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### Plan---1AC

#### The United States federal government should prohibit anticompetitive business practices that artificially extend medical patents of drugs that share bioequivalence.

### Innovation---1AC

#### Advantage 1 is Innovation:

#### Anticompetitive conduct in the pharmaceutical industry undermines effective and efficient innovation.

Robin Feldman 21. Stanford University (BA), Stanford Law School (JD). Arthur J. Goldberg Distinguished Professor of Law at the University of California, Hastings College of Law. “Drug companies keep merging. Why that’s bad for consumers and innovation.” <https://www.washingtonpost.com/outlook/2021/04/06/drug-companies-keep-merging-why-thats-bad-consumers-innovation/>.

This dramatic consolidation has remade the pharmaceutical industry. Before 1988, a robust cohort of drug manufacturers often competed across multiple therapeutic areas. This competition encouraged exploring different possible approaches for treating the same disease state as well as treatments for a wider range of health concerns, increasing the potential for innovations that might improve lives.

Although this marketplace was better for innovation, drug companies were drawn to merging because of the lure of increased market power, improved synergies, larger economies of scale and more diverse product portfolios.

Abrupt changes to the environment surrounding the pharmaceutical industry also encouraged consolidation. In the late 1980s, widespread deregulation at both the state and federal level may have facilitated an uptick in mergers, particularly as companies with expiring drug patents sought to make up for their revenue losses by acquiring other profitable drugs.

The second merger wave beginning around 1996 can be traced in part to another external shock, as globalization spurred firms to join forces to reach more potential markets. Similar to the first merger wave, “patent cliffs,” in which many of a company’s drugs were set to lose their lucrative patent monopoly around the same time, also helped push firms to combine forces.

But the newly consolidated pharmaceutical industry actually stifled innovation. In the period following merger waves one and two, the industry generated fewer new molecular entities each year compared to pre-merger levels. Merged drug companies also spent proportionally less on research than their non-merged competitors.

Consolidation also enabled drugmakers to directly quell competition through what were known as “killer acquisitions,” in which they acquired innovative peers solely to stop potential competition. Moreover, with the assistance of pharmacy benefits managers, newly giant pharmaceutical firms could leverage their dominant position with one type of drug to suppress competitors for another one of their drugs, or they could use the combined power of multiple drugs to shore up a waning monopoly position. Both of these practices could block cheaper drug competitors from reaching patients, inhibiting access and affordability.

In short, consumers were the losers from the two waves of drug company mergers. They confronted higher prices and fewer choices — and saw companies exploring fewer paths that might produce breakthroughs. To make matters worse, around 2010, another wave of mergers began.

#### Automatic substitution of bioequivalents is key---the anticompetitive costs of “product hopping” outweigh the procompetitive benefits.

Daniel Burke 18. Cleveland-Marshall College of Law. “An Examination of Product Hopping by Brand-Name Prescription Drug Manufacturers: The Problem and a Proposed Solution” Cleveland State Law Review. Volume 66; Issue 2; Article 8. 04-01-18. <https://engagedscholarship.csuohio.edu/cgi/viewcontent.cgi?article=3995&context=clevstlrev>

Another way that courts determine whether the second prong of the test (in an analysis of a potential monopoly) is satisfied is by applying the rule of reason test.131 The rule of reason test requires that courts examine the totality of the circumstances, rather than treat the potential violation of the Sherman Act as a per se violation, to determine whether the practice promotes competition in the relevant market.132 The rule of reason test requires that once the plaintiff has established the defendant’s monopoly power, the monopolist may offer justifications for maintaining that power.133 The plaintiff then may argue that “the anticompetitive harm outweighs the procompetitive benefit.”134 Relevant factors in determining whether a particular case of product hopping is a violation of the Sherman Act include looking at whether the conduct is anticompetitive, coerces consumers, and impedes competition.135 Generic drug manufacturers are inhibited from entering the prescription drug market when name-brand drug manufacturers are granted extended exclusivity protection, particularly due to automatic substitution laws.136 Automatic substitution laws allow pharmacists to substitute a generic bioequivalent drug for the more expensive name-brand prescription drug.137 Bioequivalence is defined as: the absence of a significant difference in the rate and extent to which the active ingredient or active moiety in pharmaceutical equivalents or pharmaceutical alternatives becomes available at the site of drug action when administered at the same molar dose under similar conditions in an appropriately designed study. Where there is an intentional difference in rate (e.g., in certain extended-release dosage forms), certain pharmaceutical equivalents or alternatives may be considered bioequivalent if there is no significant difference in the extent to which the active ingredient or moiety from each product becomes available at the site of drug action.138 This definition allows pharmacists to substitute generic prescription drugs, which are cheaper, for brand-name prescription drugs when filling the prescription.139 Prior to a pharmacist’s ability to make this substitution, the FDA must first determine that the generic drug is “interchangeable.”140 The goal of permitting this type of substitution is clear; allowing an equivalent, cheaper prescription benefits consumers because they receive the treatment needed at a lower cost. However, brand-name prescription drug manufacturers change the composition of the drug such that the new brand-name drug is no longer bioequivalent with the generic drug.141 The intention of the new drug is still to treat the same disease or disorder as before, but the new drug is no longer seen as “equivalent” in the eyes of the FDA.142 When brand-name prescription drug manufacturers do this, pharmacists cannot substitute the cheaper generic that would have been appropriate prior to changes to the brand-name drug. As a result, the generic drug manufacturer cannot enter the market due to state laws.143 The consumer must spend more money on a brand-name drug despite the existence of a generic prescription drug that would provide the same treatment if the consumer had access to it. For example, in the case of Forest Pharmaceuticals (the subsidiary of Actavis against whom the State of New York brought an action for engaging in allegedly monopolistic activity), a new version of their memantine drug, Namenda, is now available as Namenda XR (which stands for “extended relief”).144 However, as a result of the Second Circuit’s ruling in that case, generic memantine is available to consumers for half the price of branded Namenda.145 Had Forest (and by corollary, Actavis) been successful in its pursuit to maintain exclusivity in the memantine drug market, consumers would not be able to access generic memantine until the Namenda XR patent expires in 2025 or even later if the manufacturer altered the formula once more.146 Another example that illustrates the potential harm to consumers if the generic drug manufacturer had not been able to enter the market is the case of the brand-name Aricept, another Alzheimer’s and dementia treatment.147 When the generic version, Donepezil, entered the market, prices dropped from $230 for a thirty-day supply to less than $10.148 That amounts to potential savings of more than $2,600 per year for one drug. Most individuals with Alzheimer’s disease are aged sixty-five or older,149 a population that relies heavily on income from Social Security.150 Being able to save potentially thousands of dollars per year on the cost of medication greatly benefits consumers who are most likely to be on fixed income. Against this significant burden weighs the benefit of maintaining a brand-name drug manufacturer’s exclusivity, the expiration of which results in companies losing potentially billions of dollars in revenue.151 This loss in revenue could result in lost jobs if the drug companies fail to find new revenue sources.152 But other methods can help companies facing a patent cliff avoid such extensive losses, maintain their positions in the industry, and protect their future earnings and revenue stream.153 One way is to develop a generic version of the brand-name drug that the company developed, marketed, and sold for years before their patent expired.154 This is a way that a company can continue to explore the market in which they have enjoyed exclusivity for so long if courts adopt the approach recommended in this Note. Although companies will not be able to engage in the same activities that they engaged in before, particularly those extending their patent protection beyond their initial exclusivity period, they will be able to create a generic drug that they could continue to market and sell, albeit at a lower price than their previous brand-name prescription drug. This would create an environment where brand-name drug manufacturers become another actor in the generic market. The brand-name drug manufacturer may, in fact, have an advantage if they utilized their incumbent position in the market to position themselves in a manner to better effectuate marketing for a generic version of the brand-name drug. This approach may discourage a potential generic competitor from entering the market,155 even though this is not the type of competition that courts seek to curb.156 That is, as Judge Learned Hand warned, “[t]he successful competitor, having been urged to compete, must not be turned upon when he wins.”157 It is not in the interest of courts to insert themselves into a scenario where that company successfully enters into the generic prescription drug market after formerly competing exclusively in the brand-name prescription drug market.158 Such a scenario would provide a roadmap for other companies facing similar difficulties, vis-à-vis, patent cliffs. Ultimately, the harm at issue is the detrimental effect of a patent cliff on a corporation’s future revenue stream. While this harm is a significant event in the life- cycle of a corporation, it pales in comparison to the harm consumers suffer when brand-name prescription drug manufacturers extend their market exclusivity. The harm brand-name drug manufacturers cause when they engage in activities that prevent the triggering of automatic drug substitution invariably results in higher industry costs and decreased opportunity for innovation. The anticompetitive harm, in this case, therefore cannot justify the procompetitive benefit.

#### Antitrust regulation is key to innovation---the alternative is non-innovative patent extensions.

Tyler J. Klein 16. Lawyer. “Antitrust Enforcement Against Pharmaceutical Product Hopping: Protecting Consumers or Reaching Too Far?” Saint Louis University Journal of Health Law & Policy. Volume 10; Issue 1; Article 12. 2016. https://scholarship.law.slu.edu/cgi/viewcontent.cgi?article=1058&context=jhlp

In response to these arguments, opponents assert that antitrust enforcement impedes innovation in the pharmaceutical industry.147 The idea of chilling innovation and deterring the development of new, potentially life-saving drugs is certainly concerning. However, this argument is less concerning than it sounds. When submitting its Amicus Brief in support of Plaintiff-Appellee State of New York in the Second Circuit Actavis case, the AAI addressed this argument. First, the AAI asserted that no empirical evidence existed showing that antitrust scrutiny of product hopping deters innovation.148 Moreover, the AAI further asserted that antitrust scrutiny of product hopping actually increases innovation.149 Without antitrust scrutiny of product hopping, brand- name companies will invest in making minor alterations to products to extend the patent, rather than investing in research for new, innovative drugs.150 Indeed, one study found that “[b]rand-name firms have sought increasing recourse to ancillary patents on chemical variants, alternative formulations, methods of use, and relatively minor aspects of the drug.”151 Essentially, immunizing brand-name pharmaceutical companies from antitrust liability encourages them to spend time and resources in order to find ways to make insignificant changes to current drugs in order to preserve the patent, instead of using time and resources to develop the next innovative drug. In its Brief as Amicus Curiae filed with the district court in Mylan, the FTC bolstered this argument by asserting: “The threat posed to existing brand drugs by generic competition can incentivize the brand company facing dramatic loss of sales to develop new and innovative drugs that benefit consumers.”152 Notably, the FTC recently filed a Brief for Amicus Curiae in support of Mylan in its appeal to the Third Circuit.153 In sum, there is no evidence that antitrust regulation of product hopping slows down innovation by brand-name pharmaceutical companies. Rather, regulation actually encourages innovation, as the competition from generics causes brand-name manufactures to innovate new products and prevents them from spending resources on insignificant changes to extend patents.

#### Pharmaceutical innovation solves disease.

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As key actors in the healthcare innovation landscape, pharmaceutical and life sciences companies have been called on to develop medicines, vaccines and diagnostics for pressing public health challenges. The COVID-19 crisis is one such challenge, but there are many others. For example, MERS, SARS, Ebola, Zika and avian and swine flu are also infectious diseases that represent public health threats. Infectious agents such as anthrax, smallpox and tularemia could present threats in a bioterrorism context. The general threat to public health that is posed by antimicrobial resistance is also well-recognised as an area in need of pharmaceutical innovation. Innovating in response to these challenges does not always align well with pharmaceutical industry commercial models, shareholder expectations and competition within the industry. However, the expertise, networks and infrastructure that industry has within its reach, as well as public expectations and the moral imperative, make pharmaceutical companies and the wider life sciences sector an indispensable partner in the search for solutions that save lives. This perspective argues for the need to establish more sustainable and scalable ways of incentivising pharmaceutical innovation in response to infectious disease threats to public health. It considers both past and current examples of efforts to mobilise pharmaceutical innovation in high commercial risk areas, including in the context of current efforts to respond to the COVID-19 pandemic. In global pandemic crises like COVID-19, the urgency and scale of the crisis – as well as the spotlight placed on pharmaceutical companies – mean that contributing to the search for effective medicines, vaccines or diagnostics is essential for socially responsible companies in the sector. It is therefore unsurprising that we are seeing industry-wide efforts unfold at unprecedented scale and pace. Whereas there is always scope for more activity, industry is currently contributing in a variety of ways. Examples include pharmaceutical companies donating existing compounds to assess their utility in the fight against COVID19; screening existing compound libraries in-house or with partners to see if they can be repurposed; accelerating trials for potentially effective medicine or vaccine candidates; and in some cases rapidly accelerating in-house research and development to discover new treatments or vaccine agents and develop diagnostics tests. Pharmaceutical companies are collaborating with each other in some of these efforts and participating in global R&D partnerships (such as the Innovative Medicines Initiative effort to accelerate the development of potential therapies for COVID-19) and supporting national efforts to expand diagnosis and testing capacity and ensure affordable and ready access to potential solutions. The primary purpose of such innovation is to benefit patients and wider population health. Although there are also reputational benefits from involvement that can be realised across the industry, there are likely to be relatively few companies that are ‘commercial’ winners. Those who might gain substantial revenues will be under pressure not to be seen as profiting from the pandemic. In the United Kingdom for example, GSK has stated that it does not expect to profit from its COVID-19 related activities and that any gains will be invested in supporting research and long-term pandemic preparedness, as well as in developing products that would be affordable in the world’s poorest countries. Similarly, in the United States AbbVie has waived intellectual property rights for an existing combination product that is being tested for therapeutic potential against COVID-19, which would support affordability and allow for a supply of generics. Johnson & Johnson has stated that its potential vaccine – which is expected to begin trials – will be available on a not-for-profit basis during the pandemic. Pharma is mobilising substantial efforts to rise to the COVID-19 challenge at hand. However, we need to consider how pharmaceutical innovation for responding to emerging infectious diseases can best be enabled beyond the current crisis. Many public health threats (including those associated with other infectious diseases, bioterrorism agents and antimicrobial resistance) are urgently in need of pharmaceutical innovation, even if their impacts are not as visible to society as COVID-19 is in the immediate term. The pharmaceutical industry has responded to previous public health emergencies associated with infectious disease in recent times – for example those associated with Ebola and Zika outbreaks. However, it has done so to a lesser scale than for COVID-19 and with contributions from fewer companies. Similarly, levels of activity in response to the threat of antimicrobial resistance are still low. There are important policy questions as to whether – and how – industry could engage with such public health threats to an even greater extent under improved innovation conditions.

#### Innovation is key to preparedness.

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That so much hope is being pinned on remdesivir, the drug Gilead is testing for Covid-19, reflects the failure of our system for new drug development rather than the unqualified success some commentators are making it out to be. If anything, remdesivir is the poster child for why we need a new model of drug development for pandemics and neglected diseases that isn’t restricted by the current market-based model. The Covid-19 pandemic has provided the pharmaceutical industry with a chance at bolstering its heavily tarnished image. Abbott Laboratories is winning effusive praise for its introduction of a rapid Covid-19 test. After decades of profiteering from the opioid crisis, Johnson & Johnson has ramped-up its advertising on Twitter to promote the company’s research into a vaccine for Covid-19. It is even airing an eight-episode reality television series showcasing its efforts. The marketing offensive appears to be working. Recent polling shows that public perception of pharmaceutical companies is on the upswing after years of historical lows. The narrative emerging from the Covid-19 pandemic is that the market is responding to rescue us from global catastrophe, a public relations coup for an industry that has long known about the potential for another pandemic but hasn’t meaningfully invested in research until now. Related: With remdesivir, Gilead finds itself at strategic crossroads, with its reputation (and far more) at stake Since 2002, epidemics caused by severe acute respiratory syndrome (SARS), swine flu (H1N1), Middle East respiratory syndrome (MERS), Zika, Ebola, and other viral diseases have killed nearly 600,000 people worldwide. Yet, in the aftermath of these outbreaks, and despite clear warnings that another viral pandemic could emerge, the pharmaceutical industry failed to sustain investment into new treatments and vaccines. That may surprise the public, but it doesn’t surprise those working on public health issues. In today’s capital-driven market, investments in pandemic preparedness and in neglected diseases like tuberculosis and malaria are not, and never have been, a priority for pharmaceutical company drug development even though neglected diseases cause more than 2 million deaths per year, almost seven times the number of deaths caused so far by Covid-19. There are several reasons for this disconnect between need and action. One is that outbreaks are unpredictable and may not last long enough to generate a sufficient market for a new therapy. Another is that diseases like malaria and trachoma predominantly affect poor people living in low-income countries that don’t constitute a sufficiently profitable market. A company executive deciding between investing in a novel treatment to address a potential pandemic threat or buying back company shares to boost a company’s stock price will probably choose the latter. The practice of boosting shareholder profits and executive pay instead of investing in new products and services or employees has become the market norm, as the airline industry has shown. In 2018, global funding for basic research and product development for neglected diseases was just $4 billion. Of this funding, 64% came from public tax dollars. Another 19% came from philanthropic organizations. The private pharmaceutical sector contributed just 17% —$650 million — a drop in the ocean considering that the revenue of the top 20 pharmaceutical companies was more than $661 billion in 2019. The lack of investment by the pharmaceutical industry is not limited to neglected diseases and pandemic preparedness. Many of the largest pharmaceutical companies have stopped investing in the development of new antibiotics to treat drug-resistant infections, which is already a global health crisis that is costing lives and threatening modern medicine, including routine surgery and chemotherapy. Rather than conducting research and developing genuinely new drugs that could help solve some of the biggest public health issues now and in the future, companies spend more time finding ways to keep existing drug franchises profitable. This includes filing hundreds of patents on a single drug under the guise of medical innovation, as detailed in a report published by I-MAK, an organization one of us (T.A.) co-directs.

#### Regulated capitalism is key---alternative systems fail to innovate sufficiently.

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Nonetheless, the abolition of capitalism is not the solution. The last century witnessed a large-scale experiment with an alternative system—a system of central planning in the Soviet Union and other communist countries of Central and Eastern Europe. This system failed to offer individuals the freedom and economic incentives necessary for frontier innovation, and so these nations were unable to get beyond an intermediate level of development. Henri Weber, a well-known figure of the French movement of May 1968, was a former Trotskyist leader in the 1960s and 1970s but later became a leader of the French Socialist Party and Socialist member of the European Parliament. He explained his personal conversion to the free market economy and social democracy, looking to the Scandinavian experience: “Having witnessed from a front-row seat the disaster of collectivization of agriculture and firms in the Soviet Union, the Scandinavian Socialists were the first to break with the dogma of socializing means of production and managing the economy by a central planning committee. To control and humanize the economy, it is altogether unnecessary to expropriate management, to nationalize firms, or to eradicate the market . . . altogether unnecessary to deprive society of the creativity, knowhow, and dynamism of entrepreneurs. Under certain conditions, entrepreneurial talent can be mobilized to serve the common good.” A market economy, because it induces creative destruction, is inherently disruptive. But historically it has proved to be a formidable engine of prosperity, hoisting our societies to levels of development unimaginable two centuries ago. Must we therefore resign ourselves to the serious pitfalls and defects of capitalism as the necessary price to pay to generate prosperity and overcome poverty?

In this book, we have sought to better understand how growth through creative destruction interacts with competition, inequality, the environment, finance, unemployment, health, happiness, and industrialization, and how poor countries catch up to rich ones. We have analyzed to what degree the state, with appropriate control of the executive, can stimulate the creation of wealth while at the same time tackling the problems mentioned above. We have seen how, by moving from laissez-faire capitalism, with market forces given free rein, to a form of capitalism in which the state and civil society play their full role, it is possible to stimulate social mobility and reduce inequality without discouraging innovation. We have also seen how appropriate competition policies can curb the decline of growth and how we can redirect innovation toward green technologies to combat global warming. We have seen that, without forgoing globalization, a country can improve its competitiveness through innovative investments and put in place effective safety nets to protect individuals who lose their jobs. Lastly, we have seen how, with the indispensable support of civil society, it is possible to prevent yesterday’s innovators, in collusion with public officials, from pulling up the ladder behind themselves to block the path of tomorrow’s innovators.

#### Disease is a non-linear, existential risk---encompasses AND outweighs other threats.

Dennis Pamlin & Stuart Armstrong 15, Dennis Pamlin, Executive Project Manager Global Risks, Global Challenges Foundation, and Stuart Armstrong, James Martin Research Fellow, Future of Humanity Institute, Oxford Martin School, University of Oxford, February 2015, “Global Challenges: 12 Risks that threaten human civilization: The case for a new risk category,” Global Challenges Foundation, p.30-93, https://api.globalchallenges.org/static/wp-content/uploads/12-Risks-with-infinite-impact.pdf

2. Risks with infinite impact: A new category of risks “Most risk management is really just advanced contingency planning and disciplining yourself to realise that, given enough time, very low probability events not only can happen, but they absolutely will happen.” Lloyd Blankfein, Goldman Sachs CEO, July 2013 1 Risk = Probability × Impact Impacts where civilisation collapses to a state of great suffering and do not recover, or a situation where all human life end, are defined as infinite as the result is irreversible and lasts forever. A new group of global risks This is a report about a limited number of global risks – that can be identified through a scientific and transparent process – with impacts of a magnitude that pose a threat to human civilisation, or even possibly to all human life. With such a focus it may surprise some readers to find that the report’s essential aim is to inspire action and dialogue as well as an increased use of the methodologies used for risk assessment. The real focus is not on the almost unimaginable impacts of the risks the report outlines. Its fundamental purpose is to encourage global collaboration and to use this new category of risk as a driver for innovation. The idea that we face a number of global challenges threatening the very basis of our civilisation at the beginning of the 21st century is well accepted in the scientific community, and is studied at a number of leading universities.2 But there is still no coordinated approach to address this group of challenges and turn them into opportunities for a new generation of global cooperation and the creation of a global governance system capable of addressing the greatest challenges of our time. This report has, to the best of our knowledge, created the first science-based list of global risks with a potentially infinite impact and has made the first attempt to provide an initial overview of the uncertainties related to these risks as well as rough quantifications for the probabilities of these impacts. What is risk? Risk is the potential of losing something of value, weighed against the potential to gain something of value. Every day we make different kinds of risk assessments, in more or less rational ways, when we weigh different options against each other. The basic idea of risk is that an uncertainty exists regarding the outcome and that we must find a way to take the best possible decision based on our understanding of this uncertainty.3 To calculate risk the probability of an outcome is often multiplied by the impact. The impact is in most cases measured in economic terms, but it can also be measured in anything we want to avoid, such as suffering. At the heart of a risk assessment is a probability distribution, often described by a probability density function4; see figure X for a graphic illustration. The slightly tilted bell curve is a common probability distribution, but the shape differs and in reality is seldom as smooth as the example. The total area under the curve always represents 100 percent, i.e. all the possible outcomes fit under the curve. In this case (A) represents the most probable impact. With a much lower probability it will be a close to zero impact, illustrated by (B). In the same way as in case B there is also a low probability that the situation will be very significant, illustrated by (C). Figure 1: Probability density function [FIGURE 1 OMITTED] The impacts (A), (B) and (C) all belong to the same category, ~~normal~~ [common] impacts: the impacts may be more or less serious, but they can be dealt with within the current system. The impacts in this report are however of a special kind. These are impacts where everything will be lost and the situation will not be reversible, i.e challenges with potentially infinite impact. In insurance and finance this kind of risk is called “risk of ruin”, an impact where all capital is lost.5 This impact is however only infinite for the company that is losing the money. From society’s perspective, that is not a special category of risk. In this report the focus is on the “risk of ruin” on a global scale and on a human level, in the worst case this is when we risk the extinction of our own species. On a probability curve the impacts in this report are usually at the very far right with a relatively low probability compared with other impacts, illustrated by (D) in Figure 2. Often they are so far out on the tail of the curve that they are not even included in studies. For each risk in this report the probability of an infinite impact is very low compared to the most likely outcome. Some studies even indicate that not all risks in this report can result in an infinite impact. But a significant number of peer-reviewed reports indicate that those impacts not only can happen, but that their probability is increasing due to unsustainable trends. The assumption for this report is that by creating a better understanding of our scientific knowledge regarding risks with a potentially infinite impact, we can inspire initiatives that can turn these risks into drivers for innovation. Not only could a better understanding of the unique magnitude of these risks help address the risks we face, it could also help to create a path towards more sustainable development. The group of global risks discussed in this report are so different from most of the challenges we face that they are hard to comprehend. But that is also why they can help us to build the collaboration we need and drive the development of further solutions that benefit both people and the planet. As noted above, none of the risks in this report is likely to result directly in an infinite impact, and some are probably even physically incapable of doing so. But all are so significant that they could reach a threshold impact able to create social and ecological instability that could trigger a process which could lead to an infinite impact. For several reasons the potentially infinite impacts of the risks in this report are not as well known as they should be. One reason is the way that extreme impacts are often masked by most of the theories and models used by governments and business today. For example, the probability of extreme impacts is often below what is included in studies and strategies. The tendency to exclude impacts below a probability of five percent is one reason for the relative “invisibility” of infinite impacts. The almost standard use of a 95% confidence interval is one reason why low-probability high-impact events are often ignored.6 Figure 2: Probability density function with tail highlighted [FIGURE 2 OMITTED] Climate change is a good example, where almost all of the focus is on the most likely scenarios and there are few studies that include the low-probability high-impact scenarios. In most reports about climate impacts, the impacts caused by warming beyond five or six degrees Celsius are even omitted from tables and graphs even though the IPCC’s own research indicates that the probability of these impacts are often between one and five percent, and sometimes even higher.7 Other aspects that contribute to this relative invisibility include the fact that extreme impacts are difficult to translate into monetary terms, they have a global scope, and they often require a time-horizon of a century or more. They cannot be understood simply by linear extrapolation of current trends, and they lack historical precedents. There is also the fact that the measures required to significantly reduce the probability of infinite impacts will be radical compared to a business-as-usual scenario with a focus on incremental changes. The exact probability of a specific impact is difficult or impossible to estimate.8 However, the important thing is to establish the current magnitude of the probabilities and compare them with the probabilities for such impacts we cannot accept. A failure to provide any estimate for these risks often results in strategies and priorities defined as though the probability of a totally unacceptable outcome is zero. An approximate number for a best estimate also makes it easier to understand that a great uncertainty means the actual probability can be both much higher and much lower than the best estimate. It should also be stressed that uncertainty is not a weakness in science; it always exists in scientific work. It is a systematic way of understanding the limitations of the methodology, data, etc.9 Uncertainty is not a reason to wait to take action if the impacts are serious. Increased uncertainty is something that risk experts, e.g. insurance experts and security policy experts, interpret as a signal for action. A contrasting challenge is that our cultural references to the threat of infinite impacts have been dominated throughout history by religious groups seeking to scare society without any scientific backing, often as a way to discipline people and implement unpopular measures. It should not have to be said, but this report is obviously fundamentally different as it focuses on scientific evidence from peer-reviewed sources. Infinite impact The concept infinite impact refers to two aspects in particular; the terminology is not meant to imply a literally infinite impact (with all the mathematical subtleties that would imply) but to serve as a reminder that these risks are of a different nature. Ethical These are impacts that threaten the very survival of humanity and life on Earth – and therefore can be seen as being infinitely negative from an ethical perspective. No positive gain can outweigh even a small probability for an infinite negative impact. Such risks require society to ensure that we eliminate these risks by reducing the impact below an infinite impact as a top priority, or at least do everything we can to reduce the probability of these risks. As some of these risks are impossible to eliminate today it is also important to discuss what probability can right now be accepted for risks with a possible infinite impact. Economic Infinite impacts are beyond what most traditional economic models today are able to cope with. The impacts are irreversible in the most fundamental way, so tools like cost-benefit assessment seldom make sense. To use discounting that makes infinite impacts (which could take place 100 years or more from now and affect all future generations) close to invisible in economic assessments, is another example of a challenge with current tools. So while tools like cost-benefit models and discounting can help us in some areas, they are seldom applicable in the context of infinite impacts. New tools are needed to guide the global economy in an age of potential infinite impacts. See chapter 2.2.2 for a more detailed iscussion. Roulette and Russian roulette When probability and normal risks are discussed the example of a casino and roulette is often used. You bet something, then spin the wheel and with a certain probability you win or lose. You can use different odds to discuss different kinds of risk taking. These kinds of thought experiment can be very useful, but when it comes to infinite risks these gaming analogies become problematic. For infinite impact a more appropriate analogy is probably Russian roulette. But instead of “normal” Russian roulette where you only bet your own life you are now also betting everyone you know and everyone you don’t know. Everyone alive will die if you lose. There will be no second chance for anyone as there will be no future generations; humanity will end with your loss. What probability would you accept for different sums of money if you played this version of Russian roulette? Most people would say that it is stupid and – no matter how low the probability is and no matter how big the potential win is – this kind of game should not be played, as it is unethical. Many would also say that no person should be allowed to make such a judgment, as those who are affected do not have a say. You could add that most of those who will lose from it cannot say anything as they are not born and will never exist if you lose. The difference between ordinary roulette and “allhumanity Russian roulette” is one way of illustrating the difference in nature between a “normal” risk that is reversible, and a risk with an infinite impact. An additional challenge in acknowledging the risks outlined in this report is that many of the traditional risks including wars and violence have decreased, even though it might not always looks that way in media.10 So a significant number of experts today spend a substantial amount of time trying to explain that much of what is discussed as dangerous trends might not be as dangerous as we think. For policy makers listening only to experts in traditional risk areas it is therefore easy to get the impression that global risks are becoming less of a problem. The chain of events that could result in infinite impacts in this report also differ from most of the traditional risks, as most of them are not triggered by wilful acts, but accidents/mistakes. Even the probabilities related to nuclear war in this report are to a large degree related to inadvertent escalation. As many of the tools to analyse and address risks have been developed to protect nations and states from attacks, risks involving accidents tend to get less attention. This report emphasises the need for an open and democratic process in addressing global challenges with potentially infinite impact. Hence, this is a scientifically based invitation to discuss how we as a global community can address what could be considered the greatest challenges of our time. The difficulty for individual scientists to communicate a scientific risk approach should however not be underestimated. Scientists who today talk about low-probability impacts, that are serious but still far from infinite, are often accused of pessimism and scaremongering, even if they do nothing but highlight scientific findings.11 To highlight infinite impacts with even lower probability can therefore be something that a scientist who cares about his/her reputation would want to avoid. In the media it is still common to contrast the most probable climate impact with the probability that nothing, or almost nothing, will happen. The fact that almost nothing could happen is not wrong in most cases, but it is unscientific and dangerous if different levels of probability are presented as equal. The tendency to compare the most probable climate impact with the possibility of a low or no impact also results in a situation where low-probability high-impact outcomes are often totally ignored. An honest and scientific approach is to, whenever possible, present the whole probability distribution and pay special attention to unacceptable outcomes. The fact that we have challenges that with some probability might be infinite and therefore fundamentally irreversible is difficult to comprehend, and physiologically they are something our brains are poorly equipped to respond to, according to evolutionary psychologists.12 It is hard for us as individuals to grasp that humanity for the first time in its history now has the capacity to create such catastrophic outcomes. Professor Marianne Frankenhaeuser, former head of the psychology division, Karolinska Institute, Stockholm, put it this way: “Part of the answer is to be found in psychological defence mechanisms. The nuclear threat is collectively denied, because to face it would force us to face some aspects of the world’s situation which we do not want to recognise.” 13 This psychological denial may be one reason why there is a tendency among some stakeholders to confuse “being optimistic” with denying what science is telling us, and ignoring parts of the probability curve.14 Ignoring the fact that there is strong scientific evidence for serious impacts in different areas, and focusing only on selected sources which suggest that the problem may not be so serious, is not optimistic. It is both unscientific and dangerous.15 A scientific approach requires us to base our decisions on the whole probability distribution. Whether it is possible to address the challenge or not is the area where optimism and pessimism can make people look at the same set of data and come to different conclusions. Two things are important to keep in mind: first, that there is always a probability distribution when it comes to risk; second, that there are two different kinds of impacts that are of interest for this report. The probability distribution can have different shapes but in simplified cases the shape tends to look like a slightly modified clock (remember figure 1). In the media it can sound as though experts argue whether an impact, for example a climate impact or a pandemic, will be dangerous or not. But what serious experts discuss is the probability of different oucomes. They can disagree on the shape of the curve or what curves should be studied, but not that a probability curve exists. With climate change this includes discussions about how sensitive the climate is, how much greenhouse gas will be emitted, and what impacts that different warmings will result in. Just as it is important not to ignore challenges with potentially infinite impacts, it is also important not to use them to scare people. Dramatic images and strong language are best avoided whenever possible, as this group of risks require sophisticated strategies that benefit from rational arguments. Throughout history we have seen too many examples when threats of danger have been damagingly used to undermine important values. The history of infinite impacts: The LA-602 document The understanding of infinite impacts is very recent compared with most of our institutions and laws. It is only 70 years ago that Edward Teller, one of the greatest physicists of his time, with his back-of-the-envelope calculations, produced results that differed drastically from all that had gone before. His calculations indicated that the explosion of a nuclear bomb – a creation of some of the brightest minds on the planet, including Teller himself – could result in a chain reaction so powerful that it would ignite the world’s atmosphere, thereby ending human life on Earth.16 Robert Oppenheimer, who led the Manhattan Project to develop the nuclear bomb, halted the project to see whether Teller’s calculations were correct.17 The resulting document, LA- 602: Ignition of the Atmosphere with Nuclear Bombs, concluded that Teller was wrong, But the sheer complexity drove them to end their assessment by writing that “further work on the subject [is] highly desirable”.18 The LA-602 document can be seen as the first scientific global risk report addressing a category of risks where the worst possible impact in all practical senses is infinite.19 Since the atomic bomb more challenges have emerged with potentially infinite impact. Allmost all of these new challenges are linked to the increased knowledge, economic and technical development that has brought so many benefits. For example, climate change is the result of the industrial revolution and development that was, and still is, based heavily on fossil fuel. The increased potential for global pandemics is the result of an integrated global economy where goods and services move quickly around the world, combined with rapid urbanisation and high population density. In parallel with the increased number of risks with possible infinite impact, our capacity to analyse and solve them has greatly increased too. Science and technology today provides us with knowledge and tools that can radically reduce the risks that historically have been behind major extinctions, such as pandemics and asteroids. Recent challenges like climate change, and emerging challenges like synthetic biology and nanotechnology, can to a large degree be addressed by smart use of new technologies, new lifestyles and institutional structures. It will be hard as it will require collaboration of a kind that we have not seen before. It will also require us to create systems that can deal with the problems before they occur. The fact that the same knowledge and tools can be both a problem and a solution is important to understand in order to avoid polarisation. Within a few decades, or even sooner, many of the tools that can help us solve the global challenges of today will come from fields likely to provide us with the most powerful instruments we have ever had – resulting in their own sets of challenges. Synthetic biology, nanotechnology and artificial intelligence (AI) are all rapidly evolving fields with great potential. They may help solve many of today’s main challenges or, if not guided in a benign direction, may result in catastrophic outcomes. The point of departure of this report is the fact that we now have the knowledge, economic resources and technological ability to reduce most of the greatest risks of our time. Conversely, the infinite impacts we face are almost all unintended results of human ingenuity. The reason we are in this situation is that we have made progress in many areas without addressing unintended low-probability high-impact consequences. Creating innovative and resilient systems rather than simply managing risk would let us focus more on opportunities. But the resilience needed require moving away from legacy systems is likely to be disruptive, so an open and transparent discussion is needed regarding the transformative solutions required. Figure 3: Probability density function with tail and threshold highlighted [FIGURE 3 OMITTED] 2.1 Report structure The first part of the report is an introduction where the global risks with potential infinite impact are introduced and defined. This part also includes the methodology for selecting these risks, and presents the twelve risks that meet this definition. Four goals of the report are also presented, under the headings “acknowledge”, “inspire”, “connect” and “deliver”. The second part is an overview of the twelve global risks and key events that illustrate some of the work around the world to address them. For each challenge five important factors that influence the probability or impact are also listed. The risks are divided into four different categories depending on their characteristics. “Current challenges” is the first category and includes the risks that currently threaten humanity due to our economic and technological development - extreme climate change, for example, which depends on how much greenhouse gas we emit. “Exogenic challenges” includes risks where the basic probability of an event is beyond human control, but where the probability and magnitude of the impact can be influenced - asteroid impacts, for example, where the asteroids’ paths are beyond human control but an impact can be moderated by either changing the direction of the asteroid or preparing for an impact. “Emerging challenges” includes areas where technological development and scientific assessment indicate that they could both be a very important contribution to human welfare and help reduce the risks associated with current challenges, but could also result in new infinite impacts.20 AI, nanotechnology and synthetic biology are examples. “Global policy challenge” is a different kind of risk. It is a probable threat arising from future global governance as it resorts to destructive policies, possibly in response to the other challenges listed above. The third part of the report discusses the relationship between the different risks. Action to reduce one risk can increase another, unless their possible links are understood. Many solutions are also able to address multiple risks, so there are significant benefits from understanding how one relates to others. Investigating these correlations could be a start, but correlation is a linear measure and non-linear techniques may be more helpful for assessing the aggregate risk. The fourth part is an overview, the first ever to our knowledge, of the uncertainties and probabilities of global risks with potentially infinite impacts. The numbers are only rough estimates and are meant to be a first step in a dialogue where methodologies are developed and estimates refined. The fifth part presents some of the most important underlying trends that influence the global challenges, which often build up slowly until they reach a threshold and very rapid changes ensue. The sixth and final part presents an overview of possible ways forward. 2.2 Goals Goal 1: Acknowledge That key stakeholders, influencing global challenges, acknowledge the existence of the category of risks that could result in infinite impact. They should also recognice that the list of risks that belong to this category should be revised as new technologies are developed and our knowledge increases. Regardless of the risks included, the category should be given special attention in all processes and decisions of relevance. The report also seeks to demonstrate to all key stakeholders that we have the capacity to reduce, or even eliminate, most of the risks in this category. Establish a category of risks with potentially infinite impact. Before anything significant can happen regarding global risks with potentially infinite impacts, their existence must be acknowledged. Rapid technological development and economic growth have delivered unprecedented material welfare to billions of people in a veritable tide of utopias.21 But we now face the possibility that even tools created with the best of intentions can have a darker side too, a side that may threaten human civilisation, and conceivably the continuation of human life. This is what all decision-makers need to recognise. Rather than succumbing to terror, we need to acknowledge that we can let the prospect inspire and drive us forward. Goal 2: Inspire That policy makers inspire action by explaining how the probabilities and impacts can be reduced and turned into opportunities. Concrete examples of initiatives should be communicated in different networks in order to create ripple effects, with the long-term goal that all key stakeholders should be inspired to turn these risks into opportunities for positive action. Show concrete action that is taking place today. This report seeks to show that it is not only possible to contribute to reducing these risks, but that it is perhaps the most important thing anyone can spend their time on. It does so by combining information about the risks with information about individuals and groups who has made a significant contribution by turning challenges into opportunities. By highlighting concrete examples the report hopes to inspire a new generation of leaders. Goal 3: Connect That leaders in different sectors connect with each other to encourage collaboration. A specific focus on financial and security policy where significant risks combine to demand action beyond the incremental is required. Support new meetings between interested stakeholders. The nature of these risks spans countries and continents; they require action by governments and politicians, but also by companies, academics, NGOs, and many other groups. The magnitude of the possible impacts requires not only leaders to act but above all new models for global cooperation and decision-making to ensure delivery. The need for political leadership is therefore crucial. Even with those risks where many groups are involved, such as climate change and pandemics, very few today address the possibility of infinite impact aspects. Even fewer groups address the links between the different risks. There is also a need to connect different levels of work, so that local, regional, national and international efforts can support each other when it comes to risks with potentially infinite impacts. Goal 4: Deliver That concrete strategies are developed that allow key stakeholders to identify, quantify and address global challenges as well as gather support for concrete steps towards a wellfunctioning global governance system. This would include tools and initiatives that can help identify, quantify and reduce risks with potentially infinite impacts. Identify and implement strategies and initiatives. Reports can acknowledge, inspire and connect, but only people can deliver actual results. The main focus of the report is to show that actual initiatives need to be taken that deliver actual results. Only when the probability of an infinite impact becomes acceptably low, very close to zero, and/or when the maximum impact is significantly reduced, should we talk about real progress. In order to deliver results it is important to remember that global governance to tackle these risks is the way we organise society in order to address our greatest challenges. It is not a question of establishing a “world government”, it is about the way we organise ourselves on all levels, from the local to the global. The report is a first step and should be seen as an invitation to all responsible parties that can affect the probability and impact of risks with potentially infinite impacts. But its success will ultimately be measured only on how it contributes to concrete results. 2.3 Global challenges and infinite impact This chapter first introduces the concept of infinite impact. It then describes the methodology used to identify challenges with an infinite impact. It then presents risks with potentially infinite impact that the methodology results in. 2.3.1 Definition of infinite impact The specific criterion for including a risk in this report is that well-sourced science shows the challenge can have the following consequences: 22 1. Infinite impact: When civilisation collapses to a state of great suffering and does not recover, or a situation where all human life ends. The existence of such threats is well attested by science.23 2. Infinite impact threshold – an impact that can trigger a chain of events that could result first in a civilisation collapse, and then later result in an infinite impact. Such thresholds are especially important to recognise in a complex and interconnected society where resilience is decreasing.24 A collapse of civilisation is defined as a drastic decrease in human population size and political/economic/social complexity, globally for an extended time.25 The above definition means the list of challenges is not static. When new challenges emerge, or current ones fade away, the list will change. An additional criterion for including risks in this report is “human influence”. Only risks where humans can influence either the probability, the impact, or both, are included. For most risks both impact and probability can be affected, for example with nuclear war, where the number/size of weapons influences the impact and tensions between countries affects the probability. Other risks, such as a supervolcano, are included as it is possible to affect the impact through various mitigation methods, even if we currently cannot affect the probability. Risks that are susceptible to human influence are indirectly linked, because efforts to address one of them may increase or decrease the likelihood of another. 2.3.2 Why use “infinite impact” as a concept? The concept of infinity was chosen as it reflects many of the challenges, especially in economic theory, to addressing these risks as well as the need to question much of our current way of thinking. The concept of a category of risks based on their extreme impact is meant to provide a tool to distinguish one particular kind of risk from others. The benefit of this new concept should be assessed based on two things. First, does the category exist, and second, is the concept helpful in addressing these risks? The report has found ample evidence that there are risks with an impact that can end human civilisation and even all human life. The report further concludes that a new category of risk is not only meaningful but also timely. We live in a society where global risks with potentially infinite impacts increase in both number and probability according to multiple studies. Looking ahead, many emerging technologies which will certainly provide beneficial results, might also result in an increased probability of infinite impacts.26 Over the last few years a greater understanding of low probability or unknown probability events has helped more people to understand the importance of looking beyond the most probable scenarios. Concepts like “black swans” and “perfect storms” are now part of mainstream policy and business language.27 Greater understanding of the technology and science of complex systems has also resulted in a new understanding of potentially disruptive events. Humans now have such an impact on the planet that the term “the anthropocene” is being used, even by mainstream media like The Economist.28 The term was introduced in the 90s by the Nobel Prize winner Paul Crutzen to describe how humans are now the dominant force changing the Earth’s ecosystems.29 The idea to establish a well defined category of risks that focus on risks with a potentially infinite impact that can be used as a practical tool by policy makers is partly inspired by Nick Bostrom’s philosophical work and his introduction of a risk taxonomy that includes an academic category called “existential risks”.30 Introducing a category with risks that have a potentially infinite impact is not meant to be a mathematical definition; infinity is a thorny mathematical concept and nothing in reality can be infinite.31 It is meant to illustrate a singularity, when humanity is threatened, when many of the tools used to approach most challenges today become problematic, meaningless, or even counterproductive. The concept of an infinite impact highlights a unique situation where humanity itself is threatened and the very idea of value and price collapses from a human perspective, as the price of the last humans also can be seen to be infinite. This is not to say that those traditional tools cannot still be useful, but with infinite impacts we need to add an additional set of analytical tools. Life Value The following estimates have been applied to the value of life in the US. The estimates are either for one year of additional life or for the statistical value of a single life. – $50,000 per year of quality life (international standard most private and government-run health insurance plans worldwide use to determine whether to cover a new medical procedure) – $129,000 per year of quality life (based on analysis of kidney dialysis procedures by Stefanos Zenios and colleagues at Stanford Graduate School of Business) – $7.4 million (Environmental Protection Agency) – $7.9 million (Food and Drug Administration) – $6 million (Transportation Department) – $28 million (Richard Posner based on the willingness to pay for avoiding a plane crash) Source: Wikipedia: Value of life http://en.wikipedia.org/wiki/Value\_of\_life US EPA: Frequently Asked Questions on Mortality Risk Valuation http://yosemite.epa.gov/EE%5Cepa%5Ceed.nsf/webpages/MortalityRiskValuation.html Posner, Richard A. Catastrophe: risk and response. Oxford University Press, 2004 Some of the risks, including nuclear war, climate change and pandemics, are often included in current risk overviews, but in many cases their possible infinite impacts are excluded. The impacts which are included are in most cases still very serious, but only the more probable parts of the probability distributions are included, and the last part of the long tail – where the infinite impact is found – is excluded.32 Most risk reports do not differentiate between challenges with a limited impact and those with a potential for infinite impact. This is dangerous, as it can mean resources are spent in ways that increase the probability of an infinite impact. Ethical aspects of infinite impact The basic ethical aspect of infinite impact is this: a very small group alive today can take decisions that will fundamentally affect all future generations. “All future generations” is not a concept that is often discussed, and for good reason. All through human history we have had no tools with a measurable global impact for more than a few generations. Only in the last few decades has our potential impact reached a level where all future generations can be affected, for the simple reason that we now have the technological capacity to end human civilisation. If we count human history from the time when we began to practice settled agriculture, that gives us about 12,000 years.33 If we make a moderate assumption that humanity will live for at least 50 million more years34 our 12,000-year history so far represents 1/4200, or 0.024%, of our potential history. So our generation has the option of risking everything and annulling 99.976% of our potential history. Comparing 0.024% with the days of a person living to 100 years from the day of conception, this would equal less than nine days and is the first stage of human embryogenesis, the germinal stage.35 Two additional arguments to treat potentially infinite impacts as a separate category are: 36 1. An approach to infinite impacts cannot be one of trial-and-error, because there is no opportunity to learn from errors. The reactive approach – see what happens, limit damage, and learn from experience – is unworkable. Instead society must be proactive. This requires foresight to foresee new types of threat and willingness to take decisive preventative action and to bear the costs (moral and economic) of such actions. 2. We cannot necessarily rely on the institutions, morality, social attitudes or national security policies that developed from our experience of other sorts of risk. Infinite impacts are in a different category. Institutions and individuals may find it hard to take these risks seriously simply because they lie outside our experience. Our collective fear-response will probably be ill-calibrated to the magnitude of threat. Economic aspects of infinite impact and discounting In today’s society a monetary value is sometimes ascribed to human life. Some experts use this method to estimate risk by assigning a monetary value to human extinction.37 We have to remember that the monetary values placed on a human life in most cases are not meant to suggest that we have actually assigned a specific value to a life. Assigning a value to a human life is a tool used in a society with a limited supply of resources or infrastructure (ambulances, perhaps) or skills. In such a society it is impossible to save every life, so some trade-off must be made.38 The US Environmental Protection Agency explains its use like this: “The EPA does not place a dollar value on individual lives. Rather, when conducting a benefit-cost analysis of new environmental policies, the Agency uses estimates of how much people are willing to pay for small reductions in their risks of dying from adverse health conditions that may be caused by environmental pollution.” 39 The fact that monetary values for human lives can help to define priorities when it comes to smaller risks does not mean that they are suitable for quite different uses. Applying a monetary value to the whole human race makes little sense to most people, and from an economic perspective it makes no sense. Money helps us to prioritise, but with no humans there would be no economy and no need for priorities. Ignoring, or discounting, future generations is actually the only way to avoid astronomical numbers for impacts that may seriously affect every generation to come. In Catastrophe: Risk and Response, Richard Posner provides a cost estimate, based on the assumption that a human life is worth $50,000, resulting in a $300 tn cost for the whole of humanity, assuming a population of six billion. He then doubles the population number to include the value of all future generations, ending up with $600 tn, while acknowledging that “without discounting, the present value of the benefits of risk-avoidance measures would often approach infinity for the type of catastrophic risk with which this book is concerned.” 40 Discounting for risks that include the possibility of an infinite impact differs from risk discounting for less serious impacts. For example the Stern Review41 prompted a discussion between its chief author, Nicholas Stern, and William Nordhaus,42 each of whom argued for different discount levels using different arguments. But neither discussed a possible infinite climate impact. An overview of the discussion by David Evans of Oxford Brookes University highlighted some of the differing assumptions.43 Two things make infinite impacts special from a discounting perspective. First, there is no way that future generations can compensate for the impact, as they will not exist. Second, the impact is something that is beyond an individual preference, as society will no longer exist. Discounting is undertaken to allocate resources in the most productive way. In cases that do not include infinite impacts, discounting “reflects the fact that there are many high-yield investments that would improve the quality of life for future generations. The discount rate should be set so that our investable funds are devoted to the most productive uses.” 44 When there is a potentially infinite impact, the focus is no longer on what investments have the best rate of return, it is about avoiding the ultimate end. While many economists shy away from infinite impacts, those exploring the potentially extreme impacts of global challenges often assume infinite numbers to make their point. Nordhaus for example writes that “the sum of undiscounted anxieties would be infinite (i.e. equal to 1 + 1 +1 + … = ∞). In this situation, most of us would dissolve in a sea of anxiety about all the things that could go wrong for distant generations from asteroids, wars, out-of-control robots, fat tails, smart dust and other disasters.” 45 It is interesting that Nordhaus himself provides very good graphs that show why the most important factor when determining actions is a possible threshold (see below Figure 4 and 5). Nordhaus was discussing climate change, but the role of thresholds is similar for most infinite impacts. The first figure is based on traditional economic approaches which assume that Nature has no thresholds; the second graph illustrates what happens with the curve when a threshold exists. As Nordhaus also notes, it is hard to establish thresholds, but if they are significant all other assumptions become secondary. The challenge that Nordhaus does not address, and which is important especially with climate change, is that thresholds become invisible in economic calculations if they occur far into the future, even if it is current actions that unbalance the system and eventually push it over the threshold.46 Note that these dramatic illustrations rest on assumptions that the thresholds are still relatively benign, not moving us beyond tipping points which result in an accelerated release of methane that could result in a temperature increase of more than 8 °C, possibly producing infinite impacts.47 Calculating illustrative numbers By including the welfare of future generations, something that is important when their very existence is threatened, economic discounting becomes difficult. In this chapter, some illustrative numbers are provided to indicate the order of magnitude of the values that calculations provide when traditional calculations also include future generations. These illustrative calculations are only illustrative as the timespans that must be used make all traditional assumptions questionable to say the least. Still, as an indicator for why infinite impact might be a good approximation they might help. As a species that can manipulate our environment it could be argued that the time the human race will be around, if we do not kill ourselves, can be estimated to be between 1-10 million years – the typical time period for the biological evolution of a successful species48 – and one billion years, the inhabitable time of Earth.49 [FIGURE 4 OMITTED] [FIGURE 5 OMITTED] If we assume – 50 million years for the future of humanity as our reference, – an average life expectancy of 100 years50, and – a global population of 6 billion people51 – all conservative estimate – , we have half a million generations ahead of us with a total of 3 quadrillion individuals. Assuming a value of $50,000 per life, the cost of losing them would then be $1.5 ×1020, or $150 quintillion. This is a very low estimate, and Posner suggests that maybe the cost of a life should be “written up $28 million” for catastrophic risks52. Posner’s calculations where only one future generation is included result in a cost of $336 quadrillion. If we include all future generations with the same value, $28 million, the result is a total cost of $86 sextillion, or $86 × 1021. This $86 sextillion is obviously a very rough number (using one billion years instead of 50 million would for example require us to multiply the results by 20), but again it is the magnitude that is interesting. As a reference there are about 1011 to 1012 stars in our galaxy, and perhaps something like the same number of galaxies. With this simple calculation you get 1022 to 1024, or 10 to 1,000 sextillion, stars in the universe to put the cost of infinite impacts when including future generations in perspective.53 These numbers can be multiplied many times if a more philosophical and technology-optimistic scenario is assumed for how many lives we should include in future generations. The following quote is from an article by Nick Bostrom in Global Policy Journal: “However, the relevant figure is not how many people could live on Earth but how many descendants we could have in total. One lower bound of the number of biological human life-years in the future accessible universe (based on current cosmological estimates) is 1034 years. Another estimate, which assumes that future minds will be mainly implemented in computational hardware instead of biological neuronal wetware, produces a lower bound of 1054 human-brain-emulation subjective life-years.” 54 Likewise the value of a life, $28 million, a value that is based on an assessment of how individuals chose when it comes to flying, can be seen as much too small. This value is based on how much we value our own lives on the margin, and it is reasonable to assume that the value would be higher than only a multiplication of our own value if we also considered the risk of losing our family, everyone we know, as well as everyone else on the planet. In the same way as the cost increases when a certain product is in short supply, the cost of the last humans could be assumed to be very high, if not infinite. Obviously, the very idea to put a price on the survival of humanity can be questioned for good reasons, but if we still want to use a number, $28 million per life should at least be considered as a significant underestimation. For those that are reluctant or unable to use infinity in calculations and are in need of a number for their formulas, $86 sextillion could be a good initial start for the cost of infinite impacts. But it is important to note that this number might be orders of magnitude smaller than an estimate which actually took into account a more correct estimation of the number of people that should be included in future generations as well as the price that should be assigned to the loss of the last humans. 2.3.3 Infinite impact threshold (IIT) As we address very complex systems, such as human civilisation and global ecosystems, a concept as important as infinite impact in this report is that of infinity impact threshold. This is the impact level that can trigger a chain of events that results in the end of human civilisation. The infinite impact threshold (IIT) concept represents the idea that long before an actual infinite impact is reached there is a tipping point where it (with some probability) is no longer possible to reverse events. So instead of focusing only on the ultimate impact it is important to estimate what level of impact the infinity threshold entails. The IIT is defined as an impact that can trigger a chain of events that could result first in a civilisation collapse, and then later result in an infinite impact. Such thresholds are especially important to recognise in a complex and interconnected society where resilience is decreasing. Social and ecological systems are complex, and in most complex systems there are thresholds where positive feedback loops become self-reinforcing. In a system where resilience is too low, feedback loops can result in a total system collapse. These thresholds are very difficult to estimate and in most cases it is possible only to estimate their order of magnitude. As David Orrell and Patrick McSharry wrote in A Systems Approach to Forecasting: “Complex systems have emergent properties, qualities that cannot be predicted in advance from knowledge of systems components alone”. According to complexity scientist Stephen Wolfram’s principle of computational irreducibility, the only way to predict the evolution of such a system is to run the system itself: “There is no simple set of equations that can look into its future.” 55 Orrell and McSharry also noted that “in orthodox economics, the reductionist approach means that the economy is seen as consisting of individual, independent agents who act to maximise their own utility. It assumes that prices are driven to a state of near-equilibrium by the ‘invisible hand’ of the economy. Deviations from this state are assumed to be random and independent, so the price fluctuations are often modelled using the normal distribution or other distributions with thin tails and finite variance.” The drawbacks of an approach using the normal distribution, or other distributions with thin tails and finite variance, become obvious when the unexpected happens as in the recent credit crunch, when existing models totally failed to capture the true risks of the economy. As an employee of Lehman Brothers put it on August 11, 2007: “Events that models predicted would happen only once in 10,000 years happened every day for three days.” 56 [FIGURE 6 OMITTED] The exact level for an infinite impact threshold should not be the focus, but rather the fact that such thresholds exists and that an order of magnitude should be estimated.57 During the process of writing the report, experts suggested that a relatively quick death of two billion people could be used as a tentative number until more research is available.58 With current trends undermining ecological and social resilience it should be noted that the threshold level is likely to become lower as time progress. 2.3.4 Global F-N curves and ALARP In the context of global risks with potentially infinite impact, the possibility of establishing global F-N curves is worth exploring. One of the most common and flexible frameworks used for risk criteria divides risks into three bands: 59 1. Upper: an unacceptable/ intolerable region, where risks are intolerable except in extraordinary circumstances and risk reduction measures are essential. 2. Middle: an ALARP (“as low as reasonably practicable”) region, where risk reduction measures are desirable but may not be implemented if their cost is disproportionate to the benefit achieved. 3. Lower: a broadly acceptable/ negligible region, where no further risk reduction measures are needed. The bands are expressed by F-N curves. When the frequency of events which cause at least N fatalities is plotted against the number N on log–log scales, the result is called an F-N curve.60 If the frequency scale is replaced by annual probability, then the resultant curve is called an f-N curve. The concept for the middle band when using F-N curves is ALARP. It is a term often used in the area of safety-critical and safety-involved systems.62 The ALARP principle is that the residual risk should be as low as reasonably practicable. The upper band, the unacceptable/ intolerable region, is usually the area above the ALARP area (see figure 8) By using F-N curves it is also possible to establish absolute impact levels that are never acceptable, regardless of probability (Figure 7. Based on an actual F-n Curve showing an absolute impact level that is defined as unacceptable). This has been done in some cases for local projects. The infinite threshold could be used to create an impact limit on global F-N curves used for global challenges in the future. Such an approach would help governments, companies and researchers when they develop new technical solutions and when investing in resilience. Instead of reducing risk, such an approach encourages the building of systems which cannot have negative impacts above a certain level. Pros – Clearly shows relationship between frequency and size of accident – Allows judgement on relative importance of different sizes of accident – Slope steeper than -1 provides explicit consideration of multiple fatality aversion and favours concepts with lower potential for large fatality events – Allows company to manage overall risk exposure from portfolio of all existing and future facilities Cons – Cumulative expression makes it difficult to interpret, especially by non-risk specialists – Can be awkard to derive – May be difficult to use if criterion is exceeded in one area but otherwise is well below – Much debate about criterion lines Figure 7: Example of F-n curve showing different levels of risk 61 Figure 9: Pros and cons of F-N curves 63 46 Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 2.3 Global challenges and infinite impact practical guidance that can provide defined group of risks 2.3.5 A name for a clearly 10 100 1000 10000 10 10 10 10 10 10 10 10-2 -3 -4 -5 -6 -7 -8 -9 Number of Fatalities (N) Frequency (F) of Accidents with N or More Fatalities (Per Year) ALARP region Unacceptable Acceptable Today no established methodology exists that provides a constantly updated list of risks that threaten human civilisation, or even all human life. Given that such a category can help society to better understand and act to avoid such risks, and better understand the relation between these risks, it can be argued that a name for this category would be helpful.65 To name something that refers to the end of humanity is in itself a challenge, as the very idea is so far from our usual references and to many the intuitive feeling will be to dismiss any such thing. The concept used in this report is “infinity”. The reson for this is that many of the challenges relate to discussed. In one way the name is not very important so long as people understand the impacts and risks associated with it. Still, a name is symbolic and can either help or make it more difficult to get support to establish the new category. The work to establish a list of risks with infinite impact evolved from “existential risk”, the philosophical concept that inspired much of the work to establish a clearly defined group of risks. The reason for not using the concept “existential risk and impact” for this category, beside the fact that existential impact is also used in academic contexts to refer to a personal impact, is that the infinite category is a smaller subset of “existential risk” and this new category is meant to be used as a tool, not a scientific concept. Not only should the impacts in the category potentially result in the end of all human life, it should be possible to affect the probability and/or impact of that risk. There must also exist an agreed methodology, such as the one suggested in this report, that decides what risks belong and not belong on the list. Another concept that the category relates to is “global catastrophic risk” as it is one of the most used concepts among academics interested in infinite impacts. However it is vague enough to be used to refer to impacts from a few thousand deaths to the end of human civilisation. Already in use but not clearly defined, it includes both the academic concept existential risks and the category of risks with infinite impacts. macroeconomics and its challenges in relation to the kind of impacts that the risks in this report focus on. Further, the name clearly highlights the unique nature without any normative judgements. Still, infinity is an abstract concept and it might not be best communicate the unique group of risks that it covers to all stakeholders. In the same way as it can be hard to use singularity to describe a black hole, it can be difficult to use infinity to describe a certain risk. If people can accept that it is only from a specific perspective that the infinity concept is relevant it could be used beyond the areas of macroeconomics. Two other concepts that also have been considered during the process of writing this report are “xrisks” and “human risk of ruin”. Xrisk has the advantage, and disadvantage, of not really saying anything at all about the risk. The positive aspect is that the name can be associated with the general concept of extinction and the philosophical concept of existential risk as both have the letter x in them. The disadvantage is the x often represents the unknown and can therefore relate to any risk. There is nothing in the name that directly relates to the kind of impacts that the category covers, so it is easy to interpret the term as just unknown risks. Human risk of ruin has the advantage of having a direct link to a concept, risk of ruin, that relates to a very specific state where all is lost. Risk of ruin is a concept in use in gambling, insurance, and finance that can all give very important contributions to the work with this new category of risk. The resemblance to an existing concept that is well established could be both a strength and a liability. Below is an overview of the process when different names were Figure 8: Example of F-n curve showing an absolute impact level that is defined as unacceptable/ infinite. i.e no level of probability is acceptable above a certain level of impact, in this case 1000 dead 64 Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 47 2.3 Global challenges and infinite impact 3. 2. 1. 9. Unacceptable risks in different combinations, e.g. unacceptable global risks – This is probably not appropriate for two main reasons. First, it is a normative statement and the category aims to be scientific; whether these risks are unacceptable or not is up to the citizens of the world to decide. Second, the idea of risk is that it is a combination of probability times impact. If a risk is unacceptable is therefore also usually related to how easy it is to avoid. Even if a risk is small, due to relatively low probability and relatively low impact, but is very easy to address, it can be seen as unacceptable, in the same way a large risk can be seen as acceptable if it would require significant resources to reduce. There will not be a perfect concept and the question is what concept can find the best balance between being easy to understand, acceptable where policy decisions needs to be made and also acceptable for all key groups that are relevant for work in these area. During the process to find a name for this category inspiration has been found in the process when new concepts have been introduced; from irrational numbers and genocide to sustainable development and the Human Development Index. So far “infinite risk” can be seen as the least bad concept in some areas and “xrisks” and “human risk of ruin” the least bad in others. The purpose of this report is to establish a methodology to identify a very specific group of risks as well as continue to a process where these risks will be addressed in a systematic and appropriate way. The issue of naming this group of risks will be left to others. The important is that the category gets the attention it deserves. The three concepts are very different. Global catastrophic risk is possibly the most used concept in contexts where infinite impacts are included, but it is without any clear definition. Existential risk is an academic concept used by a much smaller group and with particular focus on future technologies. The category in this report is a tool to help decision makers develop strategies that help reduce the probability that humanity will end when it can be avoided. The relation between the three concepts can be illustrated with three circles. The large circle (1) represents global catastrophic risks, the middle one (2) existential risks and the small circle (3) the list of twelve risks in this report, i.e. risks where there are peer reviewed academic studies that estimate the probability of an infinite impact and where there are known ways to reduce the risk. A list that could be called infinite risks, xrisks, or human risk of ruin. Other concepts that are related to infinite impacts that could potentially be used to describe the same category if the above suggestions are not seen as acceptable concepts are presented below, together with the main reason why these concepts were not chosen for this report. 1. Risk of ruin – is a concept in gambling, insurance and finance relating to the likelihood of losing all one’s capital or affecting one’s bankroll beyond the point of recovery. It is used to describe individual companies rather than systems.66 2. Extinction risk – is used in biology for any species that is threatened. The concept is also used in memory/cognition research. It is a very dramatic term, to be used with care. These factors make it probably unsuitable for use by stakeholders accustomed to traditional risk assessment. 3. Astronomical risk – is seldom used scientifically, but when it is used it is often used for asteroids and is probably best reserved for them.67 4. Apocalyptic risk – could have been suitable, as the original meaning is apocálypsis, from the Greek ἀπό and καλύπτω meaning ‘un-covering’. It is sometime used, but in a more general sense, to mean significant risks.68 But through history and today it is mainly used for a religious end of time scenario. Its strong links to unscientific doom-mongers make it probably unsuitable for a scientific concept. 5. End-of-the-world risk - belongs to the irrational doomsday narratives and so is probably unsuitable for scientific risk assessments. 6. Extreme risk – is vague enough to describe anything beyond the normal, so it is probably unsuitable for risk assessments of this magnitude. 7. Unique risk – is even vaguer, as every risk is unique in some way. Probably best avoided in risk assessments. 8. Collapse risk – is based on Jared Diamond’s thinking.69 There are many different kinds of collapse and only a few result in infinite impact. 48 Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 2.3 Global challenges and infinite impact Estimations of impact Only literature where there is some estimation of impact that indicates the possibility of an infinite impact is included. Leading organisations’ priorities In order to increase the probability of covering all relevant risks an overview of leading organisations' work was conducted. This list was then compared with the initial list and subjected to the same filter regarding the possibility to affect the probability or impact. Possibility of addressing the risk Possibility of addressing the risk: From the risks gathered from literature and organisations, only those where the probability or impact can be affected by human actions are included. Expert review Qualitative assessment: Expert review in order to increase the probability of covering all relevant global risks. List of risks Result: List of risks with potentially infinite impacts. Relevant literature Identification of credible sources: search relevant literature in academic literature included in World of Knowledge and Google Scholar. 1 2 3 4 5 6 This chapter presents the methodology used to identify global risks with potentially infinite impact. Methodology overview In order to establish a list of global risks with potentially infinite impact a methodological triangulation was used, consisting of: – A quantitative assessment of relevant literature. – A strategic selection of relevant organisations and their priorities. – A qualitative assessment with the help of expert workshops. 2.4 Methodology 70 Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 49 2.4 Methodology The scientific review of literature was led by Seth Baum, Executive Director of the Global Catastrophic Risk Institute72 and research scientist at the Center for Research on Environmental Decisions, Columbia University.73 The methodology for including global risks with a potentially infinite impact is based on a scientific review of key literature, with focus on peer-reviewed academic journals, using keyword search of both World of Knowledge74 and Google Scholar75 combined with existing literature overviews in the area of global challenges. This also included a snowball methodology where references in the leading studies and books were used to identify other scientific studies and books. In order to select words for a literature search to identify infinite impacts, a process was established to identify words in the scientific literature connected to global challenges with potentially infinite impacts. Some words generate a lot of misses, i.e. publications that use the term but are not the focus of this report. For example “existential risk” is used in business; “human extinction” is used in memory/cognition. Some search terms produced relatively few hits. For example “global catastrophic risk” is not used much. Other words are only used by people within a specific research community: few use “existential risk” in our sense unless they are using Nick Bostrom’s work. The term “global catastrophe” was identified as a phrase that referred almost exclusively to extremely negative impacts on humans, by a diversity of researchers, not just people in one research community. A list of 178 relevant books and reports was established based on what other studies have referred to, and/or which are seen as landmark studies by groups interviewed during the process. They were selected for a closer examination regarding the challenges they include.76 The full bibliography, even with its focus on publications of general interest, is still rather long. So it is helpful to have a shorter list focused on the highlights; the most important publications based on how often they are quoted, how wellspread the content (methodology, lists, etc.) is and how often key organisations use them. The publications included must meet at least one of the following criteria: – Historical significance. This includes being the first publication to introduce certain key concepts, or other early discussions of global challenges. Publications of historical significance are important for showing the intellectual history of global challenges. Understanding how the state of the art research got to where it is today can also help us understand where it might go in the future. – Influential in developing the field. This includes publications that are highly cited77 and those that have motivated significant additional research. They are not necessarily the first publications to introduce the concepts they discuss, but for whatever reason they will have proved important in advancing research. – State of the art. This includes publications developing new concepts at the forefront of global challenges research as well as those providing the best discussions of important established concepts. Reading these publications would bring a researcher up to speed with current research on global challenges. So they are important for the quality of their ideas. – Covers multiple global challenges (at least two). Publications that discuss a variety of global challenges are of particular importance because they aid in identifying and comparing the various challenges. This process is essential for research on global risks to identify boundaries and research priorities. In order to identify which global challenges are most commonly discussed, key surveys were identified and coded. First, a list of publications that survey at least three global challenges was compiled, and they were then scanned to find which challenges they discussed. The publications that survey many global challenges were identified from the full bibliography. Publications from both the academic and popular literature were considered. Emphasis was placed on publications of repute or other significance.78 To qualify as a survey of global challenges, the publication had to provide an explicit list of challenges or to be of sufficient length and breadth for it to discuss a variety of challenges. Many of the publications are books or book-length collections of articles published in book form or as special issues of scholarly journals. Some individual articles were also included because they discussed a significant breadth of challenges. A total of 40 global challenge survey publications were identified. For authors with multiple entries (Bostrom with three and WEF with ten) each challenge was counted only once to avoid bias. review of key literature 71 2.4.1 A scientific 50 Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 2.4 Methodology 0 5 10 15 20 25 Climate Change Nuclear War Pandemic Biodiversity loss Asteroid / Comet / Meteor Volcano Genetic Engineering High Energy Physics Nanotech Resource Depletion Artificial Intelligence Chemical Pollution Ecological Catastrophe Biogeochem Government Failure Poverty System Failure Astronomic Explosion LULCC Biological Weapons Chemical Weapons Extraterrestrial Reject Procreation Computer Failure EM Pulse New Technology Ozone Depletion Dysgenics Ocean Acidification Interstellar Cloud Atmosphere Aerosols Phase Transition Simulation Unknown 21 18 17 15 14 14 13 13 13 13 11 11 11 8 8 8 8 7 7 5 5 5 5 4 4 4 4 3 3 2 1 1 1 1 In terms of authorship and audience, there are 17 academic publications, 9 popular publications, 1 government report, 3 publications written by academics for popular audiences. In terms of format, there are 15 books, 5 edited collections, 7 articles, 3 of miscellaneous format. Of the 40 publications identified, 22 were available at the time of coding. In addition, 10 Global Risks Reports from the World Economic Forum were coded and then gathered under one heading: “WEF Global Risk Report 2005-2014”. A list of 34 global challenges was developed based on the challenges mentioned in the publications. A spreadsheet containing the challenges and the publications was created to record mentions of specific challenges in each publication to be coded. Then each publication was scanned in its entirety for mentions of global challenges. Scanning by this method was necessary because many of the publications did not contain explicit lists of global challenges, and the ones that did often mentioned additional challenges separately from their lists. So it was not required that a global challenge be mentioned in a list for it to be counted – it only had to be mentioned somewhere in the publication as a challenge. Assessing whether a particular portion of text counts as a global challenge and which category it fits in sometimes requires some interpretation. This is inevitable for most types of textual analysis, or, more generally, for the coding of qualitative data. The need for interpretation in this coding was heightened by the fact that the publications often were not written with the purpose of surveying the breadth of global challenges, and even the publications that were intended as surveys did not use consistent definitions of global challenges. The coding presented here erred on the side of greater inclusivity: if a portion of text was in the vicinity of a global challenge, then it was coded as one. For example, some publications discussed risks associated with nuclear weapons in a general sense without specifically mentioning the possibility of large-scale nuclear war. These discussions were coded as mentions of nuclear war, even though they could also refer to single usages of nuclear weapons that would not rate as a global challenge. This more inclusive approach is warranted because many of the publications were not focused exclusively on global challenges. If they were focused on them, it is likely that they would have included these risks in their global challenge form (e.g., nuclear war), given that they were already discussing something related (e.g., nuclear weapons). Below are the results from the overview of the surveys. Figure 9: Number of times global challenges are included in surveys of global challenges Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 51 2.4 Methodology Climate Change Nuclear War Pandemic Biodiversity loss Asteroid / Comet / Meteor Volcano Genetic Engineering High Energy Physics Nanotech Resource Depletion Artificial Intelligence Chemical Pollution Ecological Catastrophe 21 18 17 15 14 14 13 13 13 13 11 11 11 0 25 20 15 10 5 dung beetle star trek zinc oxalate human extinction 0 200 400 600 800 1000 It should be noted that the literature that includes multiple global challenges with potentially infinite impact is very small, given the fact that it is about the survival of the human race. Experts in the field of global challenges, like Nick Bostrom, have urged policymakers and donors to focus more on the global challenges with infinite impacts and have used dramatic rhetoric to illustrate how little research is being done on them compared with other areas. However, it is important to note that many more studies exist that focus on individual global risks, but often without including low-probability high-impact outcomes.80 How much work actually exists on human extinction infinite impact is therefore difficult to assess. The list of risks found in the scientific literature was checked against a review of what challenges key organisations working on global challenges include in their material and on their webpages. This was done to ensure that no important risk was excluded from the list. The coding of key organisations paralleled the coding of key survey publications. Organisations were identified via the global catastrophic risk organisation directory published by the Global Catastrophic Risk Institute.82 They were selected from the directory if they worked on a variety of global challenges – at least three, and ideally more. The reason for focusing on those that work on multiple challenges is to understand which challenges they consider important and why. In contrast, organisations that focus on only one or two challenges may not Figure 10: The global challenges included ten times or more in surveys of global challenges on global challenges 81 organisations working 2.4.2 A review of Figure 11: Number of academic papers on various topics (listed in Scopus, August 2012) From the paper “Existential Risk Prevention as Global Priority” 79 52 Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 2.4 Methodology Climate Change Nuclear War Pandemic Resource Depletion Biological Weapons Computer Failure Government Failure Nanotech Chemical Weapons Artificial Intelligence Genetic Engineering System Failure Biodiversity loss Ecological Failure Poverty Volcano Asteroid / Comet / Meteor Astronomic Explosion Biogeochem Chemical Pollution Extraterrestrial High Energy Physics New Technology Ozone Depletion Atmospheric Aerosols Dysgenics EM Pulse Interstellar Cloud LULCC Ocean Acidification Phase Transition Reject Procreation Simulation Unknown 13 13 12 9 8 7 7 7 6 5 4 4 2 2 2 2 1 1 1 1 1 1 1 1 1 0 0 0 0 0 0 0 0 0 0 4 8 12 2 6 10 14 be able to adjust their focus according to which challenges they consider the most important. The organisation coding used the same coding scheme developed for coding survey publications. References to specific global challenges were obtained from organisations’ websites. Many have web pages which list the topics they work on. Where possible, references to global challenges were pulled from these pages. Additional references to these challenges were identified by browsing other web pages, including recent publications. While it is possible that some of these organisations have worked on global challenges not mentioned on the web pages that were examined, overall the main challenges that they have worked on have probably been identified and coded. So the results should give a reasonably accurate picture of what global challenges these organisations are working on. Organisations working with global challenges were initially selected on the basis of the literature overview. A snowball sampling was conducted based on the list of organisations identified, according to whether they claimed to work on global challenges and/or their web page contained information about “existential risk”, “global catastrophic risk”,“human extinction” or “greatest global challenges”. Cross-references between organisations and input during the workshops were also used to identify organisations. An initial list of 180 organisations which work with global challenges was established. Based on the production of relevant literature, which other organisations referred to the organisation, and/or are seen as influential by groups interviewed during the process, a short-list of organisations were selected for a closer examination regarding the challenges they work with. Then those working with multiple challenges were selected, resulting in a list of 19 organisations.83 Below is the overview of the results from the overview of key organisations working with multiple global challenges. The organisations working on global challenges vary widely in: 1. What they count as a global challenge 2. How systematically they identify global challenges; and 3. Their emphasis on the most important global challenges For most organisations working with global challenges there are no explanations for the methodology used to select the challenges. Only a few thought leaders, like Tower Watson and their Extreme Risk Report 2013, have a framework for the challenges and estimates of possible impacts. Figure 12: Global challenges that key organisations work with Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 53 2.4 Methodology Climate Change Nuclear War Pandemic Resource Depletion Biological Weapons Computer Failure Government Failure Nanotech Chemical Weapons Artificial Intelligence Genetic Engeneering System Failure Atmospheric Aerosols 13 13 12 9 8 7 7 7 6 5 4 4 0 4 8 12 2 6 10 14 In most cases there is neither a definition of the impact, nor a definition of the probability. The report that focuses on global risk which is probably best known is the WEF Global Risk Report. The WEF’s risk work, with many other groups’, is probably best described as belonging to the category of risk perception rather than risk assessment, where experts are asked to estimate risks, but without any clear definition of probability or impact. The more serious organisations, like the WEF, also clearly define what they do as discussing perception of risk, not a scientific assessment of the actual risk. The WEF describes its perception methodology as follows: “This approach can highlight areas that are of most concern to different stakeholders, and potentially galvanise shared efforts to address them.” 85 The question which people are asked to answer is: “What occurrence causes significant negative impact for several countries and industries?” 86 The respondents are then asked to provide a number on two scales from 1-4, one for impact and another for likelihood (within 10 years).87 It is then up to the respondent to define what 1-4 means, so the major value of the report is to track the changes in perception over the years. Such perception approaches are obviously very interesting and, as the WEF states, can influence actual probability as the readers’ decisions will be influenced by how different challenges are perceived. Still, it is important to remember that the report does not provide an assessment of the actual probability (0-100%) or an assessment of the impact (and not the impact on human suffering, as many respondents likely define risk in monetary terms for their own company or country). An overview of WEF reports from the last ten years indicates that the challenges that likely could happen when applying a five year horizon, like the first signs of climate change, governmental failure and traditional pandemic, are identified. On the other hand, challenges which have very big impacts but lower probability, like extreme climate change, nanotechnology, major volcanoes, AI, and asteroids, tend to get less, or no, attention. An important question to explore is whether a focus on the smaller but still serious impacts of global challenges can result in an increased probability of infinite impacts. For example, there are reasons to believe that a focus on incremental adaptation instead of significant mitigation could be a problem for climate change as it could result in high-carbon lock-in.88 Other research indicates that focus on commercially relevant smaller pandemics could result in actions that make a major pandemic more likely. It is argued that this could happen, for example, by encouraging increased trade of goods while investing in equipment that scans for the type of pandemics that are known. Such a system can reduce the probability for known pandemics while at the same time resulting in an increased probability for new and more serious pandemics.89 Figure 13: The top 12 global challenges that key organisations work with 2.4.3 Workshops global risks 2.5 The list of Two workshops were arranged where the selection of challenges was discussed, one with risk experts in Oxford at the Future of Humanity Institute and the other in London with experts from the financial sector. See Appendix 2 for agenda and participants. In both workshops the list of global challenges was discussed to see if any additional challenges should be included, or if there were reasons to exclude some from the list. No challenge was excluded at the workshops, but one was added. Although little research exists yet that is able to verify the potential impacts, the participants agreed to include Global System Collapse as a risk with possible infinite impact. There was agreement that further research is needed to clarify exactly what parts of the economic and political system could collapse and result in a potentially infinite outcome. The conclusion was that enough research exists to include such a collapse on the list. Based on the risks identified in the literature review and in the review of organisations and applying the criteria for potentially infinite impact, these risks were identified: 1. Extreme Climate Change 2. Nuclear War 3. Global Pandemic 4. Ecological Catastrophe 5. Global System Collapse 6. Major Asteroid Impact 7. Supervolcano 8. Synthetic Biology 9. Nanotechnology 10. Artificial Intelligence (AI) 11. Unknown Consequences 12. Future Bad Global Governance This is an initial list. Additional risks will be added as new scientific studies become available, and some will be removed if steps are taken to reduce their probability90 and/or impact so that they no longer meet the criteria. Four categories of global challenges The challenges included in this report belong to four categories. The first, current challenges, includes those where decisions today can result directly in infinite impacts. They are included even if the time between action and impact might be decades, as with climate change. The second category is exogenous challenges, those where decisions do not – currently – influence probability, but can influence impact. The third category is emerging challenges, those where technology and science are not advanced enough to pose a severe threat today, but where the challenges will probably soon be able to have an infinite impact. The technologies included in emerging challenges, including synthetic biology, nanotechnology and artificial intelligence (AI), will be critical to finding solutions to infinite impacts. Including these technologies should not be seen as an attempt to arrest them. If anything, the development of sustainable solutions should be accelerated. But it is equally important to create guidelines and frameworks to avoid their misuse, whether intentional or accidental. The fourth category, future global policy challenges, is of a different kind. It includes challenges related to the consequences of an inferior or destructive global governance system. This is especially important as well-intended actions to reduce global challenges could lead to future global governance systems with destructive impact. The first category, current challenges, includes: 1. Extreme Climate Change 2. Nuclear War 3. Global Pandemic 4. Ecological Catastrophe 5. Global System Collapse The second category, exogenous challenges, covers: 6. Major Asteroid Impact 7. Supervolcano Those in the third category, emerging challenges, are: 8. Synthetic Biology 9. Nanotechnology 10. Artificial Intelligence (AI) 11. Unknown Consequences The fourth category, global policy challenges, is: 12. Future Bad Global Governance not included 2.5.1 Risks Many risks could severely damage humanity but have not been included in this report. They were excluded for one or more of three reasons: 1. Limited impact. Many challenges can have significant local negative effects, without approaching the “2 billion negatively affected” criterion - tsunamis, for example, and chemical pollution. 2. No effective countermeasures. The report focuses on promoting effective interventions and so ignores challenges where nothing useful can be done to prevent or mitigate the impact, as with nearby gamma-ray bursts. 3. Included in other challenges. Many challenges are already covered by others, or have a damage profile so similar that there seemed no need to have a separate category. Population growth, for one, is an underlying driver significant for climate change and eco-system catastrophe, but without direct large-scale impacts. The challenges mentioned in the reviewed literature and organisations which are not included in this report often refer to economic damage such as “fiscal crises” or “unemployment”. While such impacts could have far-reaching consequences they are obviously of another magnitude than those included here. Some of the risks that were suggested and/or which exist in books and reports about global risks were rejected according to the criteria above. They include: 91 1. Astronomical explosion/nearby gamma-ray burst or supernova.92 These seem to be events of extremely low probability and which are unlikely to be survivable. Milder versions of them (where the source is sufficiently far away) may be considered in a subsequent report. ͢ Not included due to: No effective countermeasures 2. False vacuum collapse. If our universe is in a false vacuum and it collapses at any point, the collapse would expand at the speed of light destroying all organised structures in the universe.93 This would not be survivable. ͢ Not included due to: No effective countermeasures 3. Chemical pollution. Increasingly, there is particular concern about three types of chemicals: those that persist in the environment and accumulate in the bodies of wildlife and people, endocrine disruptors that can interfere with hormones, and chemicals that cause cancer or damage DNA. ͢ Not included due to: Limited impact 4. Dangerous physics experiments creating black holes/strangelets including high energy physics. These risks are of low probability94 and have been subsumed under “Uncertain Risks”. ͢ Not included due to: Included in other challenges 5. Destructive solar flares. Though solar flares or coronal mass ejections could cause great economic damage to our technological civilisation,95 they would not lead directly to mass casualties unless the system lacks basic resilience. They have been subsumed in the Global System Collapse category. ͢ Not included due to: Limited impact/included in other challenges 6. Moral collapse of humanity. Humanity may develop along a path that we would currently find morally repellent. The consequences of this are not clear-cut, and depend on value judgements that would be contentious and unshared.96 Some of these risks (such as global totalitarianism or enduring poverty) were included in the Governance Disasters category. ͢ Not included due to: included in other challenges 7. Resource depletion/LULCC/ Biodiversity loss. It has often been argued that declining resources will cause increased conflict.97 Nevertheless such conflicts would not be sufficient in themselves to threaten humanity on a large scale, without a “ System Collapse” or “Governance Disasters”. ͢ Not included due to: included in other challenges 8. New technological experimental risks. It is possible and plausible that new unexpected technological risks will emerge due to experiments. However, until we know what such risks may be, they are subsumed in the “Uncertain Risks” category. ͢ Not included due to: included in other challenges 9. Genocides. Though immense tragedies within specific areas, past genocides have remained contained in space and time and haven’t spread across the globe.98 ͢ Not included due to: Limited impact 10. Natural disasters. Most natural disasters, like tsunamis and hurricanes, have no likelihood of causing the extent of casualties100 needed for consideration on this list, as they are geographically limited and follow relatively mild impact probability curves. ͢ Not included due to: Limited impact 11. Computer failure/Cyberwarfare. Though an area of great interest and research, cyberwarfare has never caused mass casualties and would be unlikely to do so directly. It may be the subject of a future report, but in this report it is considered to be a subset of warfare and general destabilising risks. ͢ Not included due to: Limited impact/Submersed in other challenges 12. Underlying trends, e.g. overpopulation. Though increased population will put strains on resources and can contribute to increased probability for other challenges included in this report (such as climate change and ecosystem catastrophe), plausible population levels will not cause any direct harm to humanity.101 Population growth is however an important trend that is significantly affecting several risks. ͢ Not included due to: Limited impact/Submersed in other challenges Note: Important underlying trends are discussed in chapter 5. 2.5 The rseulting list of global risks using this methodology the infinite threshold impact levels beyond 2.6 Relationship between General mitigation and resilience Total short term casualties Civilisation collapse General pre-risk collapse countermeasures Post-risk collapse countermeasures Post-collapse external threats and risks Post-collapse politics Maintaining technology base Long-term reconstruction probability Anthropic effect Extinction Pre-risk rebuilding enablers (tech stores...) Social and ecosystem resilience Long term impact Post-risk politics Complex systems are often stable only within certain boundaries. Outside these boundaries the system can collapse and rapidly change to a new stable state, or it can trigger a process where change continues for a long time until a new stable state is found. Sometimes it can take a very long time for a system to stabilise again. Looking at all the biotic crises over the past 530 million years, a research team from Berkeley found an average of 10 million years between an extinction and a subsequent flourishing of life.102 What makes things difficult is that once a system is unstable, a small disaster can have knock-on effects – the death of one Austrian nobleman can result in an ultimatum which draws in neighbours until Australians end up fighting Turks and the First World War is well under way, to be followed by communism, the Second World War and the Cold War. The challenge of understanding complex systems includes the fact that many of them have multiple attractors, including what are called “strange attractors”.103 Changes are close to linear as long as the system does not change very much, but once it is pushed out of balance it will get closer to other attractors, and when those become strong enough the system will tend to move towards chaos until a new balance is achieved around the new attractor.104 None of the risks in this report is likely to result directly in an infinite impact, and some cannot do so physically. All the risks however are big enough to reach a threshold where the social and ecological systems become so unstable that an infinite impact could ensue, as the graph below shows. This graph and its accompanying text explain, how an event that reaches a threshold level could cascade into even worse situations, via civilisation collapse105 to human extinction. The graph also seeks to illustrate the importance of ensuring ecological and social resilience, the two major insurance policies we have against a negative spiral after a major impact that takes us beyond the infinite threshold. 2.6 Relations between impact levels beyond the infinite threshold 1. Social and ecosystem resilience. Resilient systems are naturally resistant to collapse, though this often comes at the cost of efficiency.106 The more resilient the system, the more likely it is to be able to adapt to even large disasters. Improving resilience ahead of time can improve outcomes, even if the nature of the disaster isn’t known. 2. General pre-risk collapse countermeasures. This category consists of all those measures put into place ahead of time to prevent civilisation collapse. It could include, for instance, measures to ensure continuity of government or prevent breakup of countries (or to allow these breakups to happen with the minimum of disruption). At the same time it should be noted that these kinds of measures could also trigger the breakdown. 3. General mitigation and resilience. This category consists of all measures that can reduce the impact of risks and prevent them getting out of hand (excluding social and ecosystem measures, which are important and general enough to deserve their own category). 4. Pre-risk rebuilding enablers. On top of attempting to prevent collapses, measures can also be taken to enable rebuilding after a collapse.107 This could involve building stores of food, of technology, or crucial reconstruction tools.108 Alternatively, it could involve training of key individuals or institutions (such as the crews of nuclear submarines) to give them useful post-collapse skills. 5. Long-term impact. Some risks (such as climate change) have strong long-term impacts after years or even decades. Others (such as pandemics) are more likely to have only a short-term impact. This category includes only direct longterm impacts. 6. Post-risk politics. The political structures of the post-risk world (governmental systems, conflicts between and within political groupings, economic and political links between groups) will be important in determining if a large impact leads ultimately to civilisation collapse or if recovery is possible. 7. Post-risk collapse countermeasures. These are the countermeasures that the postrisk political structures are likely to implement to prevent a complete civilisation collapse. 8. Maintaining a technology base. Current society is complex, with part of the world’s excess production diverted into maintaining a population of scientists, engineers and other experts, capable of preserving knowledge of technological innovations and developing new ones. In the simpler post-collapse societies, with possibly much lower populations, it will be a challenge to maintain current technology and prevent crucial skills from being lost.109 9. Post-collapse politics. Just as post-risk politics are important for preventing a collapse, post-collapse politics will be important in allowing a recovery. The ultimate fate of humanity may be tied up with the preservation of such concepts as human rights, the scientific method and technological progress. 10. Post-collapse external threats and risks. Simply because a risk has triggered the collapse of human civilisation, that does not mean that other risks are no longer present. Humanity will have much less resilience to deal with further damage, so the probability of these risks is important to determine the ultimate fate of humanity. 11. Anthropic effects. We cannot observe a world incapable of supporting life, because we could not be alive to observe it. When estimating the likelihood of disasters and recovery it is very important to take this effect into consideration and to adjust probability estimates accordingly.110 12. Long-term reconstruction probability. A post-collapse world will differ significantly from a preindustrial revolution world. Easy access to coal and oil will no longer be possible. In contrast, much usable aluminium will have been extracted and processed and will be left lying on the surface for easy use. Thus it will be important to establish how technically possible it may be to have a second industrial revolution and further reconstruction up to current capabilities without creating the problems that the first industrial revolution resulted in. “You may choose to look the other way but you can never say again that you did not know.” William Wilberforce Challenges 3. Twelve Global 60 Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 3. Twelve Global Challenges Extreme Climate Change Ecological Nanotechnology Nuclear War Catastrophe Global System Collapse Major Asteroid Impact Global Pandemic Future Bad Global Governance Super-volcano Synthetic Biology Artificial Intelligence Unknown Consequences Extreme Climate Change Ecological Nanotechnology Nuclear War Catastrophe Global System Collapse Major Asteroid Impact Global Pandemic Future Bad Global Governance Super-volcano Synthetic Biology Artificial Intelligence Unknown Consequences Extreme Climate Change Ecological Nanotechnology Nuclear War Catastrophe Global System Collapse Major Asteroid Impact Global Pandemic Future Bad Global Governance Super-volcano Synthetic Biology Artificial Intelligence Unknown Consequences Extreme Climate Change Ecological Nanotechnology Nuclear War Catastrophe Global System Collapse Major Asteroid Impact Global Pandemic Future Bad Global Governance Super-volcano Synthetic Biology Artificial Intelligence Unknown Consequences Extreme Climate Change Ecological Nanotechnology Nuclear War Catastrophe Global System Collapse Major Asteroid Impact Global Pandemic Future Bad Global Governance Super-volcano Synthetic Biology Artificial Intelligence Unknown Consequences Extreme Climate Change Ecological Nanotechnology Nuclear War Catastrophe Global System Collapse Major Asteroid Impact Global Pandemic Future Bad Global Governance Super-volcano Synthetic Biology Artificial Intelligence Unknown Consequences Extreme Climate Change Ecological Nanotechnology Nuclear War Catastrophe Global System Collapse Major Asteroid Impact Global Pandemic Future Bad Global Governance Super-volcano Synthetic Biology Artificial Intelligence Unknown Consequences Extreme Climate Change Ecological Nanotechnology Nuclear War Catastrophe Global System Collapse Major Asteroid Impact Global Pandemic Future Bad Global Governance Super-volcano Synthetic Biology Artificial Intelligence Unknown Consequences Extreme Climate Change Ecological Nanotechnology Nuclear War Catastrophe Global System Collapse Major Asteroid Impact Global Pandemic Future Bad Global Governance Super-volcano Synthetic Biology Artificial Intelligence Unknown Consequences Extreme Climate Change Ecological Nanotechnology Nuclear War Catastrophe Global System Collapse Major Asteroid Impact Global Pandemic Future Bad Global Governance Super-volcano Synthetic Biology Artificial Intelligence Unknown Consequences Extreme Climate Change Ecological Nanotechnology Nuclear War Catastrophe Global System Collapse Major Asteroid Impact Global Pandemic Future Bad Global Governance Super-volcano Synthetic Biology Artificial Intelligence Unknown Consequences Extreme Climate Change Ecological Nanotechnology Nuclear War Catastrophe Global System Collapse Major Asteroid Impact Global Pandemic Future Bad Global Governance Super-volcano Synthetic Biology Artificial Intelligence Unknown Consequences For the selection of events information from specialised bodies and scientific journals in the area of global risk was gathered.111 Using keywords related to the various risks, a global selection of events was sought, along with original sourcing in academic or official sources. The list of events was then ranked based on their risk relevance, i.e. their effect on the probability and/or the impact of the challenge. To finalise the list, a group of experts was consulted by email and a draft overview of the challenges was presented at a workshop at the Future of Humanity Institute (FHI) in Oxford, where additional input was provided on selection and content. Issue experts were then consulted before the final list of events was established. 112 Four categories were used to classify the different events: 1. Policy: Global or national policy initiatives that affect probability and/or impact 2. Event: The challenge is made real in some way that is relevant for probability and/or impact 3. Research: New knowledge about probability and/or impact 4. Initiative: A stakeholder/group addressing the challenge in concrete ways to reduce probability and impact Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 61 3. Twelve Global Challengesof risks Extreme Climate Change Ecological Nanotechnology Nuclear War Catastrophe Global System Collapse Major Asteroid Impact Global Pandemic Future Bad Global Governance Super-volcano Synthetic Biology Artificial Intelligence Unknown Consequences 3.1Current risks Climate Change 3.1.1 Extreme Climate change is a significant and lasting change in the statistical distribution of weather patterns over periods ranging from decades to millions of years. It may be a change in average weather conditions, or in the distribution of weather around the average conditions (i.e., more or fewer extreme weather events). Extreme climate change is used to distinguish from the impacts beyond the dangerous climate that a 2° C temperature rise is expected to result in.113 62 Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 3.1 Current risks 3.1.1.1 Expected impact disaggregation 3.1.1.2 Probability Many of the expected impacts of climate change are well known, including a warming climate, more severe storms and droughts, rising sea levels, ocean acidification, and damage to vulnerable ecosystems.114 As for all risks there are uncertainties in the estimates, and warming could be much more extreme than the middle estimates suggest. Models tend to underestimate uncertainty115 (especially where impact on humanity is concerned,116 where the effect also depends on modellers’ choices such as the discount rate117), so there is a probability118 that humanity could be looking at a 4°C119 or even 6°C120 warming in the coming decades. This could arise from positive feedback loops, such as the release of methane from permafrost121 or the dieback of the Amazon rainforests,122 that strengthen the warming effect. So far, efforts at curbing emissions have been only moderately successful and are still very far from what is needed.123 The impact of global warming, whether mild or severe, would be felt most strongly in poorer countries. Adaptation that can address significant warming is often very expensive,124 and many of the poorest countries are in the tropics and sub-tropics that would be hardest hit (they could become completely uninhabitable for the highest range of warming125). Mass deaths and famines, social collapse and mass migration are certainly possible in this scenario. Combined with shocks to the agriculture and biosphere-dependent industries of the more developed countries, this could lead to global conflict and possibly civilisation collapse – to the extent that many experts see climate change as a national security risk126. Further evidence of the risk comes from indications that past civilisation collapses have been driven by climate change.127 Extinction risk could develop from this if the remaining human groups were vulnerable to other shocks, such as pandemics, possibly exacerbated by the changed climate.128 There is some evidence of 6°C climate change causing mass extinction in the past,129 but a technological species such as ourselves might be more resilient to such a shock. A unique feature of the climate change challenge is what is called geo-engineering.130 Though this could - if it works - reduce many impacts at a relatively low cost, it would not do so evenly. Geo-engineering would possibly reduce the impacts of climate change in some countries, benefitting them while leaving others to suffer.131 This could lead to greater political instability. One of the most popular geo-engineering ideas – stratospheric sulphate aerosols – suffers from the weakness that it must be continuous. 132 If for any reason it stopped (such as a civilisation collapse), warming would resume at a significantly higher pace, reaching the point where it would have been without geo-engineering. The speed of this rebound would put extra pressure on the ecosystem and the world’s political system. So the biggest challenge is that geoengineering may backfire and simply make matters worse.134 Five important factors in estimating the probabilities and impacts of the challenge: 1. The uncertainties in climate sensitivity models, including the tail. 2. The likelihood - or not - of global coordination on controlling emissions. 3. The future uptake of low-carbon economies, including energy, mobility and food systems. 4. Whether technological innovations will improve or worsen the situation, and by how much. 5. The long-term climate impact caused by global warming. Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 63 3.1 Current risks CLIMATE CHANGE Climate research Pre-warming mitigation efforts Pre-warming collapse countermeasures Climate warfare Collapse of geoengineering projects New, polluting, uses for carbon products Low-carbon economies Geoengineering Technological innovations Research in emmision-reducing technologies Global coordination Economic transformations Research in mitigation and adaptation Moderate climate change Global poverty Extreme climate change Feedback loops Carbon emissions Climate change mitigation and adaptation Direct casualties Political instability in vulnerable nations Agriculture disruption Disruption to world politics and economy Ecosystem damage (e.g. ocean acidification) Post warming politics Long-term climate effects Forced migration Total short-term casualties Meta-uncertainty on how to predict the international political process Meta-uncertainty on the true uncertainty in climate change models Increased storms, flooding and natural disaters Civilization collapse Easily visible effects of climate change Extinction Uncertain events Key Meta-uncertainties Risk events Direct impacts Indirect impacts Current intervention areas Bad decisions Accidents Severe impacts GOVERNANCE DISASTERS Global povety Global instability New system of governance Smart sensors Global coordination Improvements to global governance Deliberate attempts to construct world dictatorship Technological innovations Enduring poverty Not achieving important ethical goals Climate change Lack of human flourishing Undesirable world system (e.g. global dictatorship) Global pollution Disruption to world politics and economy Total short-term casualties Collapse of world system Post-disaster politics General mitigation effort Long-term negative effects Civilisation collapse Extinction Failing to solve important problems Making things worse Uncertain events Key Meta-uncertainties Risk events Direct impacts Indirect impacts Current intervention areas Bad decisions Accidents Severe impacts Meta-uncertainty on tradeoffs between e.g. poverty, survival, freedom 64 Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 3.1 Current risks 1. Research which further refines our understanding of climate change and geo-engineering ideas will be essential in predicting change, preparing for it, and potentially reversing it. On the negative side, climate science research may allow the possibility of climate change tools being used for warfare. 2. Global poverty will affect both the vulnerability of many nations to the effects of climate change, and the likelihood of achieving global coordination earlier rather than later. 3. Pre-extreme warming mitigation efforts will affect the level of impact from climate change. 4. Pre-warming collapse countermeasures will affect the likelihood of civilisation collapse. 5. Research into mitigation and adaptation is necessary for effective implementation of either approach. 6. Research into emission-reducing technologies (such as alternative energies) will be important for transitioning to a low carbon economy. 7. Global coordination and cooperation will be key to funding mitigation/ adaptation research and development, and for the global control of carbon emissions or transitioning to a global low carbon economy. 8. Climate warfare is possible if geoengineering and climate modification methods can be harnessed by nations to harm others. 9. New, more polluting uses of carbon would, if they had a strong economic rationale, put upwards pressure on carbon emissions. 10. The direct casualties of limited global warming are likely to be few, as humans can adapt to many different temperatures and climates. The indirect effect can however be significant, e.g. migration, starvation, extreme weather. 11. Climate change is likely to cause extensive ecosystem damage, such as ocean acidification and pressure on many sensitive species that cannot easily adapt to temperature changes. 12. Agriculture will be disrupted by increased temperature. 13. The direct and indirect effects of climate change will have a great impact on the world’s political and economic systems, which will in turn determine the severity of the changes. 14. Many nations will be made politically vulnerable to the direct and indirect impacts of climate change, putting great pressure on their political systems and institutions. 15. Climate change will cause an increase in storms, floods, and other natural disasters. If political stability is maintained, most of the casualties are likely to result from these factors. 16. Forced migration from unstable or disrupted areas will put further pressure on more stable areas. 17. The long-term impact of climate change (including further carbon emissions and warming) will be important for determining the risk of collapse and subsequent rebuilding possibilities. 18. Attempts to mitigate and adapt to climate change will be important for reducing the severity of climate change’s impact. 19. The level of carbon emissions is the driver of climate change, and will be crucial in determining its ultimate impact. 20. Feedback loops will be important in determining whether carbon emissions are self-damping or self-forcing (i.e. whether an extra ton of CO2 emissions is likely to result in more or less than a ton in the atmosphere). 21. Transitioning to low carbon economies will be crucial for reducing emissions without disrupting the world’s political or economic systems. 22. Geo-engineering offers the possibility of decreasing carbon concentration in the atmosphere alongside, or instead of, emission reductions. But it may make climate warfare a possibility. 23. If geo-engineering projects collapse in the middle of implementation, this could lead to strong warming over a dangerously short period of time. 24. Technological innovations will be crucial for transitioning to low carbon economies or allowing geo-engineering. But they may also result in new, carbon-intensive innovations, which, if sufficiently profitable, could push emissions up. 25. Some level of changes to the standard economic system may be needed to transition to low carbon economies. 26. Easily visible impacts of climate change may be instrumental in pushing better global coordination on the issue. 27. The political systems in place as warming increases will determine how well the world copes with a hotter planet. 28. Climate models are extremely detailed and inevitably uncertain. But the real level of uncertainty includes uncertainties about the models themselves. 29. The course of international politics is extremely hard to predict, even for political scientists.135 Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 65 3.1 Current risks during 2013 3.1.1.3 Main events 19-Apr-13: Launch of the report “Unburnable Carbon 2013: Wasted capital and stranded assets” 136 – Research To constrain the rise in global average temperature to less than 2°C above pre-industrial levels, a maximum of around 565 – 886 billion tonnes (Gt) of carbon dioxide could be emitted before 2050.137 The world’s proven fossil fuel reserves amount to 2,860 Gt of CO2, however, and are viewed as assets by companies and countries. Since it is likely that these assets cannot be realised, these entities are over-valued at current prices – arguably, a “carbon bubble.” The report provides evidence that serious risks are growing for highcarbon assets, and aims to help investors and regulators manage these risks more effectively and prepare for a global agreement on emissions reductions. It indirectly highlights part of the challenge of emissions reductions: they will mean the loss of highly valuable assets to corporations and governments. 02-May-13: CO2 at 400 PPM for the first time in > 800,000 years138 – Event The Mauna Loa carbon dioxide record, also known as the “Keeling Curve,” is the world’s longest unbroken record of atmospheric CO2 concentrations. It recently reached 400 ppm (parts per million) of CO2. Such concentrations have not been reached for at least 800,000 years,139 placing humanity in a historically unprecedented situation. Prior to the Industrial Revolution, natural climate variations caused atmospheric CO2 to vary between about 200 ppm during ice ages and 300 ppm during the warmer inter-glacial periods. The last time concentrations were as high as they are now seems to have been during the Mid-Pliocene, about 3 million years before the present when temperatures were 2-3°C warmer, and in which geological evidence and isotopes agree that sea level was at least 15 to 25 m above today’s levels with correspondingly smaller ice sheets and lower continental aridity.140 21-May-13: China agrees to impose carbon targets by 2016141 – Policy Since China is the world’s greatest emitter of CO2,142 any reduction steps it takes can have a substantial impact. It has announced a “National Low Carbon Day“,143 a “series of major promotional events to improve awareness and get the whole society to address climate change.” More practically, the Chinese government has agreed to impose carbon targets by 2016 - a ceiling on greenhouse gas emissions.144 Figure 14-15, Source: Scripps Institution of Oceanography, via http://blogs.scientificamerican.com/ observations/2013/05/09/400-ppm-carbon-dioxide-in-the-atmosphere-reaches-prehistoric-levels 66 Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 3.1 Current risks 22-May-13: Private Sector Initiative - database of actions on adaptation145 – Initiative Global warming is an externality146 – a consequence of business decisions made by entities that do not bear the full cost of what they decide – so the drive to mitigate its effects is more likely to come from governmental or supra-governmental organisations. Nevertheless, the private sector has been involved in mitigation attempts for a variety of reasons, from investment opportunities to public relations. The United Nations Framework Convention on Climate Change (UNFCCC) maintains a database of some of these attempts, ranging from Ericsson’s enabling access to climate services in Uganda, through BASF’s development of new technologies for food security, Allianz insurers rewarding sustainable business practices, all the way to Chiles de Nicaragua’s attempts to enable small agro-exporters to adapt to climate change – and many more. The potential opportunities for private companies are listed as: – New market opportunities and expansion; – Development of climate-friendly goods and services; – Potential cost savings; – Risk reduction measures, including physical operations; – Climate proofing the supply chain; – Enhanced corporate social responsibility. 27-Sep-13: IPCC report: “Climate Change 2013: The Physical Science Basis” 147 – Research The 5th IPCC report “considers new evidence of climate change based on many independent scientific analyses from observations of the climate system, palaeoclimate archives, theoretical studies of climate processes and simulations using climate models.” It concludes that: – Warming of the climate system is unequivocal, and since the 1950s many of the observed changes are unprecedented over decades to millennia. The atmosphere and oceans have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased. – Human influence on the climate system is clear. This is evident from the increasing greenhouse gas concentrations in the atmosphere, positive radiative forcing, observed warming, and understanding of the climate system. It is extremely likely that human influence has been the dominant cause of the observed warming since the mid-20th century. – Each of the last three decades has been successively warmer at the Earth’s surface than any preceding decade since 1850. – Over the last two decades, the Greenland and Antarctic ice sheets have been losing mass, glaciers have continued to shrink almost worldwide, and Arctic sea ice and Northern Hemisphere spring snow cover have continued to decrease in extent. – The rate of sea level rise since the mid-19th century has been larger than the mean rate during the previous two millennia (high confidence). Over the period 1901 to 2010, global mean sea level rose by 0.19 [0.17 to 0.21] m. – The atmospheric concentrations of carbon dioxide, methane, and nitrous oxide have increased to levels unprecedented in at least the last 800,000 years. Carbon dioxide concentrations have increased by 40% since pre-industrial times, primarily from fossil fuel emissions and secondarily from net land use change emissions. The report further predicted, amongst other points, that: – Continued emissions of greenhouse gases will cause further warming and changes in all components of the climate system. Limiting climate change will require substantial and sustained reductions of greenhouse gas emissions. – The oceans will continue to warm during the 21st century. Heat will penetrate from the surface to the deep ocean and affect ocean circulation. Further uptake of carbon by the oceans will increase ocean acidification. Global mean sea level will continue to rise during the 21st century. – It is very likely that Arctic sea ice cover will continue to shrink and become thinner. Global glacier volume will further decrease. – Most aspects of climate change will persist for many centuries even if emissions of CO2 are stopped. Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 67 3.1 Current risks 27-Sep-13: Launch of the Global Risk and Opportunity Indicator (GROI) 148 – Research Launched by the Global Challenge Foundation, this Indicator is a web tool for illustrating quantified risks, with the objective of increasing awareness about global risks and opportunities and helping guide the changes required in the global governance system. The site is still under construction; the Foundation’s aims are to achieve, by the end of 2014: 1. An interactive Global Risk & Opportunity Indicator that allows users to calculate the probability for any global warming, between one and ten degrees Celsius, at different greenhouse gas concentrations. The indicator will then be further developed to illustrate interdependencies with other global risks and highlight opportunities for minimising the risks. Subsequent development will allow users to change different underlying assumptions and see the corresponding change in risk. 2. Methodology and data to estimate probabilities for a number of climate impacts at different temperature levels, e.g., sea level rise, droughts, flooding and heat waves, as well as to explore the risk of runaway global warming. 3. Methodology and data to estimate the probability of existential climate threats, i.e., to estimate the risk that climate change impacts pose a significant threat to human civilisation – defined as a serious negative impact on at least two billion people. 23-Nov-13: Limited progress at Warsaw COP 19 climate negotiations 149 – Policy The global environment can be considered a global public good (i.e. non-excludable and non-rivalrous).150 Economic theory claims that such goods will be undersupplied by the market.151 Hence the importance of trans-national negotiations to address climate change. Despite the importance of the subject, the main achievement of the Warsaw negotiations was to keep talks on track for more negotiations in 2015.152 Though there was general agreement on the necessity of cutting carbon emissions, the dispute was over how to share the burden of doing so. In this instance, the debate was between more- and less-developed countries, with the latter demanding compensation from the former to help them cope with the burden of reducing emissions. That particular dispute was papered over,153 but similar ones will be likely in future due to the range of different actors and their divergent agendas.154 03-Dec-13 Abrupt Impacts of Climate Change: Anticipating Surprises155 – Research Climate change has been developing gradually, at least on the human scale156 (though very rapidly on a geological timescale157). This may not continue, however: this paper looks at the potential for abrupt changes in physical, biological, and human systems, in response to steady climate change. It highlights two abrupt changes that are already under way: the rapid decline in sea ice158 and the extinction pressure on species.159 On the other hand, some widely discussed abrupt changes – the rapid shutdown of the Atlantic Meridional Overturning Circulation160 and the rapid release of methane from either thawing permafrost161 or methane hydrates162 – are shown to be unlikely to occur this century. The report argues that large uncertainties about the likelihood of some potential abrupt changes163 highlight the need for expanded research and monitoring, and propose an abrupt change early warning system. The aim would be to foresee abrupt change before it occurs, and reduce the potential consequences. 68 Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 3.1 Current risks Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 69 3.1 Current risks Extreme Climate Change Ecological Nanotechnology Nuclear War Catastrophe Global System Collapse Major Asteroid Impact Global Pandemic Future Bad Global Governance Super-volcano Synthetic Biology Artificial Intelligence Unknown Consequences 3.1 Current risks 3.1.2 Nuclear War After their use in Hiroshima and Nagasaki nuclear weapons have never been used in a conflict, but because they are extremely powerful and could cause destruction throughout the world, the possibility of nuclear war has had a great effect on international politics. 164 70 Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 3.1 Current risks 3.1.2.1 Expected impact disaggregation 3.1.2.2 Probability The likelihood of a full-scale nuclear war between the USA and Russia has probably decreased in recent decades due to some improvements in relations between these two countries and reductions in the size of their arsenals. Still, the potential for deliberate or accidental165 nuclear conflict has not been removed, with some estimates putting the risk of nuclear war in the next century or so at around 10%166 – it may have been mostly down to luck that such a war did not happen in the last half century167. A nuclear war could have a range of different impacts. At the lowest end is the most obvious and immediate impact: destruction and death in major cities across the world, due to the explosions themselves and the radioactive fallout. But even if the entire populations of Europe, Russia and the USA were directly wiped out in a nuclear war – an outcome that some studies have shown to be physically impossible168, given population dispersal and the number of missiles in existence169 – that would not raise the war to the first level of impact, which requires > 2 billion affected.170 A larger impact would depend on whether or not the war triggered what is often called a nuclear winter or something similar.171 The term refers to the creation of a pall of smoke high in the stratosphere that would plunge temperatures below freezing around the globe and possibly also destroy most of the ozone layer.172 The detonations would need to start firestorms in the targeted cities, which could lift the soot up into the stratosphere.173 There are some uncertainties about both the climate models and the likelihood of devastating firestorms,174 but the risks are severe and recent models175 have confirmed the earlier176 analysis. Even a smaller nuclear conflict (between India and Pakistan, for instance) could trigger a smaller nuclear winter which would place billions in danger.177 The disintegration of the global food supply would make mass starvation and state collapse likely. As the world balance of power would be dramatically shifted and previous ideological positions called into question, large-scale war would be likely. This could lead to a civilisation collapse. Extinction risk is only possible if the aftermath of the nuclear war fragments and diminishes human society to the point where recovery becomes impossible178 before humanity succumbs179 to other risks, such as pandemics.180 Five important factors in estimating the probabilities and impacts of the challenge: 1. How relations between current and future nuclear powers develop. 2. The probability of accidental war. 3. Whether disarmament efforts will succeed in reducing the number of nuclear warheads. 4. The likelihood of a nuclear winter. 5. The long-term effects of a nuclear war on climate, infrastructure and technology. Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 71 3.1 Current risks NUCLEAR WAR US-Russia relations Relations between future major nuclear powers Number of future major nuclear powers Meta-certainty of changes in the military technology Meta-certainty of political predictions Disarmament efforts Proliferation: desire for nuclear weapons Proliferation: building nuclear weapons Number of future small nuclear powers Relations between future nuclear powers Relations between current nuclear powers Nuclear attack Nuclear attack Full-scale Nuclear War Disruption to world politics and economy War casualties Firestorm risks Firestorm risks Nuclear Winter Small Nuclear Winter Post-war politics Pre-war casualty countermeasures (bunkers, food...) Long-term impact Extinction Civisation collapse Total short term casualties War casualties Nuclear accidents or misunderstandings Small-scale Nuclear War Nuclear terrorism Nuclear security Uncertain events Key Meta-uncertainties Risk events Direct impacts Indirect impacts Current intervention areas Bad decisions Accidents Severe impacts GOVERNANCE DISASTERS Global povety Global instability New system of governance Smart sensors Global coordination Improvements to global governance Deliberate attempts to construct world dictatorship Technological innovations Enduring poverty Not achieving important ethical goals Climate change Lack of human flourishing Undesirable world system (e.g. global dictatorship) Global pollution Disruption to world politics and economy Total short-term casualties Collapse of world system Post-disaster politics General mitigation effort Long-term negative effects Civilisation collapse Extinction Failing to solve important problems Making things worse Uncertain events Key Meta-uncertainties Risk events Direct impacts Indirect impacts Current intervention areas Bad decisions Accidents Severe impacts Meta-uncertainty on tradeoffs between e.g. poverty, survival, freedom 72 Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 3.1 Current risks 1. The success or failure of disarmament will determine the number of nuclear warheads available for a future nuclear conflict. 2. The first step of proliferation is countries desiring to possess nuclear weapons. Various political interventions may reduce or increase this desire. 3. The second step of proliferation is countries building nuclear weapons. Various mechanisms, agreements and inspections may be relevant 4. Nuclear terrorism may be the trigger of a larger nuclear conflict, especially if the detonation is misinterpreted as a traditional attack. 5. The security of nuclear weapons and materials affects both the probability of nuclear terrorism and the control likelihood of nuclear accidents. 6. The relations between future nuclear powers will be the major determinant of whether a nuclear war breaks out. 7. The relations between current nuclear powers will be a major determinant of the relations between future nuclear powers. 8. The relations between future major nuclear powers will be the major component of determining whether a major nuclear war breaks out. 9. Relations between the USA and Russia (the only current major nuclear powers) will be a major determinant of the relations between future major nuclear powers. 10. Pre-war countermeasures (such as nuclear bunkers and food stores) can help mitigate the casualties of a smaller nuclear conflict. 11. A small-scale nuclear war could start with an attack by one or more nuclear powers. 12. A full-scale nuclear war could start with an attack by one or more major nuclear powers. 13. Aside from attacks, the other way a nuclear war could start would be through accidental firings or misinterpretations of other incidents. 14. Firestorms caused by burning cities are one of the main ways a nuclear conflict could cause major climate disruption, and hence high casualties. 15. The direct war casualties from a nuclear conflict are likely to be small compared with the potential climate effects. 16. A nuclear winter is the way in which a nuclear conflict could have the most damaging effects on the world. 17. Even a smaller nuclear conflict could trigger a smaller nuclear winter that could have major disruptive effects on agriculture and hence human survival. 18. Any war will have a disruptive impact on the world’s politics and economy. A nuclear conflict – possibly accompanied by a nuclear winter – even more so. 19. The long term impact of nuclear winter, infrastructure disruption, and possibly radiation, will determine the likelihood of collapse and rebuilding. 20. Since a nuclear power must be one of the parties to a nuclear war, the number of the former affects the probability of the latter. 21. Since a major nuclear power must be one of the parties to a major nuclear war, the number of the former affects the probability of the latter. 22. Post-war politics will be determined by the war, the disruption it caused, and the number of casualties it inflicted. 23. Unlike other risks, nuclear weapons are targeted by humans, so may take out important parts of the world’s infrastructure (and conventional weapons used in a conflict may have the same effect). 24. Unlike other risks, nuclear weapons are targeted by humans, so may take out important parts of the world’s technology and research base (and conventional weapons used in a conflict may have the same effect). 25. Maintaining a technology base will be complicated by the possible targeting of infrastructure and the technology base during a conflict. 26. The further development of military technology is hard to predict. The current balance of power under MAD (mutually assured destruction) is based on certain assumptions about the effectiveness of nuclear weapons, such as second strike capability. If this were removed (such as by effective submarine detection, or anti-ballistic missile shields), the effect on the balance of power is hard to predict. 27. The course of international politics is extremely hard to predict, even for political scientists.181 Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 73 3.1 Current risks during 2013 3.1.2.3 Main events 12-Feb-13: North Korea carries out third, largest nuclear test 182 – Event On 12 February 2013, North Korea carried out its third nuclear test. The test was condemned across the world, 183 and led to increased sanctions184 against the already isolated nation.185 North Korea is the only nation to have withdrawn from the Nuclear NonProliferation Treaty,186 and is the only country to have conducted nuclear tests in the 21st century, starting in 2006, 187 as well as developing a ballistic missile capability.188 It has also been involved in the export of weapons technology, undermining the Treaty.189 Diplomatic attempts to deal with North Korea (especially on the part of the United States) have generally been inconsistent and unsuccessful.190 Though the situation remains a potential flashpoint for conventional and nuclear conflict, and its collapse could have disastrous consequences191 (including the possibility of “loose nukes” becoming available to various groups), it should be noted that the “North Korean problem” has existed in one form or another since the end of the Korean War in 1953, without erupting into open conflict.192 04-Mar-13: Conference: Humanitarian Impact of Nuclear Weapons 193 – Policy On 4 and 5 March 2013, the Norwegian Minister of Foreign Affairs, Espen Barth Eide, hosted an international conference on the humanitarian impact of nuclear weapons. The conference heard presentations on the effects of nuclear weapons detonations. Three key points emerged: – It is unlikely that any state or international body could address the immediate humanitarian emergency caused by a nuclear weapon detonation in an adequate manner and provide sufficient assistance to those affected. Moreover, it might not be possible to establish such capacities at all. – The historical experience from the use and testing of nuclear weapons has demonstrated their devastating immediate and long-term effects. While political circumstances have changed, the destructive potential of nuclear weapons remains. – The effects of a nuclear weapon detonation, irrespective of cause, will not be limited by national borders, and will affect states and people to significant degrees, regionally as well as globally. A number of states wished to explore these issues further, and Mexico said it would host a follow-up conference.194Figure 16, Source: Wikimedia Commons, http://en.wikipedia.org/wiki/ File:Worldwide\_nuclear\_testing.svg CC-BY-SA license. Worldwide nuclear testing, 1945-2013 74 Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 3.1 Current risks 16-May-13: Revealed: The USSR and US Came Closer to Nuclear War Than Was Thought 195 – Research Documents recently released under a FOIA (US Freedom Of Information Act) request show that the risk of nuclear conflict between the superpowers was higher than realised at the time. The large-scale 1983 NATO nuclear exercises Able Archer 83” spurred “a high level of Soviet military activity, with new deployments of weapons and strike forces.” This unprecedented Soviet reaction in turn created a series of introspective US intelligence analyses and counter-analyses, debating whether US intelligence had actually understood Soviet actions, perceptions, and fears – and acknowledging the danger of nuclear “miscalculation” if it had not.196 This is but one of the many nuclear accidents197 and incidents that peppered the Cold War and its aftermath, and which have been revealed only subsequently. We know now that there were at least three occasions – the Cuban missile crisis in 1962,198 the Petrov incident in 1983199 and the Norwegian rocket incident in 1995200 – where a full-scale nuclear war was only narrowly averted.201 Further information on these incidents, and on how they were interpreted and misinterpreted202 by the great powers, will be important to estimate the probability of nuclear conflict in the coming decades. On a more positive note, efforts are being made to reduce the probability of inadvertent or accidental nuclear conflicts.203 24-Jun-13: Report: “Analysing and Reducing the Risks of Inadvertent Nuclear War Between the United States and Russia” 204 – Research Though the end of the Cold War has reduced the likelihood of deliberate nuclear war, its impact on the risk of accidental nuclear war is much smaller. The arsenals remain on “launch on warning”,205 meaning that there is a possibility for a “retaliatory” strike before an attack is confirmed. The most likely cause of such an accident is either a false warning (of which there have been many, with causes ranging from weather phenomena to a faulty computer chip, wild animal activity, and controlroom training tapes loaded at the wrong time)206 or a misinterpreted terrorist attack.207 The report attempted a rigorous estimate of the numerical probability of nuclear war. Such numerical rigour is rare, with the exception of Hellman’s estimates.208 This report applied risk analysis methods using fault trees and mathematical modelling to assess the relative risks of multiple inadvertent nuclear war scenarios previously identified in the literature. Then it combined the fault tree-based risk models with parameter estimates sourced from the academic literature, characterising uncertainties in the form of probability distributions, with propagation of uncertainties in the fault tree using Monte Carlo simulation methods. Finally, it also performed sensitivity analyses to identify dominant risks under various assumptions. This kind of highly disaggregated analysis is most likely to elicit the best performance and estimates from experts.209 Their conclusion was that (under the more pessimistic assumption), there was a mean 2% risk of accidental nuclear war a year (a high risk when compounded over several decades), with the risk from false alarm being orders of magnitude higher than that from terrorist attacks. The analysis suggests that the most important inadvertent nuclear war risk factor is the short launch decision times,210 inherent in the “launch on warning” posture. Some ways of improving this were suggested, for instance by moving each country’s strategic submarines away from the other’s coasts. Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 75 3.1 Current risks 03-Sep-13: Report of the UN General Assembly working group on “Taking Forward Multilateral Nuclear Disarmament Negotiations” 211 – Policy The working group had extensive exchanges of view from different participants, and reviewed existing disarmament commitments and proposals, including international law. The issues surrounding disarmament and treaties were analysed in depth, and several proposals were put forward, with an eye to the complete elimination of nuclear weapons. A key recognition was, however, that “participants recognised the absence of concrete outcomes of multilateral nuclear disarmament negotiations within the United Nations framework for more than a decade”. Indeed, though the Nuclear Non-Proliferation Treaty212 (NPT) is a multilateral treaty closely connected with the United Nations, and though it committed the nuclear powers to reduce their arsenals, all the major nuclear arms reduction deals have been bilateral treaties between the US and the USSR/Russia. These include the INF treaty213, START I214, SORT215, and New START216, which have significantly reduced the world’s stock of nuclear weapons. It has also been argued that the NPT has been undermined by a number of bilateral deals made by NPT signatories, most notably the United States.217 This further serves to emphasise the weakness of international institutions where nuclear arms control is concerned. 15-Nov-13: International Physicians for the Prevention of Nuclear War report: “Nuclear Famine: Two Billion People at Risk?” 218 – Research This report is one of a series of reports and publications in recent years about the potential impacts of nuclear conflicts.219 It looked at the likely consequences of a “limited” nuclear war, such as between India and Pakistan. While previous papers had estimated that up to a billion people might be at risk in such a conflict,220 this report increased the estimate to two billion. The main source of this increase is decreased agricultural production in the United States221 and in China.222 A key component of these estimates was the severe agricultural impact of the relatively mild temperature reduction in 1816, the “year without a summer” 223, due mainly to the “volcanic winter” caused by the eruption of Mount Tambora. The report highlights some significant areas of uncertainty, such as whether a small nuclear conflict and its consequences would lead to further conflicts across the world, and doubts whether markets, governments and other organisations could mitigate the negative impacts. The report is a reminder that even small-scale nuclear conflict could have severe consequences. 24-Nov-13: Nuclear deal with Iran may reduce risk of proliferation 224 – Policy In November, Iran struck a deal with the so called “P5+1” (the five permanent members of the security council, plus Germany). The deal, if it holds, would allow Iran to continue some uranium enrichment, but it would have to submit to inspections to ensure it wasn’t developing a nuclear weapons programme (the deal would also result in eased sanctions in return). There have been longrunning fears than Iran may have been attempting to construct a nuclear weapon225, resulting in sanctions being imposed on it.226 This event illustrates the surprising success of the Non-Proliferation Treaty,227 which came into force in 1970. At the time it was proposed there were fears of very rapid proliferation of nuclear weapons.228 And though 40 countries or more currently have the knowhow to build nuclear weapons,229 only nine countries are currently known to possess them: the five security council members, India, Pakistan, and North Korea, plus Israel.230 76 Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 3.1 Current risks Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 77 3.1 Current risks Extreme Climate Change Ecological Nanotechnology Nuclear War Catastrophe Global System Collapse Major Asteroid Impact Global Pandemic Future Bad Global Governance Super-volcano Synthetic Biology Artificial Intelligence Unknown Consequences 3.1 Current risks Catastrophe 3.1.3 Ecological Ecological collapse refers to a situation where an ecosystem suffers a drastic, possibly permanent, reduction in carrying capacity for all organisms, often resulting in mass extinction. Usually an ecological collapse is precipitated by a disastrous event occurring on a short time scale. 231 78 Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 3.1 Current risks 3.1.3.1 Expected impact disaggregation 3.1.3.2 Probability Humans are part of the global ecosystem and so fundamentally depend on it for our welfare. Species extinction is proceeding at a greatly increased rate compared with historic data232, and attempts to quantify a safe ecological operating space place humanity well outside it.233 Furthermore, there may be signs of a “sudden” biosphere collapse, possibly within a few generations.234 Many of the problems of ecological degradation interact to multiply the damage and (unlike previous, localised collapses) the whole world is potentially at risk, 235 with severe challenges to countering this risk through global policy.236 If animals are seen to have intrinsic value, 237 or if human quality of life is dependent on a functioning ecosystem, 238 the current situation already represents a large loss. Whether such a loss will extend to human lives depends on technological and political factors - technological, because it seems plausible that some human lifestyles could be sustained in a relatively ecosystem-independent way, at relatively low costs.239 Whether this can be implemented on a large scale in practice, especially during a collapse, will be a political challenge and whether it is something we want is an ethical question. There is currently more than enough food for everyone on the planet to ensure the nutrition needed, 240 but its distribution is extremely uneven and malnutrition persists. Thus ecological collapse need not have a strong absolute effect in order to result in strong localised, or global, effects. Even a partial collapse could lead to wars, mass migrations, and social instability. It is conceivable that such a scenario, if drawn out and exacerbated by poor decision-making, could eventually lead to mass deaths and even the collapse of civilisation. Extinction risk is possible only if the aftermath of collapse fragments and diminishes human society so far that recovery becomes impossible241 before humanity succumbs to other risks (such as climate change or pandemics). After a post-civilisation collapse, human society could still be suffering from the effects of ecological collapse, and depending on what form it took, this could make the recovery of human civilisation more challenging than in some of the other scenarios presented here. Five important factors in estimating the probabilities and impacts of the challenge: 1. The extent to which humans are dependent on the ecosystem. 2. Whether there will be effective political measures taken to protect the ecosystem on a large scale. 3. The likelihood of the emergence of sustainable economies. 4. The positive and negative impacts on the eco systems of both wealth and poverty. 5. The long-term effects of an ecological collapse on ecosystems. Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 79 3.1 Current risks ECOLOGICAL CATASTROPHE Long-term ecological effects Post-eco-collapse climate change Moral tragedy from ecosystem loss Quality of life loss from ecosystem loss Ecological collapse Economic costs Disruption to politics and economy Threat to food supply Loss of biodiversity Rebuilding the ecosystem Vulnerabilities to flood and other disasters Sustainable or non-sustainable economies Post-eco-collapse politics Pollution Preservation efforts Pre-eco-collapse climate change New, environmentally damaging industries Meta-uncertainty on the true dependence of humanity on the ecosystem Total short-term casualties Civilisation collapse Extinction Pre-eco-collapse mitigation efforts Human survivability in “closed” systems Global poverty Global coordination Sustainability research Technological innovations Uncertain events Key Meta-uncertainties Risk events Direct impacts Indirect impacts Current intervention areas Bad decisions Accidents Severe impacts GOVERNANCE DISASTERS Global povety Global instability New system of governance Smart sensors Global coordination Improvements to global governance Deliberate attempts to construct world dictatorship Technological innovations Enduring poverty Not achieving important ethical goals Climate change Lack of human flourishing Undesirable world system (e.g. global dictatorship) Global pollution Disruption to world politics and economy Total short-term casualties Collapse of world system Post-disaster politics General mitigation effort Long-term negative effects Civilisation collapse Extinction Failing to solve important problems Making things worse Uncertain events Key Meta-uncertainties Risk events Direct impacts Indirect impacts Current intervention areas Bad decisions Accidents Severe impacts Meta-uncertainty on tradeoffs between e.g. poverty, survival, freedom 80 Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 3.1 Current risks 1. Global coordination and cooperation will be important to any attempt to control ecological damage on a large scale and prevent “races to the bottom”. 2. Poverty is often seen as exacerbating ecological damage through unsustainable practices, while richer countries introduce environmental regulations – but richer nations exploit many resources (such as fossil fuels) in non-sustainable and damaging ways. 3. Transitioning to sustainable economies, or sustainable economic trajectories, could control ecological damage. 4. Research into sustainability could allow the construction of sustainable economies or environments at costs that people are willing to bear. 5. Climate change exacerbates the pressure on the ecological system by changing weather patterns and increasing natural disasters in ways ecosystems find hard to adapt to. 6. Global pollution is a visible source of ecological damage, one that global agreements have had moderate success at tackling. 7. Truly global preservation efforts may be needed for some threatened ecosystems that stretch beyond natural boundaries (e.g. in the seas and oceans). 8. Beyond general all-purpose mitigation efforts, addressing this threat could include the preservation of ecosystems, species or genetic codes, to allow a subsequent rebuilding. 9. New, profitable, but environmentally damaging industries could put extra strain on the ecosystem. 10. According to some systems of value, the loss of certain animals and ecosystems constitutes a moral tragedy in and of itself. 11. Humans derive much pleasure and many benefits from various parts of the ecosystem, and losing this would result in a loss to human quality of life. 12. Ongoing and continuous biodiversity loss is a clear consequence of ecological collapse. 13. Ecological damage can put the human food system in danger, triggering famines. 14. Ecological damage increases vulnerability to floods and other natural disasters. 15. Disruptions to the world’s political and economic systems could trigger further conflicts or instabilities, causing more casualties and impairing effective response. 16. Since a lot of the world’s carbon is locked up in trees, ecological collapse could exacerbate climate change. 17. The ecosystem is of great economic benefit to humanity, so its loss would have large economic costs. 18. Ecological damage is likely to be long-term: the effects will last for many generations. 19. Technological innovations may result in more sustainable economies, or in more environmentally damaging products. 20. It may be possible to ensure human survival in semi- “closed” systems (solar power, hydroponic food, distilled water), with minimal dependency on the external ecosystem. 21. Over the long term, it may become possible and necessary to go about rebuilding the ecosystem and healing its damage. 22. Political decisions will be the most likely factors to exacerbate or mitigate an ecological disaster. 23. It is unclear how dependent humans truly are on the ecosystem, and how much damage they could inflict without threatening their own survival. Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 81 3.1 Current risks during 2013 3.1.3.3 Main events 22-Jan-13: Current extinctions probably the result of past actions; many future extinctions to come 242 – Research An estimated 40% of world trade is based on biological products or processes such as agriculture, forestry, fisheries and plant-derived pharmaceuticals, and biodiversity comprises an invaluable pool for innovations.243 And yet this biodiversity is being lost at an alarming rate – the rate of extinctions for plants and animals is 100 to 1,000 times higher than their pre-human levels.244 A variety of methods have been suggested to halt or slow this loss, ranging from putting an explicit value245 on biodiversity and ecosystem services (human benefits from a multitude of resources and processes that are supplied by ecosystems), 246 to performing triage on the most valuable species.247 This research paper suggests, however, that there is a lag of several decades between human pressure on the ecosystem and ultimate species extinction. This suggests that many extinctions will continue in decades to come, irrespective of current conservation efforts. 05-Apr-13: Ocean data added to Microsoft Eye on Earth project – Initiative In order to safeguard ecological resources, it is important to track and quantify them. This has traditionally been the role of governments or non-governmental organisations.248 Recently, however, private organisations have started developing tools to enable companies and individuals to track ecological damage and make decisions in consequence. One such tool was Eye on Earth, developed by Microsoft in alliance with the European Environment Agency and Esri.249 It was launched with three services – WaterWatch, AirWatch and NoiseWatch – keeping track of the levels of different pollutants, using official sources and inputs from citizens.250 This was subsequently expanded to include other environmentally sensitive pieces of information, such as the states of coral reefs and invasive alien species. It was primarily land-based, so the oceans were missing from this visualisation tool. This lack has been partially overcome with the inclusion of data from the MyOcean 2 project251 (partly funded by the European Commission). The data cover sea surface temperature, salinity and currents for the Mediterranean Sea and the Black Sea. 30-May-13: Improvement in managed fisheries in Europe 252 – Research Human action has been shown to be able to mitigate some ecosystem damage. Overfishing is expected by standard economic theory: the sea’s resources are a (global) common, where the rational behaviour of individual fishermen must lead to dilapidation of the resource.253 Unlike on land, where nature reserves or parks can be established, there are no easy ways of establishing property rights in the sea254 (thus privatising that “common”). A typical example of this behaviour is the collapse of the Grand Banks fisheries off Canada’s Atlantic coast in the 1990s, where cod biomass fell by over 95% from its peak and has currently not recovered.255 It is therefore significant that the European Union has been partly successful in its attempts to control over-fishing through legislation. For instance, despite the fact that North Sea cod remains vulnerable, there has been a recent increase in stock size and a decrease in fish mortality. This may point to the potential for further ecological improvements through well-chosen policy interventions. 82 Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 3.1 Current risks Figure 18: Increase in the number of species assessed for the IUCN Red List of Threatened SpeciesTM (2000–2013.2). Source: http://www.iucnredlist.org/about/summary-statistics 02-Jul-13: About 21,000 Species Face Extinction, says International Union for Conservation of Nature (IUCN) 256 – Event In 2013 the IUCN added an additional 4,807 species to its Red List of Threatened Species. This brings the total to about 21,000. Some have argued that we are entering a new geological era in Earth’s history: the Anthropocene257, when human actions are one of the major impactors on the planet’s biosphere. The graph shows a fairly steady growth in the (estimated) number of threatened species. This steadiness may be illusory, as the biosphere shows signs that it may be approaching a planetary-scale tipping point, where it may shift abruptly and irreversibly from one state to another. As a result, the biological resources humans presently take for granted may be subject to rapid and unpredictable transformations within a few human generations.258 This could be seen as a great tragedy beyond purely human concerns, if animals (and animal welfare) are seen to have intrinsic value.259 Figure 17: Collapse of Atlantic cod stocks (East Coast of Newfoundland), 1992 Source: http://en.wikipedia.org/wiki/File:Surexploitation\_morue\_surp%C3%AAcheEn.jpg) Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 83 3.1 Current risks Extreme Climate Change Ecological Nanotechnology Nuclear War Catastrophe Global System Collapse Major Asteroid Impact Global Pandemic Future Bad Global Governance Super-volcano Synthetic Biology Artificial Intelligence Unknown Consequences 3.1 Current risks Pandemic 3.1.4 Global A pandemic (from Greek πᾶν, pan, “all”, and δῆμος demos, “people”) is an epidemic of infectious disease that has spread through human populations across a large region; for instance several continents, or even worldwide. Here only worldwide events are included. A widespread endemic disease that is stable in terms of how many people become sick from it is not a pandemic. 260 84 Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 3.1 Current risks 3.1.4.1 Expected impact disaggregation 3.1.4.2 Probability Influenza subtypes266 Infectious diseases have been one of the greatest causes of mortality in history. Unlike many other global challenges pandemics have happened recently, as we can see where reasonably good data exist. Plotting historic epidemic fatalities on a log scale reveals that these tend to follow a power law with a small exponent: many plagues have been found to follow a power law with exponent 0.26.261 These kinds of power laws are heavy-tailed262 to a significant degree.263 In consequence most of the fatalities are accounted for by the top few events.264 If this law holds for future pandemics as well,265 then the majority of people who will die from epidemics will likely die from the single largest pandemic. Most epidemic fatalities follow a power law, with some extreme events – such as the Black Death and Spanish Flu – being even more deadly.267 There are other grounds for suspecting that such a highimpact epidemic will have a greater probability than usually assumed. All the features of an extremely devastating disease already exist in nature: essentially incurable (Ebola268), nearly always fatal (rabies269), extremely infectious (common cold270), and long incubation periods (HIV271). If a pathogen were to emerge that somehow combined these features (and influenza has demonstrated antigenic shift, the ability to combine features from different viruses272), its death toll would be extreme. Many relevant features of the world have changed considerably, making past comparisons problematic. The modern world has better sanitation and medical research, as well as national and supra-national institutions dedicated to combating diseases. Private insurers are also interested in modelling pandemic risks.273 Set against this is the fact that modern transport and dense human population allow infections to spread much more rapidly274, and there is the potential for urban slums to serve as breeding grounds for disease.275 Unlike events such as nuclear wars, pandemics would not damage the world’s infrastructure, and initial survivors would likely be resistant to the infection. And there would probably be survivors, if only in isolated locations. Hence the risk of a civilisation collapse would come from the ripple effect of the fatalities and the policy responses. These would include political and agricultural disruption as well as economic dislocation and damage to the world’s trade network (including the food trade). Extinction risk is only possible if the aftermath of the epidemic fragments and diminishes human society to the extent that recovery becomes impossible277 before humanity succumbs to other risks (such as climate change or further pandemics). Five important factors in estimating the probabilities and impacts of the challenge: 1. What the true probability distribution for pandemics is, especially at the tail. 2. The capacity of modern international health systems to deal with an extreme pandemic. 3. How fast medical research can proceed in an emergency. 4. How mobility of goods and people, as well as population density, will affect pandemic transmission. 5. Whether humans can develop novel and effective anti-pandemic solutions.

#### The next pandemic will be worse---action now is key.

Andy Plump 21. President for research and development at Takeda Pharmaceuticals and a cofounder of the Covid R&D Alliance. “Luck is not a strategy: The world needs to start preparing now for the next pandemic” 05-18-21. https://www.statnews.com/2021/05/18/luck-is-not-a-strategy-the-world-needs-to-start-preparing-now-for-the-next-pandemic/

As countries grapple with the worst global pandemic in a century, it’s hard to think about preparing for the next one. But if we don’t, it could be worse than Covid-19. Over the last 30 years, infectious disease outbreaks have emerged with alarming regularity. The World Health Organization lists an influenza pandemic and other high-threat viral diseases such as Ebola and dengue among the top 10 biggest threats to public health. The rate of animal-to-human transmission of viruses has been increasing, with the U.S. Centers for Disease Control and Prevention estimating that 75% of new infectious diseases in humans come from animals. These zoonotic infections can have profound effects on human life. The overall infection fatality rate is around 10% for severe acute respiratory syndrome (SARS), between 40% and 75% for Nipah virus, and as high as 88% for Ebola. While the infection fatality rate for Covid-19 is lower — likely less than 1% — the overall burden of death has been significantly higher since it has affected so many people, more than 160 million people as I write this. Luck is not a pandemic strategy Although the Covid-19 pandemic has been a human and health care disaster, by scientific measures the world was lucky this time. Covid-19 was far less lethal than its predecessors, less contagious than previous pandemic viruses, and we were able to quickly develop a cadre of effective vaccines. But luck is not a strategy. The same way the U.S. invests in and prepares for national defense, it must also prepare for another pandemic. Though the next viral outbreak cannot be prevented, the next pandemic can — but only with better preparation.

#### The magnitude of the threat justifies an escalator clause for utilitarian calculations---this avoids abuses while ensuring just outcomes at the tail end of risk.

K. Kirkwood 09. School of Health Studies, Faculty of Health Sciences, University of Western Ontario. 06/01/2009. “In the Name of the Greater Good?” Emerging Health Threats Journal, vol. 2, no. 0. CrossRef, doi:10.3402/ehtj.v2i0.7092.

Public health authorities in many economically advantaged nations are bracing themselves to face future pandemics that will harm large numbers of citizens. Modern medical horrors such as Monkeypox or the much-feared future mutations of Avian Influenza (H5N1) are mentioned in the same breath as virulent strains of influenza, as a danger to our ‘way of living.’ Far beyond sickness and large numbers of death, an outbreak of one of these pandemics poses a real threat to long-term health, as well as to the social and economic well being of significant percentages of our surviving population.1 While confronting issues brought forth by a pandemic, the fundamental nature of ‘public health’ and its focus on the welfare of a population demands special attention to utilitarian considerations of promotion of the greatest good—in this case, health—as well as the limitation of illness and death in the ‘worst-case’ scenarios posed by the most lethal of pandemics. Of particular interest to this paper are questions related to the obligation of health-care workers (HCWs) to report to work in the face of heightened immunological threat and whether those same workers should have greater access to immunizations and treatments than should non-HCWs. Utilitarianism within public health ethics The fundamental feature of the ethical theory of utilitarianism states that moral behavior is that which promotes good and minimizes harm.2 In writings based on public health, utilitarianism is widely recognized as a fragment in the ethical ‘scheme’ of public health,3 but it is not afforded a stronger role for two primary reasons: first, considering its extreme position, utilitarianism is morally problematic,4 as it could literally permit anything in the name of the ‘greatest good to the greatest number,’ and second it is virtually impossible to live a moral life under the most extreme forms of utilitarianism, because the obligations are too difficult to discern (the ‘what’ of promoting the good) and impossible to execute (the ‘how’).5 Utilitarianism, in a moderate form, used in public health ethics, means that our actions and policies should be focused on increasing the total ‘net’ goodness rather than an average ‘net’ good for each person. The institutions of individual rights and the recognition of patient autonomy are not contradictory to this, but are believed to serve the overall good, as individual benefit increases the total good, and serves as a preventative measure of unjustified majoritarian actions against smaller groups. This model of utilitarianism is evident in many aspects of public healthFnot only through health-promotion projects that encourage the otherwise illness-free individuals to take up a more healthful diet and exercise regimen but also through harm-reduction programs, in which people with negative health behaviors such as abuse of drugs or dietary fats are aided to eliminate, or at least minimize the harm they cause to those around them. In everyday practice, the force of this utilitarian aspect has a supportive role along with other ethical elements of public health practice, and presents a balanced moral justification for all actions undertaken in accordance with this practice.6 However, I contend that there must be an ‘escalator clause’ in the utilitarian aspect that suggests that in the event of an extensive threat to the existence of a population, the force of this utilitarian aspect becomes the primary consideration in proportion to the threat. Therefore, the greater the threat, the greater the moral force of utilitarianism in making public health decisions. This also entails that the greater the threat, the greater the moral impetus to minimize the harm to the population. On duty, outbreaks, and distribution of resources Obligations to minimize harm and promote the goods of public health are not particularly controversial in times of relatively stable ‘good-health’ measures among the populace. The more troubling question emerges from the scenario in which promoting health and minimizing illness and death demands more from HCWsFhow can, or should, we compel HCWs to attend to their duties in the event that a highly lethal form of communicable disease should start spreading?7 Although current debates focus on questions of duty, and how much personal risk invalidates that commitment, utilitarian aspects of that obligation are not given enough weight in the debate. In many of the debates, the question of risk is posed in terms of how we do not expect a trained ‘first responder’ to recklessly endanger his or her life to save the life of another. The classic story of the lifeguard is offered as exemplar: a lifeguard is not expected to rescue a drowning swimmer if a shark is clearly present.8 Although this statement seems reasonable, it does not justify itself. By contrast, the consideration of the utilitarian aspect makes the point that in attempting to save a life, two are likely to be lost, thus propagating a greater total harm. The same holds true for the example of firefighters rushing into a house badly damaged by an active fire. Although there may be a life on that second floor to save, we do not expect any number of firefighters to sacrifice their lives for the doomed soul because the loss of many, including the original life in peril, is a maximization of harm, when harm should be minimized. When you control for the risks involved, such as using precautions to assure a level of safety for the rescuers, such as shark nets for the lifeguard, or safety gear for the firefighters, then the obligation to assist comes back into full force, as the potential for greater harm is manageable.9 It is the variable of risk, which creates variable demands on those whose duty it is to care for the population in times of crisis. We consider not only the risk to the obligated but also a question of the scope of risk to the population. In academic and public debates regarding the compulsion to attend to duty in the face of danger, one fallacy has been allowed to stand: the notion that exposure to a pandemic can be avoided if one simply does not come to his or her job as a HCW. Although it is true that working in a hospital during times of influenza outbreak puts one at a greater risk for contracting the illness,10 the more widespread the outbreak, the more people become sick, and the more likely the ‘stayat-home’ HCW will become sick even after having avoided contact in the course of his or her duties. We could reasonably state that, by virtue of staying home during a time of need for his or her service, the HCW improves the odds that he or she will contract this illness outside professional practice as part of the greater number who will be exposed. Another feature of the argument offered to defend dereliction of duty is to suggest that this risk that the HCW takes with his or her own health is a fixed variable, and thus should be considered as an exception to duty. On the contrary, it is a common feature of the infection-control literature that states that doctors and nurses are overwhelmingly neglectful toward their own basic infection-control protocols.11 Therefore, the threat is not a fixed variable, but one that is actually quite within the scope of the control of a HCW. Ethically, one cannot willfully or negligently enhance the exceptions to duty. At the same time, it is an obligation of the management to ensure that diligent HCWs are equipped to do all they can to reduce their risks. During the SARS crisis in Toronto, health-care administrators did not effectively communicate which precautions should be undertaken by HCWs to protect themselves.12 It bears mentioning that once clear direction could be given about the type and execution of masking procedures, the intrahospital transmission of SARS decreased to 0%.13 This fact speaks to the issue of risk, as the non-transmission of SARS correlated with the increased attentions of management and staff to infection-control precautions and the provision and use of proper equipment.14 When we speak in terms of risk and pandemics from the utilitarian perspective discussed herein, we recognize that it is completely nonsensible to sacrifice highly trained HCWs by rushing them ill equipped into dangerous situations. Much as with the example of firefighters and the unsafe burning house, we find it morally unacceptable to treat them as disposable, because of the singularity of their lives and their right to exist as individuals. There is also the detriment we would cause in an event such as a pandemic by losing the people trained to save us to the very threat they were trained to save us from. By that same logic, it could be argued that HCWs should have first access to available and medically accepted vaccinations by virtue of the fact that those HCWs are absolutely essential to our survival. The fear of an Avian Influenza outbreak brought with it much debate about scarce Tamiflu supplies and giving HCWs preferential access.15 However, the added value of a HCW is the fact that he or she will be facing the greater risk by virtue of faithful and responsible execution of his or her duty, and if this is trueFand we have seen from the example of SARS that it is not always the case that HCWs exercise due diligence or face unmanageable risks of infection simply by being ‘on-site’Fthen we should do more to protect them. Nevertheless, if the claim is that they can excuse themselves from duty because of risk, then we excuse ourselves from privileging their protection, through the preferential access to measures such as Tamiflu. The same should be true for access to vaccines or treatments: those who are compelled into service to defend the overall health of a society at tremendous risk should be first in line, as their opportunity for infectionFand to act as a vector for infection both within and outside their health-care facilitiesFmeans that the greater good is served by privileging their access to prophylaxis. A common objection to this comes from the perspective of social justice. The objection would point out that those who are least able to prevent their own infection, such as those from the lower socioeconomic classes, retirees and pensioners, and other vulnerable groups, would be denied access to the protections and treatments that are going to HCWs whoFto varying degreesFenjoy more comfortable socioeconomic positions. Although this question of access is valid in questions of many public health interventions, the preference of HCWs in questions of preferential access to vaccines and treatments is not unjust in these terms. Fundamentally, justice addresses unjustified imbalances in treatment. Aristotle famously mandated that equals should be treated as equals, and unequals as unequals.16 The key point of justice is that there should be a valid justification for differential treatment, and in that light, in this context, we are describing pandemics that pose a unique and credible threat to the public in a manner that could fundamentally undermine our way of life. Preferential treatment of HCWs, in this limited context, is a just and defensible practice. It is this same special status that we afford those who can save us from the most lethal and dangerous illnesses in times of public health emergency that also places greater demands on those same people. The greater the risk to society, the greater the responsibilities on those who can reduce the body count. The relationship between the duty of a HCW and the lethality of a disease is proportional—danger and obligation increase in step with each other, as opposed to other conceptions that suggest a threshold of exception as the risk of illness becomes too great. The fundamental flaw with this suggestion is that a negation of duty in such an outbreak simply allows the outbreak to pose an even greater threat to the populationFincluding that same derelict HCWFrather than confronting the illness in the relatively controlled environment of a hospital. Conclusions Utilitarianism in the form of promoting the good and diminishing the bad is a key moral belief in the realm of public health. It is one view in concert with others, all working to counterbalance each view to achieve a tenable moral equilibrium. In the extreme cases under consideration herein, such equilibrium dictates that the moral force of health promotion and harm minimization increases in relation to the threat posed to the well being of a larger society. In the case of widespread death or disability caused by a pandemic, this paper contended that an increased threat generates a heightened obligation on the part of HCWs, while also creating a reasonable expectation that those same HCWs will have preferential access to vaccines and treatments.

#### There is no monocausal explanation for disease---it is comparatively better to focus on how to address pandemics, rather than what caused them.

Katherine Hirschfeld 17, Department of Anthropology, University of Oklahoma, “Rethinking “Structural Violence,”” Society, 54(2), April 2017, p.156–162

Rigorous comparative ethnographic and archival research that explores the intersection of politics, economics (including illicit economies of political corruption) and the natural environment should be the starting point for scholars interested in social and economic determinants of epidemic infectious disease. But the field does not take this approach. Instead of developing empirical questions that could help refine theory and improve definitional clarity of core concepts, contemporary researchers collect narratives that validate Lenin’s assumptions about imperialism. This approach makes Galtung’s model unfalsifiable and substitutes a moral argument against imperialism in place of objective historical or ethnographic research exploring how macro level structures configure patterns of disease. Epidemics move through time and space in predictable ways, configured by variations in human immunity, population density and pathogen virulence. Variables in the social environment like malnutrition, housing, and sanitation also play a role in configuring human vulnerability. But over-reliance on poorly defined concepts like structural violence erases these axes of variation and explains all epidemics in post-colonial countries with one predetermined, unfalsifiable narrative. Research linking imperialism to poor health conditions in post-colonial countries had more credibility in the 1970s when Galtung’s writing first became popular. But the world has changed since that time and many of his original assumptions are no longer accepted due to their inability to explain or predict events that have occurred in the new millennium. In Galtung’s era, international health and development specialists assumed modernization of mortality patterns was a one-way process that could not be reversed. So a country that underwent modernization of its mortality profile through control of infectious disease was not expected to regress to an earlier developmental stage. But the 1990s and the early 2000s there were many examples of reverse mortality transitions involving resurgence of preventable infectious diseases in industrialized countries. These were common in states with high levels of political corruption, civil wars and conflict between Violent Non-State Actors28 like organized crime groups. One scholar, for instance, described Russia in the 1990s as undergoing a process of “thirdworldization” whereby the former industrial superpower became afflicted by problems typical of impoverished underdeveloped countries. These included “mass poverty, hunger, regional conflicts and ethnic wars, deindustralization and huge foreign debt, corruption of the elites and governing juntas, bloody coups d'etat, outbreaks of long forgotten diseases, refugee problems, environmental degradation and societal and state collapse”.29 The political economy of state failure, epidemiological underdevelopment and “thirdworldization” are still not fully theorized, but some common patterns have been identified.30 The Fund For Peace (a non profit security studies group), for instance, has created an index of fragility to rank states according to their potential for failure or collapse. In 2015 Haiti was categorized as “high alert” status meaning it was in the second riskiest tier, together with other chronically unstable regions with high rates of water borne diseases like Afghanistan, Iraq and Zimbabwe.31 Do the same political and economic processes that create state failure and fragility also produce widespread poverty and epidemics of preventable diseases like cholera? There is some anecdotal evidence to support this argument. One anthropologist, for instance, has described witnessing Haitian officials loot foreign aid intended to alleviate poverty, improve health and promote socioeconomic development in the country.32 According to Schwartz, this has led to a perverse scenario whereby increasing foreign aid has actually resulted in negative health and mortality trends for one region. “When the money, materials and food arrived…the Haitian employees, politicians, administrators, pastors, priests and school directors embezzled it and when they had accrued enough money, most of them migrated to Miami…This left the poorer peasants behind to deal with the disaster…”. Have predatory officials also looted aid money and supplies intended to prevent cholera from spreading? Are life-saving rehydration supplies and equipment being stolen from public clinics so that poor patients have no access to treatment? These are the kinds of questions social scientists should be asking about Haiti’s current health crisis—empirical questions that can be answered through a combination of historical and ethnographic research exploring how interlocking structures at international, state and local levels have configured population vulnerability to lethal infectious disease. But scholars do not seem interested in conducting grounded empirical research exploring how the unique political economy of fragile states facilitates resurgent epidemics of preventable disease. They rely instead on a predetermined Leninist narrative that implicitly defines epidemics in poor countries as manifestations of imperial or structural violence. This narrative is often presented without supporting historical research, so the story of imperialism in a given location is not a literal history of a specific place and time, but moral story of unjust suffering at the hands of temporally and geographically remote, vaguely defined malevolent structures. In this sense, imperialism and structural violence resemble twenty-first century miasma—a vaporous, unscientific theory of disease that draws appeal from scholars’ collective revulsion against anything that smells like colonialism, but contributes little to understanding patterns of emerging infectious disease in the twenty first century.

### Costs---1AC

#### Advantage 2 is Costs:

#### Drug prices are skyrocketing---product hopping is key.

Michael A. Carrier & Steve Shadowen 17. \*\*Michael A. Carrier is a Distinguished Professor at Rutgers Law School and has testified to Congress on drug-pricing issues. \*\*Steve Shadowen is regularly recognized as a top national antitrust lawyer, a result of his dedicated work on cases where intellectual property and antitrust law intersect, including several groundbreaking cases in the pharmaceutical industry. “Pharmaceutical Product Hopping: A Proposed Framework For Antitrust Analysis” Health Affairs. 06-01-17. https://www.healthaffairs.org/do/10.1377/hblog20170601.060360/full/

Skyrocketing drug prices are in the news. Overnight price increases have riveted the attention of the public, media, and politicians of all stripes. But one reason for high prices has flown under the radar. When drug companies reformulate their product, switching from one version of a drug to another, the price doesn’t dramatically increase. Instead, it stays at a high level for longer than it otherwise would have without the switch. Although more difficult to discern than a price spike, this practice, when undertaken to prevent generic market entry, can result in the unjustified continuation of monopoly pricing, burdening patients, the government, and the health care system as a whole. Not all reformulations pose competitive concerns. Empirical studies have shown that more than 80 percent can be explained by improvements that are not temporally connected to impending generic entry. But a dangerous subset of such reformulations is undertaken for one, and only one, reason: to delay generic entry. In such cases, reformulation is called “product hopping.” When generics enter the market, the price can fall dramatically overnight, by as much as 85 percent. For that reason, brand firms have every incentive to delay this moment of reckoning as long as possible. Sure enough, making trivial changes to their drugs has that effect. Every state has a substitution law that requires or allows pharmacists to offer a generic drug when the patient presents a prescription for a brand drug. But such substitution is thwarted if the drug is not the same—in particular, if it is not bioequivalent (able to be absorbed into the body at the same rate) and therapeutically equivalent (having the same active ingredient, form, dosage, strength, and safety and efficacy profile). A minor change to a drug’s formulation can prevent the pharmacist from substituting the generic. Product hopping raises nuanced issues arising at the intersection of patent law, antitrust law, the federal Hatch-Waxman Act, and state drug product substitution laws. It is even more complex given the uniquely complicated pharmaceutical market, in which the buyer (patient, insurance company) is different from the decision maker (doctor). Courts applying US antitrust law have struggled to create a robust and defensible legal framework for separating anticompetitive product hops from competitively benign, legitimate product development. In this post, we propose a framework that would help courts defer to legitimate reformulations while targeting anticompetitive switches.

#### That financially strains consumers, providers, and insurers.

Amaka Vanni 21. PhD and LLM degrees in International Economic Law from the University of Warwick. “On Intellectual Property Rights, Access to Medicines and Vaccine Imperialism.” <https://twailr.com/on-intellectual-property-rights-access-to-medicines-and-vaccine-imperialism/>.

Third, patent practices in recent decades have seen pharmaceutical companies engaging in trivial and cosmetic tweaking of a drug whilst still reaping the benefit of 20 years of patent protection. This tweaking sometimes involves making minor changes to patented drugs, such as changes in mode of administration, new dosages, extended release, or change in color of the drug. These changes normally do not offer any significant therapeutic advantage even though pharmaceutical companies argue they provide improved health outcomes to patients. These additional patents on small changes to existing drugs, known as evergreening or patent thickets, block the early entry of competitive, generic medicines that drive medicine prices down. For example, while not mandated by TRIPS, many US led TRIPS-plus free trade agreements have expanded the scope for evergreening. These include the US-Jordan FTA (2000), US-Australia FTA (2004) as well as the US-Korea FTA (2007), which allow for the patenting of new forms, uses, or methods of using existing products.

The cancer drug Gleevec®, owned by Novartis, is another example of how pharmaceutical companies often secure patents on new, more convenient versions with marginal therapeutic benefit to patients whilst blocking the entry of generic medicines. In 2013, Novartis’ patent application for Gleevec®– the β crystalline form of the salt imatinib mesylate – was rejected by the Indian Supreme Court because it lacked novelty. However, the company has secured patents for this product in other jurisdictions such as the US and has maintained a high price of Gleevec there. But in India the price of Gleevec® was reduced from approximately USD 2,200 to USD 88 for one month’s treatment in the generic drugs market as a result of the 2013 Indian Supreme Court judgement. Novartis is not the only culprit. The depression drug Effexor® by Pfizer was granted an evergreen patent when the company introduced an extended-release version, Efexor-XR®, even though there was no additional benefit to patients. Eventually, the patent was declared invalid, but by then it had already cost an estimated USD 209 million to Australian taxpayers and kept generic competition off the market for two and a half years. In another instance, Pfizer went on to secure an additional patent for the Pristiq®, which contained identical chemical compound as Efexor-XR®,and again with no added therapeutic benefit.

These evergreening practices, of course, have material effects. Apart from delaying the entry of generic versions, they give brand-name pharmaceutical companies free reign in the market, which allows them to set the market price. Recent years have seen monopoly prices rise exorbitantly causing significant financial strain to patients, domestic healthcare services and even insurance companies in developed countries. A notorious example is Martin Shkreli, who in 2015 bought the rights to an anti-malarial drug, then raised the price by 5,000 per cent from a cost of USD 13.50 to USD 750. Similarly, a white paper by I-MAK shows how excessive patenting and related strategies are driving families to overspend on lifesaving medicines. Celgene, the makers of Revlimid® raised the price of the drug by more than 50 per cent since 2012 to over USD 125,000 per year of treatment. Using the example of Solvadi® by Gilead, which costs USD 84,000 per treatment, Feldman notes the drug would cost the US Department of Defense more than USD 12 billion to treat all hepatitis-infected patients in US Veterans Affairs. But the US is not alone. In Europe, expensive drugs have prompted a growing backlash against pharmaceutical corporations. Reacting to these price hikes, Dutch pharmacies are bypassing these exorbitant prices by preparing medicines in-house for individual patients. The broken IP system ranging from an extraordinarily low standard for granting patents to permissions of patent thickets around a single molecule has not only severely distorted the system of innovation, but they have also skewed access to life-saving drugs. As a result, prices for new and existing medicines are constantly rising, making essential medicines inaccessible for millions of people around the world.

#### Pharmaceuticals are the largest driver of healthcare costs.

Hannah Brennan et al 16. Law Clerk to the Honorable Theodore McKee, Chief Judge, Third Circuit. \*\*Amy Kapczynski; Professor of Law, Yale Law School. \*\*Christine H. Monahan; Yale Law School Class of 2016. \*\*Zain Rizv; Yale Law School Class of 2017. “A Prescription for Excessive Drug Pricing: Leveraging Government Patent Use for Health” 18 YALE J.L. & TECH. 275 (2016). https://digitalcommons.law.yale.edu/cgi/viewcontent.cgi?article=1124&context=yjolt

The soaring cost of pharmaceuticals is one of the most pressing domestic policy issues in the United States today. Nearly one-fifth of the U.S. Gross Domestic Product (GDP) is spent on healthcare, and pharmaceuticals are a key expenditure.**1** In 2014, the United States spent a record $297.7 billion on pharmaceuticals, over 12% more than the previous 2 year. The 2014 increase in prescription drug spending can be attributed almost entirely to recently approved drugs that treat the Hepatitis C virus (HCV). 3 With list prices that approach $100,000 for a twelve-week regimen, 4 these new medicines have brought the issue of drug pricing roaring to the fore in policy debates. High drug prices are of enormous concern to voters, 5 policymakers, and politicians across the political 6 spectrum. High drug prices also have a significant impact on health. The new HCV drugs offer an excellent example. Potentially deadly if untreated, HCV is one of the most pressing health problems facing the United States. 7 The new drugs are far superior to previous treatments and could potentially enable elimination of the disease.8 But treating all of the approximately 5.2 million people who currently have HCV in the United States at the best reported prices offered by Gilead, the sole supplier of the most important new drugs, would cost at least $234 billion.9 Given the budget impact of these new medicines, most payors have sharply restricted their availability-covering them only for the very sickest, or refusing to cover them at all 0-instead of rapidly rolling them out. Medicaid, for example, treated only 2.4% of enrollees estimated to have HCV in 2014, despite spending more than a billion dollars on the new medicines1.1 Even with the small number treated, Gilead's earnings have been stratospheric: the company earned $36 billion from its new HCV medicines in their first twenty-seven months on the market. 12

#### Rising healthcare costs compromise 17% of GDP---the current trajectory is unsustainable and makes collapse inevitable.

Ron Howrigon 16. President and CEO of Fulcrum Strategies, Masters in Economics from North Carolina State University, has held Senior Management level positions with three of the largest Managed Care Companies in the country, including Kaiser Permanente, CIGNA HealthCare and BlueCross BlueShield, former Director of Community Medical Services with Kaiser Permanente. “Flatlining: How Healthcare Could Kill the US Economy.”

In 2010, the United States GDP was $15 trillion. The total healthcare expenditures in the United States for 2010 were $2.6 trillion. At $2.6 trillion, the U.S. healthcare market has moved up from 15th and now ranks as the 5th largest world economy, just behind Germany and just ahead of both France and the United Kingdom. That means that while healthcare was only 5% of GDP in 1960, it has risen to over 17% of GDP in only 50 years.

Over that same time, the Defense Department has gone from 10% of GDP to less than 5% of GDP. This means that in terms of its portion of the US. economy, defense spending has been reduced by half while healthcare spending has more than tripled.

If healthcare continues to trend at the same pace it has for the last 50 years, it will consume more than 50% of the US. economy by the year 2060. Every economist worth their salt will tell you that healthcare will never reach 50% of the economy. It’s simply not possible because of all the other things it would have to crowd out to reach that point. So, if we know healthcare can’t grow to 50% of our economy, where is the breaking point? At what point does healthcare consume so much of the economy that it breaks the bank, so to speak?

This is the big question when it comes to healthcare. If something doesn’t happen to reverse the 50-year trend we’ve been riding, when will the healthcare bubble burst? How bad will it be and how exactly will it happen? While no one knows the exact answers to those questions, economists and healthcare experts agree that something needs to happen, because we simply can’t continue on this trend forever.

Another way to look at healthcare is to study its impact on the federal budget and the national debt. In 1998, federal healthcare spending accounted for 19% of the revenue taken in by the government. Just eight years later, in 2006, healthcare spending had increased to 24% of federal revenue. In 2010, the Affordable Healthcare Act passed and signiﬁcantly increased federal spending for healthcare—so much so that in 2016, healthcare spending accounted for almost one-third of all revenue received by the government and surpassed Social Security as the largest single budget category. What makes this trend even more alarming is the fact that revenue to the federal government doubled from 1998 to 2016. That means healthcare spending by the federal government has almost quadrupled in terms of actual dollars in that same time period. If this trend continues for the next 20 years, healthcare spending will account for over half the revenue received by the government by the year 2035. Again, that simply can’t happen without causing signiﬁcant issues for the ﬁnancial wellbeing of our country.

In recent history, the U.S. economy has experienced the near catastrophic failure of two major market segments. The ﬁrst was the auto industry and the second was the housing industry. While each of these reached their breaking point for different reasons, they both required a signiﬁcant government bailout to keep them from completely melting down. What is also true about both of those market failures is that, looking back, it’s easy to see the warning signs. What happens if healthcare is the next industry to suffer a major failure and collapse?

It’s safe to say that a healthcare meltdown would make both the automotive and housing industries’ experiences seem minor in comparison. While that may be hard to believe, it becomes clear if you look at the numbers. The auto industry contributes around 3.5% of this country’s GDP and employs 1.7 million people. This industry was deemed “too big to fail” which is the rationale the U.S. government used to ﬁnance its bail out. From 2009 through 2014, the federal government invested around $80 billion in the U.S. auto industry to keep it from collapsing. Healthcare is ﬁve times larger than the auto industry in terms of its percentage of GDP, and is ten times larger than the auto industry in terms of the number of people it employs.

The construction industry (which includes all construction, not just housing) contributes about 6% of our country’s GDP and employs 6.1 million people. Again, the healthcare market dwarfs this industry. It’s three times larger in terms of GDP production and, with 18 million people employed in the healthcare sector, it’s three times larger than construction in this area, too.

These comparisons give you an idea of just how signiﬁcant a portion healthcare comprises of the U.S. economy. It also begins to help us understand the impact it would have on the economy if healthcare melted down like the auto and housing industries did. So, let’s continue the comparison and use our experience with the auto and housing industries to suggest to what order of magnitude the impact a failure in the healthcare market would cause our economy.

The bailout in the auto industry cost the federal government $80 billion over ﬁve years. Imagine a similar failure in healthcare that prompted the federal government to propose a similar bailout program. Let’s imagine the government felt the need to inject cash into hospital systems and doctors’ ofﬁces to keep them aﬂoat like they did with General Motors. Since healthcare is ﬁve times the size of the auto industry, a similar bailout could easily cost in excess of $400 billion. That’s about the same amount of money the federal government spends on welfare programs. To pay for a bailout of the healthcare industry, we’d have to eliminate all welfare programs in this country. Can you imagine the impact it would have on the economy if there were suddenly none of the assistance programs so many have come to rely upon?

When the housing market crashed, it caused the loss of about 3 million jobs from its peak employment level of 7.4 million in 1996. Again, if we transfer that experience to the healthcare market, we come up with a truly frightening scenario. If healthcare lost 40% of its jobs like housing did, it would mean 7.2 million jobs lost. That’s more than four times the number of people who are employed by the entire auto industry—an industry that was considered too big to be allowed to fail.

The loss of 7.2 million jobs would increase the unemployment rate by 5%. That means we could easily top the all-time high unemployment rate for our country. In November of 1982, the U.S. unemployment rate was 10.8%. A failure in the healthcare sector could push unemployment to those levels or higher. The only time in our country’s history when unemployment was higher was during the Great Depression. It should also be noted that in 1982, home mortgage interest rates were close to 20%! The U.S. Federal Funds Rate, or the interest rate the government pays on our national debt, was also close to 20% in 1982.

Economists fear that a large increase in unemployment could cause interest rates to escalate to levels approaching those of the early 1980s. If that were to happen today, with a $19 trillion national debt, it would mean that our annual debt service would be $3.8 trillion. Keep in mind that the federal government only takes in $3.4 trillion in total revenue. That’s right, in our nightmare scenario where healthcare fails and eliminates 7.2 million jobs, which pushes unemployment above 10% and causes interest rates to climb to almost 20%, we would be in a situation where the interest payments on our current debt would be more than our entire federal tax revenue. Basically, we would be Greece, but on a much larger scale.

Ok, now it’s time to take a deep breath. I’m not convinced that healthcare is fated to unavoidable failure and economic catastrophe. That’s a worst-case scenario. The problem is that at even a fraction the severity of the auto or housing industry crises we’ve already faced, a healthcare collapse would still be devastating. Healthcare can’t be allowed to continue its current inﬂationary trending. I believe we are on the verge of some major changes in healthcare, and that how they’re implemented will determine their impact on the overall economic picture in this country and around the world. Continued failure to recognize the truth about healthcare will only cause the resulting market corrections to be worse than they need to be.

I don’t want to diminish the pain and anguish that many people caught up in the housing crash experienced. I think an argument can be made, though, that if the healthcare market crashes and millions of people end up with no healthcare, the resulting fallout could be much worse than even the housing crisis.

#### COVID creates an economic brink---recovery is strong now because of effective monetary policy, but we’ve hit the zero-lower bound.

Christopher Rugaber 21. Associated Press. “Federal Reserve keeps key interest rate near zero, signals COVID-19 economic risks receding.” https://www.chicagotribune.com/business/ct-biz-fed-interest-rates-economy-20210428-bumyc3ynpza6ri4ygsntmdsmya-story.html.

WASHINGTON — The Federal Reserve is keeping its ultra-low interest rate policies in place, a sign that it wants to see more evidence of a strengthening economic recovery before it would consider easing its support.

In a statement Wednesday, the Fed expressed a brighter outlook, saying the economy has improved along with the job market. And while the policymakers noted that inflation has risen, they ascribed the increase to temporary factors.

The Fed also signaled its belief that the pandemic’s threat to the economy has diminished, a significant point given Chair Jerome Powell’s long-stated view that the recovery depends on the virus being brought under control. Last month, the Fed had cautioned that the virus posed “considerable risks to the economic outlook.” On Wednesday, it said only that “risks to the economic outlook remain” because of the pandemic.

The central bank left its benchmark short-term rate near zero, where it’s been since the pandemic erupted nearly a year ago, to help keep loan rates down to encourage borrowing and spending. It also said in a statement after its latest policy meeting that it would keep buying $120 billion in bonds each month to try to keep longer-term borrowing rates low.

The U.S. economy has been posting unexpectedly strong gains in recent weeks, with barometers of hiring, spending and manufacturing all surging. Most economists say they detect the early stages of what could be a robust and sustained recovery, with coronavirus case counts declining, vaccinations rising and Americans spending their stimulus-boosted savings.

#### Eroding financial resilience causes war---that overcomes traditional barriers to conflict.

Jomo Kwame Sundaram & Vladimir Popov 19. Former economics professor, was United Nations Assistant Secretary-General for Economic Development, and received the Wassily Leontief Prize for Advancing the Frontiers of Economic Thought in 2007. Former senior economics researcher in the Soviet Union, Russia and the United Nations Secretariat, is now Research Director at the Dialogue of Civilizations Research Institute in Berlin “Economic Crisis Can Trigger World War.” <http://www.ipsnews.net/2019/02/economic-crisis-can-trigger-world-war/>.

Economic recovery efforts since the 2008-2009 global financial crisis have mainly depended on unconventional monetary policies. As fears rise of yet another international financial crisis, there are growing concerns about the increased possibility of large-scale military conflict.

More worryingly, in the current political landscape, prolonged economic crisis, combined with rising economic inequality, chauvinistic ethno-populism as well as aggressive jingoist rhetoric, including threats, could easily spin out of control and ‘morph’ into military conflict, and worse, world war.

Crisis responses limited

The 2008-2009 global financial crisis almost ‘bankrupted’ governments and caused systemic collapse. Policymakers managed to pull the world economy from the brink, but soon switched from counter-cyclical fiscal efforts to unconventional monetary measures, primarily ‘quantitative easing’ and very low, if not negative real interest rates.

But while these monetary interventions averted realization of the worst fears at the time by turning the US economy around, they did little to address underlying economic weaknesses, largely due to the ascendance of finance in recent decades at the expense of the real economy. Since then, despite promising to do so, policymakers have not seriously pursued, let alone achieved, such needed reforms.

Instead, ostensible structural reformers have taken advantage of the crisis to pursue largely irrelevant efforts to further ‘casualize’ labour markets. This lack of structural reform has meant that the unprecedented liquidity central banks injected into economies has not been well allocated to stimulate resurgence of the real economy.

From bust to bubble

Instead, easy credit raised asset prices to levels even higher than those prevailing before 2008. US house prices are now 8% more than at the peak of the property bubble in 2006, while its price-to-earnings ratio in late 2018 was even higher than in 2008 and in 1929, when the Wall Street Crash precipitated the Great Depression.

As monetary tightening checks asset price bubbles, another economic crisis — possibly more severe than the last, as the economy has become less responsive to such blunt monetary interventions — is considered likely. A decade of such unconventional monetary policies, with very low interest rates, has greatly depleted their ability to revive the economy.

The implications beyond the economy of such developments and policy responses are already being seen. Prolonged economic distress has worsened public antipathy towards the culturally alien — not only abroad, but also within. Thus, another round of economic stress is deemed likely to foment unrest, conflict, even war as it is blamed on the foreign.

International trade shrank by two-thirds within half a decade after the US passed the Smoot-Hawley Tariff Act in 1930, at the start of the Great Depression, ostensibly to protect American workers and farmers from foreign competition!

Liberalization’s discontents

Rising economic insecurity, inequalities and deprivation are expected to strengthen ethno-populist and jingoistic nationalist sentiments, and increase social tensions and turmoil, especially among the growing precariat and others who feel vulnerable or threatened.

Thus, ethno-populist inspired chauvinistic nationalism may exacerbate tensions, leading to conflicts and tensions among countries, as in the 1930s. Opportunistic leaders have been blaming such misfortunes on outsiders and may seek to reverse policies associated with the perceived causes, such as ‘globalist’ economic liberalization.

Policies which successfully check such problems may reduce social tensions, as well as the likelihood of social turmoil and conflict, including among countries. However, these may also inadvertently exacerbate problems. The recent spread of anti-globalization sentiment appears correlated to slow, if not negative per capita income growth and increased economic inequality.

To be sure, globalization and liberalization are statistically associated with growing economic inequality and rising ethno-populism. Declining real incomes and growing economic insecurity have apparently strengthened ethno-populism and nationalistic chauvinism, threatening economic liberalization itself, both within and among countries.

Insecurity, populism, conflict

Thomas Piketty has argued that a sudden increase in income inequality is often followed by a great crisis. Although causality is difficult to prove, with wealth and income inequality now at historical highs, this should give cause for concern.

Of course, other factors also contribute to or exacerbate civil and international tensions, with some due to policies intended for other purposes. Nevertheless, even if unintended, such developments could inadvertently catalyse future crises and conflicts.

Publics often have good reason to be restless, if not angry, but the emotional appeals of ethno-populism and jingoistic nationalism are leading to chauvinistic policy measures which only make things worse.

At the international level, despite the world’s unprecedented and still growing interconnectedness, multilateralism is increasingly being eschewed as the US increasingly resorts to unilateral, sovereigntist policies without bothering to even build coalitions with its usual allies.

Avoiding Thucydides’ iceberg

Thus, protracted economic distress, economic conflicts or another financial crisis could lead to military confrontation by the protagonists, even if unintended. Less than a decade after the Great Depression started, the Second World War had begun as the Axis powers challenged the earlier entrenched colonial powers.

They patently ignored Thucydides’ warning, in chronicling the Peloponnesian wars over two millennia before, when the rise of Athens threatened the established dominance of Sparta!

Anticipating and addressing such possibilities may well serve to help avoid otherwise imminent disasters by undertaking pre-emptive collective action, as difficult as that may be.

#### And go nuclear.

Stein Tønnesson 15. Research Professor, Peace Research Institute Oslo; Leader of East Asia Peace program, Uppsala University, 2015. “Deterrence, interdependence and Sino–US peace.” International Area Studies Review, Vol. 18, No. 3, p. 297-311.

Several recent works on China and Sino–US relations have made substantial contributions to the current understanding of how and under what circumstances a combination of nuclear deterrence and economic interdependence may reduce the risk of war between major powers. At least four conclusions can be drawn from the review above: first, those who say that interdependence may both inhibit and drive conflict are right. Interdependence raises the cost of conflict for all sides but asymmetrical or unbalanced dependencies and negative trade expectations may generate tensions leading to trade wars among inter-dependent states that in turn increase the risk of military conflict (Copeland, 2015: 1, 14, 437; Roach, 2014). The risk may increase if one of the interdependent countries is governed by an inward-looking socio-economic coalition (Solingen, 2015); second, the risk of war between China and the US should not just be analysed bilaterally but include their allies and partners. Third party countries could drag China or the US into confrontation; third, in this context it is of some comfort that the three main economic powers in Northeast Asia (China, Japan and South Korea) are all deeply integrated economically through production networks within a global system of trade and finance (Ravenhill, 2014; Yoshimatsu, 2014: 576); and fourth, decisions for war and peace are taken by very few people, who act on the basis of their future expectations. International relations theory must be supplemented by foreign policy analysis in order to assess the value attributed by national decision-makers to economic development and their assessments of risks and opportunities. If leaders on either side of the Atlantic begin to seriously fear or anticipate their own nation’s decline then they may blame this on external dependence, appeal to anti-foreign sentiments, contemplate the use of force to gain respect or credibility, adopt protectionist policies, and ultimately refuse to be deterred by either nuclear arms or prospects of socioeconomic calamities. Such a dangerous shift could happen abruptly, i.e. under the instigation of actions by a third party – or against a third party.

Yet as long as there is both nuclear deterrence and interdependence, the tensions in East Asia are unlikely to escalate to war. As Chan (2013) says, all states in the region are aware that they cannot count on support from either China or the US if they make provocative moves. The greatest risk is not that a territorial dispute leads to war under present circumstances but that changes in the world economy alter those circumstances in ways that render inter-state peace more precarious. If China and the US fail to rebalance their financial and trading relations (Roach, 2014) then a trade war could result, interrupting transnational production networks, provoking social distress, and exacerbating nationalist emotions. This could have unforeseen consequences in the field of security, with nuclear deterrence remaining the only factor to protect the world from Armageddon, and unreliably so. Deterrence could lose its credibility: one of the two great powers might gamble that the other yield in a cyber-war or conventional limited war, or third party countries might engage in conflict with each other, with a view to obliging Washington or Beijing to intervene.

#### Even if growth is imperfect, the transition away fails.

Hubert Buch-Hansen 18. Associate Professor, Department of Business and Politics, Copenhagen Business School. “The Prerequisites for a Degrowth Paradigm Shift: Insights from Critical Political Economy.” *Ecological Economics* 146: 157-63. Emory Libraries.

Still, the degrowth project is nowhere near enjoying the degree and type of support it needs if its policies are to be implemented through democratic processes. The number of political parties, labour unions, business associations and international organisations that have so far embraced degrowth is modest to say the least. Economic and political elites, including social democratic parties and most of the trade union movement, are united in the belief that economic growth is necessary and desirable. This consensus finds support in the prevailing type of economic theory and underpins the main contenders in the neoliberal project, such as centre-left and nationalist projects. In spite of the world's multidimensional crisis, a pro-growth discourse in other words continues to be hegemonic: it is widely considered a matter of common sense that continued economic growth is required.

It is also noteworthy that economic and political elites, to a large extent, continue to support the neoliberal project, even in the face of its evident shortcomings. Indeed, the 2008 financial crisis did not result in the weakening of transnational financial capital that could have paved the way for a paradigm shift. Instead of coming to an end, neoliberal capitalism has arguably entered a more authoritarian phase (Bruff, 2014). The main reason the power of the pre-crisis coalition remains intact is that governments stepped in and saved the dominant fraction by means of massive bailouts. It is a foregone conclusion that this fraction and the wider coalition behind the neoliberal paradigm (transnational industrial capital, the middle classes and segments of organized labour) will consider the degrowth paradigm unattractive and that such social forces will vehemently oppose the implementation of degrowth policies (see also Rees, 2014: 97).

While degrowth advocates envision a future in which market forces play a less prominent role than they do today, degrowth is not an antimarket project. As such, it can attract support from certain types of market actors. In particular, it is worth noting that social enterprises, such as cooperatives (Restakis, 2010), play a major role in the degrowth vision. Such enterprises are defined by being ‘organisations involved at least to some extent in the market, with a clear social, cultural and/or environmental purpose, rooted in and serving primarily the local community and ideally having a local and/or democratic ownership structure’ (Johanisova et al., 2013: 11). Social enterprises currently exist at the margins of a system, in which the dominant type of business entity is profit-oriented, shareholder-owned corporations. The further dissemination of social enterprises, which is crucial to the transitions to degrowth societies, is – in many cases – blocked or delayed as a result of the centrifugal forces of global competition (Wigger and Buch-Hansen, 2013). Overall, social enterprises thus (still) constitute a social force with modest power.

Ougaard (2016: 467) notes that one of the major dividing lines in the contemporary transnational capitalist class is between capitalists who have a material interest in the carbon-based economy and capitalists who have a material interest in decarbonisation. The latter group, for instance, includes manufacturers of equipment for the production of renewable energy (ibid.: 467). As mentioned above, degrowth advocates have singled out renewable energy as one of the sectors that needs to grow in the future. As such, it seems likely that the owners of national and transnational companies operating in this sector would be more positively inclined towards the degrowth project than would capitalists with a stake in the carbon-based economy. Still, the prospect of the “green sector” emerging as a driving force behind degrowth currently appears meagre. Being under the control of transnational capital (Harris, 2010), such companies generally embrace the “green growth” discourse, which ‘is deeply embedded in neoliberal capitalism’ and indeed serves to adjust this form of capitalism ‘to crises arising from contradictions within itself’ (Wanner, 2015: 23).

In addition to support from the social forces engendered by the production process, a political project ‘also needs the political ability to mobilize majorities in parliamentary democracies, and a sufficient measure of at least passive consent’ (van Apeldoorn and Overbeek, 2012: 5–6) if it is to become hegemonic. As mentioned, degrowth enjoys little support in parliaments, and certainly the pro-growth discourse is hegemonic among parties in government.5 With capital accumulation being the most important driving force in capitalist societies, political decision-makers are generally eager to create conditions conducive to production and the accumulation of capital (Lindblom, 1977: 172). Capitalist states and international organisations are thus “programmed” to facilitate capital accumulation, and do as such constitute a strategically selective terrain that works to the disadvantage of the degrowth project.

The main advocates of the degrowth project are grassroots, small fractions of left-wing parties and labour unions as well as academics and other citizens who are concerned about social injustice and the environmentally unsustainable nature of societies in the rich parts of the world. The project is thus ideationally driven in the sense that support for it is not so much rooted in the material circumstances or short-term self-interests of specific groups or classes as it is rooted in the conviction that degrowth is necessary if current and future generations across the globe are to be able to lead a good life. While there is no shortage of enthusiasts and creative ideas in the degrowth movement, it has only modest resources compared to other political projects. To put it bluntly, the advocates of degrowth do not possess instruments that enable them to force political decision-makers to listen to – let alone comply with – their views. As such, they are in a weaker position than the labour union movement was in its heyday, and they are in a far weaker position than the owners and managers of large corporations are today (on the structural power of transnational corporations, see Gill and Law, 1989).

6. Consent

It is also safe to say that degrowth enjoys no “passive consent” from the majority of the population. For the time being, degrowth remains unknown to most people. Yet, if it were to become generally known, most people would probably not find the vision of a smaller economic system appealing. This is not just a matter of degrowth being ‘a missile word that backfires’ because it triggers negative feelings in people when they first hear it (Drews and Antal, 2016). It is also a matter of the actual content of the degrowth project.

Two issues in particular should be mentioned in this context. First, for many, the anti-capitalist sentiments embodied in the degrowth project will inevitably be a difficult pill to swallow. Today, the vast majority of people find it almost impossible to conceive of a world without capitalism. There is a ‘widespread sense that not only is capitalism the only viable political and economic system, but also that it is now impossible to even imagine a coherent alternative to it’ (Fisher, 2009: 2). As Jameson (2003) famously observed, it is, in a sense, easier to imagine the end of the world than it is to imagine the end of capitalism. However, not only is degrowth – like other anti-capitalist projects – up against the challenge that most people consider capitalism the only system that can function; it is also up against the additional challenge that it speaks against economic growth in a world where the desirability of growth is considered common sense.

Second, degrowth is incompatible with the lifestyles to which many of us who live in rich countries have become accustomed. Economic growth in the Western world is, to no small extent, premised on the existence of consumer societies and an associated consumer culture most of us find it difficult to completely escape. In this culture, social status, happiness, well-being and identity are linked to consumption (Jackson, 2009). Indeed, it is widely considered a natural right to lead an environmentally unsustainable lifestyle – a lifestyle that includes car ownership, air travel, spacious accommodations, fashionable clothing, an omnivorous diet and all sorts of electronic gadgets. This Western norm of consumption has increasingly been exported to other parts of the world, the result being that never before have so many people taken part in consumption patterns that used to be reserved for elites (Koch, 2012). If degrowth were to be institutionalised, many citizens in the rich countries would have to adapt to a materially lower standard of living. That is, while the basic needs of the global population can be met in a non-growing economy, not all wants and preferences can be fulfilled (Koch et al., 2017). Undoubtedly, many people in the rich countries would experience various limitations on their consumption opportunities as a violent encroachment on their personal freedom. Indeed, whereas many recognize that contemporary consumer societies are environmentally unsustainable, fewer are prepared to actually change their own lifestyles to reverse/address this.

At present, then, the degrowth project is in its “deconstructive phase”, i.e., the phase in which its advocates are able to present a powerful critique of the prevailing neoliberal project and point to alternative solutions to crisis. At this stage, not enough support has been mobilised behind the degrowth project for it to be elevated to the phases of “construction” and “consolidation”. It is conceivable that at some point, enough people will become sufficiently discontent with the existing economic system and push for something radically different. Reasons for doing so could be the failure of the system to satisfy human needs and/or its inability to resolve the multidimensional crisis confronting humanity. Yet, various material and ideational path-dependencies currently stand in the way of such a development, particularly in countries with large middle-classes. Even if it were to happen that the majority wanted a break with the current system, it is far from given that a system based on the ideas of degrowth is what they would demand.

# 2AC

## Innovation

#### The Puar Evidence---the affirmative is not a form of crip nationalism. It is a critique of the ways US anti-trust law has disadvantaged people from the medical model. Advancement is possible.

Kim Hall 14. Professor of Philosophy and Director of Gender, Women's Studies, and Sexuality Studies at Appalachian State University. “No Failure: Climate Change, Radical Hope, and Queer Crip Feminist Eco-Futures,” *Radical Philosophy Review*, Vol. 17, No. 1 14, p. 203–225.

These discussions of futurity in queer and disability studies are extremely important and generative; nonetheless, I wonder if they have gone far enough. Despite their emphasis on failure, materialism, and futurity, there has been (with a few notable exceptions)7 a striking silence concerning the planet with which queer crip feminist critique and identities are intertwined. My point here is not to insist on a simple addition of another context for discussion; my point is that the absence of consideration of planetary implications is particularly puzzling given the contemporary moment in which ideas of the future and failure are so central to discourses of sustainability and climate change. Most discussions about futurity in queer studies rightly focus on the social, political, and economic crisis of neoliberal global capitalism; however, critical attention to this crisis fails for the most part to extend concern to what is arguably one of the most urgent, very material, crises in our world, a crisis fueled by neoliberal global capitalist development: climate change. In this paper I seek to address this omission by advancing a queer crip feminist8 critical engagement with the emphasis on failure and futurity in queer studies today.

Building on Rosi Braidotti’s concept of becoming-earth,9 I argue that, when radically understood, queerness and disability are sites of imaginative alternatives crucial for responding to (i.e., being critically attuned toward and accountable to) climate change. I argue for a queer crip feminist conception of and orientation to the future informed by critique of assumptions regarding and implications of boundaries between the “human” and “non-human.” Many discussions of futurity within queer studies have failed to take into account the nature-cultural10 beings we are. Building on the title of Clare Colebrook’s edited series for Open Humanities Press press, Braidotti contends the Age of the Anthropocene11 calls for a “’critical climate change,’” a shift in how we conceptualize being, life, death, and temporality. 12 Ultimately, I aim to show that far from “kid’s stuff”13 or merely a site for alternative social alliances, a more-than-human understanding of the future is vital for queer crip feminist lives and offers the conceptual resources necessary for bringing about another, more just world.

As critiques of queer theory’s whiteness have shown,14 counter-hegemonic orientations are not innate in the concept of queerness itself; instead, the resistant potential of queerness is contingent upon how the concept is deployed and in which contexts. One major context that needs to be considered in queer discussions of futurity is the more-than-human planetary context. As the contributors to Queer Ecologies: Sex, Nature, Politics, Desire demonstrate, there has been a justified suspicion of appeals to ‘nature’ and the ‘natural’ within queer theory (as well as in feminist and disability studies) because of the longstanding role of those appeals in the pathologization of non-normative bodyminds,15 identities, and lives. It is indeed important to retain a critical suspicion of appeals to nature. Nonetheless, when coupled with an inattentiveness to our naturecultural being in the world, such suspicion fails to critically address assumptions about what it means to be human that have also played a role in pathologizing identities, bodyminds, and lives that exceed gendered, racialized, and able-bodied norms. In other words, the failure to attend to the implications of queer conceptions of futurity and sustainability for the planet reflects and reinforces a conception of queerness that undermines desires for transnational alliances and livable worlds. A commitment to transnational alliances and livable worlds must address practices (for instance, emissions produced by the consumption habits of global elites) that disproportionately threaten the present and future lives of those who are least privileged in the world. Too often, appeals to a livable world in queer theory ignore the planet on which hopes, dreams, relationships—in short, our lives—take place. When calls for a more livable future and world are made, which entities’ futures do queer theorists tend to have in mind? In this paper I aim to show that radical thinking about the meaning of the future and more livable, sustainable worlds must strive to take into account and be accountable to the planet with which human lives and life in general is enmeshed.

My discussion of these issues begins with a critical consideration of the association of queerness with anti-futurity, followed by a discussion of the idea of queerness as failure. Then, I consider the view that intersectionality forecloses the future. Next, I turn to a discussion of ice in order to provide an example alternative conception of the future that resists queer anthropocentrisms and is responsive to the reality of climate change. Finally, I make a case for a queer crip feminism informed by radical hope for alternative futures. It is radical hope for alternative, more-than-human futures that can sustain queer crip feminist lives.

#### Puar starts their analysis on critique of the ADA----action like the ADA is critical to progress.

Samuel R. Bagenstos 9, professor of law at the University of Michigan, Law and the contradictions of the disability rights movement, p. 149-150

The American disability rights movement has achieved a great deal, but progress has in many respects stagnated. As I have shown throughout this book, the movement has always been a broad one that has embraced a variety of different and conflicting views of the proper means and ends of disability equality. But the movement’s policy agenda in recent decades has been too heavily weighted toward one set of these views. What the movement needs is a renewed emphasis on the approaches that have been eclipsed: approaches that look to universalism as a key element of disability policy, and that embrace social welfare programs as important tools for achieving disability equality. Such a renewed emphasis will not avoid the tensions among the various strands of disability rights thinking— indeed, as this chapter has shown, there is even tension between universalism and the social welfare approach— but it will help the movement make progress in achieving its overlapping-consensus goals of integration and equal citizenship.

In the end, there is probably no way to avoid the contradictions of the disability rights movement— and perhaps little reason for the movement even to try. What the movement can and should do is seek to manage those contradictions, and keep focused on the ultimate goals. At its best, that is precisely what the American disability rights movement has done. The willingness of disability rights activists to support such social welfare interventions as the Community Choice Act shows that the movement’s pragmatic spirit still lives. That spirit was key to the movement’s great twentieth-century victories— and it will be essential to the movement’s success in the twenty-first century.

#### Peer begins their critique by detailing the impacts of Liberalism on disability rights----Liberalism is not monolithic – it is reflexive and premised on mutual recognition of vulnerability.

Gabriele Badano 14. PhD Candidate, Centre for Philosophy, Justice, and Health, University College London. “Political liberalism and the justice claims of the disabled: a reconciliation.” *Critical Review of International Social and Political Philosophy* 17(4): 401-22. Emory Libraries.

I argue that any proposal abandoning the language of political justice would not seem to do enough for those individuals with disabilities who fall outside the basic idea of persons as depicted by Rawls. In fact, the intuitions supporting the idea that concepts like rights and opportunities are indispensable are very strong.11 Let us go back to the examples of individuals falling outside Rawls’s idea of persons because their disabilities prevent them from being a net beneﬁt to social cooperation. They are individuals who need multiple careers to work, or whose disabilities prevent them from providing a beneﬁt to social cooperation that is large enough. To put the point more sharply, it is worth noticing that the disabilities in question are compatible with being in full possession of one’s logical and moral powers. Now, should we accept that those individuals ought to be given no rights or opportunities? An afﬁrmative answer would strike us as implausible, and for a good reason. In a liberal society, having one’s rights, opportunities and basic distributive entitlements acknowledged is one and the same as being recognized as an equal. And what is missing from Rawls’s political liberalism is precisely the idea that falling below a threshold of full cooperation should not be enough to prevent the disabled from being regarded as persons on an equal footing with anyone else.

In sum, Rawls’s political liberalism is not amenable to any extension that, keeping the basic ideas of society and persons intact, is able to include a concern with the status of individuals with disabilities. In addition, the proposal that the interests of the disabled are not for public reason to protect is not satisfactory. Consequently, a substantial revision is the only way to reconcile political liberalism with our intuitions concerning what is due to the disabled.

5. Revising political liberalism I: beyond Hartley’s contractualism

The aim of this section and the next is to propose a substantial revision of Rawls’s theory that accommodates the justice claims of the disabled while upholding the project of political liberalism. A question that needs to be answered at this point is: why should we uphold the project of political liberalism, rather than endorsing a different model that more neatly ﬁts with our intuitions concerning what is due to the disabled? First, the general project of political liberalism is compelling. Rawls’s political liberalism aims to identify a common ground of political ideas that can work as the basis on which the most important political decisions should be made. This project is of the greatest importance because, if successful, it creates legitimacy by building institutions on the basis of concepts that are acceptable to each reasonable individual. Moreover, it promotes stability in societies that are characterized by deep pluralism.

Second, despite Rawls’s failure to take the interests of the disabled into consideration, political liberalism is well suited to support the justice claims of individuals with disabilities. This is because the idea that the disabled are citizens who deserve our respect is part of the common culture of our societies. In other words, there is an overlapping consensus on the idea that rights, opportunities and distributive shares must be granted to individuals who are not fully cooperating members of society, including those who fall below full moral powers. It is widely believed that those with physical disabilities should have the same rights as their fellow citizens, live in a social environment that does not excessively limit their opportunities and receive beneﬁts that help meet their special needs. Besides, although the state or third parties are given exceptional rights to interfere with the autonomy of individuals with severe cognitive disabilities, it is widely recognized that the mentally disabled are citizens whose basic interests must be protected by the law.12 In the public space, any proposal that individuals who are not fully cooperating members of society should have their basic interests neglected would be widely received with outrage. Such proposal would be said to ﬁt a fascist society, not a decent one. Among other legal documents, the United Nations Convention on the Rights of Persons with Disabilities (UN General Assembly, A/61/611) can be taken as the epitome of this widespread attitude. Adopted in 2006, the Convention requires that all individuals with disabilities should share in the enjoyment of equal fundamental rights.

#### Only liberal notions of common humanity and state policy can solve structural problems with (dis)ability. Rejection is inherently liberal, but ignores necessary reforms.

Martha Nussbaum 00. Ernst Freund Distinguished Service Professor of Law and Ethics, University of Chicago. “The Future of Feminist Liberalism.” *Proceedings and Addresses of the American Philosophical Association* 74(2): 47-79. Emory Libraries. Problematic language modified.

My solution to these problems lies, then, squarely within the liberal tradition. But Kittay suggests that we should go further departing from that tradition altogether. She holds that Western political theory must be radically reconfigured to put the fact of dependency at its heart. The fact, she says, that we are all "some mother's child," existing in intertwined relations of dependency, should be the guiding image for political thought.39 Such a care-based theory, she thinks, will be likely to be very different from any liberal theory, since the liberal tradition is deeply committed to goals of independence and liberty. Although Kittay supplies few details to clarify the practical meaning of the difference, I think her idea is that the care-based theory would support a type of politics that provides comprehensive support for need throughout all citizens' lives, as in some familiar ideals of the welfare state-but a welfare state in which liberty is far less important than security and well-being.

Kittay is not altogether consistent on this point. At times she herself uses classic liberal arguments, saying that we need to remember that caregivers have their own lives to lead, and to support policies that give them more choices.40 But on the whole she rejects, in the abstract, solutions that emphasize freedom as a central political goal. The concrete measures she favors do not seem to have such sweeping anti-liberal implications. The restoration and expansion of Aid to Families with Dependent Children expansion of the Family and Medical Leave Act of 1993; various educational measures promoting the dignity of the disabled, through a judicious combination of "mainstreaming" and separate education4"-all these are familiar liberal policies, which can be combined with an emphasis on choice and liberty as important social goals. Kittay's most controversial proposal, that of a direct non-means-tested payment to those who care for family dependents at home-clearly has, or could have, a liberal rationale: that of ensuring that these people are seen as active, dignified workers rather than passive non-contributors.

Indeed, if we adopt all the changes I have proposed, we will still have a theory that is basically liberal. For theories that take their start from an idea of human capability and functioning emphasize the importance of giving all citizens the chance to develop the full range of human powers, at whatever level their condition allows, and to enjoy the sort of liberty and independence their condition allows. Would we do better to reject this theory in favor of Kittay's idea, rejecting independence as a major social goal and conceiving of the state as a universal mother? To be sure, nobody is ever self-sufficient; the independence we enjoy is always both temporary and partial, and it is good to be reminded of that fact by a theory that also stresses the importance of care in times of dependency. But is being "some 57 mother's child" a sufficient image for the citizen in a just society? I think we need a lot more: liberty and opportunity, the chance to form a plan of life, the chance to learn and imagine on one's own. These goals are as important for [those with varying degrees of (dis)ability] the mentally handicapped as they are for others, though much more difficult to achieve. Although Kittay's daughter Sesha will never live on her own (and although Kittay is right to say that independence should not be seen as a necessary condition of dignity for all mentally disabled people)42, many others do aspire to hold a job, and vote, and tell their own story. Michael Berube ends his compelling account of his son's life with the hope that Jamie, too, will write a book about himself, as two adults with Down Syndrome recently have.43 One day Jamie's kindergarten class went round the room, asking the children what they wanted to be when they grew up. They said the usual things: basketball star, ballet dancer, fireman. The teacher wasn't sure Jamie would understand the question, so she asked it very clearly. Jamie just said, "Big." And his literal answer, said the teacher, taught them all something about the question. Berube too wants, simply, a society in which his son will be able to be "big” healthy, educated, loving, active, seen as a particular person with something distinctive to contribute, rather than as "a retarded child."

For that to happen, his dependencies must be understood and supported. But so too must his need to be distinct and an individual: and at this point Berube refers sympathetically to Rawls. He argues that the idea at the heart of the Individuals With Disabilities Education Act (IDEA)-the idea that every child has the right to an "appropriate education" in the "least restrictive environment" possible, based on an "Individualized Education Plan"-is a profoundly liberal idea, an idea about individuality and freedom. One of the most important kinds of support mentally disabled children need is the support required to be free choosing adults, each in his or her own way. Insofar as Kittay suggests that we downplay or marginalize such liberal notions in favor of a conception of the state that makes it the parental supporter of its "children’s needs, I thinks he goes too far, misconceiving what justice would be for both the disabled and the elderly. Even for Sesha, who will never vote or write, doesn't a full human life involve a kind of freedom and individuality namely, a space in which to exchange love and enjoy light and sound, free from confinement and mockery?

So I believe that the problem we have investigated shows us that liberal theory needs to question some of its most traditional starting points-questioning, in the process, the Kantian notion of the person. But that does not disable liberalism: it just challenges us all to produce a new form of liberalism, more attentive to need and its material and institutional conditions. The liberal ideas of freedom and of the human need for various types of liberty of action are precious ideas that feminist philosophers, it seems to me, should cherish and further develop, creating theories that make it possible for all citizens to have the support they need for the full development of their human capabilities.

## Cap K

#### 3. Considering alternative futures is key.

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The desire to anticipate what the future holds is not new. The Delphic oracle in the eighth century BC held a prestigious and authoritative position in the Greek world, providing predictions and guidance to both city-states and individuals. In 1555, Nostradamus’ Les Propheties attracted an enthusiastic following, and even today many credit him with predicting many major world events. During the Cold War, techniques designed to anticipate the future were instrumental in informing strategic decisions. Analysts at the RAND Corporation, for example, pioneered the development of foresight methods such as scenario development to predict the Soviet Union’s nuclear strategy during the Cold War in their seminal 1988 report, “How Nuclear War Might Start”. However, just as the Cold War ended, so too did the close relationship between foresight and nuclear weapons. Other sectors utilized and expanded upon futures methods in their work. The most well-known example is the use of scenario planning at Royal Dutch Shell, which has been in use since the 1970s to better prepare for an eventful decade of oil crises and economic turmoil. The objective of Shell-style scenario planning is **breaking** the habit of **assuming that the future will look much like the present.** Today, many parts of the private and public sectors increasingly use strategic foresight to explore the future as part of their decision-making process. In comparison, futures methods are no longer in the mainstream of nuclear policy making, **even though nuclear risks are rising**. This dearth of strategic foresight in nuclear policy making is **dangerous**, but fortunately there are some easy remedies. A fundamental challenge faces nuclear policy makers and scholars today: It is now **more important than ever** to anticipate what the future might hold due to the **uncertainty surrounding tomorrow’s strategic environment.** Moreover, the inherent—and growing—complexity of systems and new actors has made it increasingly difficult to predict the future simply by extrapolating from the past. Futures methods provide the tools to address this challenge, along with a good dose of humility about how much we can control our world. These methods can help **develop foresight**—insight into how and why the future could be different than today—which, in turn, helps to **improve policy, planning, and decision making**, all of which play an integral part in a world with nuclear weapons. We talk about futures in the plural because the objective is not to predict a single future, but to explore alternative futures. By **envisioning alternative futures**, we can **better sense, shape, and adapt** to the one that is emerging. Singapore’s foresight practice is an excellent example of how foresight readies us for change. For over 40 years, foresight has helped the Singapore government go beyond prevailing assumptions, better manage risk and uncertainty, and develop greater resilience to possible shocks. Futures methods also help to **engender ‘knowledge humility’**, where instead of seeking to deny or eliminate uncertainty, we learn to **live with it through reflexive governance.**

#### 2. The aff provides a course correction to capitalism---unfettered free markets result in consolidation, but state intervention can promote creative destruction.

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Let’s face it: Capitalism has a bad reputation these days. While it is still seen as the “least awful” of alternatives, many accuse it of having led to exploding inequality, disastrous climate change and fractured societies. For some, these consequences are enough to advocate abandoning it altogether.

In The Power of Creative Destruction, economists Philippe Aghion, Céline Antonin and Simon Bunel argue that abolishing capitalism is not the solution. Historically, a market economy has proved to be a formidable engine of prosperity, enabling societies to develop in ways that were unimaginable even two centuries ago. However, market forces cannot be given free rein. The state and civil society both have a role to play in guiding the forces of disruptive innovation that underpin growth.

Creative destruction refers to the process by which innovations continually displace existing technologies and ways of doing things. New firms continually step up to the plate and new jobs replace obsoleted ones. In sum, the new destroys the old. This constant innovation is the driving force of capitalism and the catalyst of long-term growth. However, feats of innovation aren’t heaven-sent. They are achieved by entrepreneurs motivated by the prospect of dominating over a given market. The problem is that once they manage that, they often use their might to maintain the status quo and block the natural Darwinian process.

The originator of the notion of creative destruction, Joseph Schumpeter (1883-1950), was pessimistic about the future of capitalism. He believed that powerful incumbents – think conglomerates – would eventually dominate every sector. By stifling competition, they would kill innovation and growth softly. On the strength of about 30 years of global research that yielded the body of theory and empirical evidence that Schumpeter lacked, Aghion and his co-authors are unquestionably more upbeat. Advocating a fighting optimism, their book shows there are ways to reward growth-creating innovators and, at the same time, prevent them from entrenching themselves.

Revisiting the main enigmas of economic history

History has left us with some enigmas about economic growth. Among them: Why did economic growth suddenly pick up from 1820, after being negligible for close to 2000 years? Why do some countries start to converge to the standards of living of developed countries but sputter mid-way? And why have technological revolutions so far not brought about the mass unemployment feared by the Luddites in 19th-century England and by John Maynard Keynes in 1930? The body of knowledge accumulated around creative destruction helps us solve all these enigmas and more, as shown by the following three vignettes.

The 1820 starting point of growth: The world per capita GDP was the same in the year 1000 as in the year 1 CE. From there, the average rate of yearly growth barely reached one twentieth of 1 percent. But in 1820, in the United Kingdom and then in France, economic growth suddenly picked up, reaching about 0.5 percent per year for 50 years. Why? Because of the convergence of four factors: greater transfer of knowledge (e.g. the Encyclopaedists, the weakening of overprotective guilds), effective protection of property rights, healthy competition between European nations (inventors not welcome in one country could take their brilliance elsewhere) and the development of financial instruments that dynamised innovation and risk taking.

The middle-income trap: Developing countries must implement investment-focused policies to catch up initially, but at some point, they must switch to innovation-promoting policies to compete within the world of developed economies. A crisis can help with that painful transition to a more Darwinian setting. If not, the nation’s growth stalls as the well-fed incumbents guard their turf and block new competition.

Technology as the end of jobs: The fear that machines will destroy human jobs began long ago. When William Lee presented a stocking-knitting machine to Queen Elizabeth I in 1589 (in order to get a patent), she refused, declaring: “Consider what thy invention could do to my poor subjects. It would assuredly bring them ruin by depriving them of employment, thus making them beggars.” However, we now have data to show that the impact of automation on jobs is not only positive, but it also increases over time. A 1 percent increase in automation in a plant today increases employment by 0.25 percent after two years and by 0.4 percent after ten years. This effect holds even for unskilled manufacturing workers. Automation generates productivity gains that benefit employees, consumers (via lower prices) and firms (via increased sales).

Questioning some common bits of wisdom

Creative destruction also gives us a useful lens through which to assess policy prescriptions. For instance, some believe that taxation is the sole method of making growth more inclusive. Along the same line of thinking, some insist we should tax robots, especially since they will (allegedly) create mass unemployment. Others view a complete ban on growth as the best way to fight climate change.

Aghion and his co-authors believe these policies are misguided and explain why in the book. Taxation is but one economic tool; it is just as important for the state to promote innovation to boost social mobility and raise standards of living. The focus should be on investing in education and science. More recently, the state has emerged as an investor in innovation. This is a smart move.

Taxing robots, or any new technology for that matter, goes against innovation. The state should always preserve the free entry of goods and services in the market. Will some jobs be displaced in the process? Of course, and that is why creative destruction has an important caveat, or perhaps corollary: The state must insure employees against the potentially adverse consequences of job loss.

Zero or negative growth is not the best response to climate change. Green innovation is. However, a laissez-faire economy doesn’t move spontaneously towards green innovation. On the contrary, polluting firms will naturally prefer to innovate in the same polluting technologies. So, the state must provide incentives to redirect innovation efforts. Several levers can achieve this: a carbon tax, subsidies for green innovation, technology transfers to developing countries and carbon tariffs to discourage pollution havens. Civil society also has an important role to play to persuade firms to pursue green technologies.

Rethinking the future of capitalism

Lastly, the creative destruction paradigm helps us rethink capitalism. The Covid crisis has revealed the pitfalls of capitalism, which turn out to be very different across countries. The United States has a great model of innovation, but its social model is broken. Europe (broadly) offers social welfare, but its innovation model is inadequate. The book explains how we should work towards a model of capitalism that combines the dynamism of the US innovation with the social protections afforded by a country like Denmark.

Despite Schumpeter’s initial gloom, capitalism isn’t doomed. There are ways to overcome its apparent curse. But just like innovation isn’t heaven-sent, fixing capitalism will require coordinated action, based on a solid understanding of the determinants of economic growth and prosperity.

States should pursue two types of policies simultaneously: protecting intellectual property rights on innovation on the one hand and safeguarding competition on the other. Merger and acquisition policies should also take into account the impact on innovation. The entry of smaller, potentially more innovative players, cannot be left to the good will (or distraction) of the incumbents.

Optimal innovation policies will never please the firms that have already achieved market dominance. Proper separation of power, supported and enforced by a strong civil society, is required to ensure minimal collusion between behemoth firms and the executive power. Think of it as a “magic triangle” that includes the state, the market and civil society acting as a watchdog.

Does fixing capitalism somehow involve getting rid of the 1%? The short answer is no. While innovation does help the top 1% get richer, it doesn’t impact the Gini coefficient (an index of wealth inequality within a nation). This is because innovation lifts society as a whole through promoting social mobility. This contrasts with lobbying, which also helps the rich get richer, but does nothing for innovation on top of increasing the Gini coefficient. In sum, society can reward innovators, but should never leave them in charge of policymaking.

#### 1. The first warrant is inequality, the aff addresses solves it---lack of competition is regressive, but antitrust solves.

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The direct cost of anti-competitive behavior is high. Many studies estimate this cost by implied price overcharge, typically stemming from identified cartels. A common approach to estimating the price overcharge consists in applying a difference-in-difference technique, that is, by comparing prices in a market before and after an infringement was identified (e.g., a cartel) to a “counterfactual” market in a different location or product market where no infringement was identified.3 The estimated price overcharges in advanced economies are found to be large on average, ranging from 15 to about 50 percent. Ivaldi et al. (2017) extends these estimationsto 20 developing economies, using a database of over 200 major cartel episodes over 1995–2013. They estimate that the harm to the economy in terms of excess profits resulting from price overcharges could reach about 4 percent of GDP, accounting for the probability of undetected cartels. The cost of cartels could extend to overcharges in intermediate goods, ultimately affecting finished products, as well as procurement of public goods, or it could also affect the economy through a reduction in output (World Bank-OECD 2017). Even without cartels, anti-competitive behavior would result in higher prices and lower production.

There is also growing evidence that the lack of competition not only affects more strongly the poorest countries but also hurts the poor more in each country. Higher market power in food, beverages and medicines was shown to be regressive, that is, they hurt more the poorest, as shown using Mexican data (Urzua 2013). Similar results exist in the context of advanced countries (e.g., Creedy and Dixon 1998 and 2000). There is also evidence that prices in sub-Saharan Africa are higher than in other developing regions, controlling for income and other factors. The extra cost of living in this region is negatively correlated with aggregate measures of competition (IMF 2019a). OECD (2017), using a calibrated model on a selected group of advanced countries, finds that market power could be responsible for a sizable increase in the wealth of the richest 10 percent and a large reduction in the income of the poorest 20 percent.

The decline in the labor share has also been interpreted as a sign of rising market power. Labor share has been decreasing in the U.S. and other advanced economies (IMF 2019b). This decline in labor share could be explained to a large extent as a result of the Information Technology (IT) revolution as argued by Aghion and others (2019). This revolution allowed superstar firms to expand into many sectors of the economy. As these firms have higher markups and lower labor shares than non-superstar firms, the decline in aggregate labor share and corresponding increase in aggregate markups reflect a “composition effect”. In other words, it is not the result of a within-firm increase in markup or a decline in labor share. Evidence of the predominance of a “between-firm” (or “composition”) effect over a “within-firm” effect is provided by De Locker and Eeckout (2019) and Baqaae and Farhi (2019). IMF (2019b) shows that the “reallocation” effect is pronounced in the U.S. but less so in other advanced countries. The long-term effect of this increasing hegemony of superstar firms has been to discourage innovation and entry by non-superstar firms, thereby leading to a decrease in aggregate productivity growth, broad-based growth, and business dynamism. This increasing hegemony, in turn, has been facilitated by an insufficient regulation of mergers and acquisitions, in other words by a competition policy, which has not adapted to the digital economy.

#### 2. The flip side is also true---economic decline makes their impacts worse, growth is progressive.

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There is a positive correlation between long-term growth and poverty alleviation. More specifically, Lant Pritchett argues, based on cross-country patterns, that “broad-based growth, defined as the process that raises median income, is far and away the most important source of poverty reduction.”9 The sharp decline in poverty rates in China (about 800 million people escaped poverty) amid the two decades of break-neck growth is the starkest illustration. As discussed, innovation-based growth based on Schumpeterian creative destruction is key to productivity gains and sustained growth. The question is how to achieve broad-based, high and sustained growth which means to spur the emergence of good paying jobs. This is perhaps one of the most difficult and debated questions in economics.

The standard view shared by most economists over the last few decades is that “horizontal policies”, that is improvements in education, the quality of institutions, infrastructure, business environment, and regulations are key. Many of these policies tackle what is known as “government failures” as described in Rodrik (2005). In other words, state intervention should limit itself to providing public goods and the provision of a good environment while crucially ensuring an adequate level of competition. In this context, firms would have the incentive to invest and deploy efforts to be competitive through improvements in productivity and innovation to offer new and better-quality goods among others.

However, growth can be harmed by anti-competitive behaviors or distortive policies which can take different and subtle forms and are not always easy to gauge. Among these, imposing barriers to entry or helping non-performing firms remain in business, could have a substantial negative effect. Hsieh and Klenow (2009) emphasize the importance of input reallocation effects. They show that aggregate productivity differentials can be explained by differences in terms of the distribution of firms’ productivity. This means that relatively less productive firms have access to a considerable share of the resources. They argue that it is harder for a more productive firm to grow but also easier for a less productive firm to survive in India than in the U.S. for example. In the same vein, Aghion (2016) suggests that that there is more business dynamism in the U.S. than India, that is more firms enter and exit, which would explain input misallocation and differences in income per capita.

Compared to the U.S., potential constraints in developing economies such as India include more rigid capital markets and labor/product markets, the lower supply of skills, the poorer quality of infrastructure, and the lower quality of institutions to protect property rights and to enforce contracts. However, even if markets are perfectly competitive and an adequate environment is ensured, the economy may still not reach its full potential. This is because of “market failures,” which typically happen in the presence of externalities. They are at play when firms and workers do not fully internalize the effects of their decisions on the broader economy and their dynamic implications. Typically, they are learning externalities, coordination failures, or information asymmetries (Rodrik 2005).

As argued by many, (e.g., Arrow 1962) and Matsuyama 1992) some activities entail higher productivity gains, or more learning potential, for an economy compared to other traditional activities such as non-tradable services or agriculture. Firms may not be fully aware of these productivity gains, leading to lower output in high-productivity sectors and lower relative incomes over time. The coordination failure is based on the idea that a critical size of the modern sector is needed for a firm to enter it. It would be profitable for a firm to invest in a modern sector only if there are enough firms investing simultaneously in other modern sectors. If many firms invest together in modern sectors, described as the “big push,” economy reaches a higher level of productivity and development (Rosenstein-Rodan 1943, Murphy et al. 1989). Lastly, information asymmetries exist if there is imperfect information about new markets and products, and firms underinvest as a result (Hausman and Rodrik 2003). This is clearly seen in firms trying to export and penetrate new geographical markets with their products.

In theory, tackling these externalities would necessitate a state intervention, broadly defined as industrial policy. However, the scope, the tools and whether it could in practice be superior to a more “laissez-faire” approach, leaving the outcome to unfettered competition, is the object of an ongoing debate. At the heart of the debate lies the definition of what constitutes a “modern” sector, which is conducive to productivity gains and spillovers to the rest of the economy. While it is typically associated with manufacturing (Matsuyama 1992 and Krugman 1987) or related to the concept of sophistication (Hausman, Hwang and Rodrik 2007 and Cherif and Hasanov 2019), others argue that service sectors could also play a role (IMF 2018). More important for inclusive growth, if a sector is to be targeted, it should help achieve broad-based growth to contribute to poverty alleviation. In practice it means that it should also generate (directly or indirectly) enough employment, and the level of skills to fill those jobs should be realistically met over the medium term.

The other key question relates to how state intervention to tackle externalities could curtail or distort competition. Indeed, state interventions of the past typically followed the model of import-substitution policies. The main idea was to protect domestic producers from international competition by imposing barriers to trade, such as high tariffs. In many cases, the curtailment of competition went further and encompassed the domestic market as countries relied on one or very few “champions” to achieve import-substitution goals. The many past failed cases in Latin America and the Middle East imply that such policies may be counterproductive in general (Cherif and Hasanov 2019). The comparison of Malaysia’s foray into automotive industry in the 1970s with its champion Proton to the success of Korea’s Hyundai is a case in point (Cherif and Hasanov 2019b). After decades of support and protection from domestic and international competition, Proton depended on imports of critical inputs, including the engine. The high tariffs to protect it also meant that consumers had to pay higher prices for lower quality products. In comparison, although Hyundai benefitted from state support as well, it was also forced early on to compete both on the domestic and international markets. It could be argued that competition provided Hyundai with an incentive to innovate and take advantage of economies of scale.

Moreover, support for firms could be pursued without necessarily implying less competition. Aghion and others (2015) develop a simple model showing that targeted subsidies can be used to induce several firms to operate in the same sector, and that the more competitive the sector is, the more it will induce firms to innovate in order to “escape competition” (Aghion et. al. 2005). Of course, a lot depends upon the design of industrial policy. Such policy should target sectors, not particular firms (Aghion 2016). Using Chinese firm-level panel data, Aghion and others (2015) look at the interaction between state subsidies to a sector and the level of product market competition in that sector. They show that TFP, TFP growth, and product innovation (defined as the ratio between output value generated by new products to total output value) are all positively correlated with the interaction between state aid to the sector and market competition in the sector. In other words, the more competitive the recipient sector is, the more positive the effects of targeted state subsidies to that sector are. Infact, for sectors with low degree of competition the effects are negative, whereas the effects become positive in sectors with sufficiently high degree of competition. Finally, the interaction between state aid and product market competition in the sector is more positive when state aid is less concentrated.

Yet, there are externalities that can be tackled without curtailing competition with the potential to have a sizable contribution to broad-based growth and poverty alleviation. These are typically related to informational asymmetries. Bloom and Van Reenen (2010), f or example, show that interventions to improve management practices in Indian small firms can significantly improve productivity. So did the productivity missions of the Marshall Plan in Europe after the WWII (Giorcelli 2019). In the same vein, Atkin et al. (2017) showed that Egyptian rug producers can be helped to access export markets by tackling informational asymmetries and coordination failures. In other words, they showed that interventions such as export promotion agencies can help SMEs advertise their products in foreign markets and act as a communication channel between them and customers. They also showed that export activities helped small producers improve their quality and value added which confirms the importance of export orientation. This focus on SMEs can help increase productivity and tackle inequality at the same time.

The trade-off between the benefits and costs of state intervention suggests that the way the state intervenes in the economy is crucial. This intervention needs to be cognizant of exacerbating government failures such as rent-seeking and corruption. Moreover, even if these interventions are successful in the sense that they create competitive industries and contribute to growth, they should avoid creating “islands” of relatively advanced sectors. If these sectors are disconnected from the rest of the economy, broad-based growth may not be sustained, and it would exacerbate inequality. For example, thanks to interventions and targeted policies, Costa Rica managed to foster a high-tech sector in electronics and health instruments (Spar 1998). Although it led to higher growth and declining poverty as well as productivity improvements in agricultural sectors, high inequality persisted while growth policies for inclusiveness were missing (Ferreira, Fuentes, and Ferreira 2018).

#### 2. No impact---biomedical innovation solves all sustainability arguments.

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New biological capabilities have the potential to bring sweeping change to economies and societies. The effects will be felt across value chains, from how R&D is conducted to the physical inputs in manufacturing to the way medicines and consumer products are delivered and consumed. These capabilities include the following: — Biological means could be used to produce a large share of the global economy’s physical materials, potentially with improved performance and sustainability. Significant potential exists to improve the characteristics of materials, reduce the emissions profile of manufacturing and processing, and shorten value chains. Fermentation, for centuries used to make bread and brew beer, is now being used to create fabrics such as artificial spider silk. Biology is increasingly being used to create novel materials that can raise quality, introduce entirely new capabilities, be biodegradable, and be produced in a way that generates significantly less carbon emissions. Mushroom roots rather than animal hide can be used to make leather.11 Plastics can be made with yeast instead of petrochemicals. — Increased control and precision in methodology is occurring across the value chain, from delivery to development and consumption with more personalization. Advances in biological sciences have made R&D and delivery processes more precise and predictable; the character of R&D is shifting from discovery by accident to rational design. Increasing knowledge of human genomes and the links between certain genes and diseases is enabling the spread of personalized or precision medicine, which can be more effective than the one-size-fits-all therapies of the past.12 Precision also applies to agriculture, where insights from a plant or soil’s microbiome increasingly can be used to optimize yield as well as to offer consumers with, for instance, personalized nutrition plans based on genetic tests.13 — The capability to engineer and reprogram human and nonhuman organisms is increasing. Gene therapies could offer complete cures of some diseases for the first time. The same technical advances that are driving capabilities that improve human health can be used to introduce valuable new traits that, for instance, improve the output or yield of nonhuman organisms like microbes, plants, and animals. Crops can be genetically engineered to produce higher yields and be more heat- or drought-resistant, for instance. By permanently genetically altering the vectors spreading disease (such as mosquitoes), gene drives could be used to prevent vector-borne diseases, including malaria, dengue fever, schistosomiasis, and Lyme disease, although they also come with ecological risks.14 — New methodologies using automation, machine learning, and proliferating biological data are enhancing discovery, throughput, and productivity in R&D. Biology and computing together are accelerating R&D, thereby addressing a productivity challenge. McKinsey analysis in 2017 found that the ratio of revenue to R&D spending in the biopharmaceutical industry hit a low point in productivity between 2008 and 2011.15 An explosion of biological data due to cheaper sequencing can be used by biotech companies and research institutes that increasingly are using robotic automation and sensors in labs that could increase throughput up to ten times.16 Further, advanced analytics, more powerful computational techniques, and AI can be leveraged to provide better insights during the R&D process. — Potential is growing for interfaces between biological systems and computers. A new generation of biomachine interfaces relies on close interaction between humans and computers. Such interfaces include neuroprosthetics that restore lost sensory functions (bionic vision) or enable signals from the brain to control physical movement of prosthetic or paralyzed limbs. Biocomputers that employ biology to mimic silicon, including the use of DNA to store data, are being researched. DNA is about one million times denser than hard-disk storage; technically, one kilogram of DNA could store the entirety of the world’s data (as of 2016).17 While these are early days, the scope and scale of these emerging capabilities could have a broad impact on economies and societies, touching multiple domains both directly and indirectly. These applications may change everything from the food we consume to textiles to the types of health treatments we receive and how we build our physical world. The potential value is vast. As noted, as much as 60 percent of the physical inputs to the global economy could be produced biologically, and even modest progress toward that 60 percent number could be transformative. Beyond the physical world, innovations could transform prevention, diagnostics, and treatment of disease. At least 45 percent of the global disease burden could be addressed with capabilities that are scientifically conceivable today, according to our analysis. Bio innovations, such as high-throughput screening, CRISPR, and machine learning for analyzing large and complex biological data, have also begun to shape R&D. We estimate that roughly 30 percent of private-sector R&D in major economies is in industries where biological data, biological inputs, or biological means of production could be used.18

#### 3. Capitalism solves the rest of their scenarios.

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Discourse on food ethics often advocates the anti-capitalist idea that we need less capitalism, less growth, and less globalization if we want to make the world a better and more equitable place, with arguments focused on applications to food, globalization, and a just society. For example, arguments for this anti-capitalist view are at the core of some chapters in nearly every handbook and edited volume in the rapidly expanding subdiscipline of food ethics. None of these volumes (or any article published in this subdiscipline broadly construed) focuses on a defense of globalized capitalism.1

More generally, discourse on global ethics, environment, and political theory in much of academia—and in society—increasingly features this anti-capitalist idea as well.2 The idea is especially prominent in discourse surrounding the environment, climate, and global poverty, where we face a nexus of problems of which capitalism is a key driver, including climate change, air and water pollution, the challenge of feeding the world, ensuring sustainable development for the world's poorest, and other interrelated challenges.

It is therefore important to ask whether this anti-capitalist idea is justified by reason and evidence that is as strong as the degree of confidence placed in it by activists and many commentators on food ethics, global ethics, and political theory, more generally.

In fact, many experts argue that this anti-capitalist idea is not supported by reason and argument and is actually wrong. The main contribution of this essay is to explain the structure of the leading arguments against the anti-capitalist idea, and in favor of the opposite conclusion. I begin by focusing on the general argument in favor of well-regulated globalized capitalism as the key to a just, flourishing, and environmentally healthy world. This is the most important of all of the arguments in terms of its consequences for health, wellbeing, and justice, and it is endorsed by experts in the empirically minded disciplines best placed to analyze the issue, including experts in long-run global development, human health, wellbeing, economics, law, public policy, and other related disciplines. On the basis of the arguments outlined below, well-regulated capitalism has been endorsed by recent Democratic presidents of the United States such as Barack Obama, and by progressive Nobel laureates who have devoted their lives to human development and more equitable societies, as well as by a wide range of experts in government and leading nongovernmental organizations.

The goal of this essay is to make the structure and importance of these arguments clear, and thereby highlight that discourse on global ethics and political theory should engage carefully with them. The goal is not to endorse them as necessarily sound and correct. The essay will begin by examining general arguments for and against capitalism, and then turn to implications for food, the environment, climate change, and beyond.

Arguments for and against Forms of Capitalism

The Argument against Capitalism

Capitalism is often argued to be a key driver of many of society's ills: inequalities, pollution, land use changes, and incentives that cause people to live differently than in their ideal dreams. Capitalism can sometimes deepen injustices. These negative consequences are easy to see—resting, as they do, at the center of many of society's greatest challenges.3

And at the same time, it is often difficult to see the positive consequences of capitalism.4 What are the positive consequences of allowing private interests to clear-cut forests and plant crops, especially if those private interests are rich multinational corporations and the forests are in poor, developing countries whose citizens do not receive the profits from deforestation? Why give private companies the right to exploit resources at all, since exploitation almost always has some negative consequences such as those listed above? These are the right questions to ask, and they highlight genuine challenges to capitalism. And in light of these challenges, it is reasonable to consider the possibility that perhaps a different economic system altogether would be more equitable and beneficial to the global population.

The Argument for Well-Regulated Capitalism

However, things are more complicated than the arguments above would suggest, and the benefits of capitalism, especially for the world's poorest and most vulnerable people, are in fact myriad and significant. In addition, as we will see in this section, many experts argue that capitalism is not the fundamental cause of the previously described problems but rather an essential component of the best solutions to them and of the best methods for promoting our goals of health, well-being, and justice.

To see where the defenders of capitalism are coming from, consider an analogy involving a response to a pandemic: if a country administered a rushed and untested vaccine to its population that ended up killing people, we would not say that vaccines were the problem. Instead, the problem would be the flawed and sloppy policies of vaccine implementation. Vaccines might easily remain absolutely essential to the correct response to such a pandemic and could also be essential to promoting health and flourishing, more generally.

The argument is similar with capitalism according to the leading mainstream arguments in favor of it: Capitalism is an essential part of the best society we could have, just like vaccines are an essential part of the best response to a pandemic such as COVID-19. But of course both capitalism and vaccines can be implemented poorly, and can even do harm, especially when combined with other incorrect policy decisions. But that does not mean that we should turn against them—quite the opposite. Instead, we should embrace them as essential to the best and most just outcomes for society, and educate ourselves and others on their importance and on how they must be properly designed and implemented with other policies in order to best help us all. In fact, the argument in favor of capitalism is even more dramatic because it claims that much more is at stake than even what is at stake in response to a global pandemic—what is at stake with capitalism is nothing less than whether the world's poorest and most vulnerable billion people will remain in conditions of poverty and oppression, or if they will instead finally gain access to what is minimally necessary for basic health and wellbeing and become increasingly affluent and empowered. The argument in favor of capitalism proceeds as follows:

Premise 1. Development and the past. Over the course of recorded human history, the majority of historical increases in health, wellbeing, and justice have occurred in the last two centuries, largely as a result of societies adopting or moving toward capitalism. Capitalism is a relevant cause of these improvements, in the sense that they could not have happened to such a degree if it were not for capitalism and would not have happened to the same degree under any alternative noncapitalist approach to structuring society. The argument in support of this premise relies on observed relationships across societies and centuries between indicators of degree of capitalism, wealth, investments in public goods, and outcomes for health, wellbeing, and justice, together with econometric analysis in support of the conclusion that the best explanation of these correlations and the underlying mechanism is that large increases in health, wellbeing, and justice are largely driven by increasing investments in public goods. The scale of increased wealth necessary to maximize these investments requires capitalism. Thus, as capitalist societies have become dramatically wealthier over the past hundred years (and wealthier than societies with alternative systems), this has allowed larger investments in public goods, which simply has not been possible in a sustained way in societies without the greater wealth that capitalism makes possible. Important investments in public goods include investments in basic medical knowledge, in health and nutrition programs, and in the institutional capacity and know-how to regulate society and capitalism itself. As a result, capitalism is a primary driver of positive outcomes in health and wellbeing (such as increased life expectancy, lowered child and maternal mortality, adequate calories per day, minimized infectious disease rates, a lower percentage and number of people in poverty, and more reported happiness);5 and in justice (such as reduced deaths from war and homicide; higher rankings in human rights indices; the reduced prevalence of racist, sexist, homophobic opinions in surveys; and higher literacy rates).6 These quantifiable positive consequences of global capitalism dramatically outweigh the negative consequences (such as deaths from pollution in the course of development), with the result that the net benefits from capitalism in terms of health, wellbeing, and justice have been greater than they would have been under any known noncapitalist approach to structuring society.7

Premise 2. Economics, ethics, and policy. Although capitalism has often been ill-regulated and therefore failed to maximize net benefits for health, wellbeing, and justice, it can become well-regulated so that it maximizes these societal goals, by including mechanisms identified by economists and other policy experts that do the following:

* optimally8 regulate negative effects such as pollution and monopoly power, and invest in public goods such as education, basic healthcare, and fundamental research including biomedical knowledge (more generally, policies that correct the failures of free markets that economists have long recognized will arise from “externalities” in the absence of regulation);9
* ensure equity and distributive justice (for example, via wealth redistribution);10
* ensure basic rights, justice, and the rule of law independent of the market (for example, by an independent judiciary, bill of rights, property rights, and redistribution and other legislation to correct historical injustices due to colonialism, racism, and correct current and historical distortions that have prevented markets from being fair);11 and
* ensure that there is no alternative way of structuring society that is more efficient or better promotes the equity, justice, and fairness goals outlined above (by allowing free exchange given the regulations mentioned).12

To summarize the implication of the first two premises, well-regulated capitalism is essential to best achieving our ethical goals—which is true even though capitalism has certainly not always been well regulated historically. Society can still do much better and remove the large deficits in terms of health, wellbeing, and justice that exist under the current inferior and imperfect versions of capitalism.

Premise 3. Development and the future. If the global spread of capitalism is allowed to continue, desperate poverty can be essentially eliminated in our lifetimes. Furthermore, this can be accomplished faster and in a more just way via well-regulated global capitalism than by any alternatives. If we instead opt for less capitalism, less growth, and less globalization, then desperate poverty will continue to exist for a significant portion of the world's population into the further future, and the world will be a worse and less equitable place than it would have been with more capitalism. For example, in a world with less capitalism, there would be more overpopulation, food insecurity, air pollution, ill health, injustice, and other problems. In part, this is because of the factors identified by premise 1, which connect a turn away from capitalism with a turn away from continuing improvements in health, wellbeing, and justice, especially for the developing world. In addition, fertility declines are also a consequence of increased wealth, and the size of the population is a primary determinant of food demand and other environmental stressors.13 Finally, as discussed at length in the next section of the essay, capitalism can be naturally combined with optimal environmental regulations.14 Even bracketing anything like optimal regulation, it remains true that sufficiently wealthy nations reduce environmental degradation as they become wealthier, whereas developing nations that are nearing peak degradation will remain stuck at the worst levels of degradation if we stall growth, rather than allowing them to transition to less and less degradation in the future via capitalism and economic growth.15 In contrast, well-regulated capitalism is a key part of the best way of coping with these problems, as well as a key part of dealing with climate change, global food production, and other specific challenges, as argued at length in the next section. Here it is important to stress that we should favor well-regulated capitalism that includes correct investments in public goods over other capitalist systems such as the neoliberalism of the recent past that promoted inadequately regulated capitalism with inadequate concern for externalities, equity, and background distortions and injustices.16

Conclusion. Therefore, we should be in favor of capitalism over noncapitalism, and we should especially favor well-regulated capitalism, which is the ethically optimal economic system and is essential to any just basic structure for society.

This argument is impressive because, as stated earlier in the essay, it is based on evidence that is so striking that it leads a bipartisan range of open-minded thinkers and activists to endorse well-regulated capitalism, including many of those who were not initially attracted to the view because of a reasonable concern for the societal ills with which we began. To better understand why such a range of thinkers could agree that well-regulated capitalism is best, it may help to clarify some things that are not assumed or implied by the argument for it, which could be invoked by other bad arguments for capitalism.

One thing the argument above does not assume is that health, wellbeing, or justice are the same thing as wealth, because, in fact, they are not. Instead, the argument above relies on well-accepted, measurable indicators of health and wellbeing, such as increased lifespan; decreased early childhood mortality; adequate nutrition; and other empirically measurable leading indicators of health, wellbeing, and justice.17 Similarly, the argument that capitalism promotes justice, peace, freedom, human rights, and tolerance relies on empirical metrics for each of these.18

Furthermore, the argument does not assume that because these indicators of health, wellbeing, and justice are highly correlated with high degrees of capitalism, that therefore capitalism is the direct cause of these good outcomes. Rather, the analyses suggest instead that something other than capitalism is the direct cause of societal improvements (such as improvements in knowledge and technology, public infrastructure, and good governance), and that capitalism is simply a necessary condition for these improvements to happen.19 In other words, the richer a society is, the more it is able to invest in all of these and other things that are the direct causes of health, wellbeing, and justice. But, to maximize investment in these things societies need well-regulated capitalism.

As part of these analyses, it is often stressed that current forms of capitalism around the world are highly defective and must be reformed in the direction of well-regulated capitalism because they lack investments in public goods, such as basic knowledge, healthcare, nutrition, other safety nets, and good governance.20 In this way, an argument for a particular kind of progressive reformism is an essential part of the analyses that lead many to endorse the more general argument for well-regulated capitalism.

Although these analyses are nuanced, and appropriately so, it remains the case that the things that directly lead to health, wellbeing, and justice require resources, and the best path toward generating those resources is well-regulated capitalism. And on the flip side, according to the analyses behind premise 1 described above, an anti-capitalist system would not produce the resources that are needed, and would thus be a disaster, especially for the poorest billion people who are most desperately in need of the resources that capitalism can create and direct, to escape from extreme poverty.21

#### 2. This is a critique of the squo---we solve it.

Fiona M. Scott Morton 20. Theodore Nierenberg Professor of Economics at the Yale University School of Management. “Reforming U.S. antitrust enforcement and competition policy,” https://equitablegrowth.org/reforming-u-s-antitrust-enforcement-and-competition-policy/.

Evidence that antitrust laws are falling short is plentiful. Many cartels go undiscovered, and tacit collusion is probably even more prevalent because it is harder for antitrust enforcers to prosecute and deter.9 Anticompetitive horizontal mergers (between rivals) appear to be underdeterred.10 A variety of clever strategies used by incumbents to exclude entrants, either by purchasing them when they are nascent or using tactics to confine them to a less threatening niche or forcing them to exit have been successfully deployed in recent years, often when antitrust enforcement is late or absent.11

Each of these sources of concern can be critiqued, but together they make a compelling case. Some of the evidence may have benign explanations in part, such as the growing importance of fixed costs, for example, when creating software or pharmaceuticals that leads naturally to higher markups, or the increasing benefit of being on the same platform with other users (known as “network effects” in the case of a social media site). Firms in industries with high fixed costs or large network externalities may exhibit high profits and productivity and low labor shares, and may earn high profits because they had a good idea early and executed well, thereby getting adoption from many consumers.12 Nonetheless, the overall picture is clear that market power has been growing in the United States for decades. Moreover, even where the explanation for growing market power is benign, we must ensure that companies do not use anticompetitive tactics to protect their position.

Firms with market power need not compete aggressively to sell their products, so they tend to raise prices, reduce quality, and/or innovate less. Market power can also contribute to slowed economic growth by, for example, suppressing productivity increases.13 Theoretical and empirical economic studies convincingly show that innovation is harmed by anticompetitive conduct.14

This is why antitrust enforcement is such a terrific policy tool to strengthen competition—it does not come with an efficiency downside, as do most policies that redistribute income. Policies that enhance competition are unambiguously beneficial for efficiency, as well as inclusive prosperity, with minor qualifications.15 Other policies for addressing inequality, in particular, such as labor market and tax policies, may create disincentives or allocative efficiency losses that must be weighed against their distributional benefits. Policies to enhance competition, by contrast, offer what is close to a free lunch.16

#### 4. You can’t just wish away the current system.

Andrew SAYER 95, Reader in Social Theory and Political Economy at Lancaster University [*Radical Political Economy: A Critique*, 1995, p. 33-34]

Any criticism presupposes the possibility of a better way of life; to expose something as illusory or contradictory is to imply the possibility and desirability of a life without those illusions and contradictions. This much has been established by critical theorists such as Habermas and Apel. Yet the notion that critique implies a quest for the good is a highly abstract one. Up to a point, particular critiques do imply something a little more specific than the standpoint of a better life. The critique of capitalism's anarchic and uneven development implies a critical standpoint or contrast space of an imagined society with a rationally ordered and even process of development. The critique of class points to the desirability of a classless society. Naturally, society would be better if its illusions, conflicts and contradictions were reduced, but we naturally want to know how this could be achieved. The desirability of a life without contradictions or illusions does not make it feasible.

Critical social science does not merely identify illusions, irrationality or contradictions but attempts to provide explanations of their sources, locating the 'unwanted determinations' of behaviour, as Bhaskar (1989) puts it. It would be strange, to say the least, if an analysis of the causes of problems such as hunger and exploitation were unable to indicate anything about alternatives which would eliminate them. If a critical theory cannot begin to indicate how to eliminate problems we must inevitably be suspicious of its claims to have identified their causes. If the alternative implied by a critical standpoint is not feasible, then any critique made from that standpoint is thereby seriously weakened. Not to put too fine a point on it, the critique of, say, capitalism's anarchic and uneven development would lose much of its force if all [END PAGE 33] advanced economies were necessarily anarchic and uneven in their development, though one could still criticize advanced economies - not just capitalist ones - from the very different standpoint of a 'deep ecology', calling for a return to small-scale, more primitive economies (Dobson, 1990).

We need to know enough about the critical standpoint and the implied alternative to be able to judge first whether it really is feasible and desirable. Since knowledge is 'situated' and bears the mark of its author's social position, this includes assessing whose standpoint it is made from. Does it privilege the position of a particular group (e.g. male workers, advanced countries)? Does it imply a society without difference? If it suggests greater equality on whose terms is equality to be defined?7 We have also to ask whether remedying one set of problems would generate others (it usually does), and whether these would be worse than the original problems. This is rarely considered in radical political economy, the usual implicit assumption being that all bad things go together in capitalism and all good things under socialism/communism. Yet it is possible that some of the 'contradictions' involve dilemmas which can't be eliminated along with capitalism. Evaluations in terms of desirability therefore need to be cross-checked with assessments of feasibility, and optimistic assumptions of inevitable improvement suspended.

There are two kinds of feasibility which might be considered:

1 whether a certain desired end-state or goal can be realized - for example, how people can be politically mobilized to make it happen; and

2 whether, assuming enough people are willing to try to make it happen, the goal or end-state is feasible in itself, e.g. could one have an advanced economy without money?

It is usually only the first of these questions that radicals address, the standard response to utopian discussions being not 'would it work?' but 'yes but how are you going to get from here to there?' But while many might think it idle to ignore (1), it is surprising how little attention is given to (2), as if the journey mattered more than the destination. I fully accept that I am not offering suggestions on (1) in this book, and only ideas pertinent to (2): but then I don't see how large-scale political mobilization can precede a well-worked out conception of a feasible alternative.

#### 6. The left is ineffective at best and incoherent at worst.

Epstein 14 (Barbara, author, former Professor Emerita in the Humanities Division @ UC Santa Cruz, “Prospects for a Resurgence of the U.S. Left”, Tikkun, Volume 29, Number 2, Spring 2014, Project Muse)

The United States has no coherent, effective Left. Over the last four decades, since the movements of the sixties and seventies went into decline, the problem of the degradation of the environment has reached a level that threatens the existence of humans and other species on the planet. The neoliberal form of capitalism that has taken hold globally has caused the gap between the wealth and power of those at the top and the rest of us to widen dramatically, undermining the quality of life of the majority and threatening the public arena itself. Despite the depth of the economic crisis of 2008, there is no substantial movement for the abandonment of neoliberalism, the regulation of industry, or the creation of a more egalitarian economy. The environmental movement has grown, but not to the point of having the capacity to reverse environmental degradation. There are undoubtedly more people and projects devoted to economic and social justice—and to environmental sustainability—than there were in the sixties and seventies. The problem has to do with collective impact. No movements of the Left have emerged capable of making a real difference in the conditions that we face. Why is this? And what can be done about it?¶ A Fatalistic Approach to Gradual Crises¶ The weakness of the Left is partly due to the fact that these problems have come upon us gradually, allowing us to accommodate ourselves to them. The widening of the gap in wealth and power has been for the most part incremental; it is only in retrospect that one can see how dramatic the effect has been. The same is true of the working day, which has been lengthened, for most people, bit by bit, but at no point by enough to lead to a widespread revolt. Something similar could be said about the environment. Environmental crises for the most part take place somewhere other than where one lives. Such crises are increasingly severe and increasingly common, and there is widespread awareness that at some point in the future we are all likely to be directly affected. But a future crisis does not have the mobilizing capacity of a crisis that confronts one in the present. Most people, including those who are aware of the depths of these problems, go about their business, doing what they—we—have always done, though with increasing apprehension about the future.¶ “The environmental movement has grown, but not to the point of having the capacity to reverse environmental degradation,” Epstein writes. Environmental activists march in Detroit to protest its air-polluting incinerator.¶ “The environmental movement has grown, but not to the point of having the capacity to reverse environmental degradation,” Epstein writes. Environmental activists march in Detroit to protest its air-polluting incinerator.¶ A widespread sense that nothing can be done is probably an even more significant obstacle to effective, collective action than the gradual character of these changes. Mobilization against a system, an institution, or a ruling elite is most likely to take place when it seems not only oppressive but also outmoded, on the way out, or at least on the defensive. The Civil Rights Movement had existed since World War II but gained momentum in the late fifties and early sixties, when the international aspirations of the United States made racism at home a serious embarrassment. Feminism likewise took hold on a mass basis when the entry of women into the labor force on a large scale placed patriarchal authority in question and gave women the leverage to demand equality. Movements for change are most likely to take hold when change seems possible, when there are levers that can be grasped, as when oppressive institutions seem ready to collapse or are widely seen as illegitimate. It helps when some of those in positions of power agree that the existing system is not working and support change. The depression of the 1930s affected the corporate class as well as the rest of society, though not nearly as badly; fear of a continuing downward economic spiral led some among the elite to agree that changes of some sort were necessary. In the wake of 2008, while most people have suffered economic reverses, corporate profits have more than recovered. Neoliberal capitalism is thriving, at least if measured by corporate profits.¶ The Left is weakened by its deep generational divide and by the fact that “white leftists tend to know little about movements of the Left among people of color,” Epstein writes. Here, members of a Latina immigrant organization participate in a May Day rally in San Francisco.¶ Click for larger view¶ The Left is weakened by its deep generational divide and by the fact that “white leftists tend to know little about movements of the Left among people of color,” Epstein writes. Here, members of a Latina immigrant organization participate in a May Day rally in San Francisco.¶ This is not to argue that movements of the Left take shape and grow only when conditions are propitious. Left-led resistance movements formed in the major ghettos of German-occupied Central and Eastern Europe, despite the fact that the deaths of those involved seemed the most likely outcome. Slave revolts took place in the West Indies and the American South under similar circumstances. But when circumstances are difficult, oppositional movements are most likely to take hold when there are stable organizations that provide a sustained, reliable framework for action, and when such movements have compelling goals and a clear conception of how to achieve these goals—that is, a strategic perspective. The current U.S. Left has none of these.¶ Fragmentation and Generational Divides¶ The major organizations of the Left that once provided the framework for ongoing collective action and strategic discussion either no longer exist or have atrophied. There are large numbers of progressive nonprofits but few organizations that those who want to make a difference, but lack special skills or expertise, can join and work with. Among young people, leftist activist projects thrive, but they tend to come and go. The most stable and influential institutions of the Left are its media outlets: published and online journals, radio stations, a few left-wing presses, and books with a left-wing perspective published by mainstream presses. The central role of media leads to a Left that is defined more by what people read and what opinions they hold than by their associations or their practical activity.¶ We have a fragmented Left held together by a vague commitment to a more just, egalitarian, and sustainable world, but in practical terms lacking a common focus or basis for coordinated action. The fragmented and fluid character of the Left reflects the fragmentation and fluidity of contemporary society: there is probably no going back to the structured and stable organizations of the past (the Socialist Party, the Communist Party, or even the Students for a Democratic Society) consisting of members who were likely to remain active and engaged for many years. But a Left based on individuals with leftist views and a plethora of frequently ephemeral projects has little ability to consider its collective direction and less influence than its numbers would warrant.¶ The Left is weakened especially by the deep divide between the older generation, veterans of the movements of the sixties and seventies, now in their sixties or older, and the younger generation, in their early forties or younger. The outlook and vocabulary of the older generation, shaped for the most part by perspectives ranging from Marxism to social democracy, tends to clash with the outlook of the younger generation, among whom anarchism has been a major influence. The result is little contact and less cooperation between activists of the two generations. In addition, white leftists tend to know little about (and have little contact with) movements of the Left among people of color. And the sector of the Left that consists largely of professionals and intellectuals has little contact with the labor Left.¶ The most promising sector of the U.S. Left is the arena of youth activism that tilts toward anarchism and that was at the center of the Occupy movement. Activists in this arena share an opposition to all forms of oppression (racism, sexism, homophobia, and others), a dislike of hierarchy and a deep suspicion of the state, a vision of an egalitarian, cooperative, and decentralized society, and a desire to model that society in their political practice. Many would include an explicit opposition to capitalism.¶ The Occupy movement was shaped by the idealism, energy, and commitment of a politics influenced by what some call anarchism and others call anti-authoritarianism. Occupy’s protest against the consolidation of wealth and power among the few plus the utopian quality of Occupy communities led to explosive growth of the movement and massive public support. But when police closed the encampments, the movement, as a mass movement, soon collapsed. Valuable organizing projects spun off, but these are quite different from Occupy. One may criticize Occupy activists for not having given much thought to what form the movement would take after the inevitable police closures. But the episodic, fleeting character of Occupy is shared by movements around the world: an incident sets off protest over long-standing grievances, protest mushrooms into a mass movement, the protest is repressed, and the movement collapses, having altered public discourse but leaving no organization or institution capable of bringing about social change. This is the weakness of the ascendant form of leftist or protest politics that emphasizes spontaneity and avoids organizational forms able to last.

#### 8. Causes rationing and wait times---Venezuela, Canada and Britain prove. There’s no reason the US is different.

Conover, 17

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The #3 reason Medicare-for-All as conceived by Senator Sanders is a bad idea is because of the inevitable rationing it will produce. In other well-known single-payer systems, this rationing takes several forms, including restrictions on the availability of treatments or, more commonly, rationing by waiting.

Rationing Availability of Services

Rationing of services can occur in two ways. The first is through deliberate administrative decisions not to cover certain expensive medical technologies.

The second is through the inevitable shortages that arise when monopoly public payers impose price controls that underpay providers. Venezuela is a classic illustration of this: "free" care there has resulted in an 85% shortage of medicines along with and a 90% deficit of other medical supplies used to treat severe conditions like cancer and hemophilia. USA Today reports that "more than 13,000 doctors — about 20% of medical personnel — have left the South American country in the past four years to find better opportunities elsewhere." Other estimates put the figure at 15,000 doctors who have left shortages of drugs and equipment and poor pay. Consequently, the situation has gotten to a point where thousands are dying early as the medical system implodes there.

While we might think or hope Venezuela is a worst-case outlier, the reality is that we already see signs of this in the U.S. where physician underpayment and red tape associated with Medicaid has resulted in physician non-participation rates as high as 32% in states such as NJ. Because it pays more generously than Medicaid, Medicare is not quite as bad, but Medicare non-participation exceeds 20% in states such as Nevada and Virginia. And the Medicare actuary has been warning for years that under Obamacare, this situation is likely to get far, far worse after 2030 as the law's payment restrictions ultimately force Medicare physician payment rates below those of Medicaid!

Source: Memo from John D. Shatto and M. Kent Clemens, “Projected Medicare Expenditures under an Illustrative Scenario with Alternative Payment Updates to Medicare Providers,” July 13, 2017, at https://www.cms.gov/Research-StatisticsData-and-Systems/Statistics-Trends-and-Reports/ReportsTrustFunds/Downloads/2017TRAlternativeScenario.pdf.

And there is no question that rationing is such an enduring feature of Britain's National Health Service that the Nuffield Trust has written an entire report on the matter: Rationing in the NHS. As I explained recently, advisory committees to NICE (the National Institute for Health and Care Excellence) use a threshold for recommending treatments of between £20,000 and £30,000 per quality adjusted life year (QALY). Since 1 British pound currently equals $1.29 in American currency, that translates into roughly $26,000 to $39,000 per QALY.

This is not a hard and fast ceiling: as explained in the Nuffield Trust report: "NICE recommends when people should and should not receive treatment, but its general guidance (in contrast with its technology appraisals) is not binding. 15 Clinical Commissioning Groups (CCGs) are responsible for planning and commissioning of health care services for their local geographic area. So there ends up being differences across CCGs in terms of the circumstances under which caesarean births are covered, for example. That said, there are unquestionably instances in which medications are denied altogether on

grounds they are too expensive.

Medicare currently spends approximately $88,000 a year on kidney dialysis for each patient who has end-stage renal disease. Without it, such patients would die. So Americans evidently are willing to pay $88,000 for one added year of life. But taking into account the average quality of life of kidney dialysis patients implies a cost/QALY of $185,000 [1].

This amount is substantially larger than the NICE cost-effectiveness threshold. In fairness, U.S. GDP per capita is 34% higher than in the UK, but even if we adjust the threshold to account for this (lifting it to between $35,000 and $52,000), the cost/QALY for kidney dialysis still would fall quite far beyond its upper limit. If Senator Sanders is such a fan of the NHS, he probably should explain whether he favors following their stringent cost-effectiveness guidelines by denying coverage for kidney dialysis or whether instead he believes the NHS instead has made a terrible mistake in setting its threshold too low.

Rationing by Waiting

Rationing by waiting also is a persistent feature of both the NHS and Canada's single-payer health system. According to the most recent annual report from the Fraser Institute "The median wait time in Canada in 2016 was 20 weeks—the longest ever recorded—and more than double the 9.3 weeks Canadians waited in 1993, when the Fraser Institute began tracking wait times for medically necessary elective treatments." In short, this is a problem that is non-trivial in magnitude but which also appears to be systematically growing over time.

We also have solid evidence from Canada that under single-payer health systems, physicians deliberately reduce the supply of their services. That is, the waiting time problem is a combination of the excess demand that arises under "free" care (discussed in Part 2) and a shrinkage of supply, which simply aggravates the situation [2]. As summarized by Wharton School chaired professor Patricia Danzon a quarter century ago: "In Quebec, in the two years immediately after the introduction of universal health insurance, home visits dropped by 63 percent, telephone consultations fell by 41 percent, physician time spent per office visit declined by 16 percent, and office visits rose by 32 percent." I cannot think of any reason to believe that American physicians would respond any differently were a single-payer system adopted here.

Single-payer enthusiasts claim that single-payer systems provide more physician care than in the U.S. In Japan, for example, the latest OECD data show that annual physician visits per capita in Japan (12.8), for example, is three times as high as in the U.S. (4.0). But as Prof. Danzon astutely points out, the average Japanese patient sees the doctor for a mere 5 minutes per visit, whereas the average American's doctor visit is 15-20 minutes. So the total amount of MD face-time appears to be comparable in both countries, but in Japan it is inefficiently allocated across 3 times as many visits, each of which has a hidden time cost. A recent Harvard study shows that a typical American doctor appointment (average length 20 minutes) actually took 121 minutes inclusive of travel, waiting, paying, and completing paperwork.

Even if this figure is only half as large in Japan due to lower administrative costs (an assumption, not a proven fact), it implies that the average Japanese patient incurs 50 minutes of time costs per visit, so the "excess" 8.5 visits they receive each year translate into about 7 hours of wasted time every year. Multiply this times 250 million adults in the U.S. and the result would be 1.75 billion wasted hours. At the most recent U.S. average hourly wage of $26.52, this would translate into $46 billion a year of wasted time just for physician care alone.

But time spent waiting is not limited to physician services. In Canada, hospitals are paid a fixed budget per year giving the perverse incentive to fill their beds with low-cost "bed-blockers" (the mere fact this problem has a name illustrates its pervasiveness). Canada has the same supply of hospital beds per capita as the U.S. (2.7/1,000 population). But the average length of stay in Canada is 36% higher (7.5 vs. 5.5 days) in part because, as Prof. Danzon explains, "more hospital beds in Canada are occupied by elderly patients with average length-of-stay of over sixty days, despite waiting lists for acute care admissions." The consequence is avoidable suffering as patients wait months rather than weeks for various types of surgery.

How Much Rationing Would There Be Under Medicare-for-All?

Prof. Danzon's study is a quarter-century old, but it is the best stab I've seen at trying to quantify the hidden burden imposed by rationing in the Canadian health system.

On the physician side, she concluded that patient time costs under a single-payer health system likely amounted to anywhere from 10 to 110 percent of spending on physician services. This is a conservative calculation insofar as it assumes that care is rationed to its highest-valued uses. If this is incorrect, then there would be an additional hidden cost associated with failures or delays in treating the most serious illnesses. Government actuaries project we will spend $717 billion on physician services in 2017, meaning Medicare-for-All would impose anywhere from $72 to $789 billion in hidden costs not included in the Urban Institute estimates of the cost of the Sanders plan.

On the hospital side, she synthesized findings from several Canadian studies to conclude that the foregone health benefits of excessive waiting times likely amounted to at least 7 percent of hospital spending but possibly could be as high as 11 percent. In light of projected 2017 hospital expenditures of $1.141 trillion in 2017, this implies a hidden cost of between $80 and $126 billion were we to bring Canadian-style health care to the U.S.

So the grand total hidden cost associated with the kinds of rationing typical in the Canadian-style single-payer approach proposed by Senator Sanders would range from $152 to $914 billion a year.

These are extremely conservative figures, as they do not even attempt to account for the adverse effects on health and longevity from the exclusion of certain high-cost medications that would be likely under single-payer health care.

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#### Financial stability is improving. Ignore fear mongering.

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There are good news: near-term financial stability risks are lower, driven by a decline in macroeconomic and emerging market risks.

As outlined in the IMF’s most recent World Economic Outlook, the upswing in global activity has gained further steam, with global growth projected to rise to 3.6 percent in 2017 and 3.7 percent in 2018—in both cases 0.1 percentage point above our previous forecasts, and well above the global growth rate of 3.2 percent in 2016. This is laying hopes for a sustained recovery and should allow for the eventual normalization of monetary policies.

The core of the global financial system is stronger. Systemically important banks and insurers continue to enhance their resilience by raising capital and liquidity, addressing legacy issues, and adapting their business models to the evolving regulatory and market environment.

In emerging markets, capital flows are rebounding, driven in part by stronger fundamentals. Portfolio inflows to emerging market economies are on track to reach $285 billion in 2017, more than twice the total over the past two years. The cost of financing is low, and their currencies and equity prices have strongly appreciated this year.

Globally, supportive monetary and financial conditions and buoyant financial markets have helped foster growth and repair balance sheets.