China must avoid exaggerated fears that could create a new cold or hot war.

Even if China surpasses the US to become the world’s largest economy, national income is not the only measure of geopolitical power. China ranks well behind the US in soft power, and US military expenditure is nearly four times that of China. While Chinese military capabilities have been increasing in recent years, analysts who look carefully at the military balance conclude that China will not, say, be able to exclude the US from the Western Pacific.2

On the other hand, the US was once the world’s largest trading economy and its largest bilateral lender. Today, nearly 100 countries count China as their largest trading partner, compared to 57 for the US. China plans to lend more than $1 trillion for infrastructure projects with its Belt and Road Initiative over the next decade, while the US has cut back aid. China will gain economic power from the sheer size of its market as well as its overseas investments and development assistance. China’s overall power relative to the US is likely to increase.1

Nonetheless, balances of power are hard to judge. The US will retain some long-term power advantages that contrast with areas of Chinese vulnerability.

One is geography. The US is surrounded by oceans and neighbors that are likely to remain friendly. China has borders with 14 countries, and territorial disputes with India, Japan, and Vietnam set limits on its hard and soft power.

Energy is another area where America has an advantage. A decade ago, the US was dependent on imported energy, but the shale revolution transformed North America from an energy importer to exporter. At the same time, China became more dependent on energy imports from the Middle East, which it must transport along sea routes that highlight its problematic relations with India.

The US also has demographic advantages. It is the only major developed country that is projected to hold its global ranking (third) in terms of population. While the rate of US population growth has slowed in recent years, it will not turn negative, as in Russia, Europe, and Japan. China, meanwhile, rightly fears “growing old before it grows rich.” India will soon overtake it as the most populous country, and its labor force peaked in 2015.

America also remains at the forefront in key technologies (bio, nano, information) that are central to twenty-first-century economic growth. China is investing heavily in research and development, and competes well in some fields. But 15 of the world’s top 20 research universities are in the US; none is in China.

Those who proclaim Pax Sinica and American decline fail to take account of the full range of power resources. American hubris is always a danger, but so is exaggerated fear, which can lead to overreaction. Equally dangerous is rising Chinese nationalism, which, combined with a belief in American decline, leads China to take greater risks. Both sides must beware miscalculation. After all, more often than not, the greatest risk we face is our own capacity for error.

### 2nc – at: but china bad

#### Realism only works because it omits every domestic variable.

Garlick 16 – Jan Masaryk Centre for International Studies, Faculty of International Relations, University of Economics, Prague, Czech Republic, (“Not So Simple: Complexity Theory and the Rise of China”, China Report (2016), Available online at DOI: 10.1177/0009445516661884, Accessed 09-14-2020)

For Waltz, states in the anarchic international system are, according to the well-worn metaphor, like billiard balls bouncing off each other and jostling for position in order to serve their own interests. Waltz’s theory implies that China, like all other states, will compete for power, territory and resources amid the Hobbesian anarchy of the Westphalian system of sovereign states. Waltz’s neorealism is a parsimonious theory which depends on a structural analysis of the international system to predict a dog-eat-dog world of competing states. However, the very parsimony of the theory means, as Humphreys (2006) points out, that its explanatory power is limited and unsatisfactory. For Humphreys, the main problem with Waltzian neorealism lies in the fact that it inexplicably attempts to reduce the complexity of the international system to a single independent variable (anarchic structure). This means that Waltz perceives the international system in a linear fashion, with the independent variable of anarchy (i.e., the ‘war of all against all’) exerting a direct causative effect on states’ behaviour in the international system, leading them to pursue strategies of self-help. The linearity of Waltz’s theory may appear parsimoni- ous and compelling, but, as neoclassical realists and complexity theorists point out, fails to account for complex phenomena in terms, for instance, of how foreign policy impacts upon and is impacted by developments in international affairs (see for instance Bousquet and Curtis 2011; Kavalski 2007; Rathbun 2008; Rose 1998). In the specific case of China’s rise, Waltz’s focus on anarchy tells us that China will compete with other states, but not how. In essence, he does not tell us enough to enable us to see anything beyond a vague picture of China and self-help, undifferentiated from all the other ‘like units’ (states). Waltz’s neorealism cannot predict in what direction China’s rise will take both it and the world in general, beyond a general expectation of competition and increasing influence as China’s capabilities increase. Thus, it does not provide us with any detailed or useful explanation or prediction beyond what is already quite obvious. This is largely because of what Waltz consciously leaves out. He claims that the logic of his structural analysis necessitates omitting ‘attributes and interactions’, by which he means ‘questions about the cultural, economic, political, and military interactions of states’, as well as ‘the kinds of political leaders, social and economic institutions, and ideological commitments states may have’ (1979: 80). Questions concerning ‘environment, situation, context and milieu’ are, according to Waltz, ‘vague and vary- ing systemic notions’ which can be entirely replaced by the analysis of structure alone because they have no explanatory value in a theoretical sense (1979: 80). Waltz does attempt to account for differences in the sizes and capabilities of states, but does not satisfactorily build these factors into his states-as-like-units model. For understanding a rising China, then, there is ostensibly little more that can usefully be gleaned from Waltzian neorealism beyond the general expectation of Hobbesian self-help in an anarchic international system. Because Waltz believes that the international level of analysis has to be sharply demarcated from the domestic, and so he thinks it is necessary to omit all information about China’s culture, economy, politics, and so on, his theory cannot reveal anything about the detailed mechanics of China’s rise on the international stage as the nation interacts and develops its relation- ships with other actors. On the other hand, neoclassical realism offers an interesting development of Waltzian neorealism, in that it attempts to analyse the complex impact of domestic policy on international affairs. Neoclassical realists such as Rose (1998), Christensen (1996), Wohlforth (1993) and Zakaria (1999) base their theorising on Waltz’s emphasis on structure and anarchy, but attempt to develop his theory further by giving more weight to domestic factors in foreign policy decision-making. Christensen’s (1996) study is particularly interesting for students of China because it attempts to apply a ‘two-level’ analysis of international and domestic factors to Sino-US relations between 1947 and 1958. Neoclassical realists, in essence, claim that neorealism, by focusing exclusively on the international level of analysis, does not account for ‘domestic politics and ideas’ (Rathbun 2008: 294) in its analysis of states’ behaviour at the international level. However, there is disagreement about the value of neoclassical realism, and also about whether neoclassical realists are really doing something different to neorealists in general or just expanding on its ideas about structure and anarchy (see Legro and Moravscik 1999; Rathbun 2008; Vasquez 1997). Two notable neoclassical realists (Thomas J. Christensen and Jack Snyder) have even further muddied the waters by going so far as to decline to take part in a debate about whether they are neorealists or not; they do this on the basis that they neither want to be ‘apologists for neorealism’ nor to attempt to ‘reconcile the heterogeneous arguments’ of scholars who are gener- ally labelled ‘neorealist’ (Christensen and Snyder 1997: 919). The other major weakness of the neoclassical realist project is that it has not yet come to fruition in terms of being fully expounded in theoretical terms. To be specific, while there is value in pointing out that domestic variables need to be incorporated into realist theory, neoclassical realism has not yet managed to convincingly posit an explicit theoretical framework within which this can be done. It is for this reason perhaps that neoclassical realism has been criticised for being ‘an ad hoc and theoretically degenerative effort to explain away anomalies for neorealism’ (Rathbun 2008: 294), since neoclassical realists’ ‘use of whatever tools are necessary to plug the holes of a sinking ship’ results in ‘paradigmatic incoherence and indistinctiveness’ (Rathbun 2008: 295). There, therefore, remains an obvious need to develop a clear and convincing theoretical framework for neoclassical realism’s attempt to take neorealism in a direction which systematically accounts for the effect of domestic variables on foreign policy. Thus, the possibility that CT might be able to provide the missing link from neorealism to neoclassical realism, by supplying some conceptual tools with which to study the way in which foreign policy interacts with international phenomena, is an intriguing one. In this article it is not possible to do more than point out the need for more research into the possibility of CT providing a set of tools for filling out the internal mechanics of neorealism and neoclassical realism, and to suggest that this could be done in order to attempt to develop a more complete theoretical framework within which to analyse complex international phenomena such as China’s rise.

#### Offensive realism is too narrow to accurately explain IR.

Garlick 16 – Jan Masaryk Centre for International Studies, Faculty of International Relations, University of Economics, Prague, Czech Republic, (“Not So Simple: Complexity Theory and the Rise of China”, China Report (2016), Available online at DOI: 10.1177/0009445516661884, Accessed 09-14-2020)

John Mearsheimer’s offensive realism, derived from the same structural principles as Waltz’s ‘defensive’ realism, states unequivocally that a rising power will always challenge a hegemon militarily, an outcome he designates ‘the tragedy of great power politics’ (Mearsheimer 2001). Mearsheimer, thus, consistently and confidently predicts that a rising China will inevitably clash with the USA (Mearsheimer 2006, 2010). Mearsheimer’s hard-and-fast prediction of war between USA and its challenger China gives offensive realism a clear edge over neorealism and constructivism in terms of theoretical falsifiability. Eventually, such a war will either occur or it will not. If global leadership passes from USA to China with or without military confrontation at some point in the 21st century, then Mearsheimer will be proved right or wrong: it is simply a matter of waiting to see. However, Buzan and Cox (2013) point out that there is already one historical case of peaceful power handover that casts doubt upon Mearsheimer’s hypothesis: the transition without military confrontation from British to USA world hegemony in the aftermath of the Second World War. This, they suggest, invalidates Mearsheimer’s assertion of the inevitability of a US–China war, and thus also upon offensive realism’s main tenet. Even if historically the majority of rising powers have challenged hegemons militarily, one exception is sufficient to negate the theory’s predictive power, and to suggest that a peaceful power transition is possible. Mearsheimer also does not expound upon non-militaristic aspects of China’s rise (such as economics and soft power), but focuses exclusively on security issues (see Mearsheimer 2010). So, like neorealism and constructivism, offensive realism emphasises one aspect of China’s rise to the exclusion of all others and thus offers a clear, parsimonious, but not a complete theoretical picture.

### 2nc---at: private sector key

#### Open-source software.

Rayome 20 – Alison DeNisco Rayome is a managing editor at CNET, now covering smart home topics after writing about services and software. Alison was previously an editor at TechRepublic, July 8th (“The US, China and the AI arms race: Cutting through the hype”, CNET, Available online at <https://www.cnet.com/tech/services-and-software/the-us-china-and-the-ai-arms-race-cutting-through-the-hype/>, Accessed 04-03-2022)

But full separation isn't on the horizon anytime soon. One of the problems with referring to all of this as an AI arms race is that so many of the basic platforms, algorithms and even data sources are open-source, Kania said. The vast majority of the AI developers in China use Google TensorFlow or Facebook PyTorch, Stieler added -- and there's little incentive to join domestic options that lack the same networks.

#### Corporate AI research blows.

Simonite 20 – Tom Simonite is a senior writer for WIRED in San Francisco covering artificial intelligence and its effects on the world. He was previously the San Francisco bureau chief at MIT Technology Review, December 10th (“The Dark Side of Big Tech’s Funding for AI Research”, WIRED, Available online at <https://www.wired.com/story/dark-side-big-tech-funding-ai-research/>, Accessed 06-03-2021)

Last week, prominent Google artificial intelligence researcher Timnit Gebru said she was fired by the company after managers asked her to retract or withdraw her name from a research paper, and she objected. Google maintains that she resigned, and Alphabet CEO Sundar Pichai said in a company memo on Wednesday that he would investigate what happened.

The episode is a pointed reminder of tech companies’ influence and power over their field. AI underpins lucrative products like Google’s search engine and Amazon’s virtual assistant Alexa. Big companies pump out influential research papers, fund academic conferences, compete to hire top researchers, and own the data centers required for large-scale AI experiments. A recent study found that the majority of tenure-track faculty at four prominent universities that disclose funding sources had received backing from Big Tech.

Ben Recht, an associate professor at University of California, Berkeley, who has spent time at Google as visiting faculty, says his fellow researchers sometimes forget that companies’ interest doesn’t stem only from a love of science. “Corporate research is amazing, and there have been amazing things that came out of the Bell Labs and PARC and Google,” he says. “But it’s weird to pretend that academic research and corporate research are the same.”

Ali Alkhatib, a research fellow at University of San Francisco’s Center for Applied Data Ethics, says the questions raised by Google’s treatment of Gebru risk undermining all of the company’s research. “It feels precarious to cite because there may be things behind the scenes, which they weren’t able to talk about, that we learn about later,” he says.

Alkhatib, who previously worked in Microsoft’s research division, says he understands that corporate research comes with constraints. But he would like to see Google make visible changes to win back trust from researchers inside and outside the company, perhaps by insulating its research group from other parts of Google.

The paper that led to Gebru’s exit from Google highlighted ethical questions raised by AI technology that works with language. Google’s head of research, Jeff Dean, said in a statement last week that it “didn’t meet our bar for publication.”

Gebru has said managers may have seen the work as threatening to Google’s business interests, or an excuse to remove her for criticizing the lack of diversity in the company’s AI group. Other Google researchers have said publicly that Google appears to have used its internal research review process to punish her. More than 2,300 Google employees, including many AI researchers, have signed an open letter demanding the company establish clear guidelines on how research will be handled.

Meredith Whittaker, faculty director at New York University’s AI Now institute, says what happened to Gebru is a reminder that, although companies like Google encourage researchers to consider themselves independent scholars, corporations prioritize the bottom line above academic norms. “It’s easy to forget, but at any moment a company can spike your work or shape it so it functions more as PR than as knowledge production in the public interest,” she says.

Whittaker worked at Google for 13 years but left in 2019, saying the company had retaliated against her for organizing a walkout over sexual harassment and to undermine her work raising ethical concerns about AI. She helped organize employee protests against an AI contract with the Pentagon that the company ultimately abandoned, although it has taken up other defense contracts.

Machine learning was an obscure dimension of academia until around 2012, when Google and other tech companies became intensely interested in breakthroughs that made computers much better at recognizing speech and images.

The search and ads company, quickly followed by rivals such as Facebook, hired and acquired leading academics, and urged them to keep publishing papers in between work on company systems. Even traditionally tight-lipped Apple pledged to become more open with its research, in a bid to lure AI talent. Papers with corporate authors and attendees with corporate badges flooded the conferences that are the field’s main publication venues.

NeurIPS, the largest machine-learning conference, taking place virtually this week, had fewer than 2,000 attendees in 2012 and more than 13,000 in 2019. In recent years, the conference has become a hunting ground for big tech recruitment teams, who lure PhDs with lavish dinners and parties.

A study published in July found that Alphabet, Amazon, and Microsoft hired 52 tenure-track AI professors between 2004 and 2018.

Corporate AI research has also become a staple of big tech PR strategies. Recht says this has sometimes distorted which work gets prominence among researchers and swayed high profile journals to accept corporate work that might not have been worthy of such prominent publication. He says other areas of computing, such as databases and graphics, have handled corporate influence better—for example, by creating separate tracks for industry and academic work at their conferences.

William Fitzgerald, who previously worked on public relations for AI at Google, says it was routine for his department to be consulted on new work from company researchers. “Sometimes it’s because Google wanted to shine a light on it and show off,” he says. “There were also times a researcher would put something out and I had to get on the phone and say ‘You’re not supposed to do that.’”

Recht accepted a “Test of Time” award at NeurIPS this week, via video chat, for a paper he coauthored; he wore a T-shirt that read “Corporate conferences still suck.”

Recht and others wary of corporate hype also say industrial AI research has led to an unscientific fixation on projects only possible for people with access to giant data centers. One award announced at NeurIPS this week went to GPT-3, a language-generation model developed by OpenAI, a for-profit artificial intelligence lab. GPT-3 is capable of impressive fluency, but to build it, the company paid Microsoft to build a custom supercomputer.

Jesse Dodge, a postdoctoral researcher at the Allen Institute for AI, says that although the project is impressive, it has limited academic value, because the vast resources involved make it impossible for anyone but a large corporation to replicate. OpenAI is commercializing GPT-3 with Microsoft and sells access to the model, but it has not released it.

“This breaks norms in science, where we typically release models which can be adopted broadly and evaluated along additional dimensions over time,” Dodge says. He suggests conference organizers use awards more thoughtfully, highlighting work against more defined criteria likely to offer lasting scientific benefit.

OpenAI has said continuing advances in computing power typically mean that new AI inventions quickly become easily replicable by others.

The paper that led to Gebru’s unplanned exit asked AI developers to be more cautious when building powerful AI systems to process language, which have produced impressive results but also shown a tendency to repeat stereotypes learned online. She was co-lead of a prominent team at Google dedicated to exploring the ethical implications of AI research. The company had promoted their work as evidence it was being more thoughtful with AI than rivals.

Whittaker of AI Now says properly probing the societal effects of AI is fundamentally incompatible with corporate labs. “That kind of research that looks at the power and politics of AI is and must be inherently adversarial to the firms that are profiting from this technology,” she says. “When these firms tried to co-opt that research, this type of situation was inevitable.”

Gebru is scheduled to speak at a NeurIPS workshop taking place Friday dedicated to chewing over tensions caused by corporate AI projects. The Resistance AI website notes that AI research "has been concentrating power in the hands of governments and companies and away from marginalized communities." The agenda was recently changed to list Gebru as an “acclaimed ethical AI researcher,” not “co-lead of Ethical AI @Google.”

#### Unsustainable.

\*\*\*Cut more of this card when we have time.

Gelles et al 21 – Rebecca Gelles, Data Scientist at Georgetown's Center for Security and Emerging Technology, Tim Hwang, and Simon Rodriguez, CSET Data Research Assistant, April 2021 (“Mapping Research Agendas in U.S. Corporate AI Laboratories”, Center for Security and Emerging Technology, Available online at <https://cset.georgetown.edu/publication/mapping-research-agendas-in-u-s-corporate-ai-laboratories/?utm_source=Center+for+Security+and+Emerging+Technology&utm_campaign=0c2bdea508-Mapping+Research+Agendas+in+U.S.+Corporate+AI&utm_medium=email&utm_term=0_fcbacf8c3e-0c2bdea508-438303754>, Accessed 06-03-2021)

Executive Summary

Within the broad research field of artificial intelligence (AI), it is worth understanding, specifically, what leading U.S. companies invest in. This data brief conducts an analysis of the research papers published by Amazon, Apple, Facebook, Google, IBM, and Microsoft over the past decade to better understand what work their labs are prioritizing, and the degree to which these companies have similar or different research agendas overall.

We find the following:

* Major “AI companies” are often focused on very different subfields within AI. While companies like Amazon, Apple, Facebook, Google, IBM, and Microsoft are often grouped together generically as leaders in AI, an analysis of their publications shows considerable differentiation in the areas of research they prioritize. While publications may not provide the full picture of these companies’ research agendas, as companies may not choose to publish on work that will form the basis of valuable intellectual property, it still provides a window into the differences in research agendas between these companies. Policymakers should be careful to consider these differences in framing national assessments of technological competitiveness and in strategizing government investments in research.
* The private sector may be failing to make research investments consistent with ensuring long-term national competitiveness. None of the leading companies examined in this analysis appear to be prioritizing work on problem areas within machine learning that will offset the broader structural challenges the United States faces in deploying and benefitting from the technology when competing against authoritarian regimes. This includes work in areas such as few-shot learning, federated learning, simulation learning, interpretability, and ML fairness.

### 2nc---at: no ai

#### It’s a prerequisite to human survival. The algorithms matter.

Dyer-Witheford & Digilabour 19

(Nick Dyer-Witheford, associate professor at the University of Western Ontario in the Faculty of Information and Media Studies , “Dyer-Witheford: AI Capitalism,” August 16, 2019, https://digilabour.com.br/2019/08/16/dyer-witheford-ai-capitalism/)

DIGILABOUR: What are the blindspots in research on capitalism and artificial intelligence?

DYER-WITHEFORD: There is no shortage of topics on which further research into AI-capitalism is required. The immediate consequences of machine-learning in workplaces and the gig-economy, is the proper subject of a new round of workers’ inquiry, now indeed under way in many quarters; investigation into the construction of the corporate algorithms used by social media to shape the conditions of the wider social factory, research which also involves campaigns for access to information and public control of research agendas, is clearly vital; so too is closer examination of the corporate partnerships with the military and police, already a hot topic in Silicon Valley and, given the deteriorating nature of international relations and intensifying border regulation, likely to become even more prominent. However, the issue that over which I am left most curious after helping write this book is a less empirical one. It the issue of finding communist or socialist agendas for addressing AI other than of the now widely-popular left accelerationist approval for expanding the means of production devised by capital. For reasons I hope this interview has already made clear, we are skeptical about the idea that capital-developed AI can be used as a lever to bring a post-capitalist order into being –as in the now ubiquitous post-work formula for AI plus UBI (universal basic incomes). To us, this seems like a recipe for leaving an entirely disempowered proletariat still resident within a system of general commodification, and at the mercy of a capitalism now endowed with god-like powers. At the end of the book, we sketch some alternatives to this option, the absence of which might be considered a “blindspot” for contemporary radicalism. Our perspective does not close the door on possible emancipatory applications of AI, were such systems to be trained, developed and delimited within what we can shorthand as a communist order. Some of my co-authors are therefore interested in the possibilities of specifically socialist or communist transhumanism. Others of us incline more to a perspective that deviates from Marx’s allegiance to techno-modernist Prometheanism. For if the horizons of socialism or communism remain fixed on prospects of unlimited economic expansion, it becomes, I think, hard to avoid accelerationist logic. Such growth will tend towards intensified use of AI, not least to provide eco-modernist patches and fixes the problems of industrial and informational capital, such as global climate catastrophe. However, such route paradoxically leads to prospects of human self-obsolescence. The question then arises as to whether, as a counter-move, some articulation between Marxism and radical political ecology, such as that incipient in today’s “de-growth” movements, might be envisaged, something beyond the now widely-discussed (and certainly important) New Green Deal proposals. This would require a movement aimed at a global levelling of wealth, a massive program of social equalization, in combination with a regionally focused powering-down and de-celeration of the continuous economic growth indispensable to capitalism, accompanied by a deep democratization of both work institutions and scientific and technological research agendas. Such a path—and here I elaborate a personal opinion, rather than one fully worked out with and endorsed by my co-authors–might open a way to diminishing reliance on inhuman, or, more precisely, a-human, AI systems, or at least opens a space for some genuine social deliberation on the conditions of their adoption, rather than the de facto submission to the competitive automatism dictated by high-tech capital. The impulse to such a new social and ecological levelling, an articulation of equality and sufficiency, would demand an innovative social insurgency: to use some very controversial, and admittedly rather Eurocentric, examples, it would call for something like a rapprochement between Extinction Rebellion, the Gillets Jaunes and the Gillets Noirs! However, such a project, involving as it does a radical re-fit of the much of the philosophic equipment of the left is clearly one calling for further theoretical conversation and political experimentation.

### 2nc---at: alt kills innovation

#### The K turns the case and the alt solves it – the aff’s narrative of private-sector “dynamism” driving innovation causes *rent-seeking* and *value-extraction*, hollowing out public innovation infrastructure – the state is the *primary driver* of new pharmaceutical innovation, but only *rhetorically debunking* the myth that the state is stagnant and bureaucratic unlocks its productive capacity

Mazzucato 18

(Mariana Mazzucato, Professor in the Economics of Innovation and Public Value and Director of the Institute for Innovation and Public Purpose and the RM Phillips Chair in the Economics of Innovation at the University of Sussex, *The Value of Everything: Making and Taking in the Global Economy*)

The success of some of the companies has been extraordinary. Google’s share of the global desktop search engine market is more than 80 per cent, while just have US companies (Google, Microsoft, Amazon, Facebook and IBM) own most of the world’s data, with China’s Baidu being the only foreign company coming close. This market share also results in immense wealth: Apple’s cash pile was over $250 billion in 2017.

These companies’ huge profits, and their domination of their respective markets, are claimed to be justified in terms of the value they create: such profits and such domination are simply a reflection of their enormous wealth-creating power. Similarly, big pharmaceutical companies have justified the enormous increase in drug prices—where cures for diseases like hepatitis C can cost up to a million dollars – through stories about their extraordinary innovation capability and associated costs, or – when those costs are revealed to be much lower and/or actually picked up by the taxpayer – through the notion of ‘value’-based pricing.

This chapter takes a critical look at the innovation economy and the stories around it. It explores how the dominant narratives about innovators and the reasons for their success fundamentally ignore the deeply collective and cumulative process behind innovation. This failure to recognize these processes has in turn led to a problematic distribution of the rewards for innovation, and to the policies which, in the name of innovation, have enabled a few companies to extract value from the economy.

Value extraction in the innovation economy occurs in various ways. First, in the way that the financial sector – in particular venture capital and the stock market – has interacted with the process of technology creation. Second, in the way that the system of intellectual property rights (IPR) has evolved: a system that now allows not just the products of research but also the tools for research to be patented and their use ring-fenced, thereby creating what the economist William J. Baumol termed ‘unproductive entrepreneurship’. Third, in the way that prices of innovative products do not reflect the collective contribution to the products concerned, in fields as diverse as health, energy, or broadband. And fourth, through the network dynamics characteristic of modern technologies, where first-mover advantages in a network allow large economies to reap monopolistic advantages through economies of scale and the fact that customers using the network get locked in (finding it too cumbersome or disadvantageous to switch service). The chapter will argue that the most modern form of rent-seeking in the twenty-first century knowledge economy is through the way in which risks in the innovation economy are socialized, while the rewards are privatized.

Where Does Innovation Come From?

Before looking at these four areas of value extraction, I want to consider three key characteristics of innovation processes. Innovation rarely occurs in isolation. Rather it is by nature deeply cumulative: innovation today is often the result of pre-existing investment. Innovation is, moreover, collective, with long lead-times: what might appear as a radical discovery today is actually the fruit of decades of hard work by different researchers. It is also profoundly uncertain, in that most attempts at innovation fail and many results are unexpected. (Viagra, for instance, was initially developed for heart problems.)

1. Cumulative Innovation

If there is one thing that economists agree on (and there are not many), it is that technological and organizational changes are the principal source of long-term economic growth and wealth creation. Investments in science, technology, skills and new organizational forms of production (such as Adam Smith’s emphasis on the divison of labour) drive productivity and long-term increases in GDP. Building on the work of Marx, who highlighted the role of technological change in capitalism, Joseph Schumpeter (1883-1950) is probably the economist who has most emphasized the importance of innovation in capitalism. He coined the term ‘creative destruction’ to describe the way that product innovations (new products replacing old) and process innovations (new ways to organize production and distribution of goods and services) caused a dynamic process of renewal but also a process of destruction, with old ways falling aside and in the process causing many companies to go bankrupt. Schumpeter was particularly fascinated by ‘waves’ of innovations, which he believed occurred every thirty or so years. While Marx’s interest in technological change led him to look at the crises that capitalism would experience due to the effect of innovation on capital’s ability to create surplus value (or, to put it another way, if machines replace labour, how will the exploitation of labour – the source of profits – occur?), later economists focused mainly on the positive side of innovation that Schumpeter had underscored: its role in increasing the productive capacity of national economies.

In 1987 Robert Solow, a professor at the Massachusetts Institute of Technology, won the Noble Prize in Economics for showing that improvements in the use of technology explained over 80 per cent of economic growth. Following many before him who were readers of Schumpeter, Solow argued that economic theory had to better understand how to describe technological change. Practising what they preached, they explored what forces drive technological change. But where does innovation come from? Is it lone entrepreneurs working in their garages, genius scientists having a eureka moment in the laboratory, heroic small businesses and venture capitalists struggling against the commercial odds? No, they concluded that inventions are overwhelmingly the fruits of long-term investments that build on each other over years.

To take one obvious example: innovation in personal computers, which replaced clunky mainframes, came after decades of innovation in semiconductors, in memory capacity and in the box itself (reducing the size of mainframes to much smaller units). Individual companies such as IBM were key to the introduction of personal computers in the late 1970s and 1980s. But there would have been little innovation without the contribution to that lengthy process of other actors, such as the US government’s investment in semiconductor research and its procurement power in the 1950s and 1960s. Or, later, the investments made by the US government in the Internet, or that made by companies like Xerox Parc – itself a beneficiary of large amounts of public co-funding – in the development of the graphical user interface, which Steve Jobs later made use of in Apple’s first Macintosh, Lisa.

1. Uncertain Innovation

Innovation is uncertain, in the sense that most attempts to innovate fail. It also can take a very long time: decades can pass from the conception of an idea to its realization and commercialization. The types, sources and magnitude of risks vary across technologies, sectors and innovations. Technological risks, for instance, can increase with the complexity of the target (e.g. going to the moon, solving climate change) or the paucity of knowledge within the organizations involved. The longer the time required to devise certain solutions, the greater the chance of a competitor reaching the market first, establishing what are known as first-mover advantages. Additional risks that militate against recouping the initial investment or the viability of the business include spillover effects (an event brought on by an apparently unrelated event elsewhere); the lack of demand for goods even if they make it to the market; investors’ exposure to labour or tax problems; and changing economic conditions. These are all reasons why an appetite for risk – in both the public and private sectors involved in innovation – is essential.

Yet contrary to the prevailing image of fearless, risk-taking entrepreneurs, business often does not want to take on such risk. This is especially the case in areas where a lot of capital is needed and the technological and market risks are high – pharmaceuticals, for instance, and the very early stages of sectors, from the Internet to biotech and nanotech. At this point the public sector can, and does, step in where private finance fears to tread, to provide vital long-term finance.

1. Collective Innovation

Understanding both the role of the public sector in providing strategic finance, and the contribution of employees inside companies, means understanding that innovation is collective: the interactions between different people in different roles and sectors (private, public, third sectors) are a critical part of the process. Those who might otherwise be seen as lone entrepreneurs in fact benefit from such collectivity; moreover, they stand on the shoulders of both previous entrepreneurs and taxpayers who, as we will see, often contribute to the underlying infrastructure and technologies on which innovation builds.

Such processes are evident in the technologies underpinning some of today’s most ubiquitous products: the iPhone, for instance, depends on publicly funded smartphone technology, while both the Internet and SIRI were funded by the Defense Advanced Research Projects Agency (DARPA) in the US Department of Defense; GSP by the US Navy; and touchscreen display by the CIA. In the pharmaceutical sector, research has shown that two-thirds of the most innovative drugs (new molecular entities with priority rating) trace their research back to funding by the US National Institutes of Health. Meanwhile, some of the greatest advances in energy – from nuclear to solar to fracking – have been funded by the US Department of Energy, including recent battery storage innovations by ARPA-E, DARPA’s sister organization. Both Bill Gates, CEO of Microsoft, and Eric Schmidt, Executive Chairman of Alphabet (the parent company of Google), have recently written about the immense benefits their companies gained from public investments: as well as the Internet and the html code behind the worldwide web written in CERN, a public lab in Europe, Google’s very algorithm was funded by a National Science Foundation grant.

The collective role of innovation can be seen not only in the cooperation between public and private but also in the role that workers play. Countries that have a more ‘stakeholder’ approach to corporate governance, many of which are to be found in Northern Europe, tend to involve workers more directly in the innovation process and to train them through well-developed vocational programmes: worker skills are most heavily invested in; they contribute more, and thereby are more able to share in the rewards that their work generates. When trade union representatives sit on the boards of companies, they are more likely to demand that any sacrifices in wages are compensated by higher investments in areas that eventually create more and better jobs. And countries with a more stakeholder-driven economy are more likely to embrace the kinds of public and private collaborations that are required for value creation: the strength of German manufacturing, for instance, is closely related to the strong links between science and industry fostered by public-private organizations like the German Fraunhofer Institutes.

#### Reject straw person characterizations of alternative economic principles.

Graeber 11 – David Rolfe Graeber was an American anthropologist, anarchist activist, and professor at the London School of Economics, 2011 (*Debt: The First 5000 Years*, Melville House, Available online via USC Libraries, Accessed 08-26-2021)

Communism

I will define communism here as any human relationship that operates on the principles of "from each according to their abilities, to each according to their needs."

I admit that the usage here is a bit provocative. "Communism" is a word that can evoke strong emotional reactions-mainly, of course, because we tend to identify it with "communist" regimes. This is ironic, since the Communist parties that ruled over the USSR and its satellites, and that still rule China and Cuba, never described their own systems as "communist." They described them as "socialist." "Communism" was always a distant, somewhat fuzzy utopian ideal, usually to be accompanied by the withering away of the state--to be achieved at some point in the distant future.

Our thinking about communism has been dominated by a myth. Once upon a time, humans held all things in common-in the Garden of Eden, during the Golden Age of Saturn, in Paleolithic hunter­ gatherer bands. Then came the Fall, as a result of which we are now cursed with divisions of power and private property. The dream was that someday, with the advance of technology and general prosperity, with social revolution or the guidance of the Party, we would finally be in a position to put things back, to restore common ownership and common management of collective resources. Throughout the last two centuries, Communists and anti-Communists argued over how plausible this picture was and whether it would be a blessing or a nightmare. But they all agreed on the basic framework: communism was about collective property, "primitive communism" did once exist in the distant past, and someday it might return.

We might call this "mythic communism" – or even, "epic communism" – a story we like to tell ourselves. Since the days of the French Revolution, it has inspired millions; but it has also done enormous damage to humanity. It's high time, I think, to brush the entire argument aside. In fact, "communism" is not some magical utopia, and neither does it have anything to do with ownership of the means of production. It is something that exists right now-that exists, to some degree, in any human society, although there has never been one in which everything has been organized in that way, and it would be difficult to imagine how there could be. All of us act like communists a good deal of the time. None of us acts like a communist consistently. "Communist society"-in the sense of a society organized exclusively on that single principle--could never exist. But all social systems, even economic systems like capitalism, have always been built on top of a bedrock of actually-existing communism.

Starting, as I say, from the principle of "from each according to their abilities, to each according to their needs" allows us to look past the question of individual or private ownership (which is often little more than formal legality anyway) and at much more immediate and practical questions of who has access to what sorts of things and under what conditions.9 Whenever it is the operative principle, even if it's just two people who are interacting, we can say we are in the presence of a sort of communism.

Almost everyone follows this principle if they are collaborating on some common project.10 If someone fixing a broken water pipe says, "Hand me the wrench," his co-worker will not, generally speaking, say, "And what do I get for it?"— even if they are working for Exxon­ Mobil, Burger King, or Goldman Sachs. The reason is simple efficiency (ironically enough, considering the conventional wisdom that "communism just doesn't work"): if you really care about getting something done, the most efficient way to go about it is obviously to allocate tasks by ability and give people whatever they need to do them.11 One might even say that it's one of the scandals of capitalism that most capitalist firms, internally, operate communistically. True, they don't tend to operate very democratically. Most often they are organized around military-style top-down chains of command. But there is often an interesting tension here, because top-down chains of command are not particularly efficient: they tend to promote stupidity among those on top, resentful foot-dragging among those on the bottom. The greater the need to improvise, the more democratic the cooperation tends to become. Inventors have always understood this, start-up capitalists frequently figure it out, and computer engineers have recently rediscovered the principle: not only with things like freeware, which everyone talks about, but even in the organization of their businesses. Apple Computers is a famous example: it was founded by (mostly Republican) computer engineers who broke from IBM in Silicon Valley in the 198os, forming little democratic circles of twenty to forty people with their laptops in each other's garages.

This is presumably also why in the immediate wake of great disasters – a flood, a blackout, or an economic collapse – people tend to behave the same way, reverting to a rough-and-ready communism. However briefly, hierarchies and markets and the like become luxuries that no one can afford. Anyone who has lived through such a moment can speak to their peculiar qualities, the way that strangers become sisters and brothers and human society itself seems to be reborn. This is important, because it shows that we are not simply talking about cooperation. In fact, communism is the foundation of all human sociability. It is what makes society possible. There is always an assumption that anyone who is not actually an enemy can be expected on the principle of "from each according to their abilities," at least to an extent: for example, if one needs to figure out how to get somewhere, and the other knows the way.

### 1NC---M---Thermodynamics

#### Capitalism is unsustainable. Extinction by thermodynamics.

Murphy 22 – Thomas Murphy is a Professor in Physics at University of California San Diego, a PhD in General Relativity from Caltech, February 22nd (*Energy and Human Ambitions on a Finite Planet: Assessing and Adapting to Planetary Limits*, University of California, Available online at <https://escholarship.org/uc/item/9js5291m>)

1.2 Exponential Energy Extrapolation

Having established some basic principles of exponential growth, it’s time for a first look at how we can use the math to argue about limits to our expectations. We’ll concentrate on energy use. The United States Energy Information Administration (EIA) provides information on energy use from 1949 to the present. An appendix (E1: [3]) presents an approximate account of energy use from 1635–1945. Figure 1.2 displays the more recent portion of this history.

Lacking comparable data for the world, we use U.S. data simply to illustrate the more broadly applicable global growth trend. Even countries far behind are growing energy use—often faster than the 3% characteristic of U.S. history.

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Figure 1.2: U.S. energy over 200 years, showing a dramatic rise due almost entirely to fossil fuels. The red curve is an exponential fit tuned to cover the broader period shown in Figure 1.3.

Note that the energy rate at the left edge of Figure 1.2 becomes almost invisibly small. Presenting the data on a logarithmic plot, as in Figure 1.3, we can better see the entire trajectory. On such a plot, exponentials become straight lines. The trend is remarkably consistent with an exponential (red line) for most of the history, at a rate just shy of 3% per year. Note that this total effect includes population growth, but population has not grown as fast as energy, so that per-capita energy has also risen. This makes sense: our lives today are vastly more energetically rich than lives of yesteryear, on a per-person basis.

The astute reader might note a departure from the exponential fit in recent years. This only reinforces the primary point of this chapter that sustaining exponential growth indefinitely is absurd and will not happen. If growth is destined to stop, perhaps we are beginning to experience its limits well before the theoretical timescales developed in this chapter.

Having established that energy growth over the past several centuries is well-described by an exponential, we can explore the implications of continuing this trend forward. Starting at a present-day global energy production rate of 18×1012 Watts (18 TW), we adopt a convenient growth rate of 2.3% per year for this exercise. We pick this for two reasons: 1) it is more modest than the historical trend, so will not over-exaggerate the result; 2) this rate produces the mathematical convenience of a factor of 10 increase every century.8

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What follows is a flight of fancy that quickly becomes absurd, but we will chase it to staggering levels of absurdity just because it is fun, instructive, and mind-blowing. Bear in mind that what follows should not be taken as predictions of our future: rather, we can use the absurdity to predict how our future will not look!

The sun deposits energy at Earth’s surface at a rate of about 1,000 W/m2 (1,000 Watts per square meter; we’ll reach a better understanding for these units in Chapter 5). Ignoring clouds, the projected area intercepting the sun’s rays is just , where R is the radius of the earth, around 6,400 km. Roughly a quarter of the earth’s surface is land, approximate numbers are perfectly fine for this exercise. and adding it all up we get about 30 × 1015 W hitting land. If we put solar panels on every square meter of land converting sunlight to electrical energy at 20% efficiency,10 we keep 6 × 1015 W. This is a little over 300 times the current global energy usage rate of 18 TW. What an encouraging number! Lots of margin. The merits of various alternative energy sources will be treated in later chapters, so do not use this chapter to form opinions on the usefulness of solar power, for instance. How long before our growth would get us here? After one century, we’re 10 times higher, and 100 times higher after two centuries. It would take about 2.5 centuries (250 years) to hit this limit. Then no more energy growth.

But wait, why not also float panels on all of the ocean, and also magically improve performance to 100%? Doing this, we can capture a whopping 130 × 1015 W, over 7,000 times our current rate. Now we’re talking about maxing out in just under 400 years. Each factor of ten is a century, so a factor of 10,000 would be four factors of ten (104 ), taking four centuries.

So within 400 years, we would be at the point of using every scrap of solar energy hitting the planet at 100% efficiency. But our planet is a tiny speck in space. Why not capture all the light put out by the sun, in a sphere surrounding the sun (called a Dyson sphere; see Box 1.3)? Now we’re talking some real power! The sun puts out 4 × 1026 W. If it were a light bulb, this would be its label (putting the 100 W standard incandescent bulb to shame). So the number is enormous. But the math Every century gets another factor of ten. To go from where we are now (18 × 1012 W) to the solar regime is about 14 orders-of-magnitude. So in 1,400 years,12 we would be at 18 × 1026 W, which is about 4.5 times the solar output. Therefore we would use the entire sun’s output in a time shorter than the 2,000-year run of our current calendar.

Bypassing boring realism, we recognize that our sun is not the only star in the Milky Way galaxy. In fact, we estimate our galaxy to contain roughly 100 billion stars! This seems infinite. A billion seconds is just over 30 years, so no one could count to 100 billion in a lifetime. But let’s see: 100 billion is 1011. Immediately, we see that we buy another 11 centuries at our 2.3% rate. So it takes 1,100 years to go from consuming our entire sun to all the stars in our galaxy! That’s 2,500 years from now, adding the two timescales, and still a civilization-relevant time period. Leave aside the pesky fact that the scale of our galaxy is 100,000 light years, so that we can’t possibly get to all the stars within a 2,500 year timeframe. So even as a mathematical exercise, physics places yet another limit on how long we could conceivably expect to maintain our current energy growth trajectory.

The unhinged game can continue, pretending we could capture all the light put out by all the stars in all the galaxies in the visible universe. Because the visible universe contains about 100 billion galaxies we buy another 1,100 years. We can go even further, imagining converting all matter (stars, gas, dust) into pure energy (E = mc^2), not limiting ourselves to only the light output from stars as we have so far. Even playing these unhinged games, we would exhaust all the matter in the visible universe within 5,000 years at a 2.3% rate. The exponential is a cruel beast. Table 1.3 summarizes the results. The point is not to take seriously the timescales for conquering the sun or the galaxy. But the very absurdity of the exercise serves to emphasize the impossibility of our continuing exponential growth in energy. All kinds of reasons will preclude continued energy growth, including the fact that human population cannot continue indefinite growth on this planet. We will address space colonization fantasies in Chapter 4.

1.3 Thermodynamic Consequences

Physics places another relevant constraint on growth rate, and that concerns waste heat. Essentially all of our energy expenditures end up as heat. Obviously many of our activities directly involve the production of heat: ovens, stoves, toasters, heaters, clothes dryers, etc. But even cooling devices are net heat generators. Anything that uses power from an electrical outlet ends up creating net heat in the environment, with very few exceptions. A car moving down the road gets you from place A to place B, but has stirred the air,13 heated the engine and surrounding air, and deposited heat into the brake pads and rotors, tires and road. Our metabolic energy mostly goes to maintaining body temperature. But even our own physical activity tends to end up as heat in the environment. The only exceptions would be beaming energy out of the earth environment (e.g., light or radio) or putting energy into storage (eventually to be converted to heat). But such exceptions do not amount to much, quantitatively.

What happens to all of this waste heat? If it all stayed on Earth, the temperature would climb and climb. But the heat does have an escape path: infrared radiation14 to space. The earth is in an approximate thermodynamic equilibrium: solar energy is deposited, and infrared radiation balances the input to result in steady net energy. As we will see in Chapter 5, the rate at which energy flows is called power, so that we can describe energy flows into and out of the earth system in terms of power. Physics has a well-defined and simple rule for how much power a body radiates, called the Stefan–Boltzmann law: 15

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P is the power radiated, A\_surf is the surface area, T\_hot is the temperature of the radiating object in Kelvin16 (very important!), T\_cold is the temperature of the environment (also Kelvin), and is the Stefan–Boltzmann constant: = 5.67 × 10−8 W/m2/K4.17 Note that the law operates on the difference of the fourth powers of two temperatures.

Because space is so cold (tens of Kelvin, effectively, unless exposed to the sun), the fourth power of such a small number pales so much in comparison to the fourth power of a number like 300 that we can safely ignore it for radiation to space:

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where we now just have a single temperature: that of the warm body in space.

Earth reaches an equilibrium so that power–in equals power–out. If more power is dumped onto the planet, then the temperature rises until climbs to match. The relation in Eq. 1.9 is fundamentally important to Earth’s temperature balance, and applies pretty universally, as highlighted in Box 1.4.

Diagram

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To evaluate the expected temperature of the earth, we know that the sun delivers 1,360 W/m2 to the top of the earth’s atmosphere [4] (a bit less reaches the ground). We also know that about 29.3% of this is reflected by clouds, snow, and to a lesser extent water and terrain. So the earth system absorbs about 960 W/m2 . It absorbs this energy onto the area facing the sun: a projected disk of area A\_proj = . But the total surface area of the earth is four times this, all of it participating in the radiation to space (Figure 1.4). Equating the input and output for equilibrium conditions:

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which we can rearrange to isolate temperature, satisfying

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Solving for yields ≈ 255 K, or −18◦C (about 0◦F). This is cold—too cold. We observe the average temperature of Earth to be about 288 K, or 15◦C (59◦F). The difference of 33◦C is due to greenhouse gases—mostly H2O—impacting the thermal balance by preventing most radiation from escaping directly to space. We’ll cover this more extensively in Chapter 9.

Armed with Eq. 1.11, we can now estimate the impact of waste heat on Earth’s equilibrium temperature. Using the solar input as a baseline, we can add increasing input using the exponential scheme from the previous section: starting today at 18 TW and increasing at 2.3% per year (a factor of 10 each century). It is useful to express the human input in the same terms as the solar input so that we can just add to the numerator in Eq. 1.11. In this context, our current 18 TW into the projected area adds 0.14 W/m2 to the solar input (a trivial amount, today), but then increases by a factor of ten each century. Taking this in one-century chunks, the resulting temperatures—adding in the 33 K from greenhouse gases—follow the evolution shown in Table 1.4. At first, the effect is unimportant, but in 300 years far outstrips global warming, and reaches boiling temperature in a little over 400 years! If we kept going (not possible), Earth’s temperature would exceed the surface temperature of the sun inside of 1,000 years!

A potential inconsistency in our treatment is that we based our exploration of energy scale on solar energy as a prelude to stellar energy capture. But in the thermodynamic treatment, we implicitly added our power source to the existing solar input. If the sun is the source, we should not double-count its contribution. Nonetheless, continued, relentless growth would eventually demand a departure from solar capture on Earth and drive the same thermodynamic challenges regardless. Synthesizing the messages: we can’t continue 2.3% growth for more than a few centuries using sunlight on Earth. And if we invent something new and different to replace the fully-tapped solar potential, it too will reach thermodynamic limits within a few centuries.

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Connecting some ideas, we found in the previous section that we would be consuming the sun’s entire output in 1,400 years at the 2.3% growth rate. It stands to reason that if we used a sun’s worth of energy confined to the surface of the earth, the (smaller) surface would necessarily be hotter than the sun (in 1,400 years), just like a light bulb filament is hotter than human skin despite putting out the same power—owing to the difference in area.19

One key aspect of this thermal radiation scenario is that it does not depend on the form of power source. It could in principle be fossil fuels, nuclear fission, nuclear fusion, or some form of energy we have not yet realized and may not even have named! Whatever it is, it will have to obey thermodynamics. Thus, thermodynamics puts a time limit on energy growth on this planet.

#### Turns case: Capitalism generates economic inequality that makes *imperialism inevitable* – World War I proves accumulation crises cause *global conflict* to protect capitalist class foreign assets

Hauner et al 20

(Thomas Hauner, Federal Reserve Bank of New York, Branko Milanovic, CUNY Graduate Center, Stone Center for Socio-Economic Inequality, Suresh Naidu, Columbia University, “Inequality, Foreign Investment, and Imperialism Prior to World War I,” This Draft: February 5, 2020, https://stonecenter.gc.cuny.edu/files/2017/11/milanovic-inequality-foreign-investment-and-imperialism-2020.pdf)

The number of historical and political books and articles written on the origins of the Great War (later called World War I) in all languages is enormous. Recently, around the centenary of the outbreak of the War, there appeared many new historical books, some of which went on to became international bestsellers. The discussion of the War thus appears endless and shows no signs of abating. But in one area, the discussion of the origins of the war, is strangely absent. This is economics. The lack of recent economic works on the origin of the war is even stranger because it is economics and not the other social sciences that led the analysis in the past, arguing even before the hostilities of 1914 began, that the war was almost inevitable, and then, during the war, continued with its economically-driven “dissection" of the causes. We have in mind here the seminal under consumptionist work by John Hobson Hobson (1902), Imperialism: A Study, that in the next couple of decades led to several influential works within the Marxist tradition that stressed the imperialist origins of the war (Rosa Luxemburg, Vladimir Lenin, Nikolai Bukharin, Rudolf Hilferding). That line of analysis remained very active for a while among Marxist economists (for example, Samir Amin (1974) in Accumulation on a World Scale). Paul Bairoch shared the same view.1 It was recently restated by Branko Milanovic (2016) in Global Inequality where, focusing on the role of high inequality before the conflict, he dubbed it an “endogenous" explanation of the war meaning that internal logic of the highly unequal capitalist societies at the turn of the 20th century predisposed them to imperialism2 which in turn caused the war. However, in the past fifty years, interest in this type of explanation among economists and economic historians has been limited. It is not exaggerated to say that theories of imperialism elicit today mostly an antiquarian interest, and the empirical study of late 19th century international economy is largely subsumed under “globalization", which ignores the geopolitical concerns that loomed large in the early literature.3 Even Findlay & O'Rourke (2009), who are quite attuned to the complementary relationship between force and trade, treat World War I as an exogenous shock to the well-managed globalization of the previous 50 years. Tooze (2015) provides further historiography, highlighting the disconnect between economic history literatures on 19th century globalization (who ignore geopolitics) and political science literatures on international relations (which ignore economics). Our objective in this paper is to revisit theories of imperialism in order to define them in a more coherent manner, freeing them from reliance on irrelevant details, and to investigate whether the mechanisms adduced by the authors can be empirically substantiated. However, while both the modeling and the empirics are modern, in the sense that neither the tools of the analysis nor the data were available to the authors who wrote a century ago, the main contours of the argument are theirs. They are relatively simple. According to Hobson, unequal distribution of income in advanced capitalist countries (more specifically, England) leads to secular underconsumption due to lack of purchasing power of the poorer and middle classes. There is a glut of savings compared to profitable investments that exist nationally.4 In Lenin's formulation, lower domestic profitability is due to the “tendential" decrease in the domestic rate of profit as postulated by Marx. The owners of financial capital hence need to find more profitable outlets for their investments and they can only find them in overseas territories where the marginal productivity of capital, due to its scarcity, is greater. These investments are of two kinds: lending to foreign government in the form of purchase of their bonds and direct foreign investments. But neither form of investment is safe, once it is made so far away from home and in the countries where property rights are much less secure than in the main capitalist nations.5 In order to ensure security of their property, capitalists in advanced countries resort to the use of state power, either to control the borrowing government and threaten it by military force if it fails to pay the debt (e.g. Egypt, Turkey, Venezuela, Tunisia), or to conquer the country in order to transform it into a colony where metropole rules (including those regarding the security of property) apply.6 In Hobson's view, imperialism is “vent for investments". It is “the endeavor of the great controllers of industry to broaden the channel for the flow of their surplus wealth by seeking foreign markets and foreign investments to take off the goods and capital they cannot sell or use at home" (p.85). And it is far from being class neutral, for the political and military power of the metropole is used to ensure a superior return to the owners of foreign assets who are mostly the rich: “. . . if I invest either in the public funds or in some private industrial venture in a foreign country for the bene t of my private purse, getting specially favorable terms to cover risks arising from the political insecurity of the country or the deficiencies of its Government, I am entitled to call upon my Government to use its political and military force to secure those very risks which I have already discounted in the terms of my investment. Can anything be more palpably unfair?" (Hobson, ibid, p. 358). Having a colony (formal or informal) comes with other advantages like a cheap labor force that can be exploited much more than domestic labor (where pro-worker regulations were already in place), preferential access to raw materials (which can be denied to other imperialist competitors), new monopolistic market for the products made or traded by the metropole (British textiles in India or steel in the colonial United States, opium in China). In some cases (the sack of the Summer Palace in Beijing), even outright plunder of the old-fashioned style was not excluded. Now, when several major powers are involved in these actions, the struggle for colonies and for control of the “unallocated" parts of the world rapidly ensues. It is this imperialistic competition that, after several smaller conflicts (Fashoda, the two Moroccan crises) led to the outbreak of the Great War. Empire was more than colonies, however. The literature has often focused on the difference between colonial and non-colonial holdings, and a robust empirical fact is that colonial assets were small relative to non-colonial assets.7 But as Saul (1960) shows, empire was a network of off setting trade balances, where for example British trade surpluses with North America and Continental Europe were used to pay for trade deficits with India and Turkey. [ENTER HOBSBAWM QUOTE HERE??] Our argument is not about the returns to colonies specifically, but rather the returns to empire broadly, including maintaining the security and value of trade routes (and future trade routes). The large foreign asset positions held by wealthy citizens of the metropoles could only be redeemed by future flows of income, whose smooth realization would need to be guaranteed by naval power and expeditionary forces, secured strategic routes such as Morocco and the Dardanelles, reliable prospects of future pan-African trade linkages (Fashoda) or Asian markets (Tonkin), and extensive mutual defense treaties to deter aggression. We do not take a position on the validity of either the maldistribution-cum-underconsumption hypothesis or the “tendential decrease in the rate of profit" hypothesis. We instead posit domestic financial frictions, so that investors face heterogeneous domestic rates of returns, creating an upward sloping supply curve for foreign investment. Our argument is therefore simpler but also less restrictive. We argue that the increase in income and wealth inequality in major countries has produced an increasing demand for financial assets, which are not all met by domestic investments due to credit market imperfections. The rich tended to invest overwhelmingly in foreign assets because they were, adjusted for risk, more profitable than available domestic opportunities. To protect such foreign assets, whether portfolio or direct, the countries, partially at the instigation of investors in foreign assets, increased military investments (naval dreadnoughts as well as territorial armies) and complemented it with geopolitical strategies, including both colonial conquests as well as extensive treaties.

### 2NC---AT: Decoupling

#### No decoupling:

#### Energy paradox. It would require the price of essential resources to asymptotically drop to zero.

Murphy 22 – Thomas Murphy is a Professor in Physics at University of California San Diego, a PhD in General Relativity from Caltech, February 22nd (*Energy and Human Ambitions on a Finite Planet: Assessing and Adapting to Planetary Limits*, University of California, Available online at <https://escholarship.org/uc/item/9js5291m>)

2.3 Physically Forced Economic Limits

Let us now consider a thought experiment. We will use Figure 2.4 as a guide as we go along. Colored numbers in the following text point to similarly-colored labels in the figure. We start by positing a constant growth rate for the entire economy (point 1; red curve in Figure 2.4) following the familiar 2.3% annual growth rate, picked for its convenient factor of 10 each century. Meanwhile, the scale of physical resources (energy, materials) in the economy also climbs at the same rate, starting at point 2. The vertical gap between the curves at the left-hand edge conveys that the economy is not 100% physical in the beginning: the total economy is larger than the physical piece.18

Chart, line chart

Description automatically generated

Fast-forward to a time when physical resources have stopped growing, starting at point 3. Chapter 1—using energy and thermodynamics as the basis—made the case that we cannot expect physical growth to continue indefinitely, ending on a few-century timescale at the longest.19 In this scenario, the scale of energy in our society flat-lines at a steady scale (point 4).

If we demand continued economic growth in the context of fixed energy, decoupling becomes increasingly necessary, shown as a growing gap in Figure 2.4. In other words, if the gross domestic product (GDP; as an indicator of economic activity) is to continue rising20 (point 5), then overall intensity (energy per dollar) must continually decrease. For this to happen, less-energetic activities must assume increasing importance in the economy. So far, economists are on board: this is precisely what inspires an affinity for decoupling—a way forward in the face of physical limits. One might expect more abstract services, virtual experiences, art dealing, enhanced presentation: all requiring little or no additional energy expenditure, or perhaps even less than before. In this way, the economic scale could keep rising while physical resources are held flat.

If the economy is to continue to expand on the basis of decoupled activities, a greater fraction of it must go toward these non-physical sectors. This means more monetary flow is associated with low-impact activities. In practical terms, then, a greater fraction of one’s income is directed toward experiences not tied to energy or other physical demands. In Figure 2.4, we see, at point 6, the percentage of the economy in the non-physical sector starting at 25%: not dominant, but not negligible. The magenta curve must rise as the red and blue lines separate, until at point 7 it approaches 100% non-physical and continues to drive arbitrarily close to 100%.

During this process, the obvious converse consequence is that the energetically or physically costly activities—like transportation, food, heating, cooking, manufactured items—become an ever-smaller fraction of the economy, or an ever smaller fraction of monthly expenses, to put it more personally. In other words, they become cheap.

Now, in our imagined scenario of continued economic growth, the ruthlessness of the exponential grabs the reins and drives the gulf ever wider, so that physical goods become arbitrarily cheap and demand an ever-smaller fraction of income. By the time we reach the right side of Figure 2.4, the economic scale is over 1,000 times as large as the physical scale, meaning that the physical component is less than 0.1% of the total economy. Table 2.2 illustrates the progression under the foregoing growth rate of 2.3%. If in the year 2000, 50% of one’s income (and thus about half of one’s work hours) goes toward physically intense products, this becomes ever smaller until by the end of the table it only takes 6 minutes of your annual work to earn enough for the physically intense goods: all your food, clothing, transportation, heating, cooking, manufactured goods.

If this is starting to feel like unrealistic fantasy, then good: your intuition is serving you well. How can essential, non-negotiable, life-sustaining commodities that are in finite supply become essentially free? The idea goes against another, more fundamental economic principle of supply and demand. A limited life-essential resource will always carry a moderately high value. Limited supply and inflexible demand dictate a floor to the price.

Box 2.4: Monopoly Made Easy

One way to highlight the absurdity of the scenario is that if the physically-limited but essential (life sustaining) resources became arbitrarily cheap in the fullness of time, a single person could buy them all for a pittance, and then charge a hefty price for anyone who wants to keep living. We simply will not find ourselves in the situation where precious and limited resources become arbitrarily cheap. Alternatively, if people only needed to work an hour per year to accommodate basic needs, expect a lot less work to be done, acting as a drag on economic productivity and thus preventing inexorable growth—one way or another.

Once the price floor is reached, the cost of physical resources will not be able to fall any further. This happens pretty soon after physical resources cease to grow in scale. Indeed, it seems unlikely (to the author) that limited resources essential for survival would fall much below 10% of the total economic scale, which happens within a century of physical saturation in our 2.3% growth scenario. Point 8 in Figure 2.4 depicts a more realistic trajectory for the economy (red dashed line) in reaction to a saturated physical scale. In this case, the economy keeps growing a bit more than the physical sector, but eventually settles down itself into a non-growth phase.

We therefore have a logical sequence providing a few-century timescale for an end to economic growth. Thermodynamics limits us to at most a few centuries of energy growth on Earth, and economic growth will cease within a century or so thereafter, assuming a target rate of a few percent per year. In practice, growth may come to an end well before theoretical extremes are reached.

#### Physical limits. Efficiency gains have a cap.

Murphy 11 – Thomas Murphy is a PhD in General Relativity from Caltech, Professor in Physics at University of California San Diego, July 14th (“Can Economic Growth Last?”, Do The Math, Available online at https://dothemath.ucsd.edu/2011/07/can-economic-growth-last/, Accessed 01-22-2022)

As we saw in the previous post, the U.S. has expanded its use of energy at a typical rate of 2.9% per year since 1650. We learned that continuation of this energy growth rate in any form of technology leads to a thermal reckoning in just a few hundred years (not the tepid global warming, but boiling skin!). What does this say about the long-term prospects for economic growth, if anything?

The figure at left shows the rate of global economic growth over the last century, as reconstructed by J. Bradford DeLong. Initially, the economy grew at a rate consistent with that of energy growth. Since 1950, the economy has outpaced energy, growing at a 5% annual rate. This might be taken as great news: we do not necessarily require physical growth to maintain growth in the economy. But we need to understand the sources of the additional growth before we can be confident that this condition will survive the long haul. After all, fifty years does not imply everlasting permanence.

The difference between economic and energy growth can be split into efficiency gains—we extract more activity per unit of energy—and “everything else.” The latter category includes sectors of economic activity not directly tied to energy use. Loosely, this could be thought of as non-manufacturing activity: finance, real estate, innovation, and other aspects of the “service” economy. My focus, as a physicist, is to understand whether the impossibility of indefinite physical growth (i.e., in energy, food, manufacturing) means that economic growth in general is also fated to end or reverse. We’ll start with a close look at efficiency, then move on to talk about more spritely economic factors.

Exponential vs. Linear Growth

First, let’s address what I mean when I say growth. I mean a steady rate of fractional expansion each year. For instance, 5% economic growth means any given year will have an economy 5% larger than the year before. This leads to exponential behavior, which is what drives the conclusions. If you object that exponentials are unrealistic, then we’re in agreement. But such growth is the foundation of our current economic system, so we need to explore the consequences. If you think we could save ourselves much of the mess by transitioning to linear growth, this indeed dramatically shifts the timeline—but it’s also a death knell for economic growth.

Let’s say we lock in today’s 5% growth and make it linear, so that we increase by a fixed absolute amount every year—not by a fixed fraction of that year’s level. We would then double in 20 years, and in a century would be five times bigger (as opposed to 132 times bigger under exponential 5% growth). But after just 20 years, the fractional growth rate is 2.5%, and after a century, it’s 1%. So linear growth starves the economic beast, and would force us to abandon our current debt-based financial system of interest and loans. This post is all about whether we can maintain our current, exponential trajectory.

Squeezing Efficiency: Rabbits out of the Hat

It seems clear that we could, in principle, rely on efficiency alone to allow continued economic growth even given a no-growth raw energy future (as is inevitable). The idea is simple. Each year, efficiency improvements allow us to drive further, light more homes, manufacture more goods than the year before—all on a fixed energy income. Fortunately, market forces favor greater efficiency, so that we have enjoyed the fruits of a constant drum-beat toward higher efficiency over time. To the extent that we could continue this trick forever, we could maintain economic growth indefinitely, and all the institutions that are built around it: investment, loans, banks, etc.

But how many times can we pull a rabbit out of the efficiency hat? Barring perpetual motion machines (fantasy) and heat pumps (real; discussed below), we must always settle for an efficiency less than 100%. This puts a bound on how much gain we might expect to accomplish. For instance, if some device starts out at 50% efficiency, there is no way to squeeze more than a factor of two out of its performance. To get a handle on how much there is to gain, and how fast we might expect to saturate, let’s look at what we have accomplished historically.

THE GOOD, THE BAD, AND THE AVERAGE

A few shining examples stand out. Refrigerators use half the energy that they did about 35 years ago. The family car that today gets 40 miles per gallon achieved half this value in the 1970’s. Both cases point to a 2% per year improvement (doubling time of 35 years).

Not everything has seen such impressive improvements. The Boeing 747 established a standard for air travel efficiency in 1970 that has hardly budged since. Electric motors, pumps, battery charging, hydroelectric power, electricity transmission—among many other things—operate at near perfect efficiency (often around 90%). Power plants that run on coal, natural gas, or nuclear reactions have seen only marginal gains in efficiency in the last 35 years: well less than 1% per year.

Taken as a whole, we might then loosely guess that overall efficiency has improved by about 1% per year over the past few decades—being bounded by 0% and 2%. This corresponds to a doubling time of 70 years. How many more doublings might we expect?

POTENTIAL GAINS AND LIMITS

Many of our large-scale applications of energy use heat engines to extract useful energy out of combustion or other source of heat. These include fossil-fuel and nuclear power plants operating at 30–40% efficiency, and automobiles operating at 15–25% efficiency. Heat engines therefore account for about two-thirds of the total energy use in the U.S. (27% in transportation, 36% in electricity production, a bit in industry). The requirement that the entropy of a closed system may never decrease sets a hard limit on how much efficiency one might physically achieve in any heat engine. The maximum theoretical efficiency, in percent, is given by 100×(Th−Tc)/Th, where Th and Tc denote absolute temperatures (in Kelvin) of the hot part of the heat engine and the “cold” environment, respectively. Engineering limitations prevent realization of the theoretical maximum. But in any case, a heat engine operating between 1500 K (hot for a power plant) and room temperature could at most achieve 80% efficiency. So a factor of two improvement is probably impractical in this dominant domain.

The reverse of a heat engine is a heat pump, which uses a little bit of energy to move a lot. Air conditioners, refrigerators, and some home heating systems use this technique. Somewhat magically, moving a certain quantity of heat energy can require less than that amount of energy to accomplish. For cooling applications, the thermodynamic limit to efficiency is given by 100×Tc/(Th−Tc), again expressing temperatures on an absolute scale. A refrigerator (usually a freezer with a piggybacked refrigerator) operating at room temperature can theoretically achieve 1100% efficiency. The Energy Efficiency Ratio (EER), which is displayed for most new cooling devices, is theoretically bounded by 3.4×Tc/(Th−Tc), which in this example is 36. Today’s refrigerators achieve EER values of about 12, so that only a factor of three remains. The same can be said for the Coefficient of Performance (COP) for heat pumps, which is bounded by Th/(Th−Tc). Like refrigerators, these are performing within a factor of 2–3 of theoretical limits.

Lighting has seen dramatic improvements in recent decades, going from incandescent performances of 14 lumens per Watt to compact fluorescent efficacies that are four times better, at 50–60 lumens per Watt. LED lighting currently achieves 60–80 lumens per Watt. An ideal light source emitting a spectrum we would call white (sharing the exact spectrum of daylight) but contrived to have no emission outside our visible range would have a luminous efficacy of 251 lm/W. The best LEDs are now within a factor of three of this hard limit.

The efficiency of gasoline-powered cars can not easily improve by any large factor (see heat engines, above), but the effective efficiency can be improved significantly by transitioning to electric drive trains. While a car getting 40 m.p.g. may have a 20% efficient gasoline engine, a battery-powered drive train might achieve something like 70% efficiency (85% efficiency in charging batteries, 85% in driving the electric motor). The factor of 3.5 improvement in efficiency suggests effective mileage performance of 140 m.p.g. One caution, however: if the input electricity comes from a fossil-fuel power plant operating at 40% efficiency and 90% transmission efficiency, the effective fossil-to-locomotion efficiency is reduced to 25%, and is not such a significant step.

As mentioned above, a broad swath of common devices already operate at close to perfect efficiency. Electrical devices in particular can be quite impressively frugal with energy. That which isn’t used constructively appears as waste heat, which is one way to quickly assess efficiency for devices that do not have heat generation as a goal: power plants are hot; car engines are hot; incandescent lights are hot. On the flip side, hydroelectric plants stay cool, LED lights are cool, and a car battery being charged stays cool.

SUMMING IT UP

Given that two-thirds of our energy resource is burned in heat engines, and that these cannot improve much more than a factor of two, more significant gains elsewhere are diminished in value. For instance, replacing the 10% of our energy budget spent on direct heat (e.g., in furnaces and hot water heaters) with heat pumps operating at their maximum theoretical efficiency effectively replaces a 10% expenditure with a 1% expenditure. A factor of ten sounds like a fantastic improvement, but the overall efficiency improvement in society is only 9%. Likewise with light bulb replacement: large gains in a small sector. We should still pursue these efficiency improvements with vigor, but we should not expect this gift to provide a form of unlimited growth.

On balance, the most we might expect to achieve is a factor of two net efficiency increase before theoretical limits and engineering realities clamp down. At the present 1% overall rate, this means we might expect to run out of gain this century. Some might quibble about whether the factor of two is too pessimistic, and might prefer a factor of 3 or even 4 efficiency gain. Such modifications may change the timescale of saturation, but not the ultimate result.

Faith in Technology

We have developed an unshakable faith in technology to address our problems. Its track record is most impressive. I myself can sit at my dining room table in California and direct a laser in New Mexico to launch pulses at the astronaut-placed reflectors on the moon and measure the distance to one millimeter. I built much of the system, so I am no stranger to technology, and embrace the possibilities it offers. And we’ve seen the future in our movies—it’s almost palpably real. But we have to be careful about faith, and periodically reexamine its validity or possible limits. Following are a few key examples.

What About Substitutions?

The previous discussion is rooted in the technologies of today: coal-fired power plants, for goodness sake! Any self-respecting analysis of the long term future should recognize the near-certainty that tomorrow’s solutions will look different than today’s. We may not even have a name yet for the energy source of the future!

First, I refer you to the previous post: the continued growth of any energy technology—if consumed on the planet—will bring us to a boil. Beyond that, we hit astrophysically nonsensical limits within centuries. So energy scale must cease growth. Likewise, efficiency limits will prevent us from increasing our effective energy available without bound.

Second, you might wonder: can’t we consider solar, wind and other renewables to be more efficient than fossil fuel power, since the energy has free delivery? It’s true that unlike the business model for the printer (cheap printer, expensive ink cartridges that ruin you in the end), the substantial cost for renewables is in the initial investment, with little in the way of consumables. But fossil fuels—although a limited-time offer—are also a free gift of nature. We do have to put effort into retrieving them (delivery not free), although far less than the benefit they deliver. The important metric on the energy/efficiency front is energy return on energy invested (EROEI). Fossil fuels have enjoyed EROEI values typically in the range of 20:1 to 100:1, meaning that less than 5% of the eventual benefit must be invested up front. Solar and wind are less, at 10:1 and 18:1, respectively. These technologies would avoid wasting a majority of the energy in heat engines, but the lower EROEI means it’s less of a freebee than the current juice. And yes, the 15% efficiency of many solar panels does mean that most of the remaining 85% goes to heating the dark panel.

What About Accomplishing the Same Tasks with Less?

One route to coping with a fixed energy income is to invent new devices or techniques that accomplish the same tasks using less energy, rather than incrementally improve on the efficiency of current devices. This works marvelously in some areas (e.g., generational changes in computers, cell phones, shift to online banking/news).

But some things are hard to shave down substantially. Global transportation means pushing through air or water over vast distances that will not shrink. Cooking means heating meal-sized portions of food and water. Heating a home against the winter cold involves a certain amount of thermal energy for a fixed-size home. A hot shower requires a certain amount of energy to heat a sufficient volume of water. Can all of these things be done more efficiently with better aero/hydrodynamics or traveling more slowly; foods requiring less heat to cook; insulation and heat pumps in homes; and taking showers using less water? Absolutely. Can this go on forever to maintain growth? No. As long as these physically-bounded activities comprise a finite portion of our portfolio, no amount of gadget refinement will allow indefinite economic growth. If it did, eventually economic activity would be wholly dominated by us “servicing” each other, and not the physical “stuff.”

#### No empirical evidence.

Murphy 22 – Thomas Murphy is a Professor in Physics at University of California San Diego, a PhD in General Relativity from Caltech, February 22nd (*Energy and Human Ambitions on a Finite Planet: Assessing and Adapting to Planetary Limits*, University of California, Available online at <https://escholarship.org/uc/item/9js5291m>)

2.1 Historical Coupling

In subsistence times, esthetics held little value compared to physical goods: you couldn’t eat a sculpture, for instance—nor would it help keep you warm.2 2: Life, it turns out, is a struggle against thermodynamics. Food, tools, resources like wood, pack or draft animals carried primary value. When basic subsistence requirements were met, gold or jewelry may have warranted some expenditure—but even these were physical resources.

Agriculture freed some individuals in society to think and create. The economy found more room to value arts and performance: things that fueled the mind, if not the body. During the Renaissance, patrons would support artists and scientists whose output had few other channels of economic support. In today’s world, a complex economy distributes financial assets to a wide variety of practitioners in general accordance with society’s values.

But resources are still paramount. The United States prospered largely because it possessed a frontier rich in natural resources. Mining and animal pelts dominated early on, as well as agriculture (tobacco, cotton, corn, wheat). In the middle of the 20th century, the United States was the dominant oil exporter worldwide (first developed in Pennsylvania, then California and Texas). Escaping the World Wars largely unscathed in terms of domestic infrastructure, the country had tooled-up a massive manufacturing capability. Together with a can-do attitude, Americans set out to rack up superlatives in virtually every category. As a manufacturing powerhouse during the middle of the 20th century, American raw materials joined a well-educated workforce to drive innovation and production. It is no accident that many in the U.S. yearn to return to these “glory days;” It is important to recognize that the past was not “glorious” for all people. however we cannot possibly do so, having permanently depleted some of the original stocks.

What was true in the past is largely still true today: resources like oil, steel, metals, agricultural products, and heavy machinery continue to fetch a significant price on the market. Resources fuel prosperity. It is not the only source, but remains a reliable and bedrock component. Figure 2.1 shows the tight correlation between economic scale and energy use, which is often expressed by saying that the two tend to be coupled.

Chart, scatter chart

Description automatically generated

Figure 2.1: Per capita energy use as a function of GDP on a logarithmic scale. Per capita GDP is the sum total of a country’s economy divided by population, effectively indicating average annual income. The rate at which an individual uses energy is expressed as a power, in Watts. A strong correlation exists here across many orders-ofmagnitude: rich countries use more energy, per person [6–8]. A few instructive cases (red dots) are labeled. The dot areas are scaled to population.

One way to capture the physical connection to economic activity is to represent the energy expenditure associated with each dollar3 spent. 3: Or converted monetary equivalent. This economic energy intensity (see Definition 2.1.1) of a country is just the energy expenditure of society divided by the gross domestic product (GDP).

Energy intensity therefore provides a measure of how resource-heavy a country is in relation to the size of its economy. We will cover units of energy in Chapter 5. For now, it is sufficient to know that a Joule (J) is a unit of energy, and that MJ means megajoules, or 106 J. of energy per year and has a GDP of approximately 20 trillion dollars. Dividing these gives an intensity of 5 × 106 J/$, or 5 MJ/$ (many variants are possible in terms of units). The world as a whole uses about 4.5 × 1020 J in a year at an estimated $90 trillion gross world product, also resulting in 5 MJ/$. The variation among developed countries is not especially large—generally in the single-digit MJ/$ range.

Chart, scatter chart

Description automatically generated

Figure 2.2 illustrates the range of intensities for all the countries in the world. Among the factors driving energy use are geographical extent (large countries require more long-haul transportation), climate (cold countries require more heating), efficiency, and lifestyle. Russia, Canada, and the U.S. have large territories, and the former two require more heating than most. By contrast, Switzerland is geographically small and outsources much of its heavy industry. Somebody should probably check on what’s happening in Venezuela.5

2.2 Decoupling and Substitution

As economies expand beyond subsistence level, a larger fraction of the total activity can go to “frivolous” elements, such as art and entertainment. The intensity of such activities can be quite low. An art collector may pay $1 million for a coveted painting. Very little energy is required. The painting was produced long ago. It may even remain on display in the same location—only the name of the owner changing. Financial transactions that require no manufacture, transport, and negligible energy are said to be “decoupled” from physical resources. Plenty of examples exist in society, and are held up by economists as illustrating how we can continue to expand the economy without a commensurate expansion of resource needs.6

Definition 2.2.1 Decoupling is the notion that economic activities need not be strongly tied to physical (e.g., energy) requirements, so that energy intensity might become arbitrarily small. The degree to which some economic activity is decoupled forms a continuous scale, where intense utilization of energy and physical resources (e.g., steel production) are on one end and fine art dealing on the other.7 7: Services, like plumbing, journalism, or marketing fall in between, using some physical resources, but not as much as heavy industry. The only way for an economy to maintain growth in the event that physical sector growth becomes limited is to increase the degree of decoupling in the society

The dream is that as development progresses, economic energy intensity may decline (greater decoupling) so that more money is made per unit of energy expended. If the economy can decouple from energy needs, we are not constrained in our quest to continue economic growth, bringing smiles to the faces of investors and politicians. Such a transition would mean less emphasis on energy and resource-intensive industrial development/manufacturing, and more on abstract services, broadly speaking.

Because the world is a sort of “experiment,” representing many countries having adopted many policies and in various states of development, Figure 2.2 can be viewed as a potential roadmap to decoupling.

Part of the reason prosperous countries demonstrate a lower intensity is that manufacturing moves overseas. Driving the whole world toward lower intensity is a more difficult prospect, as the physical processes must still happen somewhere.

The question is: as countries develop and become more prosperous, does intensity decrease, as we would want it to do as a signal of decoupling? On the large scale, any effect is modest. Going from India to the U.S. affords only a factor-of-two improvement in intensity, while spanning most of the horizontal extent in personal prosperity (a factor of 30 in per capita GDP).9 9: $65,000 vs. $2,100 for the U.S. and India, respectively. That’s pretty weak tea.

At the upper end of personal income (right side of Figure 2.2), we might detect a downward slope. But we must be careful about cherry-picking in the face of non-replicable circumstances. Not every country can assume the geography and financially-focused nature of Switzerland. And at the same time, if the U.S. imagines itself providing a model that other countries might emulate, the intensity of many European countries could actually increase if adopting U.S. habits. But more broadly, we don’t have evidence that a country on the prosperous end of the distribution can operate at even a factor-of-four lower intensity than the 4 MJ/$ level typical of developed countries. In the present context of assessing the future of growth, in which we are concerned with order-of-magnitude scales and limits (as in Chapter 1), it does not appear that decoupling has very much to offer.10

The past is full of examples of substitution (Definition 2.2.2). Consider the progression in lighting technology from open fires to beeswax candles to whale oil lanterns to piped gas lanterns to incandescent electric bulbs to fluorescent lights to LED (light emitting diode) technology. Every step seems to be an improvement, and it is very natural to assume the story will continue developing along these lines.

Box 2.1: A Story of Lighting Efficiency

One way to quantify lighting progress is in the luminous efficacy of light, in units of lumens per Watt. In the 20th century, incandescent bulbs were so ubiquitous for so long that we fell into the bad habit of characterizing brightness in terms of the electrical power consumed by the bulb, in Watts. Thus we have generations of people accustomed to how bright a “100 W” or “60 W” bulb is. As technology changes, we should migrate to “lumens,” which accurately captures how bright a source is perceived by the human eye.

Table 2.1 and Figure 2.3 present the evolution of luminous efficacy as sources improved. Can this trend continue indefinitely? No. Every photon of light carries a minimum energy requirement based on its wavelength. For photons spread across the visible spectrum (creating light we perceive as white), the theoretical limit is about 300 lm/W [9]. At this extreme, no energy is wasted in the production of light, putting 100% of the energy into the light itself. Engineering rarely reaches theoretical limits, due to a host of practical challenges. It would therefore not be surprising if lighting efficiency does not improve over where it is today by another factor of two, ending yet another centuries-long trend. The historical progress can fool us into thinking that we can expect a continued march to better substitutes. Having witnessed a half-dozen rabbits come out of the hat12 in the example of lighting technology (Box 12: . . . magician reference 2.1), we are conditioned to believe more are forthcoming. It will be true until it isn’t any more (e.g., see Figure 2.3) One way to put it is that 6 rabbits does not imply an infinite number. We should welcome each new rabbit, but not hinge our future on a continual stream of new rabbits. We will return to this theme in the context of fossil fuels, which might be termed the mother of all rabbits, in this context. Having pulled such a stupendous rabbit out of the hat once, many assume we’re set from now on. In this case, equating one to infinity is even more dubious.

For financially secure individuals at the top end of the wealth distribution, it is easier to buy into the allure of substitution as a way forward. Many have achieved wealth from humble beginnings, and have therefore lived a life of continual upgrades in terms of housing, transportation, clothing, food, travel, etc. Even those who have been surrounded by wealth their whole lives have been in a position to afford new upgrades as they become available. An electric car having hundreds of kilometers of range seems like an obvious path forward beyond fossil fuels. But at a price tag above $40,000, it does not look like much of a solution to most people, and we can’t be sure prices will fall steeply. Section D.3 covers electrified transportation in more detail. Yet, it is not always possible to export the capabilities of those at the top to a significant sector of the population. Not everything can scale.Chart, line chart

Description automatically generated

More generally, sometimes the best possible solution and “peak” technology arrives at some early point in history. As much as we mess around with elements on the Periodic Table, we are never going to beat H2O as a vital substance.13 Marketers might sell H2O2 as superior, having one more beneficial oxygen atom, but please don’t drink hydrogen peroxide! Some technologies in use today would be recognized by pre-industrial people: wheels, string, bowls, glass, clothing. We won’t always find better things, though we may make a series of incremental improvements over time. Not everything will experience game-changing developments.

In summary, decoupling and substitution are touted as mechanisms by which economic growth need not slow down as energy and other resources become constrained. We can make money using less of the resource (decoupling) or just find alternatives that are not constrained (substitution), the thinking goes. And yes, this is backed up by loads of examples where such things have happened. It would be foolish to claim that we have reached the end of the line and can expect no more gains from decoupling or substitution. But it would be equally foolish to imagine that they can produce dividends eternally so that economic growth is a permanent condition.

### 2NC---AT: Food

#### Industrial agriculture is unsustainable.

Raghavan 16 – Barath Raghavan, Professor of Computer Science at USC, Bonnie Nardi, Sarah T. Lovell, Juliet Norton, Bill Tomlinson, Donald J. Patterson, May 2016 (“Computational Agroecology: Sustainable Food Ecosystem Design”, *CHI’16 Extended Abstracts*, Available online at <https://dl.acm.org/doi/pdf/10.1145/2851581.2892577>, Accessed 01-09-2021)

Introduction

A small but important stream of research in HCI has pointed to food security as a common concern. Around the time sustainable HCI began ramping up, HCI research in "food futures" also began (see [6, 10]). A challenge of sustainable HCI has been the identification of relevant problems and domains for research [41]. Formulating sustainability research questions is hard because the problems can seem overwhelmingly global and large-scale. Research often succumbs to greenwashing, and small, clever, but unimpactful responses. While the problems of the global food system are large-scale and can indeed be overwhelming, we describe what we believe is a tractable approach for research to improve global food security.

We discuss our vision for sustainable global food systems through what we call computational agroecology. We are only beginning to develop this subfield, and have initiated projects that we are currently expanding [30, 31, 43, 44]. Through this paper we hope to engage other researchers, learn about relevant research that we might not yet have encountered, and discuss the problems of food security as we see them. Ongoing HCI design efforts such as Nutrire Milano: Energie per Cambiamento (Feeding Milan: Energies for Change) [5], civic agriculture [25, 42], urban agriculture [22, 33, 34], hyperculture [18], neighborhood food sanctuaries [21], and even support for practices such as "scrumping," [48], can inform, and be informed by, computational agroecology.

The premise of our work is that industrial agriculture, which has been central to contemporary civilization, is fundamentally unsustainable. Its dependence on non-renewable resources (fossil fuels for chemical fertilizers and pesticides, fertile topsoil, abundant clean water) and its massive, destructive ecosystem effects (erosion, oceanic dead zones, greenhouse gas emissions) indicate a critical need to switch to new modes of food production [2,18,19,24,46]. It is estimated that up to 29% of all greenhouse gases emitted globally are due to the industrial food system [47]—the largest among all sectors of human activity—by itself a reason to turn to new means of food production.

Over the last few decades, scientists in the field of agroecology have identified approaches to reconcile human food needs with the broader planetary ecosystem and its limits. Agroecology is "a scientific discipline that uses ecological theory to study, design, manage and evaluate agricultural systems that are productive but also resource conserving" [1]. The key to agroecology is the design of fullyfunctional and sustainable ecosystems of food crops, modeled on nature.

Despite the potential of agroecology, industrial agriculture continues to dominate. Its brute force approach deploys easily replicated, generic techniques such as monocultures of annual crops managed with fossil fuel-derived fertilizers, pesticides, and herbicides. It is only since World War II that such practices have appeared, diffused by intense government efforts and spurred by the decision to re-purpose explosives factories (which turned to making fertilizer after the war) [46]. This unsustainable approach has not been made accountable for the depletion of non-renewable resources and the severe environmental damage it causes [14], as these impacts have been ignored as economic "externalities".

With respect to HCI, agriculture in general and agroecology in particular are unique in that they are universal in their potential reach: virtually all humans today are dependent upon agriculture for their sustenance. Transforming agriculture can directly impact and engage people in myriad roles in the context of food production. We thus propose a new domain of research, computational agroecology, which aims to scale agroecology, including making the techniques accessible to a wide range of users. Potential users include farmers, scientists, students, educators, civic leaders, policymakers, and any member of the public who wishes to have a role in sustainable food production. The three core technical sub-areas of computational agroecology that we explore in this paper are 1) systematization and modeling of agroecological data, which will require the harnessing of human expertise via crowdsourcing, 2) the interactive design of agroecosystems, which will require careful attention to the context and to user needs, and 3) systems, including robotics, for maintenance, harvesting, and integration of agroecosystems that leverage and balance the best of human and machine abilities.

Computational agroecology will enable the transformation of many types of land to new food-producing ecosystems consonant with the specific conditions of local regions, and consistent with long-term ecological health and food security. Some of this land is already farmed or gardened, but, in addition, unused capacity in backyards, rooftops, parks, campuses, and other civic spaces can be brought under cultivation. The urban agriculture movement is already seeking to transform urban practices. When applied with deep knowledge, agroecology can be used in a wide range of settings, from smallholder farms to large tracts, urban gardens to untended semi-wild lands, all transformed to productive, sustainable food-producing ecosystems.

Agroecology

Any sustainable alternative form of food production must 1) greatly reduce the use of non-renewable resources and production of non-assimilable wastes, 2) reduce the need for external renewable inputs, and 3) adopt techniques that regenerate rather than harm the supportive ecosystem services that enable long-term agroecosystem sustainability. Agroecology is a transdisciplinary science, and as a result, it is quite complex and difficult to summarize succinctly.

To give a sense of its scope and "spirit," next we describe several techniques that are often employed in agroecological design. These are only examples from a much larger body of scientific work, work that includes research on the broader food system, including food distribution, waste, political and economic impacts, and more [2, 19, 24, 46]. Agroecological systems can produce yields greater than industrial agriculture without the harmful side effects [19, 37], though traditionally they also require more labor. A polyculture is a multi-species group of plants that live together and, often, support one another. One of the best studied simple polycultures is the traditional corn-bean-squash intercrop system from the Americas. This system can not only double the effective yield of industrial monocultures, but offers "[n]et gains of nitrogen in the soil...observed when the crops are associated" (i.e., the polyculture increases soil fertility without external inputs) [19]. Polycultures can be considerably more complex than this simple 3-crop system; Figure 1 shows a moderately-complex polyculture.

A common feature of agroecological systems is the use of perennial polycultures [13, 26, 35, 36, 40]. Perennial polycultures involve plants that live for more than two years or self-seed annually. Constituents in a perennial polyculture provide support services to each other and require few external inputs. Well-designed perennial polycultures provide products and services for human use over the long term. Due to their longevity, perennial polycultures minimize ecosystem disturbance, preventing topsoil and nutrient loss, such as the farm shown in Figure 2 and the garden shown in Figure 3. They promote ecosystem diversity, increasing food security. And they naturally trap available resources due to deeper root systems, taking advantage of the soil’s water storage capacity. Perennial polycultures are a common feature of many agroecological design methodologies and were the basis of traditional agriculture in some regions of the world.

Another common feature in agroecological systems is the leveraging of natural flows of resources including water, sun, nutrients, and beneficial insects, such as in Figure 3. A key process here is ecological succession, in which pioneer species (the first species in a multi-year succession) help restore an environment and enable the growth of more durable species that will overtake them [11].

Background: Agriculture Past and Present

Why is agroecology needed? What about organic agriculture? Shouldn’t that solve the problems with industrial agriculture? How about bioengineering? These approaches and others have value, but they do not go deep enough to address the core problems.

Organic Agriculture

Over the past two decades, organic agriculture has risen from a niche to an alternative providing consumers in many markets easy access to organic produce. Organic agriculture seeks to produce "products using methods that preserve the environment" [45]. This development has been a welcome change. However, while organic agriculture aims to have improved ecosystem impacts, it is still locked into many of the same practices as industrial agriculture, including, most notably, monoculture and reliance on fossil fuels. Organic agriculture is an important step away from the industrial system, but is far short of what is needed [39].

Companion Planting

For millennia, human civilizations have engaged in the process of companion planting, i.e., cultivating multiple species in close proximity to each other for mutual benefit. Scientists have confirmed the benefits of such strategies [28]. However, companion planting has typically been constrained to a small number of species, due to the combinatorics of the problem and the lack of data to support more complex designs. We are at a unique point in history when a much greater amount of data on plant species is now globally available (albeit sometimes scattered and inconsistent), and when we have the algorithms and computational power to begin to address the problem at a larger scale.

Bioengineering

Over the last few decades, crop bioengineering has become commonplace and central to industrial agriculture in many regions of the world. Often crops are bioengineered to resist pests, withstand harsh conditions, or take on some other trait that is not found in that crop species (and thus cannot be bred in through conventional breeding). Some systems of alternative agriculture, like organic agriculture, explicitly forbid bioengineered crops. Bioengineered crops can be successful in some settings by producing greater yields or pest resistance, and they can also be failures in other settings by promoting unforeseen pest resistance and annual monoculture plantings. Bioengineering is orthogonal to agroecology and is not required for the success of agroecological design.

Other approaches

There are a number of other interesting alternative agricultural methodologies that are being practiced today, including research into perennial grain crops [12, 20], aquaponics, biodynamics, and permaculture [27]. For brevity we do not describe them in detail here, but note that each methodology contains some useful insights into the design of agroecosystems, while not providing the scientific rigor and breadth of agroecology [15].

Industrial Agriculture

Industrial agricultural systems have shown both their potential and their pitfalls over the past 70 years. These highlymechanized (and data-driven) crop systems, now leveraging bioengineering and chemical responses to pests and pathogens, have yielded vast quantities of food with minimal labor. However, in doing so, industrial agriculture has denuded the land in some of the formerly most fertile growing regions of the world, locked the food system into a dependency on fossil fuels, politicized scarce resources (such as water), and created a cycle of escalation in combating crop threats due to pest and pathogen evolution [19, 46].

Industrial farms are typically monocultures, i.e., fields planted with a single plant variety, something that rarely occurs in nature. Monocultures form a precarious base from which to ensure food security: they can be wiped out by a single pest or pathogen, a single bad weather event or climate disturbance. Limits to this industrial paradigm are imminent. Of greatest concern is the declining availability of key nonrenewable inputs, i.e., fossil fuels to produce fertilizer and pesticides and to run farm machinery; topsoil in major growing regions; and groundwater deposited at the end of the last ice age. These “hard” limits have the potential to decrease yields: 80% of IPCC climate projections show crop yield decreases by the end of the century, which in some scenarios may exceed 50% [23], while billions more people are added to the global population.

The intensifying effects of “soft” limits such as water scarcity, soil fertility, pollution from pesticides and fertilizer runoff, and the extreme conditions produced by climate change exacerbate the problems. Industrial agriculture has only been “efficient” if we ignore its hidden subsidies of non-renewable rich soils, fossil water, and fossil fuels, as well as government subsidies in the US and Europe, and if we ignore the immense wastes industrial agriculture generates [38]. The system depends on extractive activities that consume natural resources that are not replaced within the cycles of food production. For example, in California, rice grown in the Sacramento Valley is organized around aviation: "Flying at 100 mph, planes plant the fields from the air" [9]. In addition to the fossil fuel for flying, rice requires enormous infusions of water in a region of low precipitation. All of this, and yet rice production in California provides few jobs and most of the rice is exported, in effect exporting water [16]. Such a mode of production generates wealth for the few, using scarce public resources for profit-driven enterprises that do not distribute wealth through employment or by feeding the populace.

Computational Agroecology

Why are computational solutions needed? As Odom’s study participant famously said, "Mate, we don’t need a chip to tell us the soil’s dry" [32]. We agree. So what is it we don’t know about agriculture, which humans have been practicing for millennia? We argue that agroecology is a fundamental shift in thinking—it is intended to create ecosystems not just farms and gardens, that exhibit biodiversity comparable to natural systems, and that become as high yielding and self-sustaining as possible. We have many more people to feed in the world today than ever before, and we have the complexities of climate change and a declining base of natural resources to deal with. In addition, some traditional agroecological knowledge has been lost [3].

In order to create such ecosystems, agroecological practitioners must have at their fingertips detailed knowledge. This knowledge includes local biogeochemical conditions; climatology; numerous plant, animal, and insect species; land topography; soil ecology and chemistry; agroforestry; water management; inter- and intra-specific plant competition; terraforming; species sunlight requirements; and plant propagation. Practitioners typically need decades of handson experience to translate this knowledge into functional agroecological systems within specific contexts. Relying on individuals to accumulate and apply this necessary knowledge is a major bottleneck; Norton points out that few experts exist and too few new experts are being trained [29]. In addition, while the scientific knowledge of agroecology is well developed, it is largely inaccessible to those outside the scientific community. Local, informal knowledge, which can be very valuable, is scattered, inconsistent, uncontextualized, and non-systematic. Techniques of agroecology can be adapted to many thousands of ecologically-unique sites of food production, but doing so requires the information necessary to build complex, productive ecosystems in each setting. It is here that we believe there is a key role for human-computer interaction: the design work, the subsequent implementation and maintenance of food producing units, and the education of new experts, can be greatly aided through the use of computational tools.

We view computational agroecology as the design of computing systems to aid in planning, building, and maintaining sustainable agroecosystems. These computing systems need not be a permanent presence; they can be selfobviating [43]. A first step is to begin building basic models to underpin interactive tools. Working with agroecologists (one of whom is a co-author of this paper), we need to build models of plants and their interactions with other plants, climate models for specific locations, soil models, and other pertinent models. These models will utilize information that is already known in existing databases such as, for example, topography from satellite data, soil surveys from the USDA, weather/climate models from NOAA, hardiness zone models from USDA, and wildlife corridors from EPA. Other information, scattered in forums, small informal databases, the minds of practitioners, and other sources, can be crowdsourced, which we discuss below as the first class of computational systems we envision.

These models could then be used in three types of systems for end users. The first user-facing system would aid in agroecosystem planning, producing designs for agroecosystems in a particular location for a user’s specific objectives. The second type of system would help during implementation of a design on the land, and could include mobile or robotic tools to help with various tasks, e.g., robotics to help the user perform an accurate survey of the topography and soil conditions of their land. A third type of system would help in maintenance and harvesting in the food producing unit. For example, a robot could identify (and possibly pull) weeds. Other types of systems will undoubtedly be needed, but these three form the beginning of our research.

Crowdsourcing Agroecological Data

Detailed knowledge about agroecosystems to inform the models and tools must come from the scientists and farmers who have spent decades studying the intricate relationships inherent in complex living systems. Using this knowledge to build models that can form the basis for end user tools can be approached as a problem of crowdsourcing. Significant agroecological expertise and data have yet to be formalized, residing in the minds and production units of scientists, farmers, practitioners of traditional agriculture, and the like. We need to extract this knowledge in a systematic way to build unified representations of the behavior of elements of agroecosystems. Knowledge extraction may take many forms: experts might be interactively surveyed on certain topics (e.g., complementary plant species), or they might directly enter data they know into a system. We can also data mine content from online gardening forums and YouTube videos. There are thousands of such forums and videos on everything from growing bananas in northern climates to precise methods for grafting specific trees [4]. Practitioners have years of experience that cannot be duplicated in any other way. However, the information needs to be brought into sophisticated models that can produce whole new sustainable ecosystems, not just used as oneoffs, to say, grow bananas in Ohio. Scientific knowledge in agroecology is growing rapidly. For all but scientists themselves, this knowledge is difficult to access and interpret, so much of its value will be in informing the dynamics of the models. Crowdsourcing is well suited to be used with both scientific and informal knowledge. The crowdsourced data can be housed in a software infrastructure in which we can implement representations of the various phenomena in the data, and model the dynamics of the interactions among the various parts.

Interactive Agroecological Design

Next we require systems that can help the user create a design for a desired agroecosystem. We do not expect that a fully automated system can design an agroecosystem; there are too many unknowns that are difficult to specify. The process of design must be one of guided co-creation between the user and the computational tools. By virtue of the inherent complexity of nature and the ongoing discoveries in agroecology, the models will never be complete. However, the aim is not to model an agroecological system for its own sake, but in the service of agroecological design. Imperfect but useful models can inform good designs. The key is for the models to capture meaningful characteristics of agroecological systems while allowing for continual refinement. We envision that people will be able to discuss designs in online communities and in peer interactions, critically examining the suggested designs, and taking advantage of knowledge and experience beyond the immediate users. For example, in some regions, certain crops may be desired over others, certain types of terraforming may be preferred or disallowed, certain species may be unavailable for propagation, or a region might be experiencing a multiyear drought or flooding.

The system must be able to evaluate the myriad possible agroecosystem designs and select one or a few that meet the user’s objectives. Even simplified sub-problems of this selection task are likely computationally intractable (i.e., NP-Hard), as the process of choosing a subset of elements for placement (e.g., tree plantings) from all possible elements and locations (even ignoring interactions and context-specific details) quickly results in combinatorial explosion. As a result, finding an “optimal” solution is unlikely. The system must be refined in consultation with experts so that the designs it generates will perform well when implemented on the land.

Implementing Agroecological Designs

Once the user settles on a design specifying the plants, their locations, and a plan for plant succession (and many other details), we must develop systems that can provide guidance as to how to physically realize the design on a specific piece of land. Agroecological designs often involve complex layering of species and earthworks over time and across space. For example, a design for digging deep earthworks must take into account the soil and the machinery required. Certain aspects of the design may need to be implemented first (e.g., swales to capture rainfall might be the first thing the user must dig), and the system must make this clear. Overall, the system should take an agroecological design, which has significant complexity over time and space, and turn it into something that can answer the following questions: What do I need? and, What do I do next? We envision that some mobile systems might be useful in this process, for example, a mobile system to guide the user on the land to ensure that swales are being dug along the land’s contour lines.

Maintaining Agroecological Systems

Agroecosystems, when well designed, can survive for hundreds of years. Friedman and Nathan [17] advocate multilifespan design, that is, design for systems that alter our infrastructures for long-term benefit. Agroecology is consistent with this approach—over a span of hundreds of years, it is possible to sustain a well-designed agroecosystem for productive use. Maintenance might involve something as simple as regular pruning of certain trees, or the gathering and scattering of seeds in certain locations at certain intervals. It might also involve repairing or healing unexpected damage, such as that following a powerful flood that uproots trees or destroys earthworks.

Harvesting is another aspect of maintenance. Due to the complexity of polycultures in which different crops are ready for harvest at different times, and are intercropped together in physical space, harvesting is more complex than in industrial monocultures. Human-robotic systems may be of value. It should be possible to design robots that can quickly identify crops that are ready for harvest, require pruning, or should be removed. Although robotic sensing, weeding, and harvesting [7], for example, exist for monocultures [8], research is needed to adapt the techniques for polycultures in which it is necessary to understand which plants are which, and where robotic navigation is more difficult because the characteristics of the plants vary. Robots powered with renewable energy might enable elderly or disabled users to participate to some degree in food production. An interesting technical challenge lies in how to develop technologies that engage a variety of participants at differing levels of physical robustness.

Example Use Cases

While transforming the agricultural system is a massive undertaking, it can take place in concrete, small-scale ways, and be accomplished through the actions of many people in many places. In this paper we have proposed a technological approach to the adoption of agroecology, but that technology must be applied by key stakeholders for it to have real-world impact. Here we describe a few example use cases for the systems we envision.

Consider a user in need of an agroecological response to desertification. If she is a farmer, the system can help with 1) identification of potential water flows during the rare heavy downpours common in desert regions, 2) terraforming the land with earthworks to capture water and nutrients, 3) planting strong-rooted pioneer species appropriate to the climate and soil, and 4) planting food crops that leverage appropriate ecological succession for the local conditions. Even in this simple example, the farmer faces choices regarding where to build the earthworks, which species of pioneer plants and crops to plant, and how to configure them on the land. In a different case, a student using the system to understand desertification might not even have an interest in actual designs, but would use the system analytically to simulate long-term behavior in an ecosystem, so that he can study productivity and sustainability. A policymaker might want to step back from a single site or farm and understand the aggregate behavior of many neighboring agroecological systems.

Consider an experienced farmer who wishes to transform existing farmland (either barren or planted in an industrial monoculture) to a sustainable agroecosystem. The farmer would begin by telling the system her objectives. For example, she may wish to simply produce the highest sustainable yield possible with minimal effort required in maintenance and minimal cost in establishment. Or she may wish to specify that certain crops be grown, that the crops be easy to harvest, that no earthworks be required in certain areas of the land, and that the system be resilient to 1000-year floods. The farmer then describes the land to the system, both its location/extent and its current conditions. She would instruct the system on any known errors or gaps in the system’s data. Some data might be insufficiently granular, e.g., satellite topographical information only includes large land features. To improve these data for himself and others, the farmer could walk the land using a mobile device-based tool to perform on-site surveys, gathering more accurate topographical information and data on the soil. On-site data would be fed back into the system to improve the quality of the model. Once the system produces a candidate design, the farmer may wish to add, remove, or modify certain elements. The system can provide feedback on these choices and alter other design components to ensure that the agroecosystem will be sustainable.

Consider users in the maintenance phase of work on their food-producing units. The system could enable, possibly through computer vision techniques applied to images taken by the user or by automated vehicles, the detection of when certain crops are ready for harvest. These determinations would not be based on pre-existing data or design assumptions, but based upon the on-the-ground conditions at the site. The user can then be notified of a potential harvest and can either manually harvest, or, if feasible and desirable, employ automated harvesters to harvest the crop. The same is true for maintenance, e.g., annual pruning of deciduous fruit trees, repair of earthworks, addition of new crops into the system, and so on.

Conclusion

Today’s industrial agriculture, reliant on non-renewable resources and causing continual damage to the global ecosystem, is unsustainable—that is, it cannot persist indefinitely [46]. However, none of the existing alternative agricultural systems is currently able to meet the challenge of feeding today’s 7.4 billion people, much less the added billions that demographers project. We believe that we have an opportunity at this juncture to change the terms of the debate through the design of sociotechnical systems to implement sustainable new ecosystems for food production, allowing many kinds of users to participate in a variety of settings from backyards to civic and community spaces to sizeable farms. We believe it is possible to feed the world through systems that are more sustainable than current agricultural systems. Undoubtedly this goal will require many changes beyond what we have discussed in this paper, such as diets with less meat, greater efficiency in all parts of the food system, including distribution, shifts to more labor-intensive modes of production, restoration of degraded lands, and commitment to multi-lifespan design.

Some components of agroecosystems are naturally longterm, such as bringing trees to maturity, and breeding trees for greater yields and resilience. Yet it is also true that rapid change, at least in some areas, is possible. Just as Victory Gardens were cultivated as an immediate response to food rationing in the US during both World Wars, producing the equivalent of commercial production in fruits and vegetables during the war years, there is nothing stopping us from beginning to intensify and diversify our own food production efforts. We are further from agrarian knowledge than citizens of the 1940s, but we have access to unprecedented stores of information. The research we discuss in this paper on computational agroecology is meant to order, systematize, and make deep agroecological knowledge widely available and useful. Perhaps we live a moment in which we can both draw from the past and leap into the future.

#### Technology won’t solve the problem. We’re at the physical efficiency limit of energy conversion.

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There are, and have been for a few decades now, competing narratives about food, hunger, and population. And supporting these narratives are a large number of divergent arguments from people with an even larger array of ideological perspectives. I’ve been puzzled for some time that these narratives not only have co-existed for as long as they have, but that it’s still unclear which is true, and more than that, which of the supporting arguments make sense and which don’t isn’t clear.

Below I’d like to attempt to break these narratives into three (oversimplified) categories and highlight a few recent and not-so-recent arguments supporting them.

We Can Feed the World, part 1.

This argument comes in a number of forms. The first, most obvious, and most prominent one is that of the agribusiness world, which says and has said for decades that new chemistry and new genetic engineering can and will continue increasing yield. The claim they often make is stronger than this, saying that only such agribusiness science and engineering can increase yields and feed the world, and that without them people will starve. (Scientific American had a recent issue dedicated to this, and it was, frankly, a bit embarrassing to see such a magazine be so narrow in what science they considered in making their judgments.)

However, often ignored in this perspective is the fact that a billion people around the world are going hungry already, and many more are food insecure. Many farmers who have switched to using these agribusiness methods have found themselves struggling to pay for them. They have also found that the techniques, when they work at all, have little staying power: artificial fertilizers only provide a boost for so long before already-depleted soil is stripped of structure, other nutrients, and soil life and can no longer produce high yields; GMO, pesticide, and herbicide manufacturers struggle to keep pace with natural adaptations against their methods. So while it’s true these systems are feeding the world, it’s not clear they can continue to.

We Can Feed the World, part 2.

A less common but still prominent argument made by Lappe and others in books such as Diet for a Small Planet and Hope’s Edge, is that scarcity of food is a matter of proper distribution of food and/or income, and a matter of not wasting food via the present-day industrial food system. That is, there is enough food being grown to feed the world, but that instead of going to feed the world, this plant-based food is either used as animal feed for heavy meat eaters in wealthy nations, is used in the production of highly-processed industrial food, or is simply wasted.

This argument is based upon a slightly shaky premise. Even if the world were short, say, enough food for 1 billion people, and there were no waste in the current food system, there are probably enough other sources of calories that could be turned to that are outside of the human economy — that is, plants and animals that are currently not viewed as food but could be. That’s not to say that it’s preferable to increase the human footprint on the planet, but rather that the argument is premised on the footprint we have today and that footprint isn’t fixed.

Turning this reasoning on its head, we find that the argument that we can feed the planet using the food that’s grown today, with today’s footprint, doesn’t squarely face the fact that humanity has already far overshot carrying capacity and has appropriated far too many ecosystems for its use. That is, for this argument to hold — making the big assumption that the economic systems that make today’s food system exist were to be radically altered — we’d need to be able to replace all of the food growing going on across the globe in a way that puts it on a sustainable footing. Maybe this is possible, and Lappe and others give plenty of examples of how it can be done better on a small scale, but as I’ll discuss later, a large question is whether we will, not whether we can.

No We Can’t, part 1.

There are some in the mainstream of this discussion who are nevertheless pessimistic about food availability. In this camp I’ve seen arguments for decreasing the birth rate in poor nations (primarily) as they view the problem as a matter of population, and that energy/resource footprints aren’t an issue in the discussion. I’ve never found mainstream “no we can’t” arguments to be particularly well thought out, as they’re often used as a bludgeon to make a political point (e.g. “people in country X are hungry not because globalization destroyed their local economic and agricultural systems but because they have too many people, and we can’t fix that”).

No We Can’t, part 2.

Many eminent, less-mainstream thinkers fall into a second category of “no we can’t feed the world” thinking, including Meadows, Catton, Diamond, and others who take a large-scale, long-term ecological view of the predicament humanity is in today. They argue that all societies and all systems that overshoot their ecological basis a) are eventually forced to return to within that basis, b) often degrade the basis itself by being in overshoot, and that c) this process happens so slowly (over many human generations) that it’s easy for these societies to believe that they have agency, d) no past societies have been able to avoid this consequence and there is little reason to believe that now is different, and e) no one subsystem (e.g. food, manufacturing, etc.) is independent and thus all subsystems rise and fall together.

Surprisingly even mainstream commentators like Thomas Friedman have gotten in on this kind of argument, though of course after making the argument that we’re in overshoot, he manages to ignore its fundamental conclusion and instead argues that we’ll find a way out.

No We Won’t, part 1.

Last year Adam wrote a nice analysis of a Toby Hemenway article on the resilience of the food system. He made the case that while Hemenway’s arguments on how the industrial food system might continue to function and feed humanity (even while fossil fuels become more expensive and scarce) make sense in the way Lappe’s arguments make sense, there’s reason to be concerned that market conditions and public policy will make entrenched actors in the food system slow to adapt to changing conditions. Thus it’s likely that people will continue to fall off the back of the truck as things decline. Beyond simply the monetary incentive to continue growing crops for non-food uses, there is also significant inertia and sunk costs in the system that are likely to make change difficult. I find myself in agreement with this part of the argument: “I’m optimistic about the proliferation of kitchen gardens in urban and suburban spaces, but transforming land currently zoned for industrial monoculture is a much more daunting task.” I’d like to consider where this leaves us next.

Energetic limits of land productivity.

To understand what sorts of physical limits might exist on food production, I did a quick calculation. While I’m sure there are many better estimates out there, this should give us a rough idea of whether it’s even reasonable to imagine that 7 billion or more humans can be fed sustainably. Let’s start with an estimate of 200 W/m^2 of sunlight, globally averaged over night and day, arriving at the Earth’s surface. Average photosynthetic efficiency is about 1-2% for normal plants (only some algae and a few rare plants like sugarcane get higher efficiency). So that’s 2-4 W/m^2 of plant energy assuming the ground is entirely covered. Then let’s allow 50% for the plant to perform its own metabolic functions, so that’s 1-2 W/m^2 of harvestable energy (edited to add: on average — if we factor in growing degree days, we might say roughly 1-2 W/m^2 is for mid-latitude/subtropical regions, with 2-4 W/m^2 in the tropics and 0.5-1 W/m^2 in high-latitude temperate regions). Given that a person requires 100 W (about 2000 kcal / day), that results in 50-100 m^2 of land requirement per person, which is about 500-1000 sq ft, which happens to be about what David Duhon and John Jeavons found is the minimum land area on which one can feed oneself growing and eating mostly potatoes in a perfectly-managed, intensively-cultivated smallholding.

So no new technology is needed, nor is new technology possible, to improve the efficiency with which we can produce food. That is, the arguments made by those in the first camp — those who argue we must increase yields through new techniques in industrial agriculture — are bunk, as techniques have already been developed to deliver the maximal yield possible given the sunshine falling on the Earth. Literally the only way out of this (energetically), I think, is to build nuclear fusion plants and then use the energy from that to produce food somehow — that’s the only possible renewable non-solar source of energy — but this remains firmly in the realm of science fiction.

However, when we look at the amount of farmland under cultivation today, we see that it’s far more than is required to feed all of humanity ten times over if such intensive cultivation were used — perhaps 500 billion people (as my friend John pointed out). The catch, I think, is twofold.

The first catch is that we must consider total human energy consumption rather than simply what humans require to stay alive. In the absence of fossil fuels, this energy will come in large part from plant sources. To begin with, intensive cultivation requires cycling back all nutrients perfectly to keep it within 100 m^2. Otherwise it requires about 3x the land area, with the remainder used for compost crops and letting the land rest (with 3x being a rule of thumb I’ve seen in a number of sustainable agricultural methods). This ignores the water cycle and other limits for simplicity. Average energy consumption globally today is 2kW / person (16 TW / 7 billion = 2285 W). So that means we need to roughly scale down the arable land by a factor of 20 (to get the portion used for just food), and that’s with perfect nutrient cycling. Take a factor of 3 on that for compost crops, and we’re at 8 billion people living at 2kW. If we had no other impact on the planet and could do perfect sustainable organic agriculture with most people living in lower-latitude temperate and tropical regions we could sustain 8 billion people on the planet.

A couple big flaws in this estimate is that a large fraction of arable land is used to feed animals for meat, and that the 2kW used per person often involves taking the products of nature and processing them, thereby consuming an outsized portion of nature relative to that energy budget (e.g. it takes much less energy to cut down a tree than it took the tree to grow). The first could be fixed by saying that we could sustain 8 billion people on a perfectly managed vegan organic diet, and with meat, somewhere between 2-4 billion. Even this ignores the possibility of getting some of the 2kW / person from photovoltaics and wind turbines. Nevertheless, the crux of this calculation is that sustainable techniques exist to produce roughly as much food as the industrial food system produces today, but also roughly as much as is possible given energetic limits.

The second catch is the one Adam identified — converting backyard gardens is one thing, but turning the farmed-out land of the American Midwest into Jeavons-style smallholdings is another thing altogether.

Premises and Conclusions.

It’s a bit odd to end on both premises and conclusions, but there are a couple of premises that are unstated in this discussion that span the categories. Specifically, this discussion is premised on the notions that feeding the people of the world is a) good and b) hard to do either now or in the future. I think both of these are true, but I’ve seen arguments that b) isn’t fundamentally true. Neoprimitivists tend to make this argument, among others: that the world is naturally abundant and that as long as societies remain uncivilized (i.e. not living in cities with high resource consumption) then the Earth will provide with little effort. Whether this was true in the distant past, it’s certainly not applicable now and won’t be for many centuries.

Pulling these strands of thought together it seems to me that there’s good evidence all these perspectives are right, but on different timescales. We have a core industrial food system that can and will feed most of (but, crucially, not all of) the world in roughly the ways it is today, with feedback loops that will keep it stable. These feedbacks include the entrenched food distribution system, political lobbying of industrial farmers and agribusiness that want to keep subsidies flowing to keep their business models viable as long as possible, and the eating habits of the world. However since this system is not on a solid foundation, it will slowly (and, perhaps in short bursts, quickly) leak people and land into the two other categories — “no we can’t” and “no we won’t” — in which people go hungry due to lack of food or because the system is imbalanced and prioritizes other things over feeding people. I do think that, like Adam wrote, that kitchen gardens are likely to pick up some of the slack and my calculations indicate that quite a lot of food can be grown that way. However, in the long run, we’re unlikely to escape the ecological fate of so many past societies; our task is make the ride down as smooth as possible.

## 1nr – fintech

### 1nr – at: iran bitcoin

#### Squo solves Iran

Ehrlich 3/3

(Steven Ehrlich, director of research for digital assets at Forbes. I was recently the Social Media/Copy Lead at Kraken, a cryptocurrency exchange based in the United States, “Iranian, Venezuelan Users Abruptly Dropped From Major Crypto Platforms As Russian Sanctions Grow,” March 3, 2022, https://www.forbes.com/sites/stevenehrlich/2022/03/03/iranian-venezuela-users-abruptly-dropped-from-major-crypto-platforms-as-russian-sanctions-grow/?sh=5a918c2470b0)

As pressure continues to mount for prominent crypto exchanges such as Coinbase, Kraken, and Binance to restrict access to their platforms for all Russian users, rather than just sanctioned individuals, other major players in the crypto industry are taking notice and plugging potential leaks in their sanctions compliance programs. Just today, OpenSea, the world’s largest NFT marketplace, which saw $5 billion worth of trading volume in January and recently achieved a $13.3 billion valuation has reportedly cut-off Iranian users from its platform. Many distraught traders took to Twitter to voice outrage at the unannounced measures. In response to a follow-up from Forbes, a spokesperson from the company said, “OpenSea blocks users and territories on the U.S. sanctions list from using our services – including buying, selling, or transferring NFTs on OpenSea – and our Terms of Service explicitly prohibit sanctioned users or users in sanctioned territories from using our services.” Additionally, Infura, a developer tool used to build decentralized applications such as trading platforms and games, has restricted access in Venezuela. By extension, this has made MetaMask, one of the most popular wallets and interface tools available to users to interact with such programs unusable. In a blog post updated around noon ET, MetaMask indirectly acknowledged the cut-off, highlighting how users located in certain sanctioned jurisdictions will receive error messages if they try to access the wallet. Both Infura and MetaMask are owned by ConsenSys, a U.S.-based venture fund and developer studio focused on Ethereum. Though the blog post does not specifically mention Venezuela, messages have been circulated on social media suggesting that individuals in that country were targeted. Note: In subsequent tweets, Infura noted that the outage was caused by overly-broad configurations incorporated as part of its sanctions compliance program. The firm has since noted that adjustments have been made to the settings. Forbes is reaching out to determine what jurisdictions were meant to be targeted and those that were inadvertently affected. The timing of these measures is likely not coincidental. With the Russian financial sector increasingly being isolated from the rest of the world through the blacklisting of several banks being cut-off from the SWIFT messaging network and the Russian Central Bank seeing its $630 billion worth of assets frozen, regulators in the U.S., Europe, and across the world are investigating whether government officials, oligarchs, and other actors may turn to crypto as a way to launder funds and move money out of the country. Bloomberg also reported today that the Securities and Exchange Commission is starting to investigate whether NFT sales, specifically those of fractionalized NFTs where a given item is split into many parts, could be needed securities. For now, the world’s collective focus appears to be on large centralized crypto currency exchanges, but it is likely that it will ultimately turn to other sanctioned states that have stayed out of the public eye recently. Iran has been an adversary of the U.S. since the fall of the shah in 1979 and institution of a autocratic theocracy in the country committed to the destruction of Israel. Over the last 20 years, concerns have also grown about the extent of Iran’s nuclear activities, specifically whether it is trying to develop a weapon - a charge that it denies. Venezuela became a strong antagonist to the U.S. during the presidency of Hugo Chavez, who held the post from 1999 until his death in 2013. He openly courted support from countries such as Russia and Iran during his presidency. His successor, Nicolas Maduro, has maintained a similar level of opposition to the U.S., and it is worth noting that the U.S. does not even recognize Maduro as the country’s legitimate president. While as U.S.-based companies these firms have an obligation to comply with all relevant sanctions and regulations, the fact that they can be implemented suddenly, so broadly, and without recourse speaks to a potentially major vulnerability within the crypto industry. Despite promoting the ideals of decentralization and self-sufficiency, many of the largest applications and companies are highly centralized. In fact Coinbase, the U.S.’ largest cryptocurrency exchange recently completed an $86 billion direct listing on Nasdaq.

### 1nr – fintech strong

#### Fintech is outcompeting banks now

1. Statistics prove – Fintech grew 64% last year and over 96% of people know about fintech. Product awareness overwhelms and shows signs for sustainable growth, so it disputes their internal warrant about patents.

#### Fintech is outcompeting traditional banking.

Wiwanto 20 – Frans Wiwanto, Forbes Council Member, 2020 (“Three Factors Driving The Rise Of Fintech And What The Banking Industry Can Learn From Them”, Forbes Magazine, Available Online at <https://www.forbes.com/sites/forbesfinancecouncil/2020/04/02/three-factors-driving-the-rise-of-fintech-and-what-the-banking-industry-can-learn-from-them/?sh=7ba6e90d6d76>, Accessed 04-02-2022)

1. Their Focus On Underserved Areas Of Banking

Incumbent players in the finance industry have traditionally focused on high-margin business, while lower-margin businesses are often deemphasized. Many banks have scaled down their retail banking business to focus on more profitable commercial and investment banking businesses. Even within the commercial banking business, many have focused almost exclusively on large corporations, underserving small and medium enterprises. The reduction of retail banking and underserving of small and medium enterprises have aided the rise of fintech players focused in these areas.

Financial providers should not look solely at current profitability numbers and fail to look at the big picture. Instead, we should think strategically by considering the long-term impact and growth potential of the various businesses within the ecosystem.

2. A Lack Of Trust In The Traditional Banking Industry

According to regtech provider Fenergo, since the 2008 financial crisis, incumbent players have been fined $36 billion for noncompliance with global anti-money laundering, know-your-customer and sanctions regulations. Furthermore, 12 of the world’s top 50 banks received fines in 2019.

In Australia, the government established a Royal Commission in 2017 to investigate the alleged misconduct in the finance industry. The subsequent Deloitte Trust Index for Banking 2018 highlighted the public’s opinion of the industry, with just 21% of respondents saying they thought banks had customers’ best interests at heart.

As a result, a healthy dose of skepticism now pervades the finance industry. This has benefited fintechs, which have offered tools that augment what banks have historically offered. The lesson here is that while trust takes time to be built, it can be destroyed instantly with one mistake. We should never forget that trust is the foundation upon which the finance industry was built and that it requires a continuous effort to maintain.

#### Fintech focus outpaces legacy institutions.

Wiwanto 20 – Frans Wiwanto, Forbes Council Member, 2020 (“Three Factors Driving The Rise Of Fintech And What The Banking Industry Can Learn From Them”, Forbes Magazine, Available Online at <https://www.forbes.com/sites/forbesfinancecouncil/2020/04/02/three-factors-driving-the-rise-of-fintech-and-what-the-banking-industry-can-learn-from-them/?sh=7ba6e90d6d76>, Accessed 04-02-2022)

3. Their Sharp Focus

Fintech players have three main advantages over incumbent players: Focus, focus and focus.

First, they usually focus only on one product or service. As they are, in most cases, smaller and nimbler, they usually have lower operating costs. This translates to the ability to concentrate more on customer experience by providing their product or service cheaper and more resourcefully than banks.

Second, they have a clear focus on the customer. Without cumbersome legacy systems operated by incumbent players, they can better focus on solving customer problems and enhancing customer experiences. The dwindling pool of legacy system specialists further exacerbates the problem as it is difficult and often expensive to find people with the coding skills necessary to maintain and fix legacy systems.

Third, they focus on new technology that gives them an edge. One example is the use of artificial intelligence technology in traditional processes, like price forecasting, fraud prevention, risk management and customer service. Another example is the use of blockchain technology in traditional processes, which offers greater transparency, increased efficiency, better security and improved traceability.

The scalpel-like focus of fintech companies helps them respond more quickly to the changing needs of customers. The lesson here is not to lose focus on our core mission objectives as we grow and expand. We should never forget why the company was created in the first place.

While some incumbent players may be late to respond to the rise of fintech, others are starting to create their own services or partnering with established fintech players. The effects of fintech reach widely across the finance industry. I see the optimal equilibrium to be one where instead of engaging in costly price wars, incumbent players collaborate with fintech players to produce better products and services. This form of cooperative competition or “coopetition” will move the industry from a zero-sum game to an environment in which the end result benefits the whole and makes all players more profitable.

I believe the finance industry is a dynamic one and the ecosystem has sufficient capacity for both fintech and incumbent players to coexist in a state of “coopetition.”

## 1nr – conduct

### 1nr – no cyber

#### No social collapse impact from cyber.

Nye 10

(David Nye, Professor of American History at the University of Southern Denmark, *When the Lights Went Out: A History of Blackouts in America*, pgs. 180-184)

The sociologist Lee Clarke noted how institutions often issue such reassurances and create detailed crisis instructions, although these preparations are largely “fantasy documents.”20 Many civil defense plans to deal with nuclear attacks are implausible, Clarke noted, including one for commandeering commercial aircraft to evacuate the entire population of New York City in three days—a comforting but impossible scenario. Many plans narrowly focus on the point of failure and lose sight of the complexity of the problem. If “the critical infrastructure is made up of those systems required to maintain life,”21 then it extends considerably beyond police, fire departments, and repairmen. In the influenza outbreak of 1918, hospitals, morticians, and graveyards were overwhelmed with dead bodies. As corpses literally piled up, the population became demoralized, normal life ceased, and in some communities public services collapsed. People fled, seeking to escape the disease, often leaving their dead to rot. Clarke argues that those who try to plan for “worst cases” tend to define preparations in narrow, technical terms and to focus on imagined “first responders” (e.g., police and firemen). Disaster plans typically overemphasize technical repairs and maintaining public order but overlook the centrality of actual first responders, many of whom work for schools, taxi companies, bus companies, churches, mortuaries, hospitals, and cities, but some of whom may be random passers- by. Plans seldom integrate a wide range of institutions into contingency plans or recognize that in practice the first to respond are people accidentally on the scene, who must improvise. In Clarke’s view, “social networks rather than formal organizations” are “far more likely” to save a life or evacuate an area in time.22¶ The collapse and blackout of New Orleans after Hurricane Katrina (2005) shows how the definition of critical infrastructure extends beyond the technical system to include a wide range of people and institutions. After Katrina hit Louisiana and Mississippi, 1.8 million people were without power. Major hospitals and homes for the elderly had to be evacuated. The Superdome, a football stadium designated as a safe haven for those who could not escape the city, also lacked electricity. About 20,000 people sweltered there in a fetid atmosphere, many suffering from heat exhaustion. And as in the London Blitz or the 1977 New York blackout, some people took advantage of the evacuation to loot, seeking not only survival necessities but also luxuries. Even hospitals were attacked. Without electricity to light the streets, sound alarms, or run pumps and other equipment, the disaster worsened each day. The National Guard went in to restore order, but much of the city remained unlivable.¶ As with Hurricane Katrina, the official response to disaster is often slow, disorganized, and inadequate. “Worst case disasters are too unexpected and overwhelming for organizations to fold into their standard operating procedures.”23 When the levees broke and the flood came, the Federal Emergency Management Agency failed to respond to the human needs of those trapped in the city. While FEMA dithered, volunteers saved thousands.24 Six months after the hurricane, some New Orleans neighbor- hoods were still without electricity and uninhabitable.¶ Without electricity, present-day life loses most of its critical infrastructure. Yet the US electrical system is hard to protect because of its sheer extent. A hurricane strikes the grid randomly, but the saboteur strikes a vulnerable point where severe damage can be done, transforming social spaces that sustain life into anti-landscapes that do not. Though American grids have not been attacked, it is not because they are impregnable. Perhaps Alfred Hitchcock’s 1936 film Sabotage suggests why transmission systems are not yet a target of choice. The film begins with a blackout that darkens a whole district of central London. A saboteur has thrown sand into some powerhouse equipment, and it takes an hour to clean and restart the system. The public response to this unexpected darkness, however, is not fear but nonchalance and even considerable laughter. Like the crowds in the 1965 New York blackout three decades later, Hitchcock’s Londoners take it with aplomb. Frustrated at this result, the saboteurs then decide to bomb a crowded public place. This seems more likely than a blackout to cause panic. Even in 1936 it was clear that short-lived power outages cause few or no deaths and little destruction, whereas a bomb causes both and is terrifying. A blackout, far from being demoralizing, may strengthen the bonds of community. Accounts of the 2003 New York black- out suggest that this is what happened. A sociologist who happened to be in Brooklyn when the blackout began spent hours walking the streets, where he found people extremely helpful and far less reserved toward strangers than usual.25¶ After the rolling blackouts of the 1990s, and especially after the terrorist attacks of September 11, 2001, the public was not likely to take blackouts lightly. Rather, they improvised moments of solidarity, based on the implicit belief that the power would soon come on again. Yet the public knows that prolonged system failure will not merely paralyze a city but will also threaten them with food shortages, dehydration, and the failure of essential services, while rendering office buildings and apartments uninhabitable. Nevertheless, New Yorkers’ behavior during the 2003 power failure often recalled that of 1965. Once initial fears of a possible terrorist attack were dispelled, people flocked into the streets, which took on a holiday air. The blackout became a carnival, not an apocalypse. The Russian critic Bakhtin once wrote that during a carnival “people who in life are separated by impenetrable hierarchical barriers enter into free and familiar contact.”26 Something similar occurred in New York in 2003. Even after a decade with many small power failures, a blackout could still become a moment of sociability and friendliness. As in 1965, few people could work without electricity, and all had to negotiate a city without most of its amenities. At Muldoon’s Irish Pub on Third Avenue, “the loss of power meant a license to party.”27 Patrons ordered extra beer, and many ambled outside, glasses in hand. As was recalled in a blog titled “The Gothamist,” at first the event “made New Yorkers wonder if there was another terrorist attack” but “then they just settled in for some street parties after finally making it home.” Many brought out battery-powered audio players, sat on their front stoops, and partied into the night. Afterward, The New Yorker published a cartoon that suggested both the solidarity that developed among those trapped in the city that day and also how quickly that unity dissolved again. A homeless man in ragged clothing chases after a businessman, calling out “Don’t you remember me? During the blackout we slept on the same sidewalk.” According to one interpreter, the “August 14 event was a bit like the medieval Feast of Fools, the Yuletide holiday when in towns around Europe class distinctions were suspended, if only for a day, and masters and servants switched places, church observances were mocked, and revelry overruled solemnity.”28¶ For anyone moving about, the city was “re-materialized.” A visiting Brazilian architect later wrote: “Forget Virilio and Baudrillard and the virtual realities, there is no compression of time and space anymore. You are left alone with the disvirtual reality of space.”29 Suddenly it was not possible to mediate one’s relation to the built environment, which had to be measured by the body and its ability to climb, to walk, and to adjust. “Without neon lights and electronics, space becomes what it has always been,” and one “cannot hide behind a wireless phone nor dive yourself into the Internet.”30 When electrified space is decompressed, the world suddenly seems populated by unavoidable others. “Others on the stairway, Others down the street, Others on the way home. It’s dark, and as a result, you start to see more and more Other people.”31 The sheer physicality of the world and its inhabitants had become bewilderingly near.

### 1nr – cyber

#### Cyberwar stays in the cyber realm. Lack of visceral damage removes public pressure to kinetic war.

Borghard and Lonergan 19 -- Erica Boghard, Assistant Professor at the Army Cyber Institute at the United States Military Academy at West Point and a research fellow at the Saltzman Institute of War and Peace Studies at Columbia University, PhD in political science from Columbia University, Shawn Lonergan, Research affiliate of the Army Cyber Institute at the United States Military Academy at West Point and a cyber officer in the US Army Reserve currently assigned to 75th Innovation Command, PhD in political science from Columbia University, 2019 (“Cyber Operations as Imperfect Tools of Escalation”, *Strategic Studies Quarterly*, Fall Issue 2019, Available Online through University of Southern California Libraries, Accessed 01-17-2021)

Willingness to Engage in Cross-Domain Escalation

Just as the limited ability of offensive cyber operations to generate meaningful and sustained costs against a target reduces their appeal as tools of escalation, it also diminishes the likelihood of cross-domain escalatory responses to a cyber incident. Cyber operations can cause significant economic and, in some instances, second-order effects on human life (such as cyberattacks against a power grid). However, they have not yet produced the physical violence and horrors of kinetic warfare or even terrorism that would engender a visceral public reaction to prod decision-makers into escalatory responses—particularly responses that would cross a key threshold from cyber to kinetic force. In other words, both the tangible and psychological costs of cyber operations may check domestic political willingness (or pressure) to escalate via cross-domain instruments in response to adversary cyber operations.

#### Media bias: self-fulfilling prophecy.

Overland 19 – Indra Overland heads the Centre for Energy Research at NUPI and is Professor II at Nord University. He did his PhD at the University of Cambridge and has since worked extensively on the post-Soviet energy sector, including oil, gas and renewables, March 2019 (“The geopolitics of renewable energy: Debunking four emerging myths”, *Energy Research and Social Science*, Vol. 49, pp. 36-40, Available online at <https://www.sciencedirect.com/science/article/pii/S2214629618308636?via%3Dihub>, Accessed 03-23-2021)

5. Cybersecurity as a geopolitical risk

The growth of renewable energy is occurring simultaneously with another major development: digitalization. Digitalization can help keep grids balanced, even as large numbers of renewable energy producers raise and lower production depending on the weather [61]. This causes academics, security think tanks, intelligence and security organizations, parliamentary committees, and consultancies to fear that terrorists or the intelligence services of hostile countries may hack the computers that control utilities and grids [39], [62].

Clearly, there is cause for these concerns as society becomes dependent on new technologies and the growing complexity of digital systems for grid management can give rise to new cybersecurity challenges. However, sometimes such concerns are overstated, as in when the potential large-scale hacking of smart meters was likened to “the modern day equivalent of a nuclear strike” [63] cited in [62].

Those who raise concerns about the cyber-security of electricity grids at seminars and conferences often invoke the case of a cyber-attack against three energy distribution companies in Ukraine in 2015 [64]. As a result of this attack, substations in 30 locations in Western Ukraine were shut down, cutting off the electricity supply to 230 000 people for a period of between 1 and 6 hours [65]. While utilities and electricity distribution networks in many countries are subject to frequent hacking attempts, this is considered to have been the first successful attack on this scale and with such geopolitical significance, foreshadowing the role of cyber-attacks in the future energy system. However, it is worth noting that Ukraine was a special case, comprising unusually dilapidated infrastructure, a high level of corruption, a military conflict with Russia, and exceptional possibilities for Russian infiltration due to the historical linkages between the two countries [66]. Despite all these issues, only 0.015% of Ukraine's daily electricity consumption was affected, and only for a few hours [67].

The use and associated risks of electricity are not new per se, as all homes, companies, and institutions in developed countries already depend on electricity grids, and grids have been controlled digitally for decades. It is also probable that increased use of renewable energy will lead to greater decentralization, with millions of prosumer households supplying electricity. This may actually make the system more resilient, as many different units will have to be hacked to destabilize the system as a whole.

Like many pessimistic, policy-oriented forecasts, those concerning digitalization and cybersecurity have merit, but are also potentially self-destructing predictions: the more such predictions are made, the greater the likelihood that incumbents will be encouraged to implement counter-measures. In other words, the predictors are part of the social context about which they are trying to make a prediction and may influence that context in the process.

As a source of policy recommendations, discourse on cybersecurity is therefore clearly useful; as a prediction about the future energy system it is trickier. As one of the rare critical contributions in the cybersecurity field put it, “Moderate and measured takes on cyber security threats are swamped by the recent flood of research and policy positions in the cyber research field offering hyperbolic perspectives based on limited observations” [68] (see also [69]).

#### Attribution deficiencies deter escalatory responses. Acquiring targeted access is time intensive and risky.

Borghard and Lonergan 19 -- Erica Boghard, Assistant Professor at the Army Cyber Institute at the United States Military Academy at West Point and a research fellow at the Saltzman Institute of War and Peace Studies at Columbia University, PhD in political science from Columbia University, Shawn Lonergan, Research affiliate of the Army Cyber Institute at the United States Military Academy at West Point and a cyber officer in the US Army Reserve currently assigned to 75th Innovation Command, PhD in political science from Columbia University, 2019 (“Cyber Operations as Imperfect Tools of Escalation”, *Strategic Studies Quarterly*, Fall Issue 2019, Available Online through University of Southern California Libraries, Accessed 01-17-2021)

First, escalatory cyber response options may simply not be available to a state because it lacks access to an appropriate set of targets against which to deliver an escalatory response. This is because offensive cyber operations deliver effects against targets through exploiting a vulnerability to gain access (through an attack vector) to a target’s network or system and deliver a payload that is activated by communicating back with a host or triggered by a command order written into the code.13 Absent the right access to deploy a capability, the latter might as well not exist.14

While critical to the success of offensive operations, the initial penetration of a target network or system can be resource intensive and net unpredictable results, which is why the employment of cyber capabilities that rely on access to a targeted network require prior planning and resource allocation and development. Indeed, according to Chris Inglis, the planning staff at US Cyber Command during the 2009–10 period assessed that “the first 90 percent of cyber reconnaissance (i.e., ISR), cyber defense, and cyberattack consisted of the common work of finding and fixing a target of interest in cyberspace.”15 Therefore, rather than occurring at lightning speed, cyber operations have crucial aspects that take time and significant resource investments, even if at the tactical level a line of code can indeed be executed at “network speed.”16

Considering means of access and types of targets reveal the various aspects of gaining access that limit potential cyber escalatory responses at a given time. Table 2, Mainstream means of gaining access, depicts various common access methods and evaluates them along a spectrum of cost, risk, and reliability.17 The broadest distinction between means of access is remote (e.g., using the Internet) versus close (e.g., gaining access through a human agent or supply chain interdiction). Most of the low-cost and low-risk means of gaining access to a target (such as through various social engineering mechanisms) are not readily applicable against more hardened (and therefore more strategically valuable) targets, such as the air-gapped networks common in critical infrastructure systems and some military and defense systems. Conversely, the most reliable type of access, physical access through a human intermediary on the ground, is also the riskiest and costliest.

The nature of the targeted network or system also shapes access requirements and consequent level of difficulty. For instance, gaining access to operational technology (OT) is typically more difficult than to information technology (IT), although this may be changing as IT and OT systems converge.18 OT networks tend to be closed (they do not touch the global Internet) and run unique protocols used to control highly specific processes and systems.19 Typically, these characteristics also mean that these networks require specific knowledge because the programs they run are customized to those systems and the networking protocols they employ may not be widely proliferated. Additionally, the simple fact of “gaining access” to a target network does not guarantee that an attacker has gained access at the requisite network layer from which to launch an offensive operation.20 Thus, most access operations are followed by operations that enable persistence through access escalation prior to the employment of any cyber weapon. Finally, gaining access to a target via a hardware implant— the actual physical components of a computer (e.g., motherboard, USB and other flash memory devices, routers, etc.)—is appreciably costlier and more difficult than gaining access to software (all of the digital programs on a computer, from the operating system to applications such as Microsoft Word).21 Software vulnerabilities are relatively easier to detect and to patch, and manufacturers routinely disseminate information about known vulnerabilities and remediation protocols.22

#### Every cyberattack recorded proves no escalation.

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This strategy of combining active defense and coercive diplomacy, the use of positive and negative instruments of power to alter adversary behavior, was also on display in Buckshot Yankee, the code name given to the U.S. retaliation against a massive intrusion of Defense Department networks by Russia in 2008.34 Notably, many in the cybersecurity community view such activities as defensive counterstrikes designed to raise the costs of future adversary incursions into U.S. networks, rather than viewing them as preemptive offensive actions.35 Cyber operations rarely work in isolation, and when they do, they tend to involve very sophisticated capabilities that impose costs and risks on the attacker.36 Because such attacks can degrade or even destroy the target’s networks and operations in the short term, they can also undermine espionage operations that rely on gathering information over the long term. Degradation attacks therefore make up the minority (14.76 percent) of documented operations between rival states. The majority of cyber operations were limited disruptions and espionage.

It is thus not surprising that given the limited objectives of most cyber operations, to date rival states have tended to respond proportionally or not at all. Returning to the data, between 2000 and 2016, only 89 operations (32.72 percent) saw a retaliatory cyber response within one year. Of those, 54 (60.7 percent) were at a low-level response severity (e.g., website defacements, limited denial of service attacks, etc.). Table 1 in the appendix compares the severity scores for cyber operations between rival states between 2000 and 2016.37 When rival states do retaliate, the responses tend to be proportional: that is, they tend to match the severity of the initial attack.38

Low-level responses beget low-level counter­responses as states constantly engage in a limited manner consistent with the ebbs and flows of what famed Cold War nuclear theorist Herman Kahn called “subcrisis maneuvering.”39 Rarely does a response include an increase in severity. Instead, we witness counterresponses of a similar or lower level than the original intrusion or a response outside the cyber domain (for example, economic sanctions or legal indictment of specific individuals). The engagement is persistent but managed, and often occurs beneath an escalatory threshold.40 As seen in Table 2 in the appendix, this behavior appears to apply equally to each possible cyber strategy: disruption, espionage, and degradation. Espionage saw little retaliatory escalation, while disruption and degradation both exhibited more low-level responses.

Of the remaining 35 operations that prompted retaliation, 25 (71.4 percent) were related to U.S. active defense responses to repeated Russian and Chinese cyber operations. That is, the United States preferred to wait on adversary networks, develop intelligence, and retaliate with precise strikes designed to undermine specific threats. This strategy was not preemptive. Consistent with the idea of active defense, the strategy is best thought of as a counter­attack that exploits rival network intrusions.

Cyber operations also offer a means of signaling future escalation risk as well as a cross-domain release valve for crises. Rival states use cyber operations as a substitute for riskier military operations. Consider the standoff between Russia and Turkey in 2016. After a Turkish F-16 shot down a Russian Su-24 Fencer, a wave of DDoS attacks hit Turkish state-owned banks and government websites.41 Similarly, China is responding to U.S. tariffs and increased freedom of navigation operations—provocatively sailing U.S. warships in waters that China claims—with increased cyber activity targeting military networks.42 Russia is using a broad-front cyber campaign in response to Western sanctions, infiltrating targets ranging from the anti-doping agencies and sports federations to Westinghouse, which builds nuclear power plants, and the Hague-based Organization for the Prohibition of Chemical Weapons.43 Rather than escalate with conventional military operations, cyber operations offer rivals a way to respond to provocations without significantly increasing tensions in a crisis. Better to have a Russian DDoS attack temporarily shut down Turkish networks than for Russian long-range missiles to target Turkish military bases.

1. We can track bitcoin – bitcoin uses the blockchain and it records all transactions, can’t buy with bitcoin – convert to cash – people use bitcoin and terrorists avoiding us sanctions, iran the government is not terrorism – central bank has done a bunch of shit to crackdown on bitcoin – no one wants to mine bc electricity prices went up by 200% - link argument, racialization – why would they ban crypto – how can u buy a nuke w bitcoin – first is that statistics prove grew 64% and 96% lmpw what fintech is – focusing on different areas than banks are, traditional banks focus on investment banking – consumer banking, credit card savings account – people don’t trust large banks cuz they are shady – focus – not as big – old software systems – fintech are smarter